Responsible Consumption Choices and Individual Values

By

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School of Economics
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A dissertation is submitted to the School of Economics, Quaid-i-Azam University, Islamabad in partial fulfillment of the requirement for the Degree of Doctor of Philosophy **(Ph.D.) in Economics**

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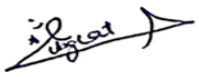

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No part of this thesis has been submitted anywhere else for any other degree. This thesis is submitted to the School of Economics, Quaid-i-Azam University, in partial fulfillment of requirements for the degree of Doctor of Philosophy in the field of Economics, School of Economics, Quaid-i-Azam University, Islamabad.

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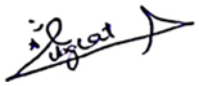

Syed Sibghatullah Shah

Abstract

The study probes the role of social learning in responsible consumption choices, deploying the DeGroot Social learning process as a theoretical framework. It scrutinizes the mechanisms through which individuals assimilate knowledge about the intrinsic value of nature, using information dissemination and network communication within social constructs, thereby shaping their consumption choices in line with the wisdom of the crowd. Two propositions and deduced assumptions are formulated on the consensus phenomenon, with findings suggesting that rational individuals tend to rely on a combination of personal experience, perception, and intellect, thus steering society towards responsible consumption choices (RC*). However, bounded rationality or irrationality skews this trajectory, resulting in a consumption network devoid of wisdom and diversity.

Through using the Friedkin-Johnsen model, we shed light on the complex impact of informational inducements and social synergies on individual consumption behaviours. The incorporation of anticipation utility in our model elucidates the relationship between individuals' beliefs about their future consumption state and their current happiness, while also considering the influence of external factors such as friends, neighbours, and social media. Results indicate that information-loving societies tend to conform quickly to group opinions, potentially leading to inefficient choices. Conversely, information-averse societies may display a lack of consensus due to inconsistent choices. Individuals with high self-confidence and self-control are more likely to resist peer pressure, aligning their decisions with their values and goals. Additionally, the study introduces a utility function, drawing on data from the World Values Survey of 460,000 individuals across 90 countries. It underscores the significance of instilling values of thrift and self-control which lead to delayed gratification, particularly among children and youth, as a conduit to responsible choices in future.

We delineate an algebraic socio-economic interaction-based policy framework for actualizing responsible consumption and production, categorizing economic agents into State (S), corporations (C), groups (G), and individuals (L). This framework systematically encapsulates the diverse socio-economic interactions within and between these entities. The governmental domain (State) S is symbolized by the finite algebra $\mathbb{Z}_p$, encompassing p functional categories (vectors) labelled $0,1,\ldots,p-1$, each signifying a distinct economic indicator. The proposed conceptual model through employing vector spaces expedites the comprehension that effective resource allocation within society emerges through harmonized

efforts and mutual trust among economic agents. The application of reflective equilibrium facilitates the bridging of the intention-behaviour gap by fostering mutual coordination among economic agents in the articulation of responsible conduct. In conclusion, this research highlights the essential role of individual values and social interactions in shaping responsible consumption choices. It underscores the importance of targeting values and beliefs for behaviour change. This study provides valuable insights for developing interventions and policies, particularly relevant in Pakistan's socio-economic context for aligning local economic imperatives with global sustainability goals.

Keywords: Wisdom of the crowd; DeGroot Social learning; Socio-economic Interaction; Responsible consumption; Anticipation utility; Rationality; Bounded Rationality; Reflective equilibrium; World Values Survey; Trust.

Chapter 1

Introduction

" The golden mean or golden middle way is the desirable middle between two extremes, one of excess and the other of deficiency".

Aristotle, Nicomachean Ethics

Decisions come in wide varieties, some whimsical and some profoundly consequential. We use our reason for the more challenging decisions, but this is not to say that it is simply a rational calculation. Our value system conditions our faculty of reason. If, for instance, we value *intellect* more than physical strength, it emphasizes more in developing our intellect through study rather than our bodily strength. It is not a logical calculation since top athletes, actors, and influencers can earn much more than top professors if money is our yardstick. We value the intellect more because of our value system, where, for instance, as a child, our parents instilled in us the notion that having *"brains"* is better than having "*brawn"*. Why is it better? It might not be as lucrative or pleasurable since one can make much money and enjoy much satisfaction playing sports. So why this emphasis on learning and the development of the intellect?

Our values are shaped by our elders and leaders, who in turn have their values shaped by our society's prevailing norms, expectations, and values. If warriors were whom our society valued, we would have been training to become fighters. The problem arises when our predispositions are out of alignment with the value system of our society. The point is that no brief aphorism will be our guiding star out of the complexity of our lives. Whatever answers we shall find, do not expect them to be straightforward or universally applicable to everyone and in all situations. Similarly, economic theories will require nuance and, in some situations, may seem contradictory to what might appear to be best.

The concept of "Homo economicus" posits that individuals are rational beings who possess complete information and are capable of making optimal choices to maximize their utility, as described by (Marshall, 2009). This viewpoint suggests that previous choices do not affect long-term spending decisions and that there is no

correlation between the expenditure patterns of different individuals. Nonetheless, it is important to acknowledge that our current level of consumption is also influenced by societal consumption norms and patterns, (Smith, 1937). Despite this, social connections and values can impact decision-making, and individuals may act "bounded" by limitations such as incomplete information, time constraints, or motivation, leading to satisfactory rather than optimal outcomes, as discussed by (Simon, 1956:1957; Kahneman and Tversky, 1979). Furthermore, individuals may encounter obstacles when resisting immediate pleasure and overspending due to self-control problems. On the other hand, the behaviourist approach suggests that human choices are influenced by innate biological drives or external stimuli, rather than individual cognition, (Freud, 2003).

The intricate nature of the human psyche, encompassing cognition, emotion, and attitude, significantly influences consumer choices (Walters, 1974). Consumption is when individuals routinely allocate their time, money, and energy toward acquiring goods and services (Colloredo and Delgaty, 2022).Consequently, pinpointing the exact motivations driving purchases becomes challenging. Advocates of hedonism assert that a fulfilling life stems from material success, well-being, and a sense of purpose. Conversely, proponents of eudaimonia prioritize spirituality, serenity, and strong familial bonds, viewing the pursuit of materialism as detrimental. Established religions offer value systems that promote responsible consumption and production guided by spiritual principles, moving away from materialistic tendencies. In traditional societies, an individual's standing was moulded by religious dedication, family connections, and social involvement. However, the shift toward consumer-focused systems has led to a society where an individual's worth is increasingly linked to the quantity, type, and quality of possessions they possess. A comprehensive understanding of consumption choices necessitates the integration of cultural and scientific aspects of human life.

The foundations of consumerist society can be traced back to ancient times, but its significant surge occurred in the 18th century when a consumption cycle emerged. This cycle led individuals to seek similar products not solely for utility, but to enhance their social standing (Kotler, 1971). This trend has been linked to eroding social bonds and fostering cultural dominance and social manipulation through branding. Consequently, the allure of a product's aesthetics often surpasses its

functionality, fostering conspicuous consumption and leisure (Veblen, 2005). Corporations capitalize on this notion by promoting self-expression, distinctiveness, and personal development, creating a hypothetical scenario where commodities equate to happiness. Advertisements frequently tap into individual cultural values, making consumption seem more acceptable, thereby driving higher consumption rates in pursuit of fulfilment and self-actualization. Environmentalists have recently critiqued consumerist societies for their detrimental ecological impacts, encompassing resource depletion and climate change (Gail, 2019).

The concept of "responsible consumption" encompasses environmentally conscious consumption and consumer responsibility in areas with environmental impacts and social, economic, and health implications. On the other hand, "sustainable consumption" refers to conserving resources and the environment by purchasing greener products, reducing food waste, and recycling. This study investigates intricate consumption patterns within the framework of individuals' varying degrees of rationality, including perfect, bounded, and imperfect rationality. These rationality modes are analyzed about the presence and accessibility of information. Individuals with a predisposition for conformity may exhibit irrational behaviour and fall into the trap of following the crowd. Bandwagon effect is sort of adoption of beliefs, trends, ideas, and fads of others. In this phenomenon, individuals derive information from others and acquire a, style, or attitude and value of a good increase along with the increase in the number of buyers or users (Leibenstein, 1950). This contradicts with classical supply and demand model in which consumption decisions are based solely on the preference of his own along with price mechanism As such, this work explicates the interconnection between values and consumption choices based on the *social learning framework.*

Our study aims to elucidate the reasons behind compliance attitudes for consumer preferences and the underlying intuitions regarding the convergence and divergence of choices towards the social optimum. If choices are sequential, there are chances that individuals will eventually reach a point where they make decisions based on previous choices made by others. However, as this phase is reached, our choices become less productive for others, and external disturbances become necessary to update information patterns.

Within the realm of social influence, individuals exhibit alterations in their

behaviours and viewpoints as a consequence of perceiving the perspectives of others. This phenomenon is attributed to various factors, including compliance, socialization, persuasion, deference, and the impact of leadership. The efficacy of this influence is contingent upon the assessment of the prevailing viewpoints within one's immediate social group, as well as the extent of connectivity and relational ties they maintain within their broader social networks. It depends on the nature of our surroundings including people, their values and the type of environment. In the case of homogenous preferences, individuals possess direct information linkages within-group compared to cross-group. One individual can directly observe everyone else in society then the global interaction phenomenon emerges in the long run leading to stationarity.

Past decisions often guide future actions, and many instances of collective behavioral imitation have been modelled using sequential learning models. Herd behavior, as expounded upon by (Banerjee, 1992), exemplifies a paradigm of collective cognitive bias, wherein a multitude of individuals converge upon a uniform decision-making course. Informational cascades occur when the initial actions of a few people provide compelling evidence that subsequent actors no longer have reason to conceal their private information (Bikhchandani et al., 1992). A society's convergence can be gauged by how rapidly its beliefs shift in response to new individuals' actions (Smith and Sorensen, 2000). Social learning models and asymptotic convergence rates have been widely employed to investigate inference processes (Duffie et al., 2009). *However, there is surprisingly little empirical data on how individuals should acquire and transmit information to promote responsible consumption and production.*

Therefore, there has been a shift in the scientific literature towards using natural and field experiments based on real-life examples (Manski, 1993). Specific questions need to be addressed; Can intimation *be considered a rational choice?* Do people learn enough to make valuable consumption decisions? Is *limited information* a hindrance to attaining responsible consumption? What criteria should be for designing economic institutions to make social learning more effective and responsible? In learning models, experience improves individual choices while changing environments worsen them. Therefore, describing circumstances that help formulate responsible consumption choices is necessary. There are three characteristics based on which learning takes

place: the *rationality of the individual, strategic environment, and information collection mechanism*. Individuals can collect information actively and passively. Active learning entails costs for research and testing, while passive learning represents an adaptive process with no immediate impact on data quality or quantity. Nevertheless, the expenses incurred in acquiring information are not straightforward, as they contribute to refining future decision-making based on prevailing suboptimal choices.

Most learning models presume that agents have incomplete information and are not completely rational (Sobel, 2000). In statistical learning models, information arrives at each period independent of the decision-maker's actions. Therefore, stationarity can be anticipated if product information is readily available, resulting in complete learning from the environment. Conversely, optimality is unavoidable if the learning cost exceeds the benefits. Furthermore, *we contend that digitization and the availability of inexpensive mechanisms have minimized the cost of information acquisition, making it possible to act entirely rationally based on reasoning, which might ultimately lead to a wise society.* In today's society, individuals are increasingly viewed as interconnected nodes within a network, necessitating examining how these connections influence individual thoughts and behaviors. When individuals discuss "conformity," they refer to the subconscious process of adjusting their beliefs and behaviors to align with the group. Cascade effects are also observed, where a few individuals adopt a new idea, fad, fashion, or technology that can trigger a chain reaction, leading to widespread support for the idea. This phenomenon underscores the importance of considering social influences in decision-making processes.

The phenomenon of convergence, defined as the gradual agreement of group members on a single point of view, is ubiquitous in all forms of communication, from traditional word-of-mouth networks to contemporary social media platforms. The tendency for individuals' opinions to converge toward one another, known as the "funnelling effect," is heightened by the degree of connectedness in a group's power structure. Additionally, the general structure of the observation network influences aggregates social outcomes, such as the presence or absence of asymptotic learning. Therefore, the network structure provides a basis for evidence-based insights into behavior, informing policy actions to enhance well-being. Similarly, in consumer-oriented societies, individuals are more likely to adopt or converge towards the

behaviors of the majority, resulting in a vicious cycle of debt. An example of this can be culture of dory persistent in Asian societies, it does not matter whether bride parents are poor or rich, they are equally attracted to those norms of society because of interconnections among heterogeneous agents and media influence in society. Due to social norms, values, and connections forced to converge towards utility mechanism of majority.

The escalating emphasis on sustainability and ethical practices underscores the significance of responsible consumption and individual values. This study delves into the interplay between individual values and responsible consumption choices, spotlighting consumption as a social learning process. It scrutinizes the drivers of responsible consumption choices within society, with a particular focus on the pace of convergence. The research integrates cultural and individual factors tied to thrift and self-control. Subsequent sections offer an in-depth examination of these variables and their impact on responsible consumption decisions. Moreover, a policy framework grounded in socio-economic interactions aims to enhance comprehension of the intricate determinants shaping responsible consumption behaviors.

1.1 Objectives of the study

This study will investigate consumer behaviour through diverse methodological approaches, including Peron Frobenius's Theorem and centrality analysis. These techniques are utilized to identify influential societal members who shape consumer preferences (Golub and Jackson, 2010). A graphical representation of the eigenvalue plot is employed to determine the duration required for reaching a consensus. A double-stochastic consumption network depicts the conditions necessary for a wise society, serving as a fundamental antecedent to the adoption and integration of the responsible consumption and production framework. The study also examines whether a more interconnected or informed population is better equipped to adopt responsible consumption choices.

Friends and family are trusted sources of information while making social and economic decisions. For example, Fertilizer discussions among farmers, political

conversations among friends, and dissemination of information about urban legends and promising investments all prove the effectiveness of word of mouth in these instances. Studying how individuals learn from one another has inspired much of the oldest and most significant empirical research on social networks. Recently, there has been a surge in the literature that draws on empirical and experimental data on social learning. In this essay, we try to take both theoretical and empirical perspectives and suggest new avenues for studying responsible consumption choices.

The primary objectives of this study are as follows:

(i) To theorize a model underpinned by deduced assumptions, elucidating responsible consumption choices in conformity with individual values, defined through DeGroot's social learning process

(ii) To identify whether responsible consumption is attainable in a society with social influence.

The factors affecting the consumer decision-making process and their tendency to help attain sustainable outcomes will be evaluated based on the objectives below.

(iii) To explore the role of thrift, self-control, and delayed gratification in shaping individuals' responsible consumption and production of choices

(iv) To develop and evaluate the effectiveness of a socioeconomic interactions framework for facilitating responsible consumption and production choices among individuals, groups, corporations, and government entities.

1.2 Significance of Study

The significance of this research stems from the escalating importance of responsible consumption in contemporary times, driven by heightened awareness among individuals regarding the far-reaching implications of their purchasing decisions on the environment, society, and personal well-being. Consequently, an increasing emphasis has been placed on comprehending the factors that shape consumer behavior and foster the adoption of sustainable practices. A pivotal determinant influencing consumer behavior lies in individual values – the foundational principles that underpin our convictions, attitudes, and actions. Insight

into the role of values in shaping consumer behavior carries the potential to inform the strategies of policymakers and marketers, facilitating the development of targeted interventions to propel responsible consumption practices.

This study aims to rectify several gaps present within the economic literature. To begin, it seeks to expound a theory that illuminates the rationale underpinning individuals' responsible consumption choices vis-à-vis their inherent values. Preceding scholarly works at times encounter limitations due to overly simplistic mathematical suppositions that hinder a comprehensive explanation of the intricate social complexities inherent in societal contexts. Acknowledging the insights of (Heider, 1946; Newcomb, 1953) concerning the dynamics of two-person groups underscores the necessity of accounting for prevailing thought patterns and interconnected relationships as integral components of a broader systemic framework. Generalizing this perspective to N-person groups, encompassing intricate webs of power dynamics, interaction patterns, and opinion interrelations, unveils a complex tapestry of relationships. Mathematical models, originating from a foundational set of assumptions and definitions, offer a logical underpinning for analysis. However, the current state of knowledge remains insufficient to thoroughly elucidate consumption choices, thereby necessitating the proposition of adaptable ideas poised for further development as empirical understanding evolves.

Notably, the United Nations Sustainable Development Goal 12, which pertains to responsible consumption and production, assumes paramount significance and holds interconnectedness with other sustainable development objectives. The model presented herein leverages assumptions derived from the DeGroot social learning process. Moreover, the intricate interplay of divergence and convergence in consumption choices contingent upon information accessibility and collective wisdom remains unexplored in preceding socioeconomic consumption analyses. Additionally, this research delves comprehensively into the myriad social, cultural, and economic factors that wield influence over consumption choices, thereby engendering a holistic understanding of the subject matter.

1.3 Research Questions

Embedded within the fabric of human decision-making, culture functions as a substantial strand that exerts notable influence on the intricate processes of choice-

making concerning consumption and the assessment of commodities. The cultural nuances encompassed within this weave encompass elements of domestic dynamics, encompassing factors like household size and the roles assumed by women in composing the day-to-day functions of domestic life. These nuances contribute to a distinct resonance in the manner through which products are acquired—instilled with attributes of quality, quantity, and dimensions, which harmonize with the rhythms of cultural underpinnings. Remarkably, the aspirational peak embodied in the United Nations Sustainable Development Goals projects a steadfast yet enigmatic presence, awaiting illumination through a comprehension of the individual values that serve as the bedrock for consumption choices. In the pursuit of our stipulated objectives, empirical validation of the conceptual framework becomes imperative, necessitating a trajectory guided by inquiries that establish a conduit toward the articulation of a model for responsible consumption. Central to our investigation resides a pivotal question of paramount significance which is,

(i) What are the dynamics of consumption choices in conformity with individual values?

In this study, we aim to dissect the intricate relationship between individual values and consumption choices, exploring the role of information availability and external influences in shaping these decisions. We seek to unravel the dynamics of opinion divergence and convergence while addressing broader questions about the feasibility of responsible consumption and production within an informed and wise society. Additionally, the impact of modern phenomena such as advertisement, the digital economy, evolving trust dynamics, and the potential of responsible consumption and production practices to mitigate environmental challenges have been examined in depth in chapters 3 and 4.

(ii) How do thrift, self-control, and delayed gratification influence the development of responsible consumption and production choices among individuals?

(iii) To what extent can a socioeconomic interactions framework be devised to effectively promote responsible consumption and production decisions across

a spectrum of stakeholders, encompassing individuals, groups, corporations, and government entities, and what policy framework is optimal in achieving this objective?

These research questions delve into distinct aspects of responsible consumption and production choices. The question (ii) investigates the psychological and behavioral factors that contribute to responsible consumption traits, namely thrift, self-control, and delayed gratification. This exploration is rooted in data collected from a World Values Survey, providing insights into how these individual traits interact with values to shape consumption and production decisions.

The Question (iii), on the other hand, shifts focus towards the development of a broader framework. This inquiry aims to address the design and implementation of a socioeconomically driven interaction framework that fosters responsible choices across various entities. Moreover, the question delves into the identification of policy frameworks that are most effective in realizing responsible consumption and production outcomes within the context of this proposed framework. Overall, these research questions encapsulate both individual-level psychological determinants and broader policy considerations in the pursuit of understanding and promoting responsible consumption and production behaviours.

1.4 The Scheme of the Study

The preface serves as an introductory section, delineating the contours of the study by foregrounding the research question, objectives, and the broader significance of the research endeavor. Within the inaugural ***chapter 2***, an abridged overview of existing literature is presented, expounding upon the concepts of individual values and their interconnected attitudes toward consumption behaviors. Additionally, the chapter encompasses a comprehensive definition of patterns of consumption, elucidates the underpinnings of social learning theory, delves into the nuances of the directed graph theory, and appraises the methodological approaches that have been harnessed by previous scholarly works in the field.

Chapter 3 is dedicated to the construction of a model, forged through inferred assumptions, which serves to theorize the intricate mechanism underpinning

consumption choices that align with individual values. This model is intricately interwoven with DeGroot's social learning process, a well-established theoretical framework. Leveraging this model's inherent properties, we explore its capacity to discern the relative significance of distinct individuals within the context of network topology. This analysis is predicated on the recurrent communication and interaction patterns exhibited among individuals, characterized by a simplistic updating approach. This scheme entails the aggregation of information through the mechanism of weighted averages. These averages are extrapolated from our established social networks or peers. Recognizing the inherent rationality within human behavior, albeit bounded by information constraints or other determining factors, forms a cornerstone of our exploration. This intricate interplay of behavior, often manifesting as a complex tapestry, finds elucidation through the employment of this process. The inquiry within this chapter tackles various questions, including the overarching query of whether a society entrenched in consumerist ideals will tend towards convergence or divergence.

In a social learning environment, where individuals learn the actual value of nature through information and subsequent network communication, consumption and production decisions are modelled in this work. *We demonstrate that as society expands, the majority opinion will eventually come to reflect reality if the power of the most influential agent diminishes. This situation will further lead us to a wise society, which is a necessary and sufficient condition to formulate responsible consumption choices.* In classical herding literature, individuals receive private information regarding a binary state of nature and sequentially choose their consumption after observing their predecessors' choices. When that informativeness is unbounded, it is known that individuals converge to the correct action and belief. We study how quickly convergence occurs and show that it happens more slowly than when individuals observe information. In particular, the expected time until individuals stop making irresponsible choices is contingent on the distribution of information. Therefore, rationality occurs in a communicative and intersubjective setting because of existing and thinking. In contrast, bounded rational and irrational choices lack diversity, independence, and decentralization, due to persuasion bias and stubbornness, which ultimately results in irresponsible attitudes towards consumption.

Human behavior is characterized by learning, modeling, imitation, and adaptation processes (Bandura, 1977). The influence of social norms, values, and interpersonal connections plays a pivotal role in guiding individuals towards aligning their choices with the prevailing utility mechanism favored by the majority. In this context, **chapter 4** of this study, building upon the foundations established in the preceding chapter, expands upon the theoretical framework through a synthesis of Friedkin Johnsen's model and insights from herd behavior. This chapter undertakes the development of a model, employing deductive reasoning, to illustrate the intricate interplay between informational stimuli, social influence, and their combined impact on consumption choices in the digital era. Within the contemporary landscape, marked advancements in advertisement techniques have culminated in a paradigm where individuals derive ***anticipation utility*** from their engagement in online shopping activities. The dynamics of consensus formation are contingent upon the temporal rate at which weightings evolve, a phenomenon explicated through graph theory as a means to visualize stability. The model constructed within this chapter encompasses a spectrum of social influence scenarios, ranging from *information-loving societies* where individuals place substantial reliance on external information for shaping their choices, to *information-averse societies* wherein individuals prioritize their personal opinions while disregarding external information sources. Additionally, the model encapsulates *responsible societies* where individuals accord higher significance to their own opinions, albeit with a measured consideration of external information.

This multifaceted model provides a unified theoretical lens through which diverse social influence situations can be comprehensively analyzed. Its explanatory scope extends to crucial societal phenomena such as advertisement dynamics, political dynamics, and consumption criteria, all of which collectively contribute to the formation of opinions within a given society. The aspiration for theoretical integration is emblematic of this model's essence, striving to synthesize complex phenomena into a cohesive framework. Furthermore, the outcomes of this theoretical framework are contingent upon the contextual factors embedded within the surroundings, encompassing the social milieu, interpersonal dynamics, and environmental attributes.

In **Chapter 5**, we have investigated the interplay between thrift, self-control, and delayed gratification and their impact on responsible consumption and production

choices. Drawing on data from the World Values Survey, the study examines 460,000 individuals across 90 countries. Country-level exploratory analysis is carried out to explore whether peoples' priority for teaching thrift to their children and their own savings behaviour is related to happiness. The main question addressed in the current study is "Whether people who emphasize teaching their children about thrift, saving money and things score on a larger self-reported happiness scale than those who do not?". Parents are the crucial agents of child socialization, so the question posed in the form of a conventional projective approach highlights the priorities and preferences of parents.

The study posits that instilling the values of thrift, saving, and self-control in children can promote responsible decision-making and consumption behaviors based on delayed gratification. The empirical findings strongly support this notion. Individuals prioritizing fate over self-control are less likely to make conscious choices, decreasing self-reported happiness. From a policy perspective, these results underscore the need to promote policies and programs that encourage self-control, thrift, and delayed gratification, particularly among children and youth.

Chapter 6 encapsulates an algebraic framework precisely constructed to summarize the outcomes and policy ramifications emerging from our conceived socio-economic interactions. The framework's inception serves to expedite the comprehension of how synergy amid economic entities – encompassing individuals, groups, corporations, and governmental bodies – culminates in the optimal distribution of societal resources. Within this context, the research incorporates an approach where the State assumes a regulatory role, instrumental in fostering responsible consumption and production choices (RCP). This chapter introduces an innovative algebraic interactive strategy, seamlessly interweaving both top-down and bottom-up hierarchical structures, to harness consumption within manageable bounds. The proposed approach accentuates the potential for governments to facilitate meaningful interactions amongst individuals and groups, establishing institutional and policy frameworks that create an environment conducive to responsible choices. Our outlined mechanism offers a pathway wherein the allocation of resources holds the potential to engender RCP congruent with intrinsic values, fostering sustainable outcomes.

Amidst the backdrop of an evolving global narrative, a pressing need arises to disentangle environmental degradation from the trajectory of economic growth, advancing towards a sustainable and all-inclusive economy. This necessitates a synergistic endeavor wherein governments, businesses, groups, and individuals collaboratively contribute towards the collective well-being. Chapter 5 encapsulates the culmination of our research journey, offering insights into the transformative potential of harmonized efforts and policy frameworks aimed at ushering in a paradigm of responsible consumption and production for the greater good.

Chapter 2

Literature Review

2.1 The Progression of Consumer Culture

Throughout history, a significant proportion of the global population has lived in conditions of poverty without access to valuable possessions beyond the necessities of life. This situation persisted for centuries, with the world economy experiencing no growth. However, a remarkable transformation occurred in the northwestern European nations from the early 18th century onwards, marked by the flourishing of businesses and a corresponding increase in earnings. Families that had hitherto subsisted on the bare essentials could indulge in luxuries such as additional undergarments, pillows, boots, towels, combs, and mirrors. This newfound capacity to spend initiated a positive feedback loop in the economy, with increased expenditure leading to greater business activity and higher remuneration for workers. This era witnessed the emergence of the first consumer revolution in history, as new enterprises sprouted up across Britain to cater to the growing demand for previously unattainable luxury goods. The urban centers of England became hubs of branded furniture, pottery, cutlery, hats, shoes, and dresses, signalling a significant shift in the economic and social landscape of the region.

Clothing and hairdo trends that used to remain unchanged for decades were constantly evolving, often in extreme and unworkable ways. There were many Christians who saw this and disapproved. Clergypersons all over England preached short sermons condemning the rise of materialism in society. They condemned it as a form of vanity. Children should not be allowed to shop, as God will not look kindly at parents more concerned with their homes' appearance than their hearts' condition. However, a new intellectual revolution has profoundly altered previous assumptions about vanity's impact on economies. Consumption of fripperies like "bonnets," "gloves," "butter dishes," "soup tureens," "shoehorns," and "hair clips" drove national prosperity and gave the government the authority to put into reality what the church

could only preach. The only way to make money was to ensure an excellent demand for useless and ludicrous products (Mandeville, 1992).

Everyone has enough ice cream, shoes with silk linings, and embroidered purses. It is encouraging, however, that consumers may be convinced to purchase. Money made from selling these luxury items helps fund the establishment of new factories, the education of new students, and the maintenance of existing hospitals. (Mandeville, 1992) stunned his audience by presenting a stark choice: "*A nation can be both enormously affluent and enslaved to luxury and mindless materialism, or incredibly impoverished and high-minded.".* Almost every prominent scholar of the 18th century bought into Mandeville's grim premise. However, specific instances of resistance to the new economic orthodoxy still existed. After seeing the adverse effects of the commercial revolution on the culture of his hometown. (Rousseau, 2012) advocated a return to a more traditional way of life, like that which prevailed in many indigenous and isolated parts of the globe. Rousseau advocated the redirection of individuals' focus from materialistic pursuits. His proposal involved isolating Geneva and instituting penalties on the consumption of luxury commodities. This proposition presented a distinct dichotomy: lavish expenditures accompanied by sufficient financial resources on one side, and disciplined thrift combined with scarcity on the other. In essence, Rousseau's stance marked an exceptional departure from prevailing norms, as he prioritized the cultivation of virtue over the acquisition of material wealth.

The discourse on economics has predominantly revolved around ideological confrontations involving proponents of free markets, environmental advocates, adherents of communism, and proponents of capitalism. Despite its notable shortcomings, including the persistence of unyielding marketing strategies and the proliferation of unhealthy dietary choices, these trade-offs are justified in the pursuit of robust economic growth and the achievement of historically high employment rates (Schumpeter, 2013). This paradigm places material achievements above ethical considerations, shaping a landscape where the primacy of material success often eclipses moral principles. In the middle of the 20th century, statues of political leaders and religious saints were replaced with outdoor eateries selling burgers, huge cheesecakes, and fries doused in ketchup in municipal squares. Could we go to the store and buy something useful instead of this nonsense? Is it possible for us to be wealthy and morally upstanding? Indeed, consumer cultures benefit people with low incomes

by creating jobs fulfilling what are, on average, less than ideal consumer demands (Smith, 1937). He recognized that people had numerous aspirational wants, such as a desire for knowledge and understanding, a desire to live in attractive communities, and a need to connect with and benefit from the company of others.

The key glimmer of optimism is that we may not always have to profit off exploitative, foolish, or vain consumer cravings. Most of us are products of a consumerist society that encourages us to desire anything except what we need. As a result of commercials, many people pursue goods like automobiles and clothing and stay in professions they despise only to afford things they do not need (Baudrillard,2016). The fast fashion industry pushes consumers to see clothing as disposable, significantly adding to the amount of trash accumulated because of all this buying and throwing away. To meet rising global demand, manufacturers throughout the globe generate an estimated 340 million metric tons of plastic annually, half of which is single-use and cannot be recycled (OECD, 2019). As consumers, we have been enslaved to a lifestyle that's out of sync with our so-called "responsible" habits.

Consumption is affected by several variables, many of which are interconnected. Individual, cultural, and societal influences and promotional efforts all shape customers' final product and service selections (Shavitt, and Barnes, 2020). Culture reflects a society's norms and customs, and its close relationship to religion may be critical in understanding how people make purchasing choices. Over the last few years, *responsible consumption* has become influential and significantly impacted individuals' consumption choices. We can see an increase in organic food sales in Germany since 2010, while a shift towards solar energy sources. On the one hand, this behavior can be regarded as intrinsically motivated while individuals believe in doing good, and joyous for others or the environment. Hence economists are referring to this as a behavioral shift as the "*warm glow effect"*. Besides, consumers are also becoming aware that their buying behavior can make a difference and might lead to a change. However, there are diversified needs and preferences of people. While some actively look for goods and services that align with their values, they are in the minority. As a result, the shift toward more responsible consumption is happening more slowly than needed, and the negative consequences of excessive consumption are increasing (White et al., 2019). Then the question arises How do people find products and services that reflect their values? Thus, companies in the world at large are supporting consumer

decision-making through product quality standard seals. These labels are subject to regulation and describe specific product characteristics, including whether the product follows ecological principles. So the product evaluation and purchase decisions are heavily influenced by the information provided on the label (Krenz et al., 2022)

2.2 Individual Values

2.2.1 What are values?

In scholarly literature, two distinct classifications of values have been elucidated. The first pertains to the significance that an individual assigns to a specific outcome. Additionally, these objects acquire their value through intricate relationships with other objects that necessitate calculations extending beyond an individual's inherent capacities. This process operates on a subconscious level (Schwartz and Bilsky, 1987). Terminal values are rooted in one's self and are associated with desired end states that an individual strives to attain, encompassing aspects such as comfort, wisdom, and a fulfilling life. In contrast, instrumental values manifest in behaviours such as honesty and helpfulness. The comprehension of individual values holds paramount importance in facilitating comprehensive socio-economic analyses (Williams, 1979). At times, values compel individuals to prioritize aiding others over their immediate gratification, as the collective benefits at the societal level outweigh individually restricted pleasures (Simon, 1990). Research posits that values are shaped by the interplay of social systems and cultures, wherein individuals conform to the prevailing social milieu through both formal and informal mechanisms.

2.2.2 Values' Role in Shaping Perception and Behavior

Sometimes the threat of social sanction (Shame punishment) by their respective community, causes an individual to conform to dominant social values in public (Kluckhohn, 1951). Different studies value development and transformation in children over time and assert that fundamental values are structured into a *rational system* that inspires to explain individual attitudes, behavior, and decision-making processes (Schwartz, 1992, 2006). Researchers describe three value formation stages: The **Inscription** period from birth to 7 years. This period is most important as values developed during these times have a long-lasting impact on individuals' lives. Then the **Modelling** period is 8-14 years, and **Socialization** takes place for 15-21 years (Morris,

2009). Influential personal values lay the foundations of customs, traditions, and laws. Individual values, at large, coincide with cultural values either in agreement with or divergent from prevailing norms. Therefore, culture can be defined as "*a social system that reveals a set of common values, enabling social prospects and collective understanding decent, terrible, delightful, productive".* Family is the most crucial constituent for building values. Families teach children about right and wrong before there are other influences. Members of culture share their cultural values. Then, the school and the respective community where they are brought up help to shape children's values.

When children's moral thinking develops, they need to learn concepts including democracy, justice, thrift and environmental preservation. Different cultures portray dissimilar values. When group members express a value that conflicts with the group's norms, the competent authority (Group representative) might ***facilitate conformity or denounce members'*** non-conforming behaviour. Values are ***socialized from parents to children,*** e.g., in *hunter-gatherer* societies, priority was placed on survival agriculture, (Giddens et al., 2009). In contrast, Italian parents reassure social and emotional skills. In Spain, parents want children to be more social, while the Swedish consider self-assurance and pleasure necessary, and the Dutch encourage stable schedules and independence. American parents are exceptional in placing a high value on intellectual aptitude, especially in the limited sense of "book learning." The Schwartz value survey (Schwartz, 1992) and portrait values questionnaire have been supported across more than 80 countries, and models have been developed to determine fundamental values. There is also a cultural map of the world formulated by (Inglehart, Welzel et al., 2003) through data utilization from the *world values survey.*

Individuals can possess both personal and communal value systems the members of society. *A society may limit the conduct of its constituent members if they violate the ideals. According to thoughts in Ecological* economics value of a product or service should be decided by the resources that go into its production rather than by the market (Odum, 1996). Alternatively, the energy idea and Marx's labour theory may be considered donor-type values. Experts in the field of energy theory argue that *this view of value is essential not just to Environmental Science but also to the other social sciences*. Culture is constituted of knowledge, beliefs, morality, customs, and values associated with these things attained through society members through perceiving role

models and emulating learning through association with others. Then the new values (Material) emerge through divergence from traditional ethical values. Some prominent values include *religion, economics*, aesthetics, ethics, and knowledge (Moore, 1903).

Norms are the rules and expectations that govern conduct in a particular culture. While offering a seat to a senior citizen is admirable, picking a nose in public is considered unsanitary. These and other standards are essential for maintaining social order, but they also have the potential to act as a stifling kind of social control (Giddens et al., 2009). Some social standards are undesirable because they promote harmful practices such as smoking, binge drinking, excessive eating, or a heightened emphasis on material possessions. However, not all cultural norms have well-defined moral boundaries, such as how a society's focus on competitiveness may encourage achievement but stifle teamwork. The cultural factors that shape ideas and behaviours are usually unnoticed because they become second nature. Individuals tend to take on their families' and communities' beliefs and ideals. Also, since they reflect the ideals of their society, individuals tend to think that these standards are correct.

We always retain the ability to self-correct, which means that our values are never entirely set in stone and that we can learn and adopt the beliefs and principles of those around us. *People with similar backgrounds (family, religion, education, and community) are more likely to hold similar beliefs.* The same beliefs might take quite diverse forms when practised by various communities and organizations. All values are instrumental, and life is a continuing rivulet" of cause and effect in the form of continuation of mean and ends, e.g., If there is a lack of food at some place, it will subsequently lead to human activity that increases energy expenditure (Dewey, 1910). Efficiently organizing needs and desires is a fundamental aspect of human engagement with the surrounding environment. Before delving deeper, it becomes imperative to comprehend the intricacies inherent in consumption patterns and their dynamics.

2.3 Defining Consumption Pattern

In literature, consumption *pattern is defined as allocating the consumer's budget to various spending classifications, i.e., housing, food, clothing, and transportation* (Brown and Deaton, 1972). However, this definition is too narrow in

scope as it does not elaborate the how allocation decisions for the budget are made, which means moving needs and lifestyle patterns resulting from the expenditure pattern of consumers. It also neglects the consumption phenomenon based on behavioural complexity. *Consumption patterns are a set of relations during consumption that lead to a consumer unit (involvement) in the process. Such relations include the object of consumption (services and products) and relationships with another consumer unit (individuals).* It is also vital to find whether the consumption process occurs at an individual or collective level. The following assertion is *whether an individual is influenced by the consumption act that led to irresponsible behaviours.* According to research, there are five distinct stages that customers go through before completing a purchase. Assuming a need has been recognised in step one, stage two entails gathering relevant information via personal contacts, professional networks, and the media. Third, potential solutions are analysed (other options available). The fifth and final stage is evaluating the purchase after it has been made. The point of no return occurs at stage four, and after that, the buyer makes their final selection. As unfortunate as it may be, some approaches impact people's needs and decisions throughout this period (Dewey, 1910).

Choosing a lifestyle based on our consumption habits puts us at either end of the spectrum. The consequence of nesting is that a person's consumption habits set limits on their discretionary spending (Gredal, 1966). In most civilizations, official or informal groups cannot make and maintain drastically different consumption decisions that are not influenced by societal norms. An individual's capacity to grasp frameworks and mechanisms within the realm of society, distinct from those operating at the individual level, becomes essential as they transition from mere choices in clothing selection to the broader sphere of consumption (Sinha and Zoltner, 1979).

2.3.1 Concept of Consumption

In prehistoric cultures, the focal point of consumption and production primarily revolved around fulfilling fundamental physiological needs. As human capabilities advanced, extending beyond the realm of basic sustenance, patterns of consumption underwent an evolution, encompassing practices such as ceremonial rituals, attire, and communal feasting. This transformation was closely linked to the increased capacity for the creation of such cultural artefacts (Clark et al., 1995). In the context of Roman

slave society, a noteworthy divergence emerged, marked by a lavish and unproductive aristocracy that engaged in excessive gluttony, culminating in a zenith of hedonistic tendencies as a prevalent cultural trait. Instances arose wherein the communal purpose of consumption was overshadowed, leading to instances where this segment of society indulged in excessive eating, irrespective of necessity. Contrasting this, during feudal civilizations, the consumption of serfs was confined to the essentials vital for sustenance. In stark contrast, the aristocratic class exhibited a wide spectrum of indulgences, spanning from hedonism and ostentation to a cultivated appreciation for the arts and refined culture. This stark differentiation stemmed from the surplus generated by the labor of serfs, which granted the lords access to such excesses. Furthermore, it is discernible that a legacy of responsible consumption is perpetuated across successive generations. This cultural pattern of controlled consumption plays a role in societal reproduction, passing down its values and practices to subsequent cohorts.

The advent of industrialization and capitalism raised severe concerns about excessive waste. It suggested that the “growing socioeconomic class” responsible for the excess output should put that money back into production rather than spending it. The hardworking, city-dwelling tradespeople and artisans (bourgeoise) did not subscribe to the same economic reasoning or aesthetic preferences as the feudal lords (capital accumulation through profit). Specifically, virtues like honesty, hard work, trust, and, most crucially, thrift were emphasised in Protestant ethics to foster a more capitalist mindset (Weber, 1978; Weber, 2013). Fundamental values of thrift and capital accumulation still guide advanced industrial countries' consumption patterns. Additionally, in today's culture, the phrase "indecent affluent" may still be evoked by consumerism. The literature is split on whether some forms of consumption should be considered wasteful rather than acceptable and beneficial to society.

There are various aspects of Consumption based on historical evidence. *Consumption can be regarded as a social activity or product of the social learning process.* From most of humanity and historical testimony, consumption has only served the purpose of sustenance. So, production patterns such as division of labour at the farm, technology, household, and consumption processes such as cooking and mending emerge, making subsistence easier. Through its monopoly on the means of production,

a ruling elite became used to living above their means. This behaviour has been prevalent for centuries, leading to consumption inequality in the world, with dominant class consumption exceeding limits and the **poor class** *in pursuit of fulfilling their basic needs.* Consumption habits (such as thrift, ostentation, or expert craftsmanship) are an outgrowth of the social and economic climate in which people work and spend their money. Therefore, production and consumption activities are always in a dialectical relationship (Marx, 2010).

The "human engagement component" pertains to how consumers connect with the products they buy, either actively or passively. Social ties form during consumption, ranging from individual to communal, influencing whether consumption is personal or shared. These social connections impact overconsumption, as seen in our work using the social learning framework. Economic history often focuses on privatizing consumer habits. "Domain of availability," determining public or private accessibility, shapes consumer behavior. While public spaces are government-owned, consumer goods belong to private businesses. The link between manufacturers and products is obscured in today's industrial era, leading to disassociated consumption. Direct sales from creators to buyers for handcrafted items exemplify a more transparent and synergistic consumption pattern, bypassing intermediaries.

The presence of public goods tends to cultivate a collective orientation towards consumption, whereas the availability of privatized goods encourages self-reliant behaviors. Skilled artisans, including professions such as bakers, blacksmiths, and shoemakers, have historically played an integral role within their local communities, offering distinctive, collaborative, and ethically-conscious products to their customers. Nevertheless, the viability of such craftsmen has been undermined within the contemporary era, characterized by mass production, cutthroat competition, and the proliferation of mechanized manufacturing processes. The consumption patterns exhibited across diverse economic and sociopolitical frameworks, encompassing systems ranging from feudalism and capitalism to the Third World and Socialism, have been methodically examined and analyzed within scholarly investigations (Polanyi, 1957). This comprehensive inquiry underscores the multifaceted nature of consumption behaviors within varying contextual landscapes. Scholarly investigation into

consumption patterns across different economic and sociopolitical frameworks has illuminated the intricate nuances that govern human behavior within these contexts.

2.4 Description of Responsible Consumption

Energy stands as the cornerstone of human activity, fueling transportation, cooking, and heating. However, escalating energy use contributes to global warming, highlighting the urgent need for change. Fossil fuels are finite, underscoring the importance of efficiency, circular economies, and being responsible for our consumption. Taking responsibility for our choices is pivotal for sustainable development. Responsible consumption is a precondition to bolster local economies, foster equity, and propel the transition towards a greener future. "*Responsible" and "sustainable"* are often used interchangeably to describe consumption behaviour. In comparison, “sustainable consumption” implies consuming in a manner that enables the conservation of resources and the environment via purchasing better (greener items), eating better (wasting less) and throwing away better (recycling). Although the “*responsible consumption”* definition is broad, besides ecological consumption, it also includes consumer responsibility that may affect many areas having an environmental effect on consumption to its social, economic and health impact. Several tactics correspond with individual cultural and societal ideals to become a more responsible consumer. Therefore, one must understand such individuals’ cultural features.

The preceding century exhibited remarkable social and economic advancement, yet this progress came at the expense of environmental degradation, jeopardizing the very foundation essential for our existence. Astonishingly, nearly one-third of the global food supply, valued at approximately $1 trillion (1.3 billion tons), goes to waste annually within supermarket and grocery store disposals (United Nations, 2020). Likewise, transitioning to energy-efficient light bulbs on a global scale could yield a substantial yearly savings of $120 billion. The proliferation of automobiles within OECD nations exemplifies this trend, with an anticipated 82.3% increase in the number of motor cars from 2015 to 2022, reaching 550 million vehicles (OECD, 2022). Escalating population growth and rising affluence are propelling energy demand, with household energy consumption now accounting for 35% of the global energy pie. As this demand escalates, the potential for environmental deterioration looms due to

overreliance on fossil fuels and energy resources. Mitigating this risk necessitates the swift adoption of energy-efficient strategies to counteract this mounting demand.

The concept of responsible consumption is rooted in scholarly exploration concerning the interplay between individual consumption behaviors and their consequential impacts on ecological, health, and social outcomes (Schor, 1998). This classification encompasses consumers within the lower strata, encompassing environmentally conscious, health-oriented, and financially literate individuals. Within the discourse of neoliberal ideology, a distinction emerges between responsibility and participation. The free market is upheld as a self-regulating mechanism that fosters moral conduct and personal accountability, thereby facilitating the equitable allocation of resources and meeting individual requisites. In stark contrast, proponents of social protectionism perceive the market as a disruptive force, exacerbating societal discord and environmental degradation (Polanyi, 2001). Within this framework, the market is absolved of moral and social obligations, while individual market actors bear the onus for societal and ethical outcomes. Conversely, the neoliberal perspective posits that the market and capitalism are natural constructs (Bourdieu and Wacquant, 2001). In alignment with this viewpoint, individuals bear heightened responsibility vis-à-vis the state and corporations. The locus of accountability within a community is positioned upon rational economic agents who precisely consider the ramifications of their choices and actions. Hence, morally conscientious market participants are envisaged as potential catalysts for addressing socio-environmental predicaments (Amable, 2011).

In the fields of cognitive psychology and traditional economics, the prevailing view of consumer behaviour is one of rationality, whereby consumers are presumed to act by their preferences and beliefs. Models of attitude, such as the theory of reasoned action (Ajzen, 1986; Ajzen et al., 2018) and the theory of planned behaviour, are commonly employed in investigations into responsible consumer behaviour which have shown that attitudes can predict behaviours (intentions) with some degree of accuracy, albeit with a weaker relationship between the two, (Ajzen, 1991). However, a significant inconsistency arises from the intention-behaviour gap (Moisander, 2007), which indicates that there is a disparity between consumers' intentions and their actual behaviour. Furthermore, the existence of a free rider problem, in which individual utility conflicts with social goals, adds to the complexity of responsible consumption.

Environmentally conscious consumers frequently utilize multi-attribute choice criteria, unlike single-criterion reliance (Smith et al., 2013).

The recent investigation involving 31 in-depth interviews with British consumers delves into distinctive choice behaviors. The study unveils dual judgments—ethical and unethical—often balanced as consumers attempt to offset one with the other. This exploration sheds light on the attitude-behavior gap, revealing its complexity in responsible consumption. Authors propose an examination of emotions, incongruent behavior, and cognitive dissonance throughout the consumption cycle to comprehensively grasp consumer decision-making processes (Smith et al., 2013). Despite the link between materialism and economic growth, those prioritizing status through acquisition often overlook prolonging possession lifespan. Materialism's focus on wealth pursuit hampers responsible consumption due to its impact on identity and social standing (Kasser, 2016). This behavior aligns with social consumption, wherein possessions are showcased for visibility and affirmation (Dermody et al., 2021).

2.5 Consumption and Economic Growth

Increases in the size of a country's economy over time are referred to as economic growth. An economy's cyclical motions may be understood partly because of consumption. Spending is such a significant contributor to GDP that changes in consumer sentiment may significantly affect the economy. However, savings and investment determine an economy's long-term growth and capacity for consumption. The United Nations Sustainable Development Goal (12) contends that long-term development and economic growth depend on changing our consumption and production patterns. SDG target 12.2 concerns the efficient use and disposal of materials, including minerals, fossil fuels and metals. Target 12.3 is about reducing food loss at all stages of the food supply chain and reducing plastic waste (target 12.5).

In low-income developing nations, food loss predominantly arises during production and distribution due to inadequate infrastructure. Conversely, developed and high-income countries experience substantial losses at the consumption stage. Globally, plastic constitutes over 20% of total waste, with just under 6% being recycled from two-thirds of all plastics produced, leading to environmental pollution (Geyer et

al., 2017). E-waste, reaching 50 million tons in 2019, sees less than one-fifth recycled, yielding harmful health and ecological consequences. Although technological strides enhance energy efficiency, global energy consumption is escalating, depleting oil, coal, and gas reserves. Biodiversity dwindles from habitat loss, with agriculture utilizing 69% of annual water consumption, while clean water access remains a challenge for over a billion people. Mounting air, land, and water pollution, driven by escalating demands, pose grave health hazards and resource depletion. Rapid economic expansion threatens natural systems' carrying capacity, necessitating consideration for sustainability. The Environmental Kuznets Curve hypothesis indicates that post-industrial economies may enhance environmental conditions after an initial threshold (Dinda, 2004). For instance, the UK and the US have curbed CO2 emissions since 1980, while emerging nations fuel global emission increments initially. Progress towards cleaner technologies correlates with economic growth, reducing pollution through increased investment.

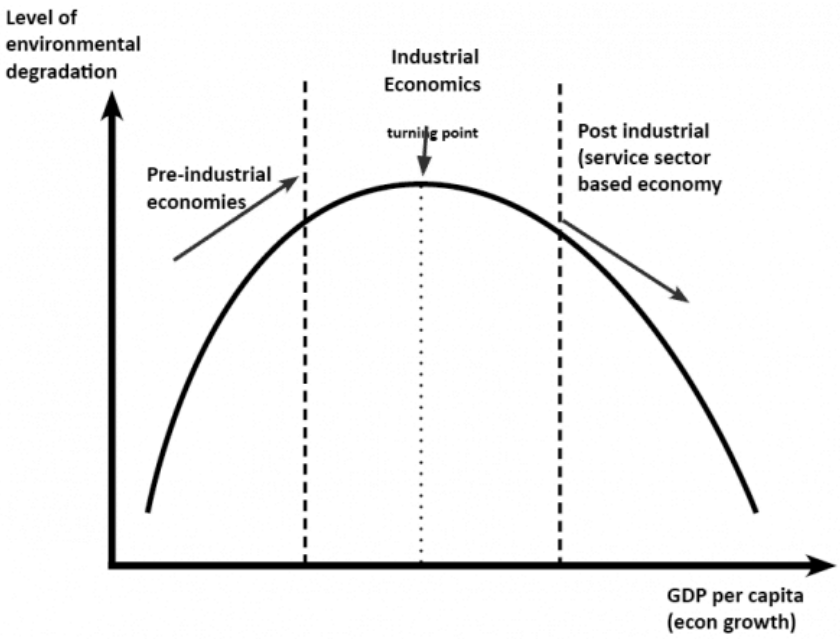

Figure 2.1: U-shaped Curve between environment and economic growth. *Source*: Dinda, S. (2004). Environmental Kuznets curve hypothesis: a survey.

Conversely, (Arrow et al. 1995) argue that this U-shape simplification is inappropriate. Where environmental costs of economic activity fall disproportionately on the poor, future generations, or foreign countries, incentives to fix the problem are unlikely to be high. Kuznets was incorrect in thinking that the decline in inequality

between 1930 and 1950 marked the last stage of this phenomenon (Piketty, 2014). Inequality levels have been back to pre-World War II levels since 1950. European nations are also experiencing these tendencies. While this U-shaped pattern may hold for pollution levels, it does not apply to natural resource stocks, as rising prosperity does not slow the rate of resource depletion. When we buy coal from developing nations, for instance, and ship our waste there to be disposed of or recycled, we may be transferring pollution from one country to another; *that is an irresponsible attitude at the state level.*

2.6 Exploring the Nexus of Religion, Responsible Consumption, and Cultural Values

Attitudes, perceptions, personality, self-concept, and learning are social and psychological aspects that impact consumer behaviour. At the same time, sociological factors describe how consumer choices are influenced by reference groups, i.e., culture, social class, and family. However, individuals demonstrate little motivation to adopt responsible consumption patterns, including a switch towards solar panels or an increase in the use of public transportation as compared to private transportation. Culture is defined as the symbolic system represented in music, ritual, arts, drama, and aesthetics by members of society and is also considered as society's personality (Mansori et al., 2015). It explains our identity and origins, a unifying principle for shared values and a means of transmitting those values to newcomers. Therefore, it is instrumental in designing the consumption choices of individuals. There is also a considerable link between religion and people’s culture. For instance, Muslims are more likely to trust product and service recommendations made inside the community (Jamal and Sharifuddin, 2015). The concept of religiosity may be described as "the degree to which a person conforms to the ideals, beliefs, and practises of his or her religion and applies them in everyday life" (Worthington et al., 2003). Many facets of daily life, from religious practices to economic models to managerial techniques, are implicit in the term "culture."

There is an increase in scholarly interest in responsible consumption elements in a modern economy, and several notions emerged in literature, such as Green, sustainable, political, and anti-consumption (Moisander 2007). A broad definition of

"responsible consumption" would include behaviour that reduces negative impacts on human health, animal welfare, and environmental quality. However, such commitment needs a change in lifestyle and avoidance of choices that do not emerge through utilizing reasoning capabilities. Religion occupies a position beyond the immanency of daily life, while it remains excluded in studies concerning everyday responsible consumption. It has long been accepted that all economic activities have a moral foundation (Roth and Weber, 1976). The moral economy framework helps us understand the interplay between norms, values, and economic outcomes during crises and transitions (Thompson, 1971). 18th century food riots in England were protests against unfair market prices, triggered by poverty, unemployment, and government and intermediary violations of societal norms and values. In addition, society is a network of normative institutions including the market, the state, religion, and the family. Organizations like this provide people with the time, space, and purpose they need to carry out the actions that bring about material sustenance and reproduction (Trentmann, 2007).

In the realm of responsible consumption, factors like religion, politics, environment, and social considerations shape product choices. Beyond its religious significance, Christmas has morphed into a public holiday and a shopping season. Christmas-related spending is substantial; about $2.6 billion annually is spent on wrapping paper alone (Lampert and Menrad, 2022). This transformation showcases how a religious occasion intersects with consumerism. Even places of worship, like churches, are not untouched by consumer culture, with artisan vendors often present. It's crucial to note that certain products and services clash with religious doctrines, emphasizing distinct values and principles. For Christianity, Easter and Christmas hold significance, while in Islam people observe Ramadan, Hajj, and Eid, shaping consumption choices. During religious events, consumption patterns shift to align with religious teachings, leading to seasonal consumption variations across religions. Festivities involve gift-giving, and decorating homes and streets. Technology, such as smartphones, contributes to increased sales during these events, but it also comes with an environmental impact. Despite profitability, responsible resource management is underlined by religious teachings.

It is essential to be mindful of the teachings of religious scriptures and use our reasoning, hearing, seeing, and thinking capabilities to make responsible choices during these events. When a product does not align with religious teachings, religious leaders advise their members not to use specific products. For an example, (Meyer, 1998) examines that Pentecostals view design and fashion as suspicious in Ghana and consider possessing jewellery as passion by satanic powers that distract people from God. Thus, religious values affect people's attitudes towards fashions by controlling dress codes.

The definition of waste is the use of scarce resources for inappropriate or harmful ends. Consumers' wastefulness is reflected in many ways, including food waste or spending on durable products and governmental expenditures. In the religious scripture, wasteful spending is criticised[1]. Untreated rubbish harms the ecosystem, and food waste is no exception. Fighting poverty at a low marginal cost in a world plagued by climate change, lack of natural resources like water, and hunger in developing nations may be aided by reducing food waste. Moderation is taking a medium ground between extremes, such as extravagance and misery. It does not reveal, for instance, whether a person's spending patterns suggest thrift or waste. An objective standard is needed to determine whether consumption levels are acceptable and when they are excessive. Moderation in public spending is defined as spending that (a) does not exceed the allotted budget and (b) is used to accomplish the stated goals. The views of the social strata and the practical use of the acquired commodities and services should be considered while defining moderation in consumption. Considering these two components, the following definitions of responsible consumption may be made: When we talk about consuming in moderation, we mean doing so at a level that is (a) acceptable to the social group to which we belong and (b) results in the actual use of the purchased products and services.

Spending more than required is an example of extravagance. An individual is extravagant if they habitually spend more than they earn. An example of social extravagance would be spending above one's means due to societal pressures like conformity, duty, or the need to stand out. Excessive government expenditure would be defined as the purchase, use, or administration of public resources that are not cost-

[1] [Proverbs, 21:20; Quran, 90:6-17]

effective. According to (Bagader et al., 1994), actions that harm people, animals, and plants are also examples of extravagance. In religious texts, wastefulness is an irrational act[2]. Keeping up with the Joneses is the only logical excuse for purchasing certain items by the customer. Many individuals engage in conspicuous spending to set themselves apart from their peers, as a kind of social validation, for the sake of variety, and out of a sense of superiority or conceit (Lambert et al., 2012).

A rational person should not try to *emulate* others but be happy with what God has provided by lawful methods[3]. There are no concrete measures by which to assess whether or not a consumer is being wasteful; the criteria for deciding what constitutes appropriate application and good gain are subjective. Humans naturally tend to spend more money on ostentatious purchases, and this inclination becomes more robust with increasing wealth. The religious texts negatively portray the wealthy as haughty and unreasoning, mindlessly following in their ancestors' footsteps[4] . The following are situations where the bare necessities are unmet: a) Failing to meet basic needs, such as nutrition, clothes, housing, health, and physical well-being. Like moderation, extravagance, and waste, b) not engaging in mandatory charity, c) not participating in community welfare activities, and d) not working with loved ones to save costs. Individuals miserly refuse to spend money on themselves or their loved ones, choosing instead to live lives of austerity and misery. Miserly public sector organisations take in tax revenue but do little to improve the lives of those who pay them. It is a kind of imperfect rationality. One may be miserly or lavish, but not both at the same time if greedy. It concludes that avoiding being miserly puts one on the road to happiness (Friedman et al., 2022) Because "inner emptiness, boredom, loneliness, and sadness" are the results of always striving for more; is never a good thing.

The landscape of consumerism has evolved drastically, ushering in an era of unprecedented technological advancements and material abundance. The range of possessions available today, from big-screen televisions to portable wireless gadgets, far exceeds that of 1957. Despite these material gains, a crucial question emerges: Does our enhanced materialistic lifestyle truly translate into happiness? Research has unveiled a nuanced relationship between materialistic values and happiness.

[2] [Luke 15:13; Quran,25:67;6:141]
[3] [John, 1:11]
[4] [Mathew, 15:14; Quran 43:23]

Psychologists have found a correlation between materialism and decreased happiness, suggesting that elevating one's financial status does not equate to lasting contentment (DeAngelis, 2004). Paradoxically, contemporary generations, raised in relative affluence, are more susceptible to mental health issues like depression (Myers, 2001). The interplay between materialism and discontentment is intricate. Scholars debate whether materialism breeds discontent or vice versa (Diener and Diener, 2002). Materialistic individuals may possess goal orientations that undermine their well-being (Kasser and Kanner, 2004). Surprisingly, despite economic growth, present-day Americans report lower happiness levels compared to their ancestors from centuries ago (Clark et al., 2008). Ancient wisdom from Aristotle, Jesus, and Buddha cautions against placing undue emphasis on material wealth. They advocate for a holistic approach to happiness, grounded in values beyond materialism. This perspective aligns with modern concerns about excessive consumption's adverse impact on both the environment and personal well-being

Striking the right balance is crucial. Aristotle's "Golden Mean" suggests virtue lies between extremes. For most, self-control moderates' consumption desires. But the instinctual pull toward instant gratification challenges this self-control. The value perspective, echoed by Aristotle's concept of eudaimonia, emphasizes virtuous activity and human excellence. Focusing solely on material gains and extrinsic objectives hampers mental well-being and relationships (Kasser, 2003). Materialists often assume that accumulating more possessions leads to fulfilment, a misconception that underscores the deeper complexities of human satisfaction. Childhood experiences and social contexts shape materialism. Coping mechanisms can lead to materialism, especially in adverse environments (Kasser, 2003). Critically, the root issue lies not in material wealth itself, but in the ceaseless pursuit of financial improvement. Finding contentment within one's belongings while prioritizing family, community, and spiritual aspects proves crucial for genuine happiness. Ultimately, individuals' consumption habits are shaped by intricate social learning processes. This underscores the importance of understanding social learning theory to decipher consumers' decisions."

2.7 Social Learning Theory

The Social Cognitive Theory posits that learning occurs in a social setting via the dynamic and reciprocal interaction of the individual, their environment, and their actions. The key distinguishing element of the Social Cognitive Theory (SCT) is its look at how both good and negative feedback from others may influence someone's actions. Interactions between people and their surroundings shape both parties' actions and, in turn, the surrounding world. Different cognitive and external factors will influence the interaction between a Person, environment, and behaviour. One is called *observational learning;* our behaviour is influenced by modelling. The cognitive factor *outcome expectancy*, is our ability to anticipate and value the outcome of behaviour. Self-efficacy is trust in the capability to perform the behaviour. These three constructs also are part of the Social Cognitive Theory. Attitudes, subjective standards, and perceived behavioural control are the building blocks upon which the Theory of Planned Behavior rests. Regarding subjective norms, people's actions are influenced by the views of others around them, especially those in their inner circle.

All three components come together to produce an *intention*, with short-term perceived behavioural controls answering the question, "Can I accomplish it?" In contrast, the intention is the will to carry out the activity, such as the desire to decrease one's material footprints but failing to do so. There is a gap between intention and actual behaviour. The idea of reasoned action interprets the connection between beliefs and actions in the real world (Fishbein, 1979). It is primarily used to predict an individual's conduct based on their beliefs and behavioural intentions. Retailed dive customer surveys may light up why people act in specific ways since people's choices are motivated by the rewards, they anticipate receiving.

A person's decision on whether or not to purchase a new smartphone will be influenced by several factors, including research into the various models available on the market and the opinions of friends and family members, hands-on experience with the various models, and advice from the salesperson (Ajzen, 1991). Most people conform to social norms by following dress codes and traffic laws. Some acts of conformity are non-conscious, e.g., people laughing and nodding heads when others are doing. Thus, *conformity* describes how we adopt or follow the behaviours of a

belonging group (Milgram, 1978). Moreover, (McLeod, 2008) claims that Solomon Asch ran an experiment to investigate the effects of peer pressure from the majority on a minority member's propensity to conform. Results suggest that individuals conform for two main reasons: i) to conform to social expectations (to fit in) and (ii) to comply with authoritative information (because of the belief that the group has more information than the individual himself).

2.7.1 Understanding the Nature of the Crowd

The 18th-century philosopher (Rousseau, 2012) said that our study of the human heart is incomplete if we do not also analyse it in crowds. To be part of a "crowd" is to be part of a group with a shared belief or philosophy. Therefore, knowing the crowd's makeup is essential for understanding their purchasing habit. Three factors contribute to what makes a crowd; First, being part of a large group makes people feel less accountable for their actions and less fearful of the repercussions of their actions. The second factor that gives a crowd its unique qualities is the contagious nature of every emotion and behaviour inside. The contagious nature of the phenomena may explain the unusual occurrence of fads. The last explanation for the strong effect of a crowd is its *suggestibility*. A mob is not always crazy; sometimes, they do heroic things. The Spartan civilization of ancient Greece, which fostered in its people a feeling of community and a rejection of personal interest in favour of the group's goals, dramatically illustrates the courage and heroism that crowds can elicit from individuals.

2.7.2 Herding Behavior

Humans are often portrayed as social creatures Because they tend to panic in new situations and look to others for reassurance. Herding refers to the phenomenon in which individuals follow the lead of their peers and those who came before them rather than relying on their judgement and knowledge (Shiller, 2003). These events, often known as "informational cascades," provide light on the causes and consequences of phenomena as varied as standard conformance, fads, booms, and busts. When we base our judgments and actions on what other people are doing, we risk becoming ignorant and making poor choices (Banerjee, 1992). Propaganda is such a robust set of tools that it can convince people to live in misery and think they are blessed. It contains essential information such as motives, feelings, and conflicts. It also contains primitive instincts such as the need for survival, sexual urges, tribal mentality, and fears. Manipulation

techniques have proven so effective that businesses still use them to move products and use the language of béarnaise by the powers that control and regiment the masses. Society teaches us to hide or repress certain feelings and motivations because they might be inappropriate for others. (Le Bon, 2002) *argued that the popular mind was not driven by reason but by illogical and primitive forces. It has always been possible to manipulate a crowd with a well-placed illusion. Whoever controls their access to illusions has complete control. Their victims are those who try to shatter their delusions.*

Irresponsible choices are formulated from irrational thoughts that are turned into beliefs then the brain responds by building Defense Mechanisms. This means individuals then unconsciously act to protect these beliefs. It led to a New Perception of themselves and the world of illusions. Such an illusion can only be destroyed through increasing self-defence mechanisms and reasoning. If someone tries to destroy illusions, even for their benefit, they will face incredible resistance. In this way, people get indoctrinated and adamant about staying in that zone. *Since people live with daily problems and minimal access to facts, their sense of reality is shaped by pseudo-environments which can be altered by understanding individuals' patterns of perception (*Lippmann, 2017).

Human perception is a collection of senses, past experiences, stereotypes, symbols, rationalizations, and fantasies. It is about figuring out what type of products the target audience is consuming, which is targeted by crafting a powerful message. Companies use a shocking event that happened in the past to make a point today and use positive emotions. For example, Coca-Cola connects their product with the feeling of *nostalgia. In the words of Lippmann (2017),* A stereotype is a preconceived notion about a person, group, or idea that has been formed outside of direct experience and is instead the product of shared cultural assumptions. We accept them as mental shortcuts to minimize the effort of thought and defend our societal position. People decide on emotion and justify with logic, even in today's world, where we have tremendous access to information. It is challenging to separate the truth from lies. Individuals interact through social networks, and consumption choices are formulated based on the extent of the individual's connectedness in the network. So, it is necessary to understand social networks and comprehend individuals' consumption patterns.

2.8 Network Theory

Network theory, also known as graph theory, is a branch of mathematics and computer science that deals with the study of interconnected structures called networks or graphs. These networks can represent a wide range of systems, such as social networks, transportation systems, computer networks, biological systems, and more (Borgatti, and Halgin, 2011). Network theory provides tools and concepts for analyzing the relationships, interactions, and patterns within these networks. A network consists of two main components: nodes (vertices) and edges (links). Nodes represent entities or elements, and edges represent the connections or relationships between these entities. There are different types of networks based on their characteristics, such as directed networks (where edges have a direction) and undirected networks (where edges are bidirectional). The way nodes are connected and the patterns of connections give rise to various properties and phenomena in network theory (Parkhe et al., 2006).

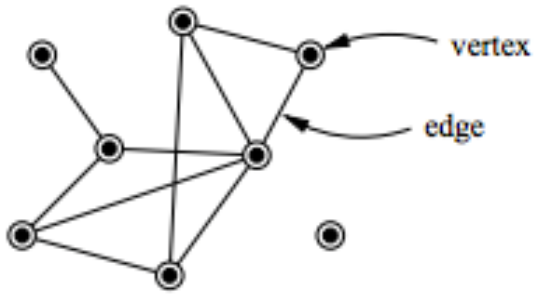

Figure 2.2: Representation of a network

The mathematical formulation of a graph involves defining its components and properties using symbols and equations. A graph G is defined as a pair $G = (V, E)$, where: V is the set of nodes (vertices), often represented by symbols like $v_1, v_2, \ldots, v_n$. E is the set of edges (links) connecting pairs of nodes. Each edge is represented as an unordered pair of nodes (v_i, v_j). An adjacency matrix A is used to represent the connectivity between nodes in a graph. It is a square matrix where Aij is 1 if there's an edge between nodes v_i and v_j, and 0 otherwise.

Example of an adjacency matrix for an undirected graph

$$\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$$

The degree $d(v)$ of a node v is the number of edges incident to that node. In an undirected graph, the degree is simply the count of neighbors of the node. In directed graphs, edges have a direction, indicated by an arrow from the source node to the target node. An adjacency matrix can be used for directed graphs, where $A_{ij} = 1$ indicates an edge from v_i to v_j. In some cases, edges can have weights representing some quantity (e.g., distance, cost, strength). Weighted graphs are represented using a weighted adjacency matrix where A_{ij} holds the weight of the edge between $v_i \, and \, v_j$. Eigenvector centrality measures the influence of a node in the network based on the influence of its neighbors. It can be computed by solving the equation:

$$Ax = \lambda x,$$

where A is the adjacency matrix, x is the eigenvector, and λ is the eigenvalue corresponding to the eigenvector. The clustering coefficient of a node v can be derived as

$$C(v) = \frac{2.E_v}{d_v.(d_v - 1)}$$

where E_v is the number of edges between neighbors of v and d_v is the degree of v.

Network theory uses mathematical concepts from linear algebra, graph theory, and combinatorics to analyze and model various properties of networks. These mathematical formulations enable researchers to quantify and understand relationships, patterns, and behaviors within complex interconnected systems, (Lin, 2017). The degree of a node (vertex) is the number of edges connected to it. In an undirected network, the degree of a node is the number of its neighbors. *Clustering Coefficient* measures the likelihood that the neighbors of a node are also connected. It quantifies the "clustering" or formation of groups within the network. The shortest distance (number of edges) between two nodes in the network is path length. Diameter is the

longest shortest path length between any two nodes in the network. Metrics that quantify the importance of nodes in the network include degree centrality, closeness centrality, and betweenness centrality. Decentralized networks, also known as small-world networks, are formed when there are clusters of connections in a particular area as well as some random long-distance ties (Amaral, 2000). The phrase "small world" refers to the ease with which any two individuals, wherever in the globe, may be linked together via a combination of close and distant relationships of six steps. In a country where several smaller and medium-sized cities supply critical public services, the loss of any one city would have only a minimal effect on the system due to the spread structure of the networks. However, suppose we imagine a county with a single dominant capital city that provides core services to the rest of the urban network. In that case, this centralized network may be more efficient, but it is also in a more critical state, as any disruption to this primary node would have far-reaching consequences for the entire system. As we go from an industrial to an information society, networks become the dominant organizing principle for our increasingly interconnected social and technical infrastructures.

Scale-free networks are those where the degree distribution follows a power-law distribution, implying that a few nodes have significantly higher degrees than others. These "hub" nodes play a crucial role in information flow (Barabási, and Bonabeau, 2003). Equations are often used in network theory to formalize and analyze these concepts, but they can become quite complex depending on the specific aspect of the network being studied. For example, the degree distribution of a network can be mathematically represented as a function, and algorithms are used to calculate metrics like shortest paths or centrality measures. We may learn a lot about a network, such as how fast a new event could spread or propagate, by asking questions about its degree of connectedness or how linked a single component or the entire network. It can be determined by calculating the average degree of connectivity, which is done by dividing the total number of edges by the total number of nodes in the network. Because of this emphasis on connection, we typically assign importance to specific nodes in a network based on their Eigenvector centrality score. This score considers the number of edges that link the two nodes and the degree of connectedness between them. A dispersed network is one in which the weight of each node is proportional to its distance from the

center of the network, as would be the case if the interactions between components were produced randomly.

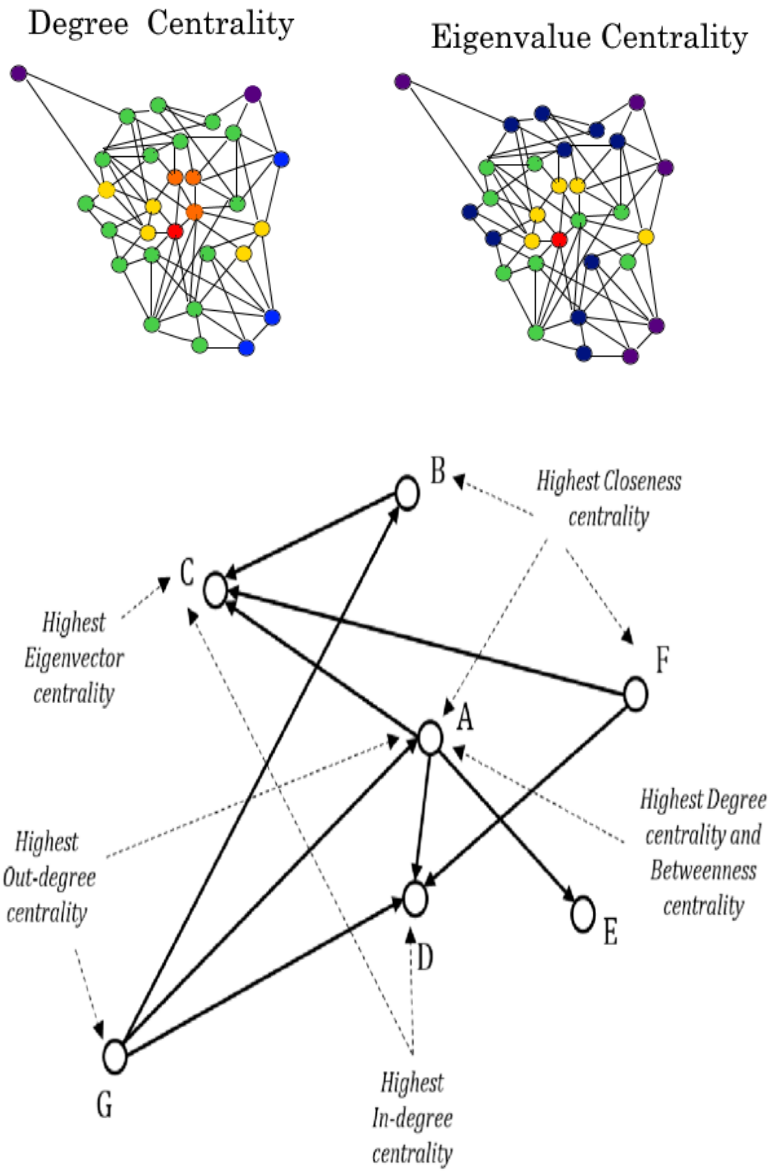

Figure 2.3: Degree and Eigenvalue Centrality in a network

The network model is a technique to describe the universe that enables us to record data about the connections between entities (Lin, 2017). It is common to speak about factors like GDP, age, and automobile colour while describing the globe. Connectivity and interaction between system components are amplified, resulting in the connections forming and defining the system's components. First, in network theory, there are "nodes," which may be anything from a person to a city to a computer, and "edges," which are the connections between the nodes and can be anything from

friendships to commercial deals. Social networks, biological networks made up of interacting organisms in an ecosystem, and logistic networks made up of interacting suppliers. Customers are all possible model systems thanks to this oversimplification of reality (Borgatti and Halgen, 2011).

Network theory has been applied to various resource allocation models and decision-making processes, including defining sustainable consumption and rationalizing expenditures. It can help model and optimize the allocation of resources within a system. In resource allocation problems, nodes may represent resource providers or consumers, and edges can represent the flow of resources between them. Various algorithms and metrics from network theory can be applied to find efficient allocation strategies. Network theory is used to model flow networks, such as transportation or communication networks, where resources (like goods, data, or energy) flow through the network's edges. Algorithms like the Max Flow-Min Cut theorem are employed to determine the optimal flow distribution. For instance, in urban transportation planning, researchers apply network theory to design efficient routes for public transportation, minimizing travel time and congestion. An example is the application of network flow algorithms in designing optimal bus routes in cities (Serdar et al., 2022).

In *supply chain management*, network theory helps optimize the flow of products and resources among suppliers, manufacturers, and retailers. Researchers also have used network analysis to model the sustainable supply chain network. By analyzing the network structure, one can identify critical nodes and optimize the distribution process for efficiency and cost-effectiveness. Social Networks and Collaboration Networks within organizations or industries represent collaboration and information-sharing among members. By analyzing these networks, it's possible to enhance resource allocation for innovation, knowledge transfer, and decision-making. The analysis of co-authorship networks in scientific publications helps identify influential researchers and interdisciplinary collaborations (Newman, 2001). Network theory can provide insights into sustainable consumption patterns and help individuals make informed decisions about their expenditures (Taghvaee et al., 2022). By analyzing social networks and patterns of influence, researchers can better understand how people's consumption behaviors are shaped. This understanding is critical for promoting sustainable choices through peer influence and awareness campaigns.

Social network analysis has been used to understand the spread of sustainable behaviors through peer influence. Research on energy conservation has shown that individuals are more likely to adopt energy-saving practices if they observe their peers doing so (Allcott, 2011). Studying influence networks can reveal how individuals' decisions are influenced by their peers, family, or colleagues. This knowledge can guide interventions aimed at promoting sustainable consumption practices. In the context of sustainable consumption, network analysis can reveal how consumer choices are influenced by family and friends. This approach helps design interventions that leverage social influence to promote eco-friendly behaviors (Centola, 2011). Platforms for collaborative consumption, such as ride-sharing or co-housing, can benefit from network theory to match supply and demand effectively, optimizing resource use and minimizing waste. Network effects play a significant role in the growth of such platforms (Bapna et al., 2008). Network analysis helps identify consumer segments based on shared preferences. For instance, social media data can be analyzed to identify clusters of consumers interested in sustainable fashion, enabling targeted marketing efforts (McNeil and Moore, 2015). This segmentation can be used to tailor sustainable products and services to specific audiences. Moreover (Hong and Stein, 2003) employ network theory to examine how differences in opinions among investors, coupled with constraints on short-selling, can lead to herd behavior and market crashes. (Watts, 2002) explores the dynamics of cascades and information diffusion in networks, demonstrating how herd behavior can emerge due to the interconnectedness of individuals. (Surowiecki, 2004) explores how collective decisions made by groups, often referred to as the "wisdom of crowds," can lead to rational and informed outcomes. Moreover, (Borge et al., 2016) explore how information flows and influences coordination phenomena, shedding light on the interplay between rational and irrational behaviors. In both resource allocation models and sustainable consumption scenarios, network theory contributes by providing a structured approach to understanding interactions, dependencies, and flows. It helps decision-makers optimize resource utilization, minimize waste, and design interventions that promote sustainable behaviors. The application of network theory in these contexts showcases its versatility and utility in addressing complex real-world challenges.

2.8.1 Social Network Analysis

Social network analysis attempts to capture the underlying process of event propagation across complex networks. When we examine societies, we do it with the assumption that they consist of a wide range of different people and groups. Spreading via online social networks, the topic of attention may be a virus, a social movement, a new style, a *consumer trend*, an invention, or a commercial message (Borgatti and Ofem, 2010; Kadushin, 2012). For instance, if we consider providing help to an African nation, a significant portion of that material may be diverted at the network's epicentre before any spread occurs. Broadcast media is another good illustration of a centralised system that can disseminate consistent information to many people from different locations. It has also been used for manipulative and propagandistic purposes with remarkable success. Centralised networks generally benefit from a concentration of resources that makes them highly cohesive, highly successful, and capable of fast dissemination. To paraphrase Metcalfe's rule, individuals will not only accept phenomena based on their worth in isolation but also on measuring how many others will adopt that phenomenon. Using the same network results in so much synergy that it is an influential driving factor towards convergence. For example, a person may not react to information when they see it on just one social media site, but seeing it on a second or third site may cause them to have more faith in that information and begin sharing it.

2.8.1.1 Role of Social Networks in Information Diffusion

Diffusion of information refers to the process of sharing knowledge within a community. It is the process through which information spreads inside and across societies and institutions (Bakshy et al., 2012). The extent of the spread of information depends on how appealing and favourable the people perceive the information. *Social networks on social media platforms provide access to information that allows individuals worldwide to produce and consume the content and share this information with other people*. Social contagion is an effect that happens when an individual has an idea that he shares with another person. That person adopts the idea and then shares it with another person or group. Out of this group of people, other people adapt and share this information with others, and all these connections become the network. Homophily

is the propensity for people with similar traits to hang with one another (McPherson, 2001). S*trong ties refer to* close relationships with people we know, like friends and family. People are more likely to open up and share when they have much in common.

Sequentially, people take in private information and create opinions based on their observations of the behaviours of those who came before them (Banerjee, 1992). *Actions taken by one individual in a cascade are useless to others that come after them, preventing social learning from occurring, at least momentarily*. As a result, succeeding persons experience a *negative information externality* due to cascade. Thus, judgments are often made with little knowledge. That is why these models predict that the system will eventually settle into a steady state where it is very vulnerable to perturbations of a small magnitude. In a system with infinite decision-makers, the likelihood of a cascade approaching one is guaranteed. Individual decisions have bounded rationality owing to information constraints (e.g., whether accepting or rejecting is the appropriate option) and probabilistic knowledge of the initial truth, which may lead to cascade errors. Furthermore, a few people who insist on a perspective as being reasonable may quickly affect a much larger section of the population.

The developing contemporary society must provide the groundwork for comprehending information flow via consumer networks (Bikhchandani et al., 1998). Information cascades have been the connecting mechanism for transmitting, revising, and comprehending data across several nationalities and cultures (Polis et al., 1997). There are five stages to the informational cascade process: 1) Deciding whether to try a new technological device, item of clothing, dining place, or even political philosophy. The second criterion is that the range of choices is limited (for example, to accept or refuse). Third, each participant acts after the others and is, therefore, privy to the outcomes of their predecessors' choices. 4) Information that complements individual experience is available to all individuals. Fifth, is it feasible to infer what other people know about the world based on their beliefs and attitudes, even while receiving direct proof of their knowledge is hard? *Therefore, exploring whether the information cascade leads to a wise and responsible society is interesting for further evaluation.*

2.8.2 Empirical Studies on Social Networks

This section unveils significant empirical insights illuminating the effects of social influence, utilizing historical and experimental evidence. A novel empirical inquiry delves into whether conformists or deviants from cooperative action exhibit distinct valuations, aiding the distinction between consumption network theories. Technological strides like social media and electronic databases have enriched data for studying social interaction impacts on behavior (Bailey et al., 2018). These datasets allow textual analysis as proxies for diverse individuals' information or thoughts. Vendors might furnish influencers with products for reviews or pay social networks to notify members of friends' recent purchases. Theoretical progress yields new empirical implications, highlighting actors within networks of social observation and partially logical attitudes.

Exploring information arrangement in sequential social learning settings warrants further examination. Augmenting data collection is an avenue, albeit sometimes requiring sacrificing specific agents. Salespeople can manipulate information architecture and observation networks, impacting behaviors. For instance, (Welch, 1992) highlights how monopolists' pricing structures affect early adopter behavior by shaping accessible information quality. (Bala and Goyal, 1998) employ quasi-Bayesian agents for analysis. Stubborn individuals may exhibit overconfidence in choices, disregarding external sources. A case is someone disbelieving climate change despite consensus. Confirmation bias leads them to selectively access confirming sources, ignoring opposing evidence. This confirms beliefs but disregards diverse information sources, showcasing overconfidence.

(Bohren and Hauser, 2019) conduct a study on social learning, examining scenarios where psychological biases like correlation biases may emerge. Their models assume continuous, unbounded information availability, and sufficient data for asymptotic rational learning. Yet, they note biases can impede asymptotic learning, leading to wrong actions, irresponsibility, disagreement, or cycles. Contrastingly, (Acemoglu et al., 2011) propose a decision maker's reward as a sum of expected action value (approximated) and known precise reward. If actions are always informative and

cascades impossible, asymptotic learning[5] can occur. These insights emphasize the intricate interplay between social learning and psychological biases, stressing the consequences of ignoring information sources. Recognizing these dynamics equips individuals and decision-makers for informed, rational choices, averting adverse outcomes tied to biases and wrong herds. Conventional wisdom from the early days of social learning theory held that each person acted just once, in a predetermined sequence (Banerjee 1992). Proactive social network agents think ahead and act realistically (Mossel et al., 2015). Everyone in the standard cascade's setup knows the identities of the individuals her superiors have watched. In a broader sense, an individual's observing neighbour may constitute sensitive personal information. If every agent in (Bohren's 2016) imperfectly rational model has an empty neighbourhood, then a failure in asymptotic learning is possible.

There is a model of rational social learning where individuals possess sequential choices (Banerjee, 1992). In such a scenario, each individual is identified based on information they possess and they are moving sequentially as individual I_m Watches how her predecessors have behaved and reacted accordingly I_l, and $l < m$. A person can only learn from a small sample of the decisions made by his predecessors since observing all of them is impossible. The neighbours of Individual I_m is presented as N_m Which is a set of individuals whose choices are observed by I_m. Instead of being binary, each state is equivalent to a collection of individuals' private information. While neither herding nor information cascades occur in this network configuration, the likelihood is that subsequent individuals would replicate their immediate predecessors' approaches toward unity. For example, consider a scenario where individuals decide to invest in the stock market. Suppose individual I_l invests in a particular stock, and individual I_2 observes this decision. Based on the limited information available to I_2, they may decide to invest in the same stock as I_1. Similarly, individual I_3, who observes the decisions of I_1 and I_2, may also decide to invest in the same stock, leading to a trend of individuals replicating the decisions of their predecessors. However, if one of the initial investors made a wrong decision, this trend could lead to an incorrect outcome.

[5] In mathematics and computer science, "asymptotic behavior" refers to the behavior of a function or algorithm as its input approaches a certain value (often infinity) or as it becomes very large or very small. Asymptotic learning in the context of human behavior or choices refers to the process by which individuals gradually refine their decisions over time as they gain more experience and exposure to information. It involves the convergence of choices toward optimal or stable patterns as the individual accumulates knowledge and adapts to their environment, often influenced by factors like feedback, learning curves, and cognitive adjustment

(Acemoglu et al. 2011) provide an example of a sacrificial lamb in a stochastic network that cannot attain asymptotic learning. In the topology of a network, few individual choices are considered dominant in some networks shaping the attitudes of other members of that respective group. They represented a set of individuals as $\{I_l, \dots, I_L\}$. Furthermore, if individuals 3 and 2 observe the choices of individual 1 and individual 4 observe all preceding individuals by putting positive weight on individuals 2 and 3 and negative weight on the individual. In stochastic networks, the sacrificial lamb process that allows for asymptotic learning is easy to understand; in deterministic networks, the picture is less black and white. Suppose there is a linked set of neighbours between any two agents in the network. Then it is said to be strongly connected if the likelihood that a sacrificial lamb would choose the false choice does not approach zero as n increases. There exists a fixed proportion of agents ($p < 1$) who never see anything else happen. Despite the decrease in the number of these agents, the network's increased connectivity ensures that this news gets spread to a growing proportion of the population as $p \to 1$. Therefore, if there are any sacrificial lambs, no matter how tiny a proportion, then learning is accomplished, but wisdom is not.

Suppose there is a network of individuals, each with two choices, A and B. In this network, individuals 3 and 2 observe the choices of individual 1, and individual 4 observes all preceding individuals with positive weight on individuals 2 and 3 and negative weight on individual 1. If individual 1 chooses option A and is the sacrificial lamb, then individuals 2 and 3 will be influenced by this choice and choose option A. Individual 4, on the other hand, will choose option B because of the negative weighting assigned to individual 1's choice. It can then lead to a cascade of incorrect choices in the network.

Data loss arises due to cascading model limitations in one-shot agent actions. Over time, an individual's signal outperforms social information, but the coarse action space hampers behavioral adaptation. Actions keep personal details hidden despite accurate social information. The "imitation principle" applies, allowing the matching of a seen neighbour's performance. Agents can revert to prior decisions anytime. Research on rapid learning in repeated action models is nascent. Identifying efficient knowledge-aggregating social networks is vital (Golub and Jackson, 2010). Strategic

informational incentives impact a discounting agent's value in repeated actions. An action might encourage others to reveal more in subsequent acts.

Consider an agent facing conflicting social and private information. They might opt to follow their private signal even if it reduces their current payout, seeking informational value from others' responses. Unresolved questions remain: How well do actions align with states during stability? Is there a link between private signal structure, irrational behavior, and this agreement? After status shifts, how swiftly does the trend reverse? (Bala and Goyal, 1998). Networks with agent overrepresentation may encounter communication and knowledge retention issues (DeMarzo et al., 2003). Persuasion bias, where individuals alter views assuming others lack visibility, leads to consequences. Asymptotic learning falters when social knowledge influences decisions, concealing private information. Bala and Goyal (1998) reveal that learning outcomes hinge on geometry in a quasi-Bayesian setting. The royal family exemplifies this, as high connectivity prevents unanimous action due to partial visibility. Negative news could be disseminated swiftly. This mirrors information cascades when agents disregard private signals in shared-action models (Arieli and Mueller-Frank, 2019). Shared details yield uniform decisions.

Agents sequentially decide, learning from each other, and fostering shared comprehension of the underlying probability distribution. Convergence to optimal decisions can hinge on limited influence (Acemoglu et al., 2008; Lobel and Sadler, 2015; Mansour et al., 2022). Pineapple growers' fertilizer choices in Ghana showcase the impact of social learning (Conley and Udry, 2010). They analyze farmers' social and spatial networks, financial sources, and soil quality variations. Wheat farmers benefit more due to greater nearby rice farming variability (Munshi, 2004). Successful farmers share knowledge beyond neighbours. Consider technology's intrinsic worth and potential gains from broad adoption. In Nepal, a study on menstrual cups found usage likelihood increased by 18.6 percentage points per adopting female friend (Oster and Thornton, 2012). Initial social influence diminishes over time, but learning transcends imitation.

2.8.3 Exploring Heuristic Approaches and Network-Centric Learning in Opinion Dynamics

A heuristic is any strategy used for problem-solving or self-discovery that is not always flawless, logical, or ideal but is good enough for the current task. When an ideal solution cannot be found, heuristic approaches may be employed to arrive at a workable one quickly (Myers, 2010). Some typical heuristic applications include making assumptions based on experience or making the best approximation. These principles may be taught or instilled by evolutionary processes. Psychologists have recommended using heuristics to shed light on the mental processes behind human choice, judgement, and problem-solving. It is common practice for these guidelines to be used when dealing with complex challenges or lacking critical information.

Partially prompted by the issue of how to quantify network centrality (Bonacich, 1987), Mathematical and physical disciplines (through models like the "voter model"), as well as sociological ones, conduct quantitative research into opinion exchanges over networks. If there are few agents in the social network, as presented by (DeGroot, 1974) in his seminal model, it has impacted economics and other disciplines. Every actor begins with a unique subjective previous belief about some fixed state. Each time, the agents share their current views with their neighbours in the network and then update their opinions based on a weighted average of the ideas held by their neighbours. These p_{nm} Weights are not internal to the system and remain constant across time. Under ideal circumstances, as discovered by DeGroot, this process converges, and all agents agree on something. The first eigenvector of the matrix, p_{nm}Determines the weights used to calculate the limiting belief, equal to an average of the initial beliefs.

(Golub & Jackson, 2010) suggest using DeGroot's technique[6] for data analysis. Their method presupposes a range of values $\mu \in [0; 1]$. Every person follows DeGroot's rule and utilizes a prior derived from a distribution with expectations and updates. Individuals in the same area are given the same relative importance. Suppose no agent has an excessively high degree. They further demonstrate that for large networks,

[6] Cognitive heuristics are mental shortcuts or strategies that individuals use to simplify decision-making and problem-solving processes. DeGroot's model describes a simplified mechanism for how individuals update their opinions by averaging their own beliefs with those of others in a social network. This process is a cognitive simplification of how people integrate information from their peers to form or revise their own opinions.

individual views will converge. Another measure of equality, the ratio of the highest degree to the total number of degrees, must be low enough to be significant. Learning is slowed beyond the socially optimum pace if information externalities are present. The comparative statics of learning velocity have not been studied extensively. This concept states that, in information cascade situations, under appropriate circumstances, agents would respond to new information by entering a cascade sooner, thereby working against the buildup of social knowledge. Like how changing a parameter in a non-cascade scenario would not necessarily speed up learning, the reverse is also true. Changes to the model that have the immediate impact of improving the reliability of social information tend to reduce the weight on the individual agent's private signal at that moment.

Synchrony in agent behaviour allows ecologists to pinpoint the origin of an impact. Without signals that might prompt consumers to revise their prior assessments of a product's quality, consumers learn about its availability via word of mouth from others in their immediate vicinity. According to naive[7] learning models, information should be aggregated more quickly by more influential agents (as assessed by their eigenvector centrality) than by less central agents. The author of this study analyses the income rankings of villagers in Indonesian communities to determine the strength of social networks. They conclude that an individual's social standing significantly affects the accuracy of their reported rankings (Chandrasekhar et al., 2020). The results of these studies highlight the need for more investigation into the nature and content of topic communication during social learning.

2.8.3.1 Social Learning Dynamics and Imperfect Rationality in Consumer Networks

In models where agents do repeated actions on networks, the agents may lack vision if they are allowed to disregard the potential effects of their actions on the future behaviour of others due to a lack of available information. On the other hand, social information aggregation is often enhanced by biases that encourage agents to be more

[7] Naive learning models are simplified decision-making approaches that individuals use to form beliefs or make choices when facing uncertainty, often based on straightforward heuristics and assumptions. Examples include Naïve Bayesia, Naïve decision tree and Majority Voting.

proactive in disseminating their signals to others. Different models do not consistently predict the level to which even small amounts of bias are socially amplified to have enormous and long-lasting impacts on social outcomes. Furthermore, further research is required to fully understand the dynamics of adopting behaviours like investments and consumption driven by imperfectly rational social learning. The next step is to account for various psychological biases that impact social interactions. Some instances of this include the tendency to believe only one's own beliefs or to disregard the rational choices of others (Bernardo and Welch, 2001).

Potential confounding factors in these observational studies include selection bias and the effect of repeated shocks, both of which weaken the reliability of the results. The field test conducted by the authors lacks reliable information on social networks and an impartial metric of knowledge (Did employees' friends who went to the fair tell them about the various retirement plans available? (Duflo and Saez, 2003). Research demonstrates that social interactions substantially impact attendance, as 28% of those invited showed up, whereas just 15.1% of those who were not at a treatment centre. Employees in treatment departments showed almost the same level of increased involvement without financial incentives as invited workers. Second-order connections seem to degrade just a little from first-order ones. At the same time, (Rao et al., 2007) observed significant positive social learning from direct friends (but not second-order friends) on the advantages of flu vaccination among students at a private university. A student's likelihood of becoming vaccinated rises by 8.3 per cent if more than 10% of their immediate social network has been immunized.

It is assumed that people want to pick up on either the consensus (in the case of binary signals) or the mean/average of choices (in the case of continuous signals) under the conventional social learning paradigm mentioned in Chapter 2 (With continuous signals). In this case, the social planner's conviction, $\frac{\sum_i^n x_i}{n}$. and accuracy nh_e. When the world state $\emptyset$ and the signals, x_i Follow a normal distribution. This belief distribution is sufficiently accurate that the mean belief functions as a mass point for networks of a reasonable size. However, very few individuals have actual knowledge, and the vast majority remain in the dark. The planner's belief has to mean, $\frac{\sum_i^n x_i}{m}$ and accuracy nh_e. If there are only $m \ll n$ knowledgeable agents. The aggregate belief variance can no

longer be ignored for m. Suppose, for argument's sake, the social network attempts to compile analysts' predictions for a stock's performance. In this situation, the network's aggregated view of 100 analysts may differ significantly from that of 5 experts. Agents cannot distinguish between a well-informed social network suggestion and a baseless rumour if they learn the median viewpoint. The prevalence of urban tales and rumors implies that online communities have trouble evaluating the veracity of collective assessments. As the number of signals available in current models is almost limitless, we cannot consider the accuracy of social learning.

Some aspects of consumer behaviour that affect both economic trends and the quality of life are missed by this oversimplification. The "rational consumer," an idealised figure in economics who aims to maximise value within the constraints of finite resources, is the object of much attention (Stiglitz 2019). A "collective illusion" is at the core of everything that counts in our society. Because it is risky to be shunned by the group, there is an evolutionary carryover that explains why we are so scared to break away from our groups. The brain assumes that most sounds are repeated loudest and most frequently. The need to fit in with the group is ingrained in human nature. Humans are not lone wolves; when they depart from the group, they send out an "error signal" that alerts others that a severe problem must be addressed. People who deviate from the norm are usually punished. However, there are occasions when the collective is mistaken, which has social and environmental implications. Individual agents' information is reportedly pooled in word-of-mouth communication, according to (Ellison and Fudenberg, 1995). The structure of the communication process can be used to explain conformity, where all agents ultimately make the same decisions. Communication through word of mouth can occasionally cause all participants to make, on average, better consumption decisions. It is largely down to the central agent of that network.

Individuals inherently exhibit social tendencies, engaging with the needs and aspirations of others amidst a landscape of evolving opportunities and challenges. The consensus persists that parent universally bears the responsibility for their children's welfare in their initial years, transcending cultural and religious affiliations. Comparable to the majority, many individuals contribute to household responsibilities or care for elderly parents. In the realm of consumerism, the conventional depiction of an economic consumer often neglects the integration of familial, social, and communal

dimensions, emphasizing the economic market dissociation. Although resource allocation towards family and progeny may not optimize resource efficiency, the favorable emotional and psychological outcomes considerably outweigh utility trade-offs. Nevertheless, this discourse does not quantify individuals based on thriftiness, profligacy, or extravagance. Thus, network theory nomenclature becomes imperative to comprehend the intricate dynamics underpinning wise consumption decisions.

2.9 Consumption and Environmental Implications: Analyzing Global Trends

Biocapacity is declining, and consumption is growing across the world. *Since 1970, consumption has been above biocapacity.* We buy clothes, food, and other commodities to meet our requirements, desires, and future reserves. However, how we buy, organize and discard objects leads us to *mindless consumption* with an increased abundance of manufactured products. The decision of a consumer to buy something is based on the valuation assigned to those certain commodities. However, few co*nsider the intent of purchasing and the product's durability through reason and available information before making any decision*. Moreover, countries have a tremendous gap in consumption levels and ownership. This difference increases wealth distribution inequality and influences healthcare and education. We have utilized data from the national footprint account and explain visually some of the key statistics related to consumption and its environmental implications.

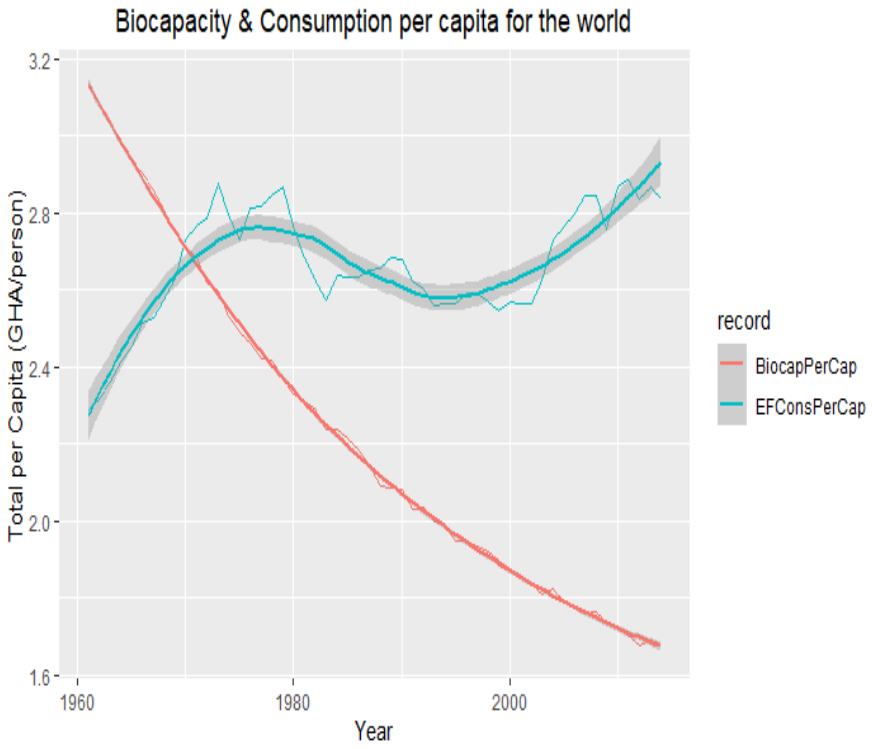

Figure 2.4: Biocapacity and consumption per capita from the world (Bottom).

Data source: National footprints account, https://www.footprintnetwork.org/resources/data/

The rapid growth in consumption rates further exacerbates the widening gap between consumption and biocapacity. For instance, China's consumption is projected to increase four-fold to $8.2 trillion by 2030, the deadline for meeting the UN Sustainable Development Goals (SDGs). Consumer spending accounts for 60% of global GDP, with the United States alone consuming $16 trillion annually. Despite being less frugal than five years ago, such massive consumption has significant implications for ecosystem health and biodiversity. This is because consumer spending drives natural resource extraction and industrial production, necessitating the use of water, energy, and land resources. In 1990, it took approximately 5.1 tons of natural resources to meet an individual's needs, but by 2015, that number had risen to over 12 tons. The impact of such consumption patterns will impede progress towards meeting SDG 12's objective of achieving sustainable consumption and production, as well as the Paris Agreement's targets of reducing emissions and limiting global temperature increase.

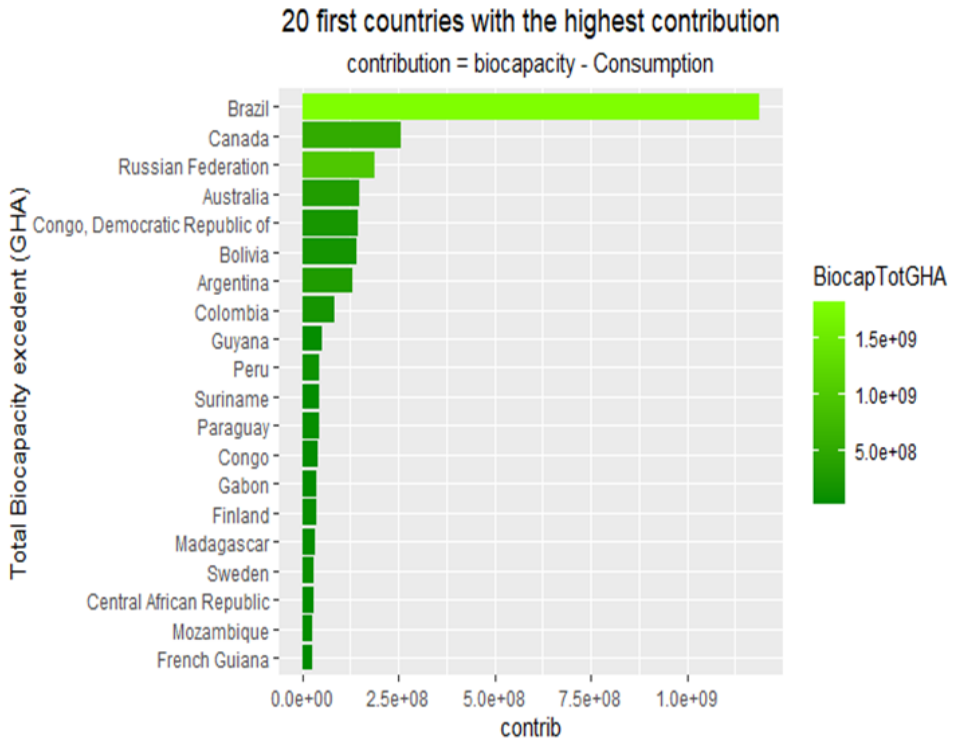

Figure 2.5: Top 20 countries with the highest biocapacity.

Data source: National footprints account, https://www.footprintnetwork.org/resources/data/

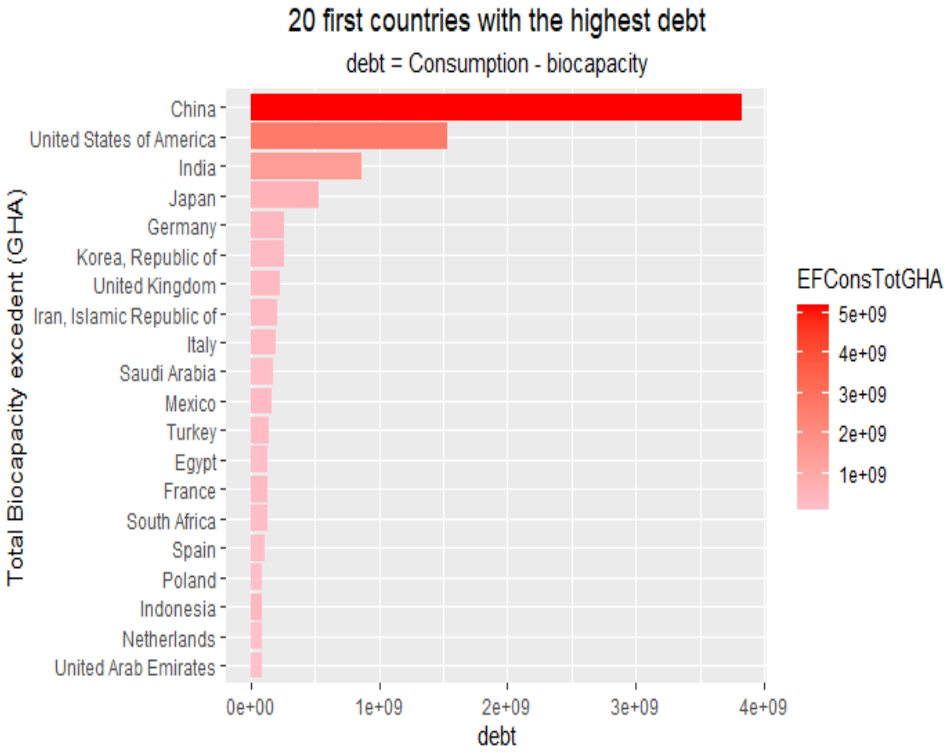

Figure 2.6: Top 20 countries with the lowest biocapacity.

Data source: National footprints account, https://www.footprintnetwork.org/resources/data/

Contribution is the difference between biocapacity and consumption to see which countries still have a positive impact. Positive contribution is mainly by Latin America and Africa, which can make sense due to their natural environment and low consumption. Brazil is far ahead, and we can find Canada, Russia, and Australia, which, even if they are in the top countries for consumption, have a positive impact due to their high biocapacity. The major countries are from Latin America and Africa, which can make sense due to their natural environment and low consumption. The top 3 countries are China, the USA and India, with the most negative effects, along with European countries (Germany, the UK, and Italy). Debt is the difference between consumption and biocapacity.

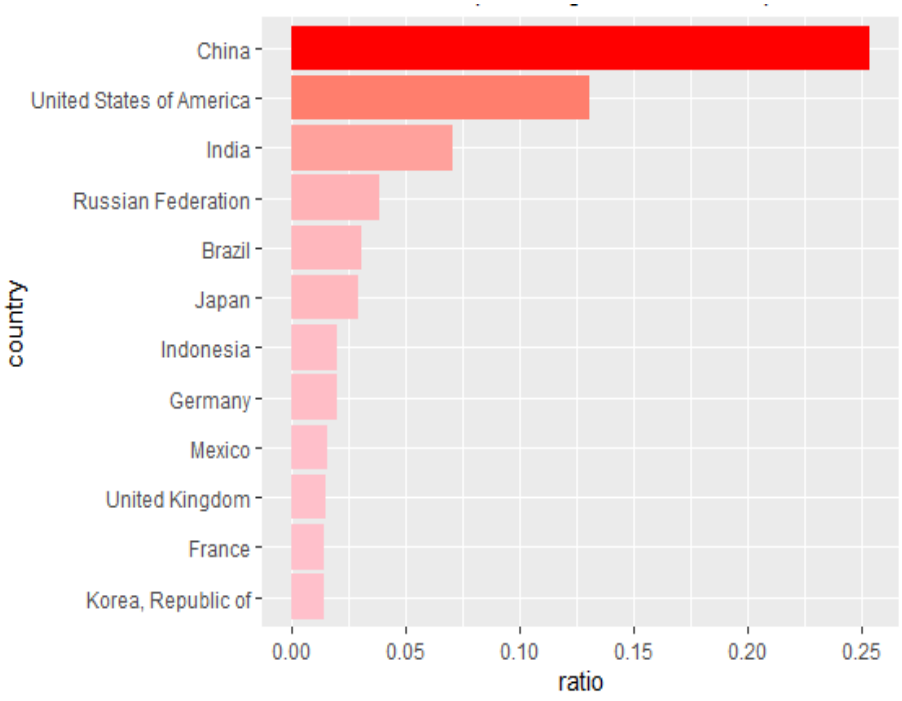

Figure 2.7: Countries of the world with 2/3 of world consumption.

Data source: National footprints account, https://www.footprintnetwork.org/resources/data/

Only 12 countries consume 2/3 of the total world consumption. China, the USA, India, Russia, and Brazil consume more than half of the world's consumption. We can show it as a map of the first country with the highest consumption that ***utilizes 2/3 of the total world consumption***. Consumption is more than just purchasing. It uses a product over its lifetime and then disposes or transforms it. Nevertheless, are our consumers truly driving our economy? It appears that we are being presented and supplied with more and more items that we do not require but are motivated to desire.

Many manufactured items are flooding the market, and their creation depletes the planet's precious natural resources. To counteract this, however, large swaths of valuable forest are being cut down to expand agricultural land, increasing food production overall. As customers, how can we stop feeling helpless and dissatisfied? Although it may seem like our everyday choices (such as where to buy, what to eat, and what to dress) do not matter much, the collective influence of billions of people making ethical choices may start to repair the natural environment (Goodall, 2013). It is as easy as saying, "Respect nature and the interconnection of everything vital to humankind". Consumption and production fuel the world economy but deplete natural resources and harm the earth. While drafting, many groups, including national governments, international organizations, and private businesses, had input on the SDGs. Biocapacity per capita is substantially inversely linked with a population (-0.9994), while total consumption is positively associated with population size (0.9967).

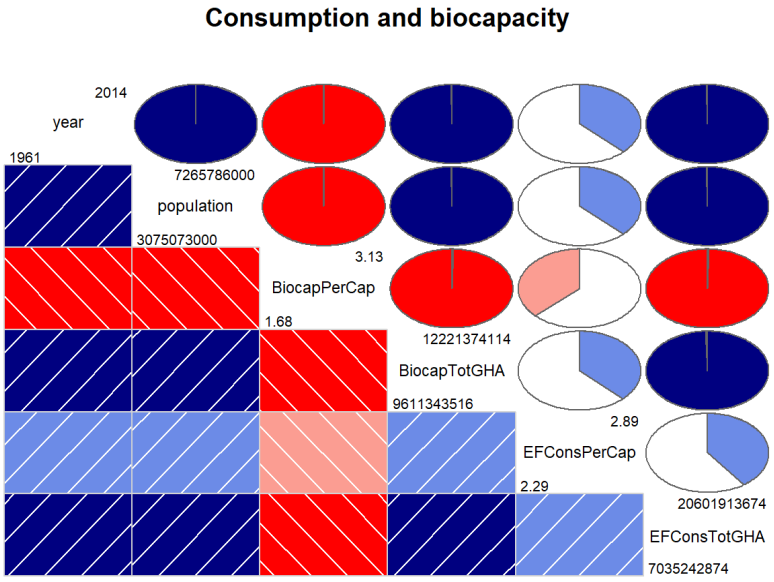

Figure 2.8: Consumption and biocapacity correlation plot (1961-2014)
Data source: National footprints account, https://www.footprintnetwork.org/resources/data/

2.9.1 Literature Review Highlights

The literature review explores that responsible consumption choices are not simply a matter of individual values, but also a social learning process influenced by networks of individuals and their values. The review shows that a range of values, such

as sustainability, ethics, and social responsibility, play a significant role in shaping consumer decisions about what and how to consume. However, these values are not developed in isolation but are influenced by the social networks in which individuals are embedded. The review emphasizes the importance of understanding consumption choices as a social learning process. Through interactions with peers, family members, and other social groups, individuals learn about the norms, values, and behaviors that are considered appropriate concerning consumption. Social networks can also influence the extent to which individuals prioritize certain values over others.

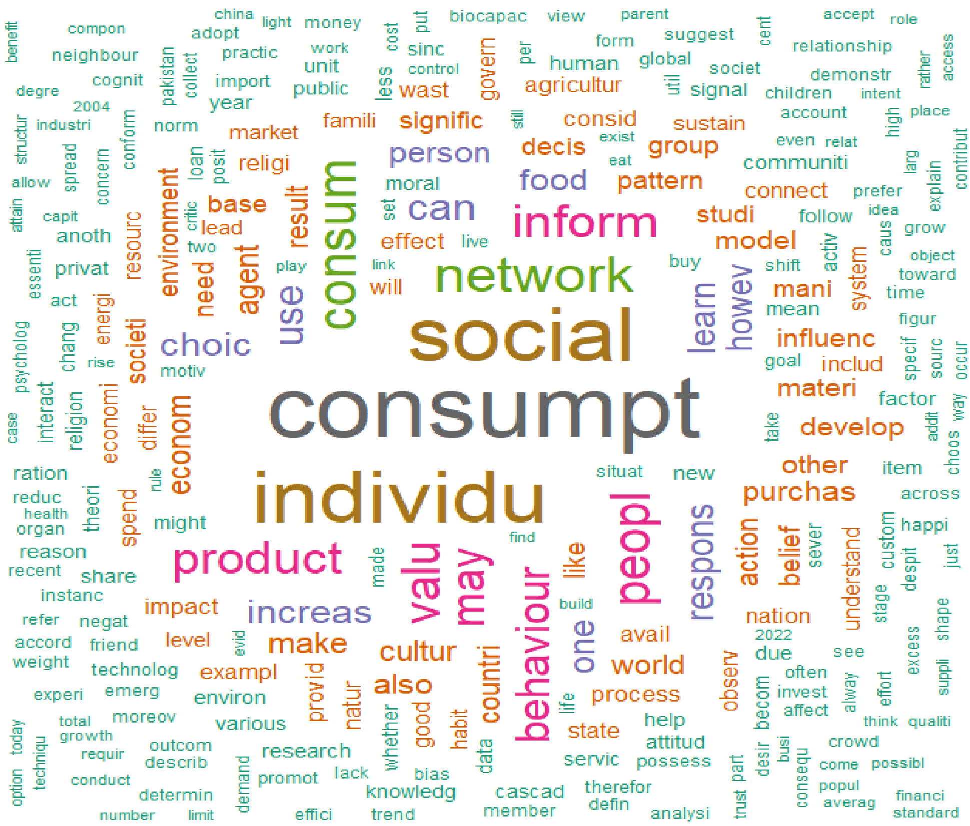

Figure 2.9: Word cloud of literature review

The word cloud generated from the literature review reveals the main themes and concepts that emerged from the studies. The cloud highlights the key role of individual values in shaping responsible consumption, as well as the influence of social networks and learning processes. It underscores the importance of understanding how social norms and values influence consumer behavior, and the impact of external factors such as marketing and advertising on consumption choices. Overall, the literature

review suggests that promoting responsible consumption requires a deep understanding of the complex social and individual processes that underlie consumption choices. The insights from the literature review presented in Chapter 2 pave the way for a deeper exploration of responsible consumption choices in Chapter 3. As we delve into the role of social learning, the foundation laid by the preceding chapter's discussion on the influence of individual values, social networks, and learning processes will be instrumental. Chapter 3 will further expand on these themes, demonstrating how social learning processes and the exchange of information in networks play a pivotal role in shaping responsible consumption choices, making it a logical progression in our study.

Chapter 3

The Role of Social Learning in Ensuring Responsible Consumption Choices: Theory and Practice

"Yesterday, I was clever, so I wanted to change the world. Today I am wise, so I am changing myself."

Rumi ~

Executive Summary

The present study investigates the influence of social learning on consumption and production decisions in a societal context[8]. Specifically, it examines how individuals acquire knowledge regarding the true value of nature through information and subsequent network communication, employing the DeGroot Social learning process as a theoretical framework. Responsible consumption choices are defined in the context of the crowd's wisdom and two propositions along with deduced assumptions are presented based on the consensus phenomenon in social networks. In this context, individuals with greater access to private information are called "neighbours." The findings suggest that in a perfectly rational scenario, individuals exhibit high levels of confidence in their abilities and base their decisions on a combination of personal experience, perception, and intellect, leading to society's convergence towards responsible consumption choices R_c^*. However, when individuals are bounded or irrational, they tend to exhibit persuasion bias or stubbornness, resulting in a lack of diversity, independence, and decentralization. Such a situation leads to a consumption network that lacks wisdom and may never converge towards responsible consumption choices. Hence, finite, uniformly conspicuous neighbours will rapidly converge towards the opinion of the group. Suppose many individuals in a society consume excessively (extravagance) or below the optimal level (misery). In that case, the consumption network is dominated by unwise decision-makers, resulting in a society that deviates from promoting responsible. In conclusion, this study underscores the significance of considering the impact of social learning on responsible consumption

[8] I extend my gratitude to Robinson-Julian Serna and Omaida Sepúlveda Delgado for their insightful comments to the graph theory study and for securing the funding necessary to advance our project.

choices and stresses the need for a more rational and informed decision-making process to achieve a sustainable future.

3.1 Introduction

Social learning refers to the process by which one modifies their views after considering the acts of others. People who see the choices of others are more likely to adopt such behaviours themselves, which is a crucial conclusion of social learning. Studies show that individuals rely on the opinions and advice of their peers in almost every area of their lives, often more than they rely on their own direct experience or intuitive intuitions. First, people tend to converge on the same activity, which frequently deviates them away from responsible consumption. However, results are often fragile because they are very susceptible to informational shocks and hence highly reliant on the circumstances under which they emerge (i.e., path-dependent). The notions of "information cascades" and "informational herding" were introduced in the works of (Banerjee, 1992; Bikhchandani et al., 1992; French, 1956; Harary, 1959). In these models, people sequentially make judgments after seeing the acts of those who came before them, resulting in a cascade of knowledge. It is not often the case that everyone in the network of observers can see and know the decisions made by everyone else in the network before them. Therefore, insufficient information is collected, leading to faulty decisions.

Individual consumption networks are often far more complicated as; a person may not be privy to other people's experiences (Bounded rational). Given the complexity of inference difficulties in consumption networks, we have accommodated bounded, perfect, and imperfect rationality situations in our work. So, consumption choices are assessed based on these criteria of rationality conditioned on information availability and extent of influence on decisions. The ears and eyes represent the senses through which man learns and acquires information. While the brain processes sensory data, makes inferences and plans of action, and then decides whether to carry them out. However, with the advancement in techniques, availability of data and technology, individuals have the possibility to act rationally because of the access to abundant and low-cost information.

Our study focuses on the mechanisms through which information and its externalities may cause or prevent behavioural convergence and divergence in the context of responsible consumption. The DeGroot, a non-Bayesian Rule of thumb model and frequently realistic, has been widely explored in numerous studies concerning interactions via social networks. It accurately depicts that when an individual gains information from others, this impacts their choice mechanism. Individuals' social networks primarily facilitate the spread of values, attitudes, and choices. They spread information about goods, services, and societal initiatives; and encourage or discourage people from pursuing higher consumption. It may be difficult for individuals, even with complete information about the network, to update their views accurately because of the complexity of that social network. We also illustrate consumption networks, where individual choices converge to the rational limit, with more considerable confidence in their choices.

The DeGroot model offers a robust mathematical framework for exploring the role of social learning in shaping responsible consumption choices. These mathematical tools provide a rigorous and systematic way to analyze and understand the complex dynamics of social networks, including the flow of information, influence, and opinion formation. The directed graph theory visually represents the relationships between individuals in a social network and the flow of influence and information. It captures the interactions between individuals and highlights key influencers and opinion leaders. On the other hand, the DeGroot model is a mathematical framework that quantifies the extent to which those of others influence each individual's beliefs and behaviours. It provides a quantitative measure of the influence of different individuals in the network and the strength of the relationships between them. By combining the directed graph theory and the DeGroot model, researchers can gain new insights into the dynamics of social networks and the role of social learning in shaping responsible consumption choices. For example, the analysis may reveal key critical influencers in promoting environmentally-friendly behaviours or highlight the most effective strategies for disseminating information about sustainable products.

The study of consumer behavior and the formulation of a definition of responsible consumption necessitates the consideration of cultural factors, such as religion, in addition to quantitative frameworks. Insightful explanations about human character and

behaviour may be found in religious texts. Religious texts refer to how hassled[9] and frugal[10] people are in general. Religious scriptures often mention the concepts of thrift, saving money, and wanting more material possessions. Consumerism externalities, the desire for positional goods, and the practice of conspicuous consumption[11] are all discussed. Religious scriptures also recognise the human tendency to satisfy physiological and aesthetic wants[12]while urging moderation and compassion. Responsible consumption is emphasized, as is the value of knowledge gained through rational decision-making. All religious texts, however, advise their adherents to restrain these instincts and instil empathy in their conduct and behaviour. Humans are endowed with wisdom, which can only be attained by using reason to make life decisions. Therefore, a society might be led away from wisdom if its members mindlessly follow the views of others[13]. The significance of social learning in influencing responsible consumption may be better understood if researchers consider a more comprehensive range of cultural views.

The availability of information has made it feasible for contemporary human society to make informed decisions about efficient resource utilisation. In economics, the focus is on the actions of a "rational consumer" who seeks to maximise utility while considering the cost of information and market pricing. However, this oversimplified picture does not capture irresponsible consumption choices. It holds when a person maximises utility by squandering resources and negating the negative externality of their choices on society and the environment. Individual actions that are wasteful cannot be considered reasonable and logical. Regardless of religion or belief, parents raise their children in every society. Similarly, most people care for their parents and feel some obligation to their neighbours, co-workers, friends, and family members. So, the interconnection of individuals with other economic actors sometimes makes our choices either bounded rational or derive us towards absolute irrationality (DeAngelis, 2004)

The role of social learning in consumption networks has been widely studied in network science literature. Research in this field has shown that individuals'

[9] (Proverbs, 21:5; Al-Quran,17: 11)
[10] (Proverbs, 28:22-24; Al-Quran,17: 100)
[11] (Luke, 12:15; Timothy, 6:9-10; Quran, 102: 1-2)
[12] (John, 2:16; Quran, 3: 14).
[13] (Matthew 15:14).

consumption choices are influenced by the behaviours and opinions of their social network members. Understanding the dynamics of social networks can provide valuable insights into how to promote responsible consumption through social learning. The diffusion of innovations, such as new products or sustainable practices, often occurs through weak ties or individuals who are not close friends but have a distant relationship (Granovetter, 1973). Moreover, the structure of social networks can also significantly impact the spread of information and influence among network members. For instance, highly centralised networks with strong ties between a few key individuals can facilitate the spread of information and promote coordinated action. On the other hand, decentralised networks with weak ties can increase the diversity of information and promote the spread of new ideas.

Some individual choices are based on the greater weight of their neighbour's opinion and information. It means that the gap between our most radical and moderate ideas gradually shrinks over time in a society where large social movements compete for control over our choices on consumption and production. This question calls for evaluating group relations and the extent to which these structures foster inclusivity in information exchange, at least in part. We will be analysing the consumption choices of individuals based on the work of (Golub and Jackson, 2010). Regarding consumption choices, we have explored whether community members eventually adopt a common viewpoint or retain divergent views based on Perron-Frobenius Theorem (Meyer, 2000). A society with the most significant influence on its members' beliefs is demonstrated through centrality and asymptotic behaviour[14]. Moreover, the time required to achieve consensus describes our conditions based on the extent of connectedness among members of society. When community or group members exhibit wasteful spending habits, the group moves away from developing the collective wisdom necessary to avoid making careless decisions that may have lasting adverse effects on its members' well-being. Moreover, (Rrmoku et al., 2022) use network simulation to find the imitation patterns in individuals' decisions, especially those of experts[15].

[14] It shows how a function acts when the input (or independent variable) gets closer to infinity. There is a built-in method for limiting behaviour in every Markov chain.

[15] The recommendations might not be as persuasive for unrelated products, but those guide consumption and production choices in economies. While (Orland and Padubrin, 2022) uses network analysis to find the gender hiring gap in economics academia.

The role of social learning in ensuring responsible consumption choices is a topic that has received increased attention in recent years due to the growing recognition of the environmental and social impacts of consumer behaviour. Previous research has focused on individual-level factors influencing consumer choices, such as values, beliefs, and attitudes. However, the role of social learning in shaping responsible consumption behaviour has not been extensively studied. For example, sharing details about others' energy-saving practices led to a significant uptick in people taking up such practices themselves. Academic studies in this field have examined how social learning affects people's purchasing habits and how it might motivate people to make more environmentally friendly decisions. It exemplifies how people might learn to make more sustainable buying decisions by watching and emulating others. For instance, (Brough et al., 2016) have underlined the significance of social views in sustainable consumption by analyzing the Green-Feminine stereotype and its influence on environmentally conscious actions. (Graham et al., 2014) used the extended theory of planned behaviour to forecast home food waste reduction, highlighting the importance of social learning in determining waste management practices.

Different psychological processes behind social learning, including result expectancies and behavioural intentions, have a moderating role in encouraging environmentally friendly purchasing decisions. Social learning may motivate responsible consumption decisions, as recognized in intervention design literature (Hynes and Wilson, 2016). The importance of social learning processes is also explored in the context of the psychological aspects of intervention design for encouraging sustainable consumption. Social learning interventions are needed to close the "attitude-behavioural intention" gap in our food consumption choices (Vermeir and Verbeke, 2006).

Responsible consumption is encouraged through community-based efforts that facilitate shared knowledge and coordinated action. The Transition Town movement began in Totnes, England, and now advocates for more environmentally responsible and secure communities worldwide. Social learning and behavioural change opportunities may be found in community initiatives like gardens and renewable energy cooperatives (Kenis, 2014). Businesses that engage in CSR efforts through social learning may influence customers' actions. Patagonia is well known as a pioneer in the sustainable outdoor gear industry (Rattalino, 2018). It's strategy has shown the efficacy

of social learning by impacting both customers and other businesses. Consumers benefit from having access to information about energy efficiency ratings on appliances because of obligatory labelling initiatives such as the EU Energy Label and the Energy Star programme. The proliferation of online platforms and social media has significantly aided the dissemination of information and the shaping of consumer behaviour.

The research significance of this work lies in its contribution to understanding how individuals form their preferences and make decisions in a world where information is limited and uncertain. The practical problem addressed in this article is the influence of social learning on responsible consumption choices in society. We aim to investigate how individuals' decisions are shaped by social interactions and the implications this has for promoting sustainability. The novelty of our work lies in its exploration of the relationship between rationality, bounded rationality, and imperfect rationality and the role of social learning in shaping responsible consumption choices. By using DeGroot and Bayesian methodologies, the study provides a more nuanced and sophisticated understanding of how individuals use information from others to form their preferences and make decisions. By considering the role of social learning, this research expands the current understanding of responsible consumption choices beyond individual-level factors. It provides insights into how collective wisdom and behaviour can shape individual decision-making. Additionally, the focus on the role of digital technology in facilitating social learning is novel, as previous research has largely overlooked the impact of digital technology on responsible consumption behaviour.

This work aims to study responsible consumption choices, and Section 1 explains our work's introduction with a literature review in Section 2. The methodology explained in Section 3 includes theorizing a consumption social network and using directed graphs, eigenvalue plots, and the Perron-Frobenius Theorem. In Section 4, responsible consumption choices are defined in the context of the crowd's wisdom and two propositions are presented based on the consensus phenomenon in social networks. Furthermore, we have explained three scenarios representing rational, bounded rational and irrational choices of individuals in Section 5. The goal is to bridge the gap between empirical and theoretical studies on social learning by incorporating recent technological advancements and social media. We need more specific information to

tease out the processes of memory storage, information aggregation, and information transmission in the consumption networks of individuals. The proliferation of social media sites in recent years has made it feasible to keep track of in-depth records of communication inside actual social groups. In turn, theorists may calibrate and expand their models by learning from empirical investigations of the natural conversational structure, communication frequency, and information degradation along transmission pathways.

3.2 Literature review

Understanding how people learn and adopt sustainable purchasing patterns has become critical in light of the rising concern for responsible behaviour. This study seeks to comb through the available research on modelling the effect of social learning on responsible consumption by using directed graphs as a framework for analysis. The term "social learning" describes how people pick up new skills, values, and habits by witnessing and mimicking those of their peers in a group setting (Spaargaren, 2003). An important factor in moulding one's behaviour and choice-making is social learning which entails learning from the experiences, actions, and consequences of others (Goldsmith, 2015). When people see their friends and coworkers engaged in eco-friendly behaviours like recycling and buying secondhand goods, they pick up those habits themselves. Individuals may be encouraged to engage in more responsible habits after seeing the beneficial effects of these actions modelled for them (Bandura, 1977). The term "responsible consumption" describes buying and using products that consider the potential adverse effects on the environment, society, and ethics. It entails minimizing waste, conserving resources, and advocating for fair trade to help the environment and ensure a sustainable future[16].

The connecting factor between social learning and responsible consumption is how social interactions and observations influence people. A person's social networks, which might include friends, family, coworkers, and media influences, are essential sources of information on engaging in responsible consumption. Individuals' perspectives and decisions are influenced by the social norms, beliefs, and behaviours they witness inside these networks. Individuals are more likely to make

[16] Buying locally produced and organic foods is an example of responsible consumerism because of the positive effects on the local economy and the environment. Another strategy to lessen waste is to choose items with minimum packaging [Vermeir and Verbeke, 2006; Yang et al., 2022; 2023].

environmentally conscious purchases after seeing members of their social network make similar ones, such as when they see individuals using reusable bags, reducing their energy use, or participating in community recycling initiatives (Cialdini et al., 1991).

Social networks and the spread of information are only two examples of complex systems that benefit significantly from directed graphs employed as a modelling tool. Interpersonal connections, societal conventions, trust, cultural values, and the spread of knowledge all affect people's tendency toward responsible consumption. These models are helpful because they represent interdependencies between people and make it easier to investigate information dissemination patterns (Newman, 2018). These models consider aspects like network topology, connection strength, and individual adoption thresholds (Centola, 2018). The impact of social learning on responsible consumption across several domains, including energy saving, waste reduction, and sustainable buying, has been the subject of several empirical studies that have employed such models, (Salazar et al., 2013).

Social ties in the form of interpersonal interactions have been found to increase the likelihood that an individual would adopt sustainable habits (Jain et al., 2013). Responsible consumption is influenced by *social norms*, both descriptive (perceptions of what others do) and injunctive (perceptions of what others approve or disapprove of). Social norms' impact on individual choices can be modelled using directed graphs. For examples, see [Cialdini and Goldstein, 2004; Salem and Alanadoly, 2021; Schultz et al., 2007). When people trust the information, they get and those in their social networks, they are more likely to adopt behaviors from their surroundings. However, graph models can capture the cultural factors influencing people's perspectives and actions regarding sustainability (Stern, 1999). Social learning and responsible consumption rely on the free flow of information, and determining the effects of information sharing across social networks is possible through directed graph models.

Important mechanisms in the spread of responsible consumption include *feedback loops, contagion effects, and information cascades*. By mapping these patterns, researchers can gain insights into intervention techniques to encourage sustainable behaviour. When people model responsible consumption, it encourages others to do the same and creates a positive feedback cycle. This procedure strengthens the habit and

helps it spread further (Schultz et al., 2007). The term *"*contagion effect*"* describes the propagation of a pattern of behaviour in which people consume more of a particular product or service. There is a cascade effect wherein consuming patterns spread across the network as people see and mimic the actions of their social connections. People experience information cascades when they begin to adopt consuming routines based on the actions and decisions of others rather than their own. The same holds for the spread of responsible consumption within a network: if some people are persuaded to adopt these practices, even if their preferences run counter to them, the trend spreads (Bikhchandani et al., 1992).

Researchers have also created agent-based models, network diffusion models, and Bayesian networks to simulate and forecast the spread of consumption behaviour inside social networks. Social learning affects consumer responsibility, and the evolution of group outcomes may be studied using these models. The dynamics of social learning and responsible consumption have been illuminated using computational models such as agent-based and network diffusion models (Watts and Dodds, 2007), Bayesian networks (Heckerman, 1997) and directed graph representations. These models aid in improving the area by allowing researchers to simulate, forecast, and comprehend the propagation of consumption preferences inside social networks (Gilbert, and Troitzsch, 2005; Epstein, and Axtell, 1996). These case studies give empirical data and practical insights to better understand the dynamics of social learning and the variables that either encourage or discourage the adoption of responsible consumption behaviors.

Empirical data and novel insights have resulted from studies using directed graph models on responsible consumption. Using directed network models, some researchers have examined how social learning affects responsible consumption in the real world (Yang et al., 2014). Effective intervention tactics to encourage responsible consumption may be better understood with the help of directed graph models. Interventions may exploit social learning processes for long-term behaviour change by focusing on essential people or critical network positions. In addition, pinpointing key hubs in the system helps boost the propagation of eco-friendly habits among consumers (Freeman, 2000). Researchers can better develop treatments that take advantage of social learning processes and influential people to promote sustainable habits if they have a firm grasp on the network structure and dynamics at play (Gionis et al., 2013; Bramoullé et al., 2019; Basu and Sen, 2021).

3.3 Methodology

In this work, we recognise that individuals are influenced by various factors, including their social network, cultural norms, personal values, and economic conditions. For example, peer pressure and social norms may encourage individuals to purchase products that are not environmentally friendly. At the same time, personal values and environmental concerns may also lead to responsible consumption patterns. We aim to understand these complex relationships and how they shape individual consumption behaviours and decisions through utilizing the Degroot social learning process.

3.3.1 Individuals and Interaction

The main goal of this methodology is to see whether it may shed light on the dynamics of groups when planning consumption decisions via the lens of social connections, which includes interactions between individuals. The current hypothesis reduces the complexity of influencing large groups of N individuals to a direct interpersonal impact by (a) connections among group members, (b) patterns of interaction within the group, and (c) linkages among group members' viewpoints. There must be a clear and consistent set of definitions and postulates to apply the rules of logic and give a mathematical model its deductive power and internal coherence. A theory's plausibility is questioned when it is shown to be too simplistic compared to the complexity of actual human social behaviour for *mathematical* ease. *In game theory*, "the rational economic man" is described, but economic conduct frequently deviates significantly from this ideal. The proposed theory partly addresses this problem by using the theory of directed graphs[17], a branch of mathematics that may be used without the need to make exact quantitative assumptions about empirical data.

The workhorse model in our work is the DeGroot; given continuous information with probability, p_h, individuals forecast the future condition of the world each time as follows. Even before they get a chance to consult with anybody else, their finest source

[17] Directed graph theory, an extension of graph theory, with an eye toward its application in the social sciences. These mathematicians helped in establishing the theorems of this theory and match the findings of studies on the power of social networks (Harary and Norman, 1953).

of data is what they have discovered on their own. They take an average of their most recent estimate and the guesses of their neighbours to whom they have listened in the next interval. According to the rules of a social network, connections between people/nodes are made through describing finite set $N = \{1, 2, \dots, n\}$. Utilizing this methodology investigated various networks in which consumption choices are formulated deduced from the opinions of respective group members. Consumption interactions among individuals are captured through an $n \times n$ stochastic[18] matrix C. Then $C_{hi} > 0$ demonstrates that individual h *for making his/her choices allocates some* weightage to the opinion of i to make some consumption choices. The actual state of the world $\theta \in R$ is that *we have responsible consumption choices*. Each individual has some initial Choice with a probability $p_h(0)$; we assume $\theta = 1/n \sum_{h=1}^{n} p_h(0)$ and with time[19] (k) individual updates his choices as $p_h(k)$.

$$p_h(k+1) = \sum_{i=1}^{n} C_{hi}\, p_i(k) \qquad (3.1)$$

Each individual is adjusting their opinions based on the average of others around them. An example of this can be herding behaviour which refers to the phenomenon where individuals in a network tend to follow the opinions and decisions of others rather than forming their own independent opinions. It can result in individuals converging on a common opinion, even if it is not the most accurate or best supported by the available evidence. Although individuals cannot modify their behaviour, they may share information with their neighbours to revise their opinions. There are chances that an Individual gets a noisy signal $p_h^{(0)} = \mu + e_h$, [20] when time $k = 0$.

Various mechanisms can drive herding behaviour, including social influence,

[18] In a stochastic matrix, values across each row are normalized sum to one.

[19] In time $\boldsymbol{k} \in \{\mathbf{0}, \mathbf{1}, \mathbf{2}, \dots\}$ **and** $\boldsymbol{p_h^{(k)}} \in \mathbb{R}$ **and** $\boldsymbol{p_h^{(k)}}$ to lie in $[\mathbf{0}, \mathbf{1}]$. A probability of 0 means that an event is certain not to occur, while a probability of 1 means that an event is certain to occur. In the context of a social network, probability can be used to model the spread of information or influence between individuals. For example, the probability of an individual adopting a new idea or behavior can be estimated based on their network connections and the influence of others in their network. Overall, the use of probabilities in social network analysis provides a way to quantify and model the uncertainty and complexity of social relationships and interactions.

[20] where $e_h \in \mathbb{R}$ is an unforseen noise term, and μ is a specific natural condition n. In a social network, an individual can receive a noisy signal when they receive information that is inaccurate, misleading, or otherwise distorted. This can occur when the information is transmitted through the network, and it becomes distorted as it passes from person to person. For example, if a piece of information is initially accurate but is later changed as it is passed along, the final information received by an individual may be different from the original. Noisy signals can also arise due to intentional or unintentional misinformation, where individuals in the network may deliberately or inadvertently spread false information. Additionally, social networks can also be subject to biases, where certain individuals or groups receive more attention or are more likely to be heard than others, leading to the spread of biased information.

network structure, and individual behaviour. Understanding these structures helps understand social network dynamics (Acemoglu et al., 2015). In the context of the empirical illustration of the crowd's wisdom, the doubly stochastic[21] matrix can represent individuals' influence in a network on each other's beliefs.

3.3.2 Directed Graph

A digraph (directed graph) is a type of graph in mathematics and computer science that consists of vertices or nodes connected by directed edges, which have a direction and lead from one vertex to another. In a directed graph, the vertices (also known as nodes) can represent individuals or entities, and the directed edges can represent the interactions or relationships between them. The direction of the edge represents the direction of the interaction or relationship, and the edge's weight can represent the interaction's strength or importance (Wasserman and Faust, 1994). It may be said that the consumption matrix C is connected if and only if $C_{hi} > 0$. Additionally, there are also self-loops with non-zero probabilities, C_{hh} of cycling back to the initial state h.

In the context of a consumption network, a recurrent graph may represent a closed system where resources are constantly being reused and recycled. A transient graph may represent a system where resources are consumed and eventually depleted. For example, a food chain in an ecosystem can be modelled as a transient graph, where energy flows through the system and is eventually lost as heat. On the other hand, the carbon cycle in the ecosystem can be modelled as a recurrent graph, where carbon is constantly cycled through the biosphere. Periodicity refers to the presence of repeated patterns in the behaviour of a network over time. For example, in a social network, periodicity may refer to the regularity with which individuals interact or the regularity with which certain events occur within the network. In the context of a social network, irreducibility may refer to the idea that the behaviour of a group of individuals cannot be fully understood by examining only the behaviour of individual members but must be studied in terms of the interactions and relationships between individuals. Moreover, Convergence/ Consensus refers to the process by which multiple agents or nodes in a network reach agreement on an expected value or set of values. In this process, the nodes in the network exchange information and update their values based on the

[21] It is a square matrix whose elements are non-negative and the sum of elements in each row and each column is equal to 1.

information received from other nodes until they reach a typical value.

3.3.3 Representing Consensus

We have discussed the conditions under which a consumption network's participants' preferences stabilise within finite boundaries rather than continuing to oscillate indefinitely. As a result, wisdom cannot be realised in such convergence (Golub and Jackson, 2010). A consumption matrix C can be regarded as convergent if $\lim_{\mathrm{k}\to\infty}(\mathrm{C^k p}) = \lim_{\mathrm{k}\to\infty}(\mathrm{C^k(Cp)})$, This implies that, $\mathrm{r^* = r^*C}$ and $\mathrm{p} \in [0,1]^{\mathrm{n}}$. In economics, the consumption matrix can converge if the limit of C as time goes to infinity exists, is aperiodic and is finite. In practice, the convergence of the consumption matrix can be influenced by various factors such as income, preferences, and market conditions. For example, consider a matrix that represents a household's monthly consumption of food items. If the household consistently spends the same amount each month on each food item, then the matrix's limit would represent the household's steady-state monthly consumption. Convergence, in this sense, means that all starting consumer opinions will eventually converge to the same point. If $\mathrm{p_1(0) \neq p_2(0)}$, the belief vector will always be in flux as people constantly revise their opinions. However, convergence does not require that an individual h always put some weight on his own opinions to formulate a consumption choice that is $\mathrm{C_{hh} > 0}$ for any h. However, convergence does not mean that the crowd is wise, and blindly following the opinions of others does not lead us towards responsible choices in our lives. There is also a left eigenvector r of C with the sum of rows equal to 1 (Horn and Johnson, 2012).

$$(\lim_{k\to\infty} C^k p)_h = rp$$

The limiting choices mean that individual weightage to the initial opinions of others. Moreover, Individual h influence in their respective group, corporations or governments is represented by r_h whereas, $r\ (r1, \dots, rn) \in [0,1]^n$. It would measure how much each influences the consumption choices of others.

$$(\lim_{k\to\infty} C^k p)_h = \sum_h r_h p_h(0) \qquad (3.2)$$

Noting that $(\lim_{k\to\infty} C^k p = (\lim_{k\to\infty} C^k(Cp)$, This implies that.

$$r = rC$$

It is sufficient to know that $r_h = \sum_{i \in N} C_{ih} r_i$. Every h has an influence equal to the weighted sum of the influences of all the individuals i who pay attention to h, where each individual's influence (denoted by r_i) is multiplied by their confidence (denoted by C_{ih}), in h. A Consumption matrix C is reaching a consensus if $p_1(\infty) = \cdots = p_n(\infty) = rp(0)$. Therefore, suppose the initial vectors of opinions are, $p(0) = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$ Then updating gives us, $p(1) = C.p(0)$, $p(2) = C.p(1) = C^2.p(0)$, $r(Cp(0)) = rp(0), \forall p(0)$

$$C^k \to C^\infty = \begin{pmatrix} r \\ \vdots \\ r \end{pmatrix}$$

Our research has focused on how long-term consensus may be maintained. We use the Perron-Frobenius theorem from probability theory (Friedland et al., 2013). Each person who is not a part of one of these closely linked groupings will eventually come to accept the restricting views held by the absorbing group as the norm and then C^k Reach its limit if one exists. These findings point in the same direction, showing that less cohesive societies converge more slowly than more cohesive ones. The vector r quantifies each individual's societal impact: The views of more powerful individuals have more weight in the eventual unified decision. It is straightforward to demonstrate that an individual's sway in a network is precisely proportional to his or her degree,$r_h = 1 + d_h$, in symmetric networks. According to the formalisations of (Golub and Jackson, 2010; Jackson, 2010), the only structural aspect of a symmetric network that affects the distribution of social influence is the degree distribution, not the average social distance impacting the pace of convergence.

Homophily refers to the phenomenon where people are likelier to make friends in their community or social group (Golub and Jackson, 2008). Homophily has no bearing on a person's ability to absorb and retain information over the long term since it does not affect their social impact. Convergence speed, however, may be significantly slowed: Within any community, attitudes will inevitably converge rapidly, but opinions may take considerably longer to become uniform across groups. Our consuming habits are a direct result of these repercussions. If all the nodes in our consumption network

are in constant contact with one another and have about equal influence, then our network is functioning optimally. What happens when one person's viewpoint does not fit in a highly cohesive power structure with a matrix of interconnected communication channels? The number of group members who differ from the dissenter is directly proportional to the degree to which the dissenter is converted to the mainstream position via persuasion. As the number of people in the group increases, their combined power to affect the deviation increases, represented as $(d_1 - d)$.

3.3.4 The Perron-Frobenius Theorem

The second-largest eigenvalue modulus $|\sigma_{SLEM}|$controls the pace of convergence to r^*. The rate may be written as $1 - |\sigma_{SLEM}|$ [22]. As the distance becomes prominent, the rate of convergence increases. Departure from equilibrium, measured in terms of the total variation distance, has a temporal characteristic that may be measured in terms of the mixing time. As a result of the exponential nature of convergence, the mixing time for the exponential decay is e^1

$$C_{mix} = -\frac{1}{log|\sigma_{SLEM}|}$$

3.4 From Individual Choices to Collective Wisdom: A Theoretical Formulation of Responsible Consumption Network

It refers to the idea that the collective decision or judgment of a large group of people can often be more accurate and reliable than the judgment of a single expert. This concept can be applied in the context of consumption networks to understand how large groups of people can influence buying behaviour. For example, consider an online product review platform like Amazon or Yelp, where consumers can rate and review products. The average rating of a product, derived from the collective opinions of many people, can accurately represent its quality and value. Other consumers can then use this information to make informed purchasing decisions. Another example is social media networks, where users can follow and share product recommendations. The collective judgment of a user's friends and followers can significantly impact their

[22] The spectral gap $|\sigma_{SLEM}|$ is the space between the radii whose lengths equal the magnitudes of the second and first most significant eigenvalues (SLEM and LREM, respectively). It is a representation of eigenvalues on the complex plane..

purchasing decisions, as people tend to trust the opinions of their social network more than those of strangers. In both of these examples, the Wisdom of the Crowds principle is at play as the collective opinions and experiences of a large group of people are leveraged to inform and influence individual purchasing decisions.

We start by finding the long-term choice convergence for three kinds of consumption networks, i.e., *rational, bounded, and imperfect rationality scenarios*. Moreover, a community needs a large population size to have enough variety of thought to flush out individual mistakes and uncover the truth. We can say that a crowd is "wise" if the influence of the most powerful in the group vanishes (Golub and Sadler, 2007; Golub and Jackson, 2010). Nearly as ancient as democracies themselves is the belief that "wisdom of the crowd" *(collective wisdom)* can be used to solve societal issues. According to Aristotle, who is often credited with coining the phrase "the wisdom of the crowd," *human emotions impact all of us to some degree and cause us to make wrong judgments.* Human desires cancel each other out, leading to intelligent decisions if we can find the mean of all options. (Surowiecki, 2005) contends that using the collective information of the public to make predictions is superior to relying on a small team of specialists. He believes that *diversity*[23]*, autonomy*[24]*, and decentralisation*[25] are necessary for tapping into the collective intelligence of a crowd and that modern computing technology has made it possible to help "decision makers" to generate accurate forecasts about several aspects of life. An example of the crowd's wisdom in promoting responsible consumption and production is using *crowdsourcing* platforms to gather input from a large group of people on environmental issues. For example, a company could use a crowdsourcing platform to solicit customers' ideas on making its production processes more sustainable. It is tempting to rely on the "wise crowd" to help understand public opinion on policy matters because of the potential for reducing individual bias.

3.4.1 Wisdom-Driven Responsible Consumption: Formulating Propositions

Wisdom in the context of responsible consumption choices can be defined as the

[23] Having a diverse group of individuals with different backgrounds and perspectives leads to a broader range of ideas and solutions being considered when making decisions..
[24] Autonomy allows individuals to act freely and express their opinions, which can help to avoid groupthink and promote creative thinking.
[25] Decentralization of decision-making powers and responsibilities helps to prevent a single person or group from dominating the decision-making process. This can help to ensure that responsible consumption and production choices are made at the local level, where the needs and circumstances of the community can be best understood.

ability to make informed decisions based on a deep understanding of the interconnectedness of social, economic, and environmental systems. It requires weighing the long-term impacts of one's actions and considering the consequences for future generations. A collective effort can help us shift towards more responsible choices during our lifetime (Meadows et al., 2018; Latta, 2009; McDonough and Braungart, 2010).

In our work, a set of $n \times n$ interaction matrices represent the order of networks. We define a society as the sequence, $(\mathrm{C}(n))_{n=1}^{\infty}$. To avoid confusion, we shall refer to the (h, i) entry of the interaction matrix n as, $C_{hi}(n)$. *Slow convergence may be considered a priori required for a "wise" individual, state, corporation, or group.* However, a highly linked network and rapid convergence speed are not necessities for acquiring wisdom (Jackson, 2019). There is an actual state of nature $\theta \in [0, 1]$. If the information that people receive has restricted support, this may be readily generalised to enable the actual state, which is the Responsible state denoted as R_c^*. At time $k = 0$, an agent h in a network n observes a piece of information, $p_h^{(0)}(n)$ that is contained inside a discrete interval $[0, 1]$ normalized without sacrificing realism. In the scenario, variance is $\sigma^2 > 0$, and the mean is θ. Information $p_h^{(0)}(n), \ldots, p_n^{(0)}(n)$ are entirely unrelated to one another for all values of n. Many highly informed community members, as determined by the variance lower bounds rules, increase the likelihood of convergence to the truth. In this era of digitisation, access to information is not a problem. Therefore, individuals can make rational choices that help society *achieve responsible consumption mechanisms.*

Consider the consumption network $C(n)$ and label its associated influence vector as $r(n)$. Attitudes of individual h in the network at time k are represented as, $p_h^{(k)}(n)$. It can be shown that for each n and implementation, $p_h^{(0)}(n)$. For each size n of the networks, there exists an upper bound, $p_h^{(\infty)}(n)$, beyond which the beliefs of any given set of nodes h converge. Each final option is a stochastic variable that changes based on the input information. By definition, a *wise consumption network* sequence is one in which all possible limiting choices converge concurrently in probability to the actual state θ *and Only wise individual, group, or State can acheive* R_c^*.

However, widespread consensus is not always desirable. There is an agreement (of

sorts) in the herding case, but it might implode. We would like consensus to be at $p^* = \frac{1}{n}\sum_{h=1}^{n} p_h(0) = \theta = R_c^*$. Influential people (such as media, local and religious leaders, and their close associates) have a disproportionate impact on the behaviour and beliefs of others. The idea is that if we consider the network of individuals who influence one another through their interactions and the flow of information and ideas, the presence of a few influential actors can disrupt the stability and diversity of the network. A "doubly stochastic" network refers to a system where the flow of information and influence is spread evenly and randomly across all participants, creating a balanced and diverse network. The absence of double stochasticity and the presence of influential actors can lead to a network dominated by a few voices and perspectives, reducing the wisdom of society as a whole. For understanding wise societies, the law of large numbers[26] can be helpful in our model. We have averages of a random variable that are non-identical. It will be used to define wisdom in terms of power rankings. Label the individuals for all values of h and n, $r_i(n) \geq r_{i+1}(n) \geq 0$. Thus, the people are listed from most influential to least.

3.4.1.1 Proposition I

Consumption network $(C(n))_{n=1}^{\infty}$ is wise, if, $\operatorname{plim}_{n\to\infty} \max_{i\leq n} |p_h^{\infty}(n) - \theta| = 0$ and individuals make rational choices based on utilising sight, hearing, and intellect converging towards a responsible state R_c^*. *For wisdom to be achieved, the information must be i) independent, ii) uncorrelated, iii) have a mean* θ*, and have variances > 0. If* $(r(n))_{n=1}^{\infty}$ *is any sequence of influence vectors, then,* $\operatorname{plim}_{n\to\infty} r(n)p^0(n) = \theta$*, When n* $\to \infty$ Individuals with the most influence tend to zero $r_1(n) \to 0$, resulting in a wise society. Furthermore, wisdom is a precondition to attain R_c^*.

[26] In probability and statistics, the "law of large numbers" states that a larger sample's mean will approach the average of the entire population, ensuring statistical reliability. When many individuals opt for environmentally and socially responsible products, overall sustainability rises. This influences producers to adopt sustainable practices in response to demand changes. As responsible choices increase, population-level sustainability trends toward a more responsible norm. *This principle drives collective action for responsible consumption and production.*

Responsible consumption based on intellect[27], hearing[28], and sight[29] refers to the idea that individuals should make informed and deliberate choices about what they consume and how they consume it, considering their intellect, the information they hear, and what they see. This interpretation, however, does not contribute to an objective definition of the notion. A person's spending habits on food, clothes, and health care, or at any one moment, cannot be used to indicate their frugality or wastefulness. Even sacred texts advise appreciating one's blessings and avoiding the waste that might result from limited or irrational decision-making. Currently, there is a lack of a universally accepted standard for determining what constitutes moderate and excessive consumption levels. Consumption levels are considered moderate when they (a) fall within the range considered acceptable by the target social group (b) fulfil the intended purpose for which they were purchased (c) spending stays within the allotted budget. Standard responsible individual conduct in terms of expenditures on necessities such as food, clothes, housing, transportation, healthcare, and education, as judged by members of the appropriate social strata. Each main kind of spending would have moderation defined by how the typical person in that socioeconomic class sees the category. Based on proposition 1 we have devised a framework to attain Responsible consumption depicted below in the figure,

[27] Intellect refers to an individual's ability to critically evaluate information, weigh the pros and cons of different choices, and make informed decisions. When making decisions about what to consume, individuals should use their intellect to carefully consider the social, economic, and environmental impacts of their choices.

[28] Hearing refers to the information that individuals receive through various sources, such as media, advertising, or word of mouth. When making decisions about what to consume, individuals should seek out diverse sources of information and critically evaluate the reliability and accuracy of the information they receive.

[29] Sight refers to the visual representations of products, their packaging, and the production processes used to create them. When making decisions about what to consume, individuals should use their sense of sight to evaluate the appearance and quality of products, and to consider the environmental impact of their production processes.

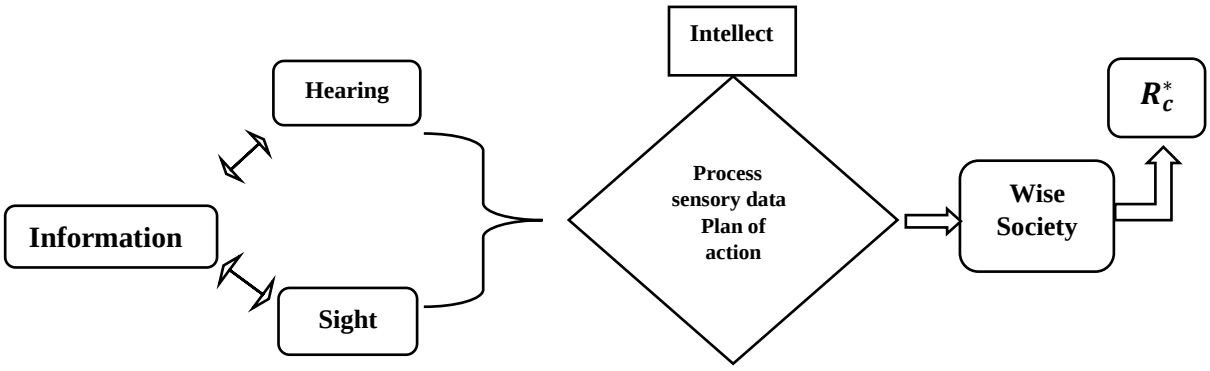

Figure 3.1: Responsible consumption in the context of rationality deduced based on Proposition 1

According to the probability limit condition, as the number of individuals making responsible choices increases, the influence of any single individual will diminish, allowing the collective wisdom of the group to emerge and individual choices to converge to the actual state of nature. In this way, the wise society can be seen as a self-correcting system, where the collective behaviour of individuals drives the convergence towards a responsible state. In such a system, individuals may make choices that prioritise the long-term health of the environment, the well-being of future generations, and the sustainability of social and economic systems.

3.4.1.2 Proposition II

The consumption network or group is not wise and will never lead to responsible consumption decisions if there is a finite, uniformly conspicuous neighbour regarding $\big(C\ (n)\big)$*, then,* $\underset{n\to\infty}{plim}\, r(n)p^0(n) \neq \theta$*. So individual choices will never converge to the actual state of nature* R_c^* *as* $n \to \infty$*. Individuals with the most influence never approach zero* $r_1(n) \neq 0$.

In a society where individuals blindly follow the choices and actions of others, the overall decisions made by the group will not lead to wise and responsible consumption. It is because individuals are not using their judgement and abilities of hearing, sight, and intellect to gather information but instead relying on the influence of others. Then for individuals in a society, the cost is either no convergence or a faster convergence

resulting in deviation away from wisdom. Therefore, information becomes *(i) dependent, (ii) correlated, (iii) has a mean greater than* θ, and has variances = 0. An example of this can be seen in the fashion industry, where people blindly follow the latest trends and wear clothes not because they like them but because they believe others will approve of them. As a result, they may make extravagant purchases, even if they cannot afford them, and waste resources on things they do not need. In literature, this concept is portrayed by (Fitzgerald, 2015), where the characters are consumed by the desire to fit in with the wealthy and make extravagant purchases to keep up with their neighbours.

Harmony is the key to achieving responsible choices in an individual's life. Aristotle was on to something when, 2,300 years ago, he began the study of happiness. Aristotle's "Golden Mean" states that "virtue" is found midway between the extremes of excess and deficiency. We know deep down that being happy is the whole goal of living. The man was created to serve his fellow man, but he turns into his adversary when he puts no value on anything outside his own practical needs, (Shleifer, and Vishny, 1997). Scientists have connected dopamine to the euphoria most people feel while shopping: when someone goes out to buy something new, the brain expects a reward from that sparkling item, so it fires dopamine in the brain's reward centre. Most individuals cannot afford to purchase anything they want to consume indefinitely, whether it is food or drink. *Self-control* comes into play for the ordinary person in this situation, as it may help explain why so many individuals have trouble saying no to a sweet treat. Everyone experiences the urge to give in to their baser animal instincts. However, the *logic-based portion of their brains where self-control resides* does its best to rein them in.

3.4.1.3 Unveiling Assumptions in Responsible Consumption: Proposition-Based Insights

Based on the above propositions formualated we have assumed there are two states in the economy; state 1 is the Responsible level of consumption (R_c) and state 2 = is a Higher or lower level of consumption (L_c).Two risks for moving as Individuals move from R_c with risk probability α to L_r and Individuals with risk probability φ to remain in L_c.These probabilities are considered transitioning from one state to another.

$$U_{R_c} = (1-\alpha)U\left(c_{R_c} + B^i\right) + \alpha U(c_{L_c} - \emptyset) \qquad (3.4)$$

Individuals in R_c Have responsible consumption choices while there are social and environmental benefits B^i . However, there are higher external social and environmental costs if the individual moves to a higher consumption state Lc.

$$U_{L_c} = (1-\varphi)U\left(c_{R_c}\right) + \varphi U(c_{L_c} - \emptyset) \qquad (3.5)$$

If an individual moves from L_c to R_c, then consumption will be (c_{R_c}) as costs are greater than benefits. Individuals remaining in a state L_c Have to bear monetary, social, and environmental costs, which will be transmitted to the whole society if they are in the majority. In a consumer-oriented society, people tend to conform to the behaviours and preferences of the majority. When the proportion of individuals who engage in extravagant consumption ($\boldsymbol{p > 1/2}$) is large, there is an excess of consumption relative to the optimal level, leading to economic inefficiencies and an unsustainable balance in the long run. On the other hand, when a large proportion of individuals are below the optimal level of consumption (misery), there can be a lack of demand for goods and services, leading to economic stagnation. In their paper, (Shleifer, and Vishny, 1997) argue that herding behaviour arises when investors lack information and rely on the actions of others to make investment decisions. In a society driven by consumerism, the affluent upper class often indulges in lavish consumption as a means of showcasing their social status (Veblen, 1899). This trend sets off a phenomenon known as the "trickle-down effect," wherein the less privileged segments of society seek to emulate the opulent lifestyles of the wealthy. Consequently, the consumption behaviors of the most prosperous individuals come to dictate the equilibrium of the overall economy.

$$R_c < L_c, \text{ where p} > ½$$

Ergodic state $L_c = L^*_c$

Consequently, the preferences of society are shaped by those in L^*_c. Engaging in irresponsible consumption comes with a multitude of ramifications. These encompass escalated pollution levels, the depletion of non-renewable resources, the possibility of exacerbating global warming, unpredictable weather patterns, and the potential degradation of environmental habitats. Our utilization of natural resources has

surpassed sustainable limits by over seventy per cent, posing a serious concern. Additionally, this behavior bears adverse consequences for both individuals and societies alike, including financial instability, societal tension, elevated rates of obesity, as well as health and mental well-being issues. These are some of the costs that we have mentioned by remaining in L_c State. These costs are labelled as x_h and degree or level of consumption as ɗ_h

$$\text{ɗ}_h + x_h = 1$$

The cost associated with consumption that is either extravagant (higher) or miser (lower) are minimised at a steady state when, x_i Converge to a lower value. Now utility function of individual h is shown as,

$$U(c_h B^h x_h) = ln(c_h + B^h) + \Phi x_h \qquad (3.6)$$

$$B^h = 1 + \text{ɗ}_h, \qquad x_h = (1 - \text{ɗ}_h)$$

$$U = \ln[(c_h) + (1 + \text{ɗ}_h)] + \alpha \ln\left(\frac{1-\varphi}{\alpha + \text{ɗ}_h}\right) + \Phi(1 - \text{ɗ}_h)$$

Φ is the weight associated with the costs of other activities; if there is a responsible level of consumption, then Φ converges to a smaller nominal value, which means that the least costs are imposed on the environment. Applying F.O.C concerning ɗ_h

$$\text{ɗ}_h = \frac{1}{\Phi} + 2\left(\frac{(1-\varphi)}{\varphi - \Phi - 1}\right) \qquad (3.7)$$

Weight is inversely related to the degree of consumption level ɗ_h, as Φ it is smaller for responsible consumption, but when Φ is high results in higher costs imposed on society and the environment. There is a systemic challenge to wisdom in random consumption networks: the dominance of a few influential individuals that disrupt the effective coordination between, State, group, corporations and individuals and sway them from attaining the actual state of nature, i.e., R_c^* . Both observational learning and the iterative updating approach presented here run the risk of collective mistakes if too much weight is placed on the opinions of a small minority of the population (Bala and Goyal, 1998). As a result, each action's optimistic individual will accurately calculate

its payout, and ultimately, society will learn which acts are ideal. For this result, connectivity is the sole attribute of the network required. Within the framework we have established, centered on our formulated propositions and underlying assumptions, we have delineated three distinct scenarios. The first scenario involves individuals possessing flawless comprehension of the prevailing natural conditions and disregarding external opinions. Conversely, the other two scenarios encompass situations marked by rational decision-making and bounded rationality, respectively

3.5 Choices in Action: Real-life Scenarios Showcasing Individual Decision-Making

3.5.1 Reasoned Choices: Examining *Rationality* Across Different Scenarios

It is worth noting that groups with many individuals having little information may provide accurate outcomes if each person chooses their own (Surowiecki, 2005). Wrong results are more likely when a group chooses sequentially. When individuals are free to do what they like, they frequently copy one another (Fisher, 1971). There seems to be a troubling uniformity in a society where everyone has complete freedom to behave as they like. In religious terms, God gave us the hearing, eyesight, and intellect to make informed or rational choices in life.[30] Those who do not utilise their senses effectively put harm to themselves and others in the form of creating negative externalities for society and the environment. Religious texts emphasise the importance of rationality in an intersubjective environment. Several passages in the religious scriptures explain a "*tribe, country, or community who thinks.*" In contrast, criticise those "*who do not apply their reason*". Humans are part of a broader world, and our thoughts operate inside a more significant framework of comprehensibility.[31]

The five senses, sight, sound, smell, taste, and touch, are how humans gain insight and understanding, as theorised by philosophers. Only two of man's five senses have been emphasized thus far: sight and hearing. This is because *the information* a person may get from smelling, tasting, and touching is restricted. Human obtains most of his knowledge via his senses of hearing and sight. Things we hear are stored in our memories. According to statistical analyses, hearing is highlighted ahead of sight

[30] (Proverbs,18:13, 4:7-8; Acts, 17:17, James 1:19, Quran, 17:36; 2:269)

[31] (Proverbs, 18:15, Quran: 2:164)

because humans learn most of their daily experiences via auditory means. Humans were not created to mindlessly absorb any heretic or aberration prevalent in the world without questioning its legitimacy. *Hearing* is not to ignore the one who attempts to tell us right from wrong and instead hold on to the misconceptions. Given its importance to human cognition, the visual system is often the subject of study in psychology. Philosophers give it much thought since it is essential for making sense of the world's mysteries. We may learn from and profit from enlightening glances. Moreover, the sense of sight is not blindly following the crowd and ignoring the reason. *We have intellect, hearing, and sight to know the truth, but those who are not efficiently using these will lead to suboptimal choices in life, harming themselves and the environment.*

Rationalism is a philosophical viewpoint that *emphasises reason above emotions.* Therefore, reason is the only way to find and verify ultimate truths (information) (Descartes, 1850). Spinoza's Ethics uses a methodology that is, once again, deductive and is based on Euclid's Elements of Geometry (Scruton, 2002). Therefore, *rationality occurs in a communicative and intersubjective setting* because of existing and thinking. The ontological roots of reason have shifted dramatically at a time when we quantify rationality in terms of measurable qualities and computerised judgments, leading to the identification of highly idealised, inevitable irrational forms of rationality as the origin of human intelligence. *The reason,* the trait that sets us apart from the rest of creation and advantages us above others, acts mainly in a qualitative and axiological environment. One may classify human wants and requirements into the things we cannot live without and the luxuries and improvements that make life more congenial. There will be a direct impact of the information acquisition cost in time the attainment of responsible consumption choices. *Therefore, if information received by an individual is unbounded and costless, then asymptotic learning can be achieved, which leads to a wise society. That is why we need to use our intellect to make good decisions.*

Individual consumption decisions tend to converge on the actual state, the responsible consumption state. According to (Golub and Sadler, 2017), individuals are prone to a cognitive bias known as persuasion bias, which causes them to incorrectly attribute a lack of independence to the knowledge they have gleaned from a common source. Information aggregation effectiveness is influenced by the structure of available social networks and the information itself. When there is a great deal of variation in the

quality of the information being aggregated, it is easier for people to separate irrelevant or irrelevant-to-the-present-state bits of information from the whole. Empirically consumption matrix should be doubly stochastic for a wise society. We have defined some boundaries for this purpose $0.50 < p_{hh} < 0.85$ *while* $p_{hi=}(1 - p_{hh})$. *It means that an individual in a rational society places more weight on their own opinion but also considers the opinions of others to some extent. The fact that the weight placed on others' opinions is less than 0.50 implies that the individual values their own opinion more than the opinions of others*. p_{hi} represents the influence of other individuals' opinions, and its value should satisfy p_{hi}= (1 - p_{hh})/$(n - 1)$. To satisfy the double stochasticity condition which is a prerequisite for a wise society, The sum of each row should be equal to 1, meaning that the probabilities of all influences (including self-influence) add up to 1 for each individual.

$$C_{hi} = \begin{bmatrix} p_{hh} & p_{hi} & \cdots & p_{hi} \\ p_{hi} & p_{hh} & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ p_{hi} & p_{hi} & \cdots & p_{hh} \end{bmatrix}$$

The matrix size is $n\ by\ n$, where n represents the number of individuals. Each row represents an individual's consumption decision. Each column represents the influence of other individuals' opinions on an individual's consumption decision. A rational consumer is defined as someone who makes purchases based on their needs and does so at the best possible price. Such a consumer is expected to put the purchased products to good use and not waste them. However, what constitutes appropriate use and fair benefit is subjective and can vary from person to person. Education and moral mandates are necessary to ensure that individuals make responsible choices in their lives. These can help promote social control and ensure that consumers make choices that align with a shared understanding of what is considered appropriate and beneficial (Scitovsky, 1992). There is an open-ended question: *How often have we considered the social and environmental aspects of our purchase decision?* Before buying a shirt, shoes, smartphone, computer, or any other product, did we think about the social and environmental performance of the brands or companies or the human rights conditions behind the production of those products? The answer will be a big "No". This

phenomenon is known as the *"intention behaviour gap*[32] " (Sheeran, P., & Webb, 2016) because we have all the best intentions. However, when it comes to decision-making, people neglect their intentions and follow herd behaviour. *This intention behaviour gap can be minimised when people have confidence in their choices, utilise information from other sources effectively and finally decide based on reasoning considering positive and negative externalities. Information access* is not a problem in this digital age. *However, we as a consumer are good at rationalising our own unsustainable decisions by blaming corporations and framing unsustainable as a production problem.* This is just part of the tale; today's issues directly result from our culture's insatiable pursuit of greater convenience at a lower cost and faster speeds. Therefore, changing consumption norms is just as important as bettering production circumstances.

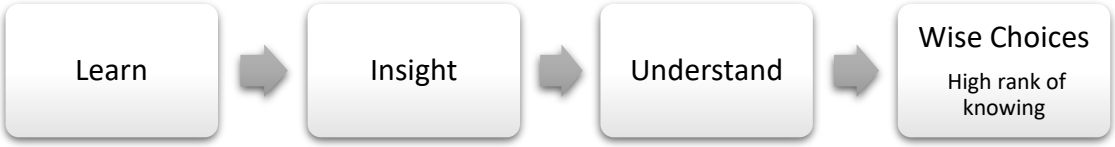

Figure 3.2: Learning towards Wise Choices.

Learning towards wise choices refers to acquiring knowledge, insight, and understanding to make informed and responsible decisions. This concept is rooted in the idea that by gaining a deeper understanding of a subject, we can make more informed choices that align with our values and contribute to our well-being and that of others. For instance, a person may learn about the environmental impact of single-use plastics, reduce them, and switch to more sustainable alternatives. Another example is someone who learns about unethical labour practices in the fashion industry and purchases clothing from brands that prioritise fair labour practices and environmentally sustainable production processes. In literature, this concept has been explored by (Light et al., 2013), which examines the role of personal choices in promoting a just and sustainable world. (Eisenstein, 2013) explores the idea that our current economic and social systems are driven by ignorance and argues for a shift towards a more holistic,

[32] When a consumer chooses between two equally appealing T-shirts, knowledge about their origins matters. One shirt originates from a brand with ethical production practices, including fair wages and safe conditions, while the other comes from a notorious "sweatshop" brand. Publicly, many would opt for the responsible choice. Yet, actual decisions involve peer influence and financial limits. This reflects the impact of available consumer information. Historically, instances like the Dhaka Bangladesh garment factory collapse (April) showed dire labor conditions, involving reputable brands. Despite such events, consumers still purchase from these brands, neglecting their cost on labor, environment, and society. If companies prioritize worker conditions and fair pay, it could alleviate poverty.

interconnected, and responsible way of life. In conclusion, learning towards wise choices is a crucial aspect of responsible consumption and a way to promote a more sustainable and just world. By gaining knowledge, insight, and understanding, we can make informed decisions that align with our values and contribute to a better future for all.

The likelihood of consumers choosing healthier products can be enhanced by reducing costs. In the digital age, more consumers are now concerned with the way of production of goods and services and their environmental costs and benefits. It means digitisation has improved our ability to become rational and responsible consumers. There is a Potential Effect of Pro-environmental Self-identity on Responsible Consumption Behavior. Different kinds of Behaviors, including consumption, are explained through identity. It can be coordinated through attitudes, values, and behaviours (Oyserman, 2009). Market dynamics and consumer choices can play a significant role in promoting sustainable practices. By buying organic, sustainable, and fair-trade products, consumers can drive demand for these items and incentivize companies to adopt more environmentally friendly practices. This approach does not require a complete overhaul but rather a shift in consumer attitudes and purchasing habits (Walsh, 2020).

Boycotts are situations where individuals stop buying commodities from a particular manufacturer to express disapproval. When a product does not align with religious teachings, religious leaders advise their members not to use specific products, due to which companies witnessed a tremendous drop in sales. Thus, from the example, it is evident that religious sentiments can broadly impact people's consumption choices. If that is so, they can also spread responsible consumption patterns and teach the adherents about the consequences of climate change. Therefore, places of worship and clerics have an influential role in disseminating information regarding the consequences of environmental degradation and promoting the teaching of efficient utilisation of resources. *In other words, our behaviours are driven by ideas, beliefs, and ideologies that we may not fully comprehend. Bringing anything to the light of Reason is an excellent way to get partial freedom and independence.*

3.5.1.1 An Example of the Rational Consumer Network.

Let us suppose a responsible individual forms all choices (consumption, education, marriage, investment, production) by utilising information efficiently through reasoning. Such an individual further gives a signal to accept, represented by G, While B represents information that indicates that a particular choice is not suitable for the individual and society. When the majority choice is to accept, there are more chances that individuals will choose G to formulate their choices. This work is in the form of conditional probability for G as $P[G|E]$. When the correct action chosen is based on information B, then $P[B \mid F]$. e.g., Individual 1 buys a car x; however, after a few days of discovering that it has a terrible fuel average. So, he gives information about car x to his friend (individual 2) and then individually chooses to reject that car and exclude it from his preferences list. This kind of likelihood is depicted by r, then r > 0.5,

Individual	**True Probability state**	
information	Reject	Accept
B	r	1-r
G	1-r	r

Table 3.1. Rationality of individuals, based on information.

Further, we assume that all individuals act rationally. Based on the reasoning through utilizing all information, the first individual decides whether to make a choice based on his information or whether there is a need for information to be extracted from other sources and uses his sight, hearing, and intellect to collect the best possible options available. If the Bayesian rule is employed, then,

$$P(E|G) = \frac{P(E)P(G|E)}{P(G)}$$

$$= \frac{P(E)P(G|E)}{P(E)P(G|E) + P(F)P(G|F)}$$

$$= \frac{sr}{sr + (1-s)(1-r)}$$

$$> s$$

The probability of accepting information G is found by summing the product

$P[G|E]$. The first person, if making a choice based on his thinking, will always raise his estimate s with a G, according to the equation, since $r > 0.5$. It means the other person will agree if he thinks s is more than 0.5 but disagrees otherwise. Observing a G will lead the agent to conclude that accepting is the logical decision, even if he initially assumed that accepting and rejecting are equally feasible possibilities (p = 0.5). Moreover, it also depends on the level of trust and interaction of individual two on 1. Conveying accurate information to individuals helps other people to make their choices more sustainable. With digitisation, it is easy to access information through online rating scales based on reviews of valuable customers for different kinds of products and services.

The second person decides after carefully weighing the first person's conclusion and data. For the most part, in making his own decision, the nth agent takes into account not just the actions of the previous $n-1$ individuals but also the information at his disposal. Using Bayesian reasoning, he selects the optimum course of action. $q = r$

$$P(E|Previous|Personal\ Information) = \frac{sr^a(1-r)^b}{sr^a(1-r)^b + (1-s)(1-r)^a q^b}$$

The transition matrix exemplified in the form of the heat map as,

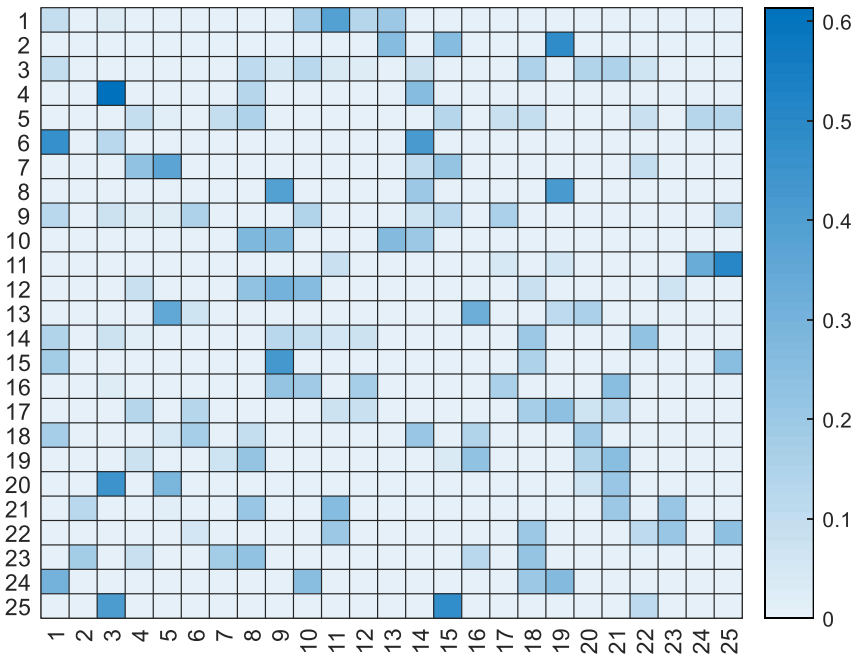

Figure 3.3: Consumption matrix of rational consumers

The heat map is likely to visualize the transition probabilities between different

states. The diagonal line represents the weight or influence of an individual's opinion on their choices. This transition matrix has been constructed following Proposition 1, drawing inspiration from real-life scenarios, and further refined through the lens of simulations. It encapsulates the intricate interplay between individual consumption choices and the dynamics of information sharing. The matrix embodies how individuals' decisions are shaped by their viewpoints as well as the perspectives of their peers, all while factoring in the cognitive biases and intricate information dynamics previously elucidated. In the context of responsible consumption choices, the Perron-Frobenius theorem is used to demonstrate the stability and predictability of the system over time. Darker regions on the heat map indicate a higher probability of staying in a particular state. Compared, lighter regions indicate a higher likelihood of transition to another state. The dark regions on the map likely indicate high probabilities of remaining in the same state, which is consistent with the concept of ergodicity.

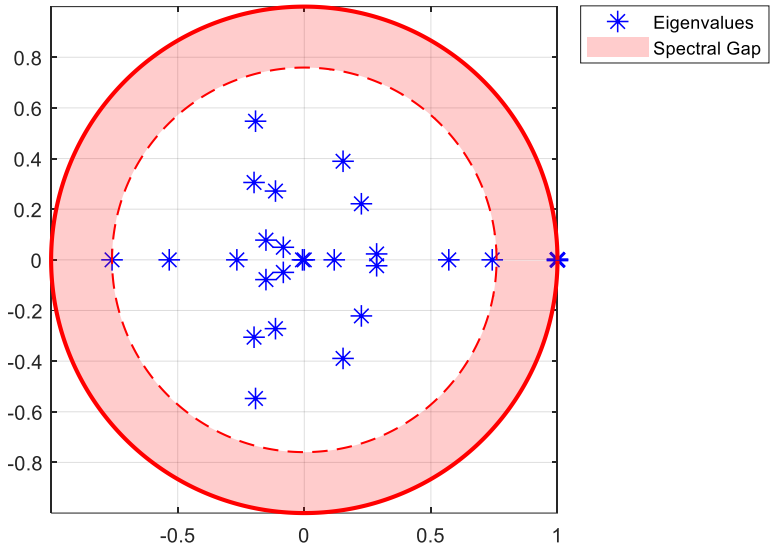

Figure 3.4: The current economic spectral gap is thin, indicating a considerable time interval for mixing /convergence towards equilibrium, i.e. (tmix ~3.6326).

In the context of responsible consumption choices, heterogeneous preferences mean that individuals have different values, beliefs, and priorities when purchasing goods and services. This diversity can help reduce inefficient herding because individuals are less likely to follow the actions of others blindly and instead make choices based on their own needs and wants. When individuals are aware of past behaviour or prevailing trends, they can counterbalance or reverse those observations to make more informed decisions (Smith and Sørensen, 2000). It might lead to more

responsible choices that align with individual values and goals. Figure 2.5 below shows a graph plot function depicting a slow convergence rate in the case of complete learning. Slow convergence is essential, depicting that society is good with respect for opposing choices (Banerjee, 1992, Banerjee, et al., 2018). As consumers become more aware of environmental and social issues, they are more likely to choose sustainable consumption options, such as sharing goods and services, rather than buying and owning them (Duchin and Szeidl, 2010). This shift in behaviour can be seen as a form of counterbalancing past consumption patterns and a move towards responsible choices based on individual values and beliefs.

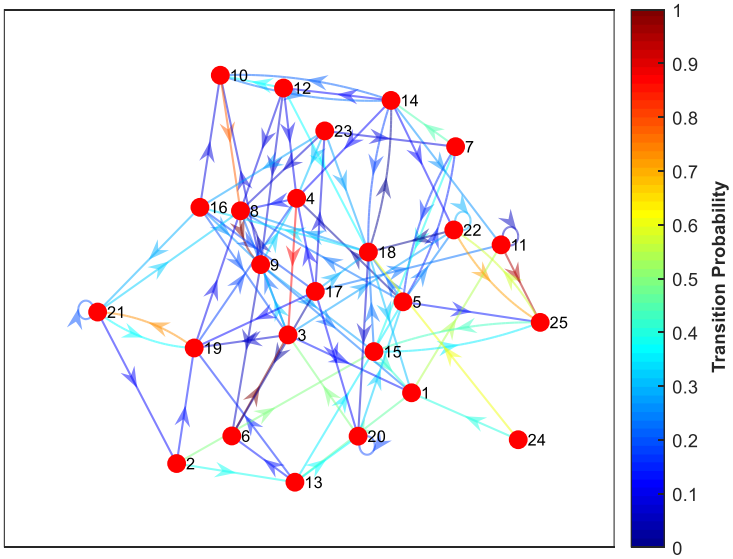

Figure 3.5: Structure showing interactions of individuals among each other.

Overall, the advancement in techniques, availability of data, and technology can help individuals act more rationally by providing them with the information and resources they need to make informed decisions. Companies and organisations have used social learning strategies to encourage responsible consumption behaviours. For example, product labelling and certification programs, such as Energy Star or USDA Organic, provide consumers with information on the environmental impact of products and promote responsible consumption choices (Peattie and Peattie, 2001). Social media and other digital platforms have also been utilised to promote responsible consumption by providing consumers with information and peer-to-peer communication. Regarding production choices, social learning can play a role in the diffusion of new technologies and innovations. It can lead to increased efficiency and productivity in the long run. For

example, farmers observing their neighbours using new technologies are likelier to adopt them. However, it is essential to note that social learning can also lead to suboptimal outcomes if individuals are influenced by misinformation. In conclusion, social learning plays a significant role in individual consumption and production choices, but it is essential to consider both the positive and negative effects of this process. Understanding how individuals use social information to make decisions can help policymakers design interventions to promote more efficient outcomes.

3.5.1.2 Criteria to Attain Responsible Consumption

"Information" node" is the availability of information that an individual can use to make informed choices. It could be information about the impact of their consumption and production on the environment. While "Rationality" is an individual's ability to make rational decisions based on the information they have. They use their hearing, sight and intellect best to make informed choices. "Perception" represents how individuals perceive the information they receive based on their beliefs and biases. The "Utilization" represents how individuals use their information to make decisions, considering their rationality and perception. While the "Awareness of Consequences" represents the individual's understanding of their actions' environmental impact. Finally, "Responsible Consumption" represents the individual's ultimate decision on whether they make responsible choices in their consumption activities based on their awareness of the consequences and utilization of information.

Information → Rationality → Perception → Utilization → Awareness of Consequences → Responsible Consumption

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For instance, individuals who frequently purchase new clothing from fast fashion stores offering trendy pieces at low prices due to their enjoyment of clothes shopping may progress through several stages of responsible consumption. In the Information stage, the individual may not have been aware of the negative impacts of fast fashion on the environment and the workers who produce the clothes. Subsequently, they may progress to the Rationality stage, where they learn more about these issues and recognize that their clothing purchases have a more significant impact than solely on themselves. At this point, the individual may start questioning their shopping habits'

ethics and sustainability. During the Perception stage, the individual begins to see their shopping habits in a different light and becomes aware of the large amount of waste generated by frequent purchases or the poor quality of the clothes bought. In the Utilization stage, the individual actively changes their consumption habits and purchases clothes made from sustainable materials or shops at second-hand stores to reduce waste. In the Awareness of Consequences stage, the individual begins to observe the positive impacts of their changes, feeling good about their choices and their impact on the environment and the people involved in producing clothing. Finally, in the Responsible Consumption stage, the individual fully integrates responsible consumption into their lifestyle and continues to make choices that align with their values and positively impact the world.

3.5.2 Bounded Rationality

Individuals are limited in their ability to see and understand their environment. Thus, a threshold exists beyond which social forces (culture, religion, values, norms) may sway individuals away from their right choices. The second is that individuals in a particular sequence have only partial knowledge of the individuals who came before them, which is the foundation of the original information cascade model. Humans are assumed to be boundedly rational in the original independent cascade model, meaning they will not always make rational judgments based on the information they can see if that knowledge is incomplete or incorrect. Individuals with bounded rationality make decisions that are not guided by Bayes' Law or any anticipated utility-maximising decision procedure. In (DeGroot's, 1974) ground-breaking concept, for instance, agents constantly adjust their preferences until they match those of their peers in the social network. Maximizing predicted benefits in each period is the goal of biased individuals, but they ignore the repercussions of their actions on others by entirely discounting future value. A person in such a situation may be unable to mature enough to make appropriate decisions. Furthermore, asymptotic learning never happens when individuals watch all predecessors and have limited knowledge (Fang et al., 2022).

Context: *A false information cascade may last indefinitely if each person only sees a small fraction of the whole history of events. In other words, asymptotic learning is not a given, and societies might end up veering away from their efforts to promote responsible consumption choices. Therefore, when knowledge is limited,*

individuals give their opinions a weight of less than ½. In such a scenario, individuals may be bound away from rationality and reasoning by always relying on others' decisions. There is still a negative information externality since each acts in her self-interest without considering the impact of his/her choice on others.

In bounded rationality, information aggregation is often self-limiting since more illuminating acts typically induce cascading onto most actions in the individual's observation sample. Getting information from others should be done to improve but not to get influenced. A meat eater's choice of restaurant means something different to a vegetarian. It is easy to deduce a decision-maker's preferences from her behaviour if previous decision-maker preferences are well known. The opposite is true if individuals keep their preferences secret; in this case, observers must decipher prior private information from actual preferences. Asymptotic learning is shown to not occur in a social learning model (Fudenberg and Kreps, 1995; DeMarzo et al., 2003) if agents have a finite number of preference categories and information is bounded—several possible manifestations of this mistake, including the ones mentioned above.

3.5.2.1 An Illustrative Scenario of Bounded Rationality: Navigating Low Trust in Private Information

When Individuals have a lower level of trust in their information, they rely on others for decision-making. Individuals, when they allocate less weight to themselves than neighbours, can be represented by $p_{hh} < 0.50$ —representing a lower self-confidence level to propel us into a natural state. A group's consensus on a consumption issue, denoted by the letter C, may be represented as a matrix with columns labelled "e," "f," "g," and "h," respectively, representing the weight given to the initial positions taken by individuals $E, F, G, and\ H$. The rows show the weight given to these views by the other views in the group. The coefficients on the right-hand side of the general differential equations show the percentage by which one opinion changed due to a change in another during the same unit. Thus, the values placed into the cells should reflect that as $e_n = 0.24e_{n-1} + 0.50f_{n-1} + 0.26g_{n-1}$;$f_n = 0.50e_{n-1} + 0.33f_{n-1} + 0.17h_{n-1}$,$h_n = 0.65f_{n-1} + 0.24g_{n-1} + 0.11h_{n-1}$. These values are represented in Table 2.2 below.

There are no directed pathways from F, G, or H to E. The value 1 in cell a indicates

that in any given unit, E's opinion is entirely controlled by his prior opinion, while the value 0 in the other cells in a row indicates that views F, G, and H do not affect E. Since, $f_{n.}$, is a middle ground between the prior positions of E and F. Each row in C (and in C^2 and C^3), represents a group's consensus by adding up to 1, with the fractions along the row representing the individual member's contributions to the group's overall viewpoint. C's sum of a column shows how one member's viewpoint in the first period affected the rest of the group (including the impact of his initial opinion on his second opinion). The consumption matrix for the bounded rational group is represented below,

	e	**f**	**g**	**h**
e	0.24	0.50	0.26	0
f	0.50	0.33	0	0.17
g	0.10	0.69	0.21	0
h	0	0.65	0.24	0.11
	0.85	1.88	0.7	0.28

Table 3.2: Consumption matrix for bounded rational individuals.

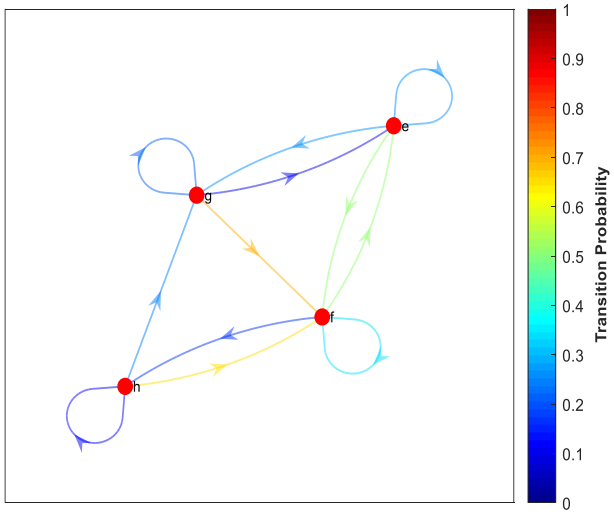


Figure 3.6: Graph plot representing the extent of connectivity interactions among group members

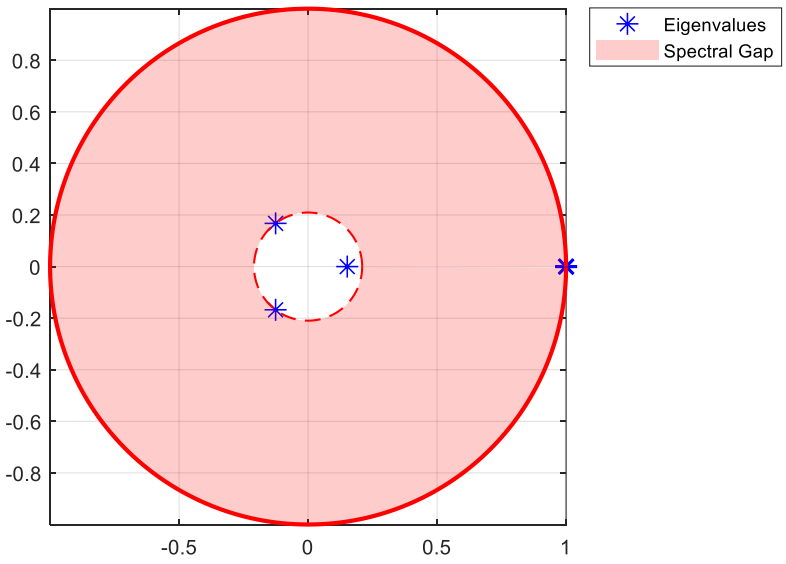


Figure 3.7: Eigenvalue plot for the bounded rational group.

In the context of bounded rationality, individuals tend to rely more heavily on the opinions of others, especially those in influential positions, when making decisions. It can result in a convergence of opinions towards the group's consensus, with a large spectral gap meaning that this convergence occurs faster. This phenomenon of opinion convergence can be seen in many areas, including consumer behaviour, financial markets, and political opinions. However, it is essential to note that this convergence may not always lead to optimal outcomes, as the opinions and behaviour of the influential group may not always align with individual needs and values. The influence distribution through time may be inferred from the sums of the columns representing the increasing powers of C. In Group G, F is the lone member of the structure, steadily expanding his power at the cost of the other members. However, he has the least say since he is affected by everyone else's opinions in the group. The group's hierarchy may be represented as a matrix, with rows representing the authority exercised over a member and columns representing the authority exercised by that person. Matrix multiplication may determine the precise distribution of direct and indirect leadership in any organisation, regardless of its power structure or communication network.

One example of this can be seen in "social comparison," where individuals compare their possessions and lifestyles to those of others in their social network and strive to maintain or improve their relative social standing. Moreover, people tend to conform to the consumption patterns of their reference groups (family and friends)

based on the perceived level of similarity between the individual and the reference group (Belk, 1988). Besides, the physical environment, such as urban design, significantly impacts consumption patterns, as it determines what products and services are available and accessible to consumers (McCann, 1999).

The royal family is a vital example of a tightly linked network where individuals may not converge on the best course of action because all agents directly view a relatively limited number of people who cannot observe all group members. If the royal family in a network receives lousy information, it might have a cascading effect on the rest of the population. When this occurs, individuals in the population still rely on their private information during the introductory phase, but their actions do not spread across the network. This finding is strongly related to information cascades in single-action models, where people may cease paying attention to their internal information after exposure to new information from the outside world. Most often, people buying some commodities rely on the opinion of others, e.g., for buying a car, individuals may rely on the opinion of friends or persons in their social circle. In today's digital age, however, consumers can access rating scales for goods, companies, and institutions, allowing them to make more educated purchases. The family plays a vital role in shaping consumer habits in many civilisations. Ads for children and women are more likely to persuade them, especially mothers, to overconsume. In Asian societies, mainly in India and Pakistan Culture of dowry is prevalent[33]. With the increased use of social media platforms, there is a subsequent increase in influenced consumption decisions directed by friends, family members and society, e.g., extravagancy seen in weddings which is a waste of resources and the ultimate burden on the environment. People think that if they do not follow others, it will devastate their social status. Therefore, such choices lead to conspicuous consumption that causes towards squandering of resources.

There are cases when advertisers specifically target children by showcasing products on sites to influence parental purchasing decisions. Economically, it stimulates consumer spending and economic growth but negatively affects social values and the

[33] Dowry is a re-enactment of ancient Hindu society, in which daughters have not been given a portion of the family property but instead were compensated with money, some of which could be in the form of items (like dowry). Dowry is a sum of money, assets, or property given to the bride by her family at the time of her wedding in way to lure a suitable husband for her. When man marries her then dowry and woman both become the husband's or his family's property. This is total unethical and women should not be traded like a commodity. Due to cultural values and norms, status symbol parents are forced to adopt that dowry for their daughters resulting in delay in marriages in Asian societies.

environment. First, a small group of individuals creates faith in the network before word can spread, and then numerous constrained options may emerge, resulting in a false information cascade. If people in today's market often consult with their peers before making critical choices, we may expect to see widespread conformity. Therefore, people give some thought to what they think. They are also willing to give other people's ideas greater weight, as seen by a transition matrix (Figure 2.8) with fewer zeros in certain spots, representing a higher concentration of connectedness.

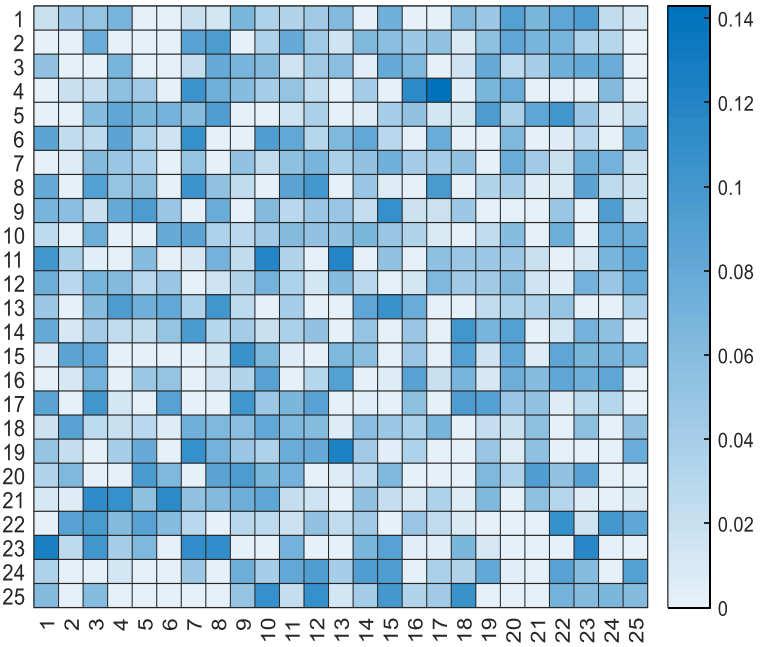


Figure 3.8: Consumption Matrix for Bounded Rational Economy.

In the above consumption matrix, the economic decision is determined through the extent of dependence on each other in formulating socioeconomic decisions. It is based on a theorem formulated by (Hoffman, and Wielandt, 2003): Such consumption network quickly converges toward stability, affirming ergodicity, and visually it is confirmed through an eigenvalues plot (figure 3.9).

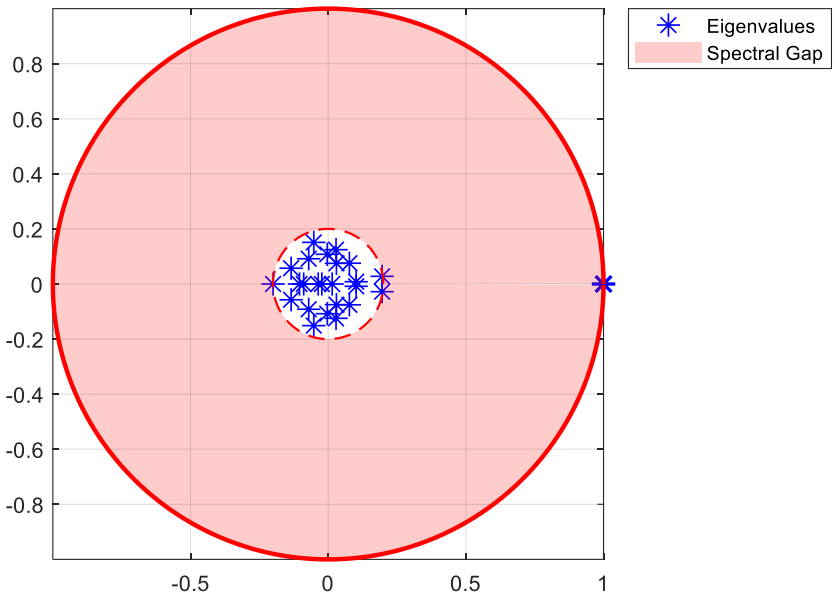


Figure 3.9: Individuals converge towards equilibrium in a shorter time (~0.6567).

Optimizing individuals will be following others rather than using their information leading to inefficient equilibrium (Banerjee, 1992). There are several examples of influenced decision-making. Daily, we have to decide which store/restaurant to go to or buy groceries and which universities join based on popularity Correspondingly, researchers choose a hot topic in fertility choices, voting, and academic writing. Similarly, the first few decision-makers formulate the direction of the crowd.

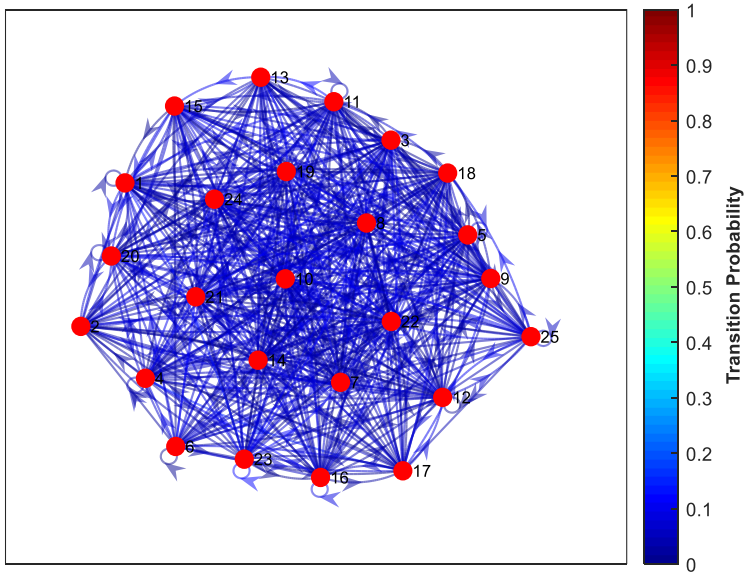


Figure 3.10: This graph shows the strongly connected structure of the Bounded rational consumption network.

Advertisements targeting children and items arranged on shelves of marts are examples of how efficiently marketers take advantage of consumers' limited information capacity (Smith and Sørensen, 2000; Mobius and Rosenblat, 2014; Grujić, and Lenaerts, 2020). Perception from knowledge is that people are more indulgent in making choices when they have experience and ease of doing so. Therefore, trust in companies, their products, institutions, and other individuals is also a key determinant in shaping people's attitudes regarding economic decision-making. Quicker decision-making *without effectively utilising sight, hearing, and intellect results* in sacrificing the environment (Deviation from responsible consumption is characterized by faster convergence and connected network). For example, when purchasing a car, a consumer may not have enough information about all available options to make the optimal choice. Instead, they may rely on simplified heuristics, such as the reputation of a particular brand, to make their decision. Similarly, a corporation may not have enough resources to gather all relevant information and analyze it thoroughly before making an investment decision. As a result, they may rely on rules of thumb or experience to make their choice. This limited rationality can prevent individuals, groups, and corporations from making wise and responsible consumption choices[34]. For instance, a person may buy a product without considering its environmental impact, or a corporation may prioritize short-term profits over long-term sustainability.

3.5.3 Complete irrationality

One takeaway from studies of human fallibility and social learning is the importance of avoiding cognitive biases that encourage individuals to rely too heavily on their information. Overconfidence or the belief that others have relied too heavily on the experiences of their forefathers when making decisions. Persuasion bias, however, has the reverse impact, leading people to give too much weight to precedent (bounded rational case). The cascades model includes overconfident people, which leads to a similar result (Bernardo and Welch, 2001). The group cannot gather information effectively when people follow the crowd rather than think for themselves. When

[34] In India, limited information contributes to air pollution from practices like burning agricultural waste and vehicle emissions. Alternative farming methods and transportation choices have been resisted due to people's limited ability to make well-informed decisions. Similarly, in Indonesia, irrational consumer preferences for goods drive deforestation, causing environmental and economic losses. ExxonMobil's focus on fossil fuels despite the need for cleaner energy results in climate-related damage. Nestlé's water extraction methods in arid regions have ecological and reputational costs

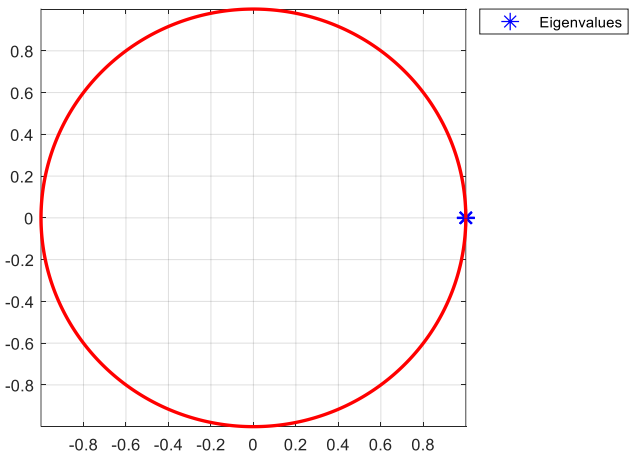
people behave in ways that are obviously out of line with the norm, they reveal personal information about themselves. Factors such as group size, the prevalence of overconfidence, and the accuracy of their information affect the socially optimum number of persons in a group. It balances the high attribution rates of people against the positive information externality. Overconfident or antisocial agents rely heavily on their knowledge to inform others, leading to more informed decisions in the future. When stubborn individuals make irrational choices, it will ultimately result in incorrect preferences by everyone who follows them. It can be regarded as a case of bounded rationality when an individual puts some weight on his own opinion to formulate a choice that is less than the weight assigned to choose probabilities of other members of respective members. In other cases, when an individual is stubborn, he puts all weight on his own opinion.

Overconfidence and the tendency to be easily persuaded are two examples of psychological bias that may affect social learning in consumption networks. One case of imperfect rationality is that the patterns of interaction are recorded by an $n \times n$ consumption interaction matrix C, where $I_{hi} = C_{hi}$ for $h, i = 1,2, \dots, n$. In this case C_{hi} act as Kronecker delta. $C_{hi} \begin{cases} 0 & for\ h \neq i \\ 1 & for\ h = i \end{cases}$

$$C_{hi} = \begin{bmatrix} 1 & 0 & \dots & 0 \\ 0 & 1 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & 1 \end{bmatrix}$$

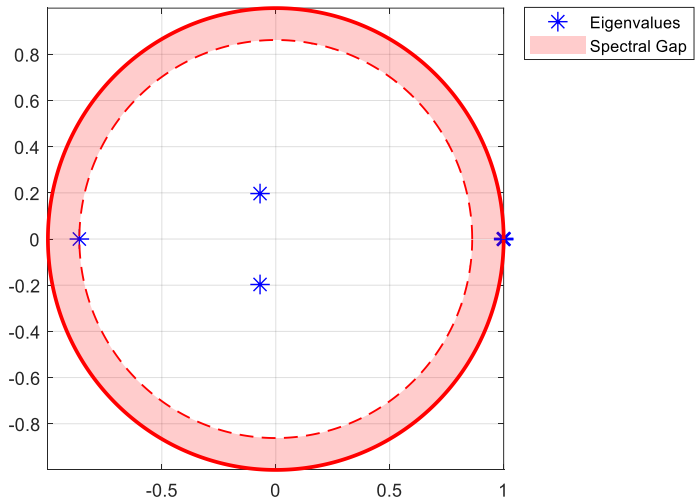
By increasing the power of $C_{hi} to\ C_{hi}^2$

$$\begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix} \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix} = \begin{bmatrix} 1 & 0 & \dots & 0 \\ 0 & 1 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & 1 \end{bmatrix}$$



$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Figure 3.11: Stubborn agents putting all weight on their opinion; Consensus is not possible in such a consumption network.



$$\begin{bmatrix} 0 & 0.50 & 0.50 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0.25 & 0 & 0.75 \\ 0 & 0.55 & 0.45 & 1 \end{bmatrix}$$

Figure 3.12: Individuals putting no weight on their opinion; Delayed convergence (long-term)

We have formulated an extreme case of irrationality when an individual puts all weight on his own opinions neglecting helpful information available and does not use reasoning. In the second matrix, zero in the diagonal is another extreme case where the individual has no self-confidence and always relies entirely on information from others to decide.

$$\begin{bmatrix} 0 & 0 & 1/2 & 1/4 & 1/4 & 0 & 0 \\ 0 & 0 & 1/3 & 0 & 2/3 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1/3 & 2/3 \\ 0 & 0 & 0 & 0 & 0 & 1/2 & 1/2 \\ 0 & 0 & 0 & 0 & 0 & 3/4 & 1/4 \\ 1/2 & 1/2 & 0 & 0 & 0 & 0 & 0 \\ 1/4 & 3/4 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

Table 3.3: Consumption matrix for irrational scenario

Many individuals engage in conspicuous consumption to set themselves apart from their peers, get acceptance from others, satisfy their curiosity and need for novelty, and satisfy their egos (Lambert et al., 2012; Stillman et al., 2012). Tolerating such imitation in the name of the value it provides to the customer is crucial to the capitalist economic system. Only the desire to "keep up with the Joneses" may justify purchasing certain products with no practical use. Still, this investment provides nothing in the way of tangible benefits for the consumer. It might have unfavourable results in certain circumstances. It is common knowledge that wasteful spending places an unnecessary strain on finite resources that might be put to more productive use elsewhere today. Alternatively, manufacturing things less essential to society would be irrational.

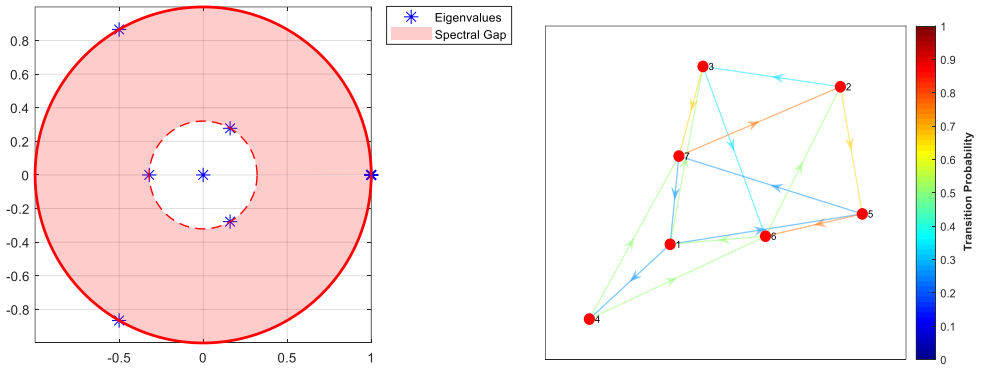


Figure 3.13: Eigenvalue and graph plot for bounded rationality scenario

In the context of bounded rationality, having a zero in the diagonal of the decision-making matrix can represent a situation where the individual has no self-confidence and relies entirely on information from others to make decisions. It means the individual lacks the ability or resources to gather and process information independently and instead relies solely on external sources for information and guidance. Such reliance on external sources of information can lead to suboptimal decisions, as the information provided may not always be accurate, relevant, or aligned

with the individual's best interests. Additionally, this lack of self-confidence can limit individuals' decision-making ability and negatively affect their personal, professional, and financial well-being. Making irrational purchases might mean supporting businesses or sectors with dubious moral standards. For instance, buying from businesses that exploit their people or cause environmental damage may go against one's morals and contribute to societal inequities. We may better align our activities with our beliefs and effect good social change if we are well-informed and mindful of the ethical implications of our consumer decisions. Choosing items made responsibly, ecologically friendly, and constructed to last will help cut down on waste, save resources, and inspire other producers to do the same. A more sustainable future is possible with the support of consumption habits driven through efficient utilization of reasoning capabilities. When making purchases, it is essential to remember what we need, the bigger picture, and how our purchases will affect our beliefs and long-term objectives. By doing so, people may improve not just their own lives but also that of others and the world.

3.6 Conclusion

This work analyses consumption and production decisions in a social learning environment, where individuals learn the actual value of nature through information and subsequent network communication using the DeGroot Social learning process. The study of choices in the context of rationality, bounded rationality, and imperfect rationality is one of the central assertions of this study. We refer to people perceived by others as knowing more detailed private information as neighbours. A society where individuals have high confidence in their ability to reason and make decisions based on a combination of their senses, personal experiences, and intellect can be considered a "wise" society. Such individuals are more likely to make informed and responsible consumption choices as they can critically evaluate information and weigh the potential consequences of their actions. When individuals trust their ability to reason, they are less susceptible to manipulation and false information, which can lead to more responsible and ethical consumption practices R_c^*. This scenario, where individuals make decisions based on a combination of factors and not solely on what they are told, is an example of a perfectly rational scenario where wise choices are made.

In contrast, bounded rational and irrational choices lack diversity, independence,

and decentralization due to persuasion bias and stubbornness, resulting in irresponsible attitudes towards consumption and production. When community or group members exhibit wasteful spending habits, the group moves away from developing the collective wisdom necessary to avoid making careless decisions that may have lasting adverse effects on its members' well-being. Efficiency in learning is undermined by influential individuals or organisations who get a disproportionate share of society's attention, and their peculiar mistakes mislead everyone. It may sound like a depressing conclusion, but it reflects the presence of a powerful minority inside a significant majority. This initial balancing condition emphasises the need to ensure that no one person, group or corporation has more significant influence than it does in the more extensive system. First, it is counterproductive to social learning to focus too much on select opinion makers unless their information much outweighs that of the general population.

At the individual level, social learning can occur through exposure to information and opinions shared by friends, family, and other trusted sources and media and advertising campaigns promoting sustainable practices. At the group level, social learning can occur through collective learning and problem-solving activities, such as community meetings and workshops. Corporations and organizations can also promote responsible consumption and production choices through their behaviours, practices, and the information and resources they provide consumers. For example, a company might implement sustainable manufacturing processes, offer environmentally friendly products, or engage in public education and awareness campaigns related to sustainability. Corporate social responsibility (CSR) practices and communication can positively impact consumers' attitudes and behaviours related to sustainability (Tan and Tan, 2017). In the digital age, individuals can access information and communicate with others more efficiently resulting in a transition from irrational to rational behaviour. Similarly, companies that once prioritized short-term profits over sustainable practices in clothing production may change their behaviour as consumers become more informed and demand environmentally responsible products. These companies may use sustainable materials and production processes to meet consumer demand and maintain market share.

Social learning may be streamlined if most people ignore obstinate or closed-off communities. These are all avenues that might be explored in the future. Our work on

convergence rates sheds light on the connection between group dynamics and the emergence of consensus. The idea that insular cultures would converge slowly, whereas cohesive ones might converge rapidly, seems consistent. The theory has broad strategic applications where social networks are a factor. The presence of a social network is an obvious need. For a comparable function, thinking about companies that offer equivalent goods in direct competition is relevant. In this case, one company may gain from the marketing efforts of another. Adding people with different backgrounds and perspectives would make the network more dynamic. *More knowledgeable people may interrupt a cascade if they join the process late.* If an individual in an observational learning scenario is persistent enough, their neighbours will learn the value of the superior action by frequently seeing the payoffs of the inferior activity. Because of this, they act, which informs their neighbours, and so on.

Religious texts emphasize the importance of being mindful of one's environmental impact and promoting sustainability. By applying these teachings daily, individuals can learn about the benefits of responsible consumption and production and become more conscious of their choices. Hinduism's "ahimsa" extends non-violence to all life and the environment, driving conscientious choices. Islam's "khalifa" promotes stewardship, urging care for Earth's resources, waste reduction, energy conservation, and sustainable agriculture. Christianity and Judaism advocate stewardship of Earth's resources, guiding responsible consumption. By integrating religious teachings into daily lives, individuals engage in social learning, making informed, responsible consumption and production choices. Capitalism's problem is not just that it makes too much; it also makes the wrong things, like fast fashion and planned obsolescence, instead of public transportation, affordable housing, and healthcare for all. It is unreasonable to prioritise corporate profits and elite accumulation above human well-being and environmental sustainability in production organisations. The solution to this craziness is economic democracy. Under democratic circumstances, people concentrate production more on social and ecological concerns. Today, choices regarding what to create and how to utilise resources are primarily decided by 1%. Responsible consumption and production decisions need strong collaboration and mutual trust among people, communities, businesses, and governments.

Chapter 3 establishes a comprehensive framework delineating the parameters of

responsible consumption and production within the context of the wisdom of the crowd, predicated on carefully formulated propositions. These propositions are underpinned by the fundamental role of values as guiding principles in individual decision-making. Nevertheless, it is imperative to acknowledge that consumption choices are subject to significant influence from the prevailing social milieu, a theme that we delve into more deeply in the subsequent chapter. In Chapter 4, we embark on a detailed exploration of the intricate dynamics of social influence, shedding light on the profound impact of external factors. These factors encompass a broad spectrum, ranging from the behavior of one's social network and peers to the pervasive effects of social media platforms. We also extend our analysis to the realm of anticipation utility, dissecting how it shapes the decision-making processes of individuals.

Our investigation uncovers how societal norms and group opinions can yield both inefficiencies and inconsistencies in choice patterns, underscoring the utmost importance of comprehending these dynamics. While religious values furnish a moral compass for individuals, it is essential to recognize the substantial role played by the broader social environment in shaping consumption behavior. This realization emphasizes the intricate interplay between personal values and the influences stemming from the societal context. This comprehension is pivotal in nurturing social norms that advocate responsible consumption and in enabling individuals to make well-informed choices that align harmoniously with their deeply held beliefs. As we transition from the spiritual sphere to the social domain, the complex relationship between individual moral values and external pressures becomes increasingly conspicuous.

Chapter 4

Dynamics of Social Influence on Consumption Choices: A Social Network Representation

"Whenever you find yourself on the side of the majority, it is time to reform, pause or reflect."

Mark Twain

Executive Summary

In this work, by employing Friedkin Johnsen's model, we provide a valuable tool for understanding the complex dynamics of social influence through informational inducements in shaping consumption behaviour. People derive pleasure and satisfaction not only from the actual consumption of goods and services but also from the anticipation of consuming them, especially in the context of online shopping. The anticipation of a future state of enjoyment can affect people's current happiness and well-being. However, this anticipation can also be influenced by external factors such as the behavior of friends, neighbors, and social media platforms, which can lead to unrealistic expectations and over-optimism. Results suggest that in an *information-loving society*, people tend to follow the opinions of their groups, which can lead to inefficient choices. On the other hand, in a completely *information-averse society*, people tend to make inconsistent choices, leading to a lack of consensus. People should be encouraged to form their own opinions based on their own experiences, preferences and reasoning while still considering the information and opinions of others. Individuals with high self-confidence and self-control are more likely to resist peer pressure and make decisions that align with their values and goals. So, it is essential to consider the context and nature of the social influence when evaluating its impact on people's decision-making. Social influence can lead to overconsumption in societies where choices are heavily influenced by the behavior of others. To address this issue, it is important to create social norms that promote sustainable consumption, provide individuals with accurate information about the environmental and social impact of their choices, and encourage people to make independent choices that align with their values and priorities. Experts, celebrities, fashion icons, and sports heroes should all

play a role in raising public awareness about the adverse effects of excessive consumption. Though only consumers cannot direct the world's future, Government, companies, and media also have a significant role in coping with environmental challenges.

4.1 Introduction

Utility and happiness are often used interchangeably in economics, but they are not necessarily the same concept. In economics, utility measures satisfaction or pleasure derived from consuming a good or service. It is a subjective concept and can vary from person to person. On the other hand, happiness is a broader term that encompasses not just the pleasure derived from consuming goods and services but also the satisfaction from other aspects of life, such as relationships, health, and personal growth. Utility was popularised as a reflection of people's choices (Hicks and Allen, 1934), while happiness is the overall goodness or badness that a person encounters at any time (Kahneman et al., 1999). Society can create incentives and disincentives that influence individual behaviour, but ultimately, it is up to the individual to determine what brings them the most satisfaction and pleasure. In the short run, happiness is based on news or information about preferences, while in the long run, it is crucial for attaining economic welfare (Morris, 2009). In countless daily decisions, we use our faculty of reason to weigh our options. However, not every decision requires deep pondering; We have personal preferences, some of which are driven by our cultural background, values, and geographic location and others by our' fads,' which would take some psychologising to unearth their roots. Advertisement of products exhibited daily through various social media platforms gives us temporary pleasure followed by desire and futility to get more. People use smartphones for around 5-6 hours on average (Statista, 2021). Most people's daily choices are *influenced* to some extent, either directly or indirectly[35]. Individuals began inferring happiness from augmented consumption due to increased dopamine levels.[36]

Previous research has not fully explored the dynamics of social influence and responsible behaviour. The influence of persuasion on individual choices has been a

[35] The decision we made for buying a car, might be influenced by the surrounding community where we live (friends, networks, social media, advertisements, news.
[36] Dopamine is a brain chemical associated with wanting. While social media platforms and video games are engineered in such way that they provide next thing to brain in a sequence to get excited resulting in a continuous dopamine release.

topic of interest for some time, with (Baudrillard, 2016) arguing that persuasion often imposes choices. The study aims to provide insights into how an increase in anticipation utility (happiness) affects individual consumption decisions. This research fills a gap in our understanding of the effects of social influence and advertising on individual behaviour and decision-making. Incorporating social influence dynamics on consumption choices in the context of anticipation utility is a novel approach to responsible consumption and production. This novel approach highlights the importance of social and psychological factors in promoting responsible consumption and production patterns.

In the past, collecting many material things was considered a source of survival. Online platforms have provided the individual freedom to shop for anything at any time and replaced traditional ways of buying goods and services. Religious values are also targeted during the advertisement, as every day is Christmas to buy stuff online. Certain emotions like faith, anxiety and enjoyment depend on the person's thoughts about the future. When utility is obtained by anticipating about future is known as an anticipatory utility (Caplin and Leahy, 2001). This kind of utility is unexpected in the form of pre-enjoyment and excitement. It is crucial in defining individuals' influenced consumption choices, especially during online purchases. It works through time; the closer we get to experience, the level of anticipatory utility rises. When people's daily choices are influenced, their tastes and utility functions resemble those of the general population. In our pursuit of instant gratification, we have dramatically increased our consumption, but our mental health numbers have steadily declined (Layard, 2005).

We, as social beings, interpret situations based on how others respond. Nonperishables, notably cleaning goods, have become a 'condition[37] symbol of safety,' leading to a flurry of last-minute purchases and stockpiling as people prepare for the COVID-19 pandemic (Jorda et al., 2022). Another example of the uneven impact of COVID-19 is a rise in online shopping trends. Crises can lead to long-lasting changes in behaviour by shifting attitudes (Reeves et al., 2020). In the top-down advertisement approach, companies target wealthy consumers' lifestyles, tastes, and preferences as they know it will trickle down to the bottom and eventually imitate all consumers

[37] This buying occurs because people either miss forecasts or over-purchase to show others that their carts are stocked with goods (toilet paper during a pandemic)

(Levine, 2007). This vicious consumption cycle creates a cluster of like-minded individuals consuming similar products to enhance their socioeconomic status and social stratification.

Individuals' cultural values and traditions are targeted during the advertisement to make them more acceptable (Czarnecka and Schivinski, 2019). There is a commodity self as an identity associated with the consumption of the product[38] . With technological advancement, ads are displayed to consumers on social media platforms based on their searches, resulting in more products and services (Kucuk, 2016). Thus, the consumer is motivated to articulate their wants as needs. The drive to consume and accumulate more goods and experiences is often driven by a desire to feel fulfilled and self-actualised. However, this can lead to irresponsible choices, such as overspending, too much debt, or engaging in unsustainable consumption patterns that harm the environment.

The dynamics of this influence[39] can vary depending on factors such as the type of product, the context in which the choice is being made and the characteristics of the individuals involved. One way to represent and analyse these dynamics is through social network analysis, which allows mapping and examining the relationships between individuals and the influence flow within a group. It explains several critical phenomena, such as advertisement, politics, and consumption, that lead to opinion formation in society. Our model is utilised in several natural settings based on how individuals perceive information from their social networks. Individuals' influence on group opinion depends on the interconnectivity in the specific network. Similarly, when certain payoffs for economic or social decisions are unknown, people use the experiences of others to update their existing beliefs. Sometimes these updates might take longer due to the homogeneity of surroundings. This research could provide insights into how advertising and influencers affect consumer behaviour and whether it genuinely leads to long-term changes in consumption choices.

[38] People get recognizable by introducing themselves as Coke drinker rather than Pepsi or some choose to be either Mac user or Pc users that creates uniqueness associated with identity of brand.

[39] There are three steps to the social influence process, first is compliance, in which individuals agree with others though maintaining their negative behaviours private (Kelman, 1958). Then Identification takes place when individuals get influenced by someone adored and respected by many in society (celebrity). The final step is internalization, in which particular behaviour or opinion is publicly and privately accepted. In informational social influence, individuals must be appropriately informed about reality, leading to personal acceptance, and normative social influence directs individuals to conform to other expectations.

Our theoretical model is based on (Friedkin and Johnsen, 1999; 2011). Three scenarios are formulated in this study; i) *Information loving:* a society where individuals value information from others ($\eta_{ij} = 1$) and place significant importance on it when making decisions. However, they do not consider their own opinions ($\text{self} - \text{weight};\ \eta_{ii} = 0$) to be as valuable as those of others. Instead, they make decisions based on the most meaningful information they receive from others. It could lead to homogenous preferences and conformism, as individuals may be swayed by the opinions and choices of those they are connected to in their social network. The assumption of a connected graph suggests that individuals are interconnected and can influence each other's decisions; ii) In an information-averse society, individuals place their own opinions ($\eta_{ii} = 1$) above all others and do not consider information from external sources ($\eta_{ij} = 0$) when making decisions. It can lead to individuals making choices that are independent of the influence of others, and therefore, individuality is emphasised in this society. The model captures the diversity of social influence situations and allows us to understand and analyse them from a single theoretical perspective. The nature of the surrounding environment and the people within it play a crucial role in shaping the dynamics of social influence.

The model is analysed by looking at the asymptotic behaviour of the opinions over time. In particular, we can examine whether the opinions eventually converge to a single value or remain divergent. It depends on the initial opinions and the weights assigned to each neighbour's opinion. The weights assigned to each neighbour's opinion can be based on various factors, such as the strength of the tie between the two individuals, the similarity of their opinions, or other factors. The Friedkin-Johnsen model takes this analysis a step further by separating the social influence process into two separate systems: a "rational system" where individuals weigh the opinions of their neighbours based on their relative expertise, and an "expressive system" where the opinions of their peers more influence individuals. By separating the two systems, the model allows us to study how differences in persuasion from others and the minimisation of environmental costs affect the final consensus reached by the group in the age of digitization.

Friedkin Johnsen's model provides a valuable tool for understanding the complex dynamics of social influence and informational inducements in shaping consumption behaviour. By representing these relationships in a social network, the model provides a way to understand how changes in the network can affect the spread of information and influence consumption patterns. The research highlights the need for governments, businesses, and individuals to address environmental concerns proactively. The study aims to provide insights into how an increase in anticipation utility (happiness) affects individual consumption decisions. Social influence can act positively to guide us towards responsible consumption and production patterns, but it can also lead to the spread of misinformation or the reinforcement of unsustainable practices. By understanding the dynamics of social influence, we can design strategies that encourage responsible consumption and help mitigate the negative impacts of consumption on the environment.

In the remaining article, section 2, we have provided an extensive literature review that summarizes the previous research relevant to the current study. The theoretical framework is presented in section 3, which provides the theoretical basis for the research question. Then it is continued by explaining the research method in section 4. Section 5 is an empirical section, where the results of the study are presented and analyzed through graphical representation. This section seems to focus on the three different informational contexts (information-averse, Information-loving loving and responsible society) and their implications for society. Finally, section 6 is the conclusion section, where we have provided a summary of findings and discussed their practical policy implications.

4.2 Literature Review

Researchers searched for ways to improve struggling economies in World War II's aftermath. While (Lebow, 1955) proposed a solution that would become the norm for many economies worldwide. He argued that the key to a productive economy is to increase consumption at an ever-accelerating rate and make buying and using goods a ritual that brings ultimate satisfaction. Perception of it is essential to our sense of security. In other words, if people believe their economy is strong and can buy the goods they need, they will feel more secure and confident. This increased security and confidence can drive further consumption and economic growth (Haybron, 2013).

While having wealth can give us a sense of security, it can also erode our autonomy and freedom of choice. For example, if someone has too much wealth, they may become dependent on their money and unable to make decisions without considering the financial implications. On the other hand, having too little money can also restrict our autonomy, as we may feel limited in our choices and unable to pursue what we truly want. It highlights the importance of balancing wealth and autonomy, where we have enough resources to provide for ourselves and our families and the freedom to make our own decisions and live on our terms (Tran, 2022).

Consumer culture originates when purchasing ownership and commodities become the centre of social life. The object of consumption becomes less critical than its culturally coded meaning and symbolic value (Lury, 1996). The problem with consumerism is the tendency to opt for quicker and cheaper options, which take us away from the naturally fulfilling path of slow returns. The advertising and marketing industry makes consumers feel "you will not be happy until you buy and become momentarily satisfied" (Ambec and Donder, 2022). The fashion industry has grown tremendously over the past years as it is a $2.5 trillion business. At the same time, the fashion sector is booming, with an impressive range of adverse environmental impacts in the form of production, which make up 10 per cent of world Co2 emissions, as more than eighty per cent of textile is dumped each year (Agarwal et al., 2016).

For a while now, we have been cognizant of the consequences of our continued consumption. Aside from the economy and population, the environment and human health are negatively impacted. Therefore, "responsible consumption" is becoming a popular topic of discussion in the media, among consumers, and companies. In the first place, it helps the economy, particularly the local economy, since it facilitates the exchange of products and services, which in turn helps the individuals who engage in these exchanges. Second, it benefits both the customer and society since the items or services they purchase are associated with a fairly paid workforce and enjoy safe working conditions (in matters such as health). Finally, a conscientious consumer is aware of the effects caused by each phase of a product's life cycle (from manufacture to shipping to disposal) and makes an effort to choose items with the smallest footprint. Sustainable consumption implies consuming in a manner that enables the conservation of resources and the environment via purchasing better (greener items), eating better (wasting less) and throwing away better (recycling). While the Responsible

consumption definition is broad, besides ecological consumption, it also includes consumer responsibility that may affect many areas having an environmental effect on consumption to its social, economic and health impact.

Social influence can come from various sources, such as family, friends, and media and plays a significant role in shaping individuals' consumption and production choices. Research has also shown that social network representation, or the way individuals are connected in a social network, can also impact responsible consumption and production choices (Dholakia et al., 2004; Ostrom, 2009; Schultz et al., 2007; Thøgersen, and Crompton, 2009). However, much is still to be learned about how social influence operates and can be harnessed to promote more sustainable behaviours. The literature on the dynamics of social influence on consumption choices highlights the importance of considering the interplay between individual utility, information availability, and social influence. Anticipation utility refers to the expected enjoyment or dissatisfaction individuals feel when they think about a potential outcome. The Friedkin-Johnsen model provides a framework for understanding social influence in a network context.

Individuals are likelier to adopt new ideas and behaviours from acquaintances rather than close friends or family members (Granovetter, 1973). Since acquaintances are more likely to provide access to diverse information and perspectives. The presence of multiple social identities can moderate social networks' impact on behaviour (Cheung and Lee, 2010). While communication within networks can reinforce or challenge existing behaviours and attitudes. Certain factors influence the rate and extent of adoption, such as relative advantage, compatibility, complexity, trialability and observability (Rogers et al., 2014). Finally, (Gass and Seiter, 2018) found that online social networks can be effectively used to target advertising and influence consumer behaviour. (Gladwell, 2000) emphasizes the role of "influentials" in spreading social epidemics. (Abrahamese and Steg, 2013) find a significant social influence on pro-environmental behavior, especially through interventions targeting norms. (White et al., 2019) show that social networks and community campaigns promote sustainable consumption. While interventions centring around consumer values and self-identity wield substantial influence in cultivating responsible consumption practices, those grounded in the manipulation of social norms and comparative benchmarks exhibit comparatively lesser potency.

The extent of information availability plays a crucial role in the Friedkin-Johnsen model It refers to individuals' information about a particular product, technology, or issue. The following examples illustrate the extent of information availability: *High Information Availability:* If individuals have access to a large amount of information about a product or technology, they are less likely to be influenced by the opinions and behaviours of others (Divayana et al., 2021). For instance, if a person has conducted extensive research on the features and benefits of a new car, they may be less likely to be swayed by the opinions of friends and family and more likely to make a decision based on their own. *Low Information Availability:* In contrast, if individuals have limited information about a product or technology, they may be more likely to be influenced by the opinions and behaviours of others. For example, suppose a person is considering purchasing a new smartphone and has limited information about its features. In that case, they may be more likely to rely on the opinions of friends and family. *Differential Information Availability:* different individuals in a network may have different levels of information about a product or technology. In this case, individuals with high information availability may act as opinion leaders and strongly influence others in the network (Bray et al., 2011). These examples illustrate how the extent of information available can impact the dynamics of social influence on consumption choices.

4.3 Preliminaries and Notation

Let, c, $d \geq c$ *are two integers*. While $c{:}d$ indicated as, $\{c, c+1, \dots, n\}$.We, at this moment, present set Ṡ *which is finite,* and the number of elements in a set is represented by $|\dot{S}|$.A square matrix is represented as $T = (e_{ij})$. Whereas I_n is the identity matrix. Then, $T = (e_{ij})_{i,j=1}^{n}$, the diagonal $T = diag(e_{11}, e_{22}, \dots, e_{NN}) \in \mathbb{R}^{d\times d}$ is its main diagonal, and Þ (T) is the spectral radius (same as Markov). The matrix T *is schur table* if Þ $(T) < 1$. (T) is stochastic(row) if $(e_{ij} \geq 0$ and $\sum_{j=1}^{n} e_{ij} = 1 \forall i$. Hence, matrices $T \in \mathbb{R}^{c\times d}$, while $\mathcal{B} \in \mathbb{R}^{p\times q}$, their Kronecker product [51] explained as,

$$T \otimes \mathcal{B} = \begin{bmatrix} e_{11}\mathcal{B} & e_{12}\mathcal{B} & \dots & e_{1n}\mathcal{B} \\ e_{21}\mathcal{B} & e_{22}\mathcal{B} & \dots & e_{2n}\mathcal{B} \\ \vdots & \vdots & \dots & \vdots \\ e_{m1}\mathcal{B} & e_{m2}\mathcal{B} & \dots & e_{mn}\mathcal{B} \end{bmatrix} \in \mathbb{R}^{cp\times dq}$$

4.3.1 Classical and THE FJ Model

It is the repeated process of opinion formation considered as discrete-time T = {0,1,2,…,}. Let a community have n number of individuals $(1, \dots, n)$. While $\mathcal{Y} = (\mathcal{Y}_1, \dots, \mathcal{Y}_n)^{\mathrm{T}}$ and $\mathcal{Y}_i \in \mathbb{R}$ represents the column vector of their scalar opinions. Real numbers generalised under continuous opinion dynamics can represent individuals or agents. In the (Friedkin and Johnsen, 2011) opinions, development is defined by two row-stochastic matrix matrices, representing personal influences $N \in \mathbb{R}^{n \times n}$ And individuals' propensities to the influence are explained through a diagonal matrix of $0 \leq \Psi \leq I_n$. While during each process $z = 0,1, \dots, n$ feelings or opinions of individuals progress as $\mathcal{Y}(z) = \mathcal{Y}_1(z) \dots x\mathcal{Y}_n(z))^{\mathrm{T}}$

$\mathcal{Y}(z + 1) = \Psi N x(z) + (I - \Psi)u, \quad (F)$ (a, FJ opinion dynamics.) (Initial opinion $u = y(0)$)

The values $u_i = \mathcal{Y}_i(0)$ are the agents' *preconceptions or initial opinions.* Model (a) extension of DeGroot's model through averaging information integration (DeGroot, 1974). where $\Psi = I_n$. In that process individual i assign weights to the established opinions of others,under the constraint of weight to the initial opinion of the individual.

In the particular case of the respected model assumes the "connection condition." $\Omega_{ii} = 1 - \eta_{ii}$ ∀i (that is, $\Psi = I - \mathrm{diag}N$). Under this supposition, the self-weight is η_{ii}. If η_{ii} =1 and $\eta_{ij} = 0$ ∀j ≠ i, then the Individual completely willfully and utterly disregards opinions from other sources. (In opposition, $\eta_{ii} = 0$, then $\Omega_{ii} = 1$, then the agent puts no weight on its own opinion and takes complete influence from others (thus ignoring its initial conditions). The $\Omega_{ii} = 1 - \eta_{ii}$ ∀i (that is, $\Psi = I - \mathrm{diag}N$). Different opinion measures have been employed to evaluate this in the past (Childess and Friedkin, 2012). Individual i modifies his choices in period $z + 1$ based on the average weight assigned. With time opinions can evolve, and the resultant matrix is stochastic, i.e., a nonnegative matrix with all its rows summing up to 1.

The classical model of fixed weights, i.e., $\mathcal{Y}(t + 1) = N\mathcal{Y}(t)$ for $t \in T$, and N is a stochastic matrix and $\mathcal{Y}(t)$ the column vector of opinions at time t. $\mathcal{Y}(t) =$

$N^t\,\mathcal{Y}(0)$ for all $t \in T$ and, hence, the analysis amounts to analysing the powers of a given matrix. The Friedkin-Johnsen model is $(t+1) = G\,\mathcal{Y}(0) + (I - G)\,A\mathcal{Y}(t)$ for $t \in T$. If G=0, then it becomes a classical model, and it does deliberate G≠0. In graph theory, a directed graph is represented as $\mathcal{G} = (V, E,)$ Where V signifies vertices and edges are $E \subset V \times V$. A sequence $i = i_0 \to i_1 \to,\ldots,\to i_k = i'$ is movement from i to i'; i' is vertex, which is accessible from node i, (i move to i'at least one time. If each vertex can move to another vertex, then we can get a strongly connected graph, whereas vertices are indexed as $1, \ldots, n = |\dot{S}|$. Moreover, matrix N is linked with $\mathcal{G}[N] = (V, E[N])$.While $V = 1{:}\,n$ represents a set of vertices having communication with individuals' arcs related to ties individuals possess, $(i,j) \in (E[N])$ iff $\eta_{ij} > 0$. When an individual puts positive weight on himself (self-weight $\eta_{ii} > 0$) results in a self-loop. Then $\mathcal{G} = \mathcal{G}[N]$ the communication graph representing a social network. Similarly, (Everett and Schoch, 2022) explain the dynamics of a directed network.

4.3.2 Ergodicity

"If N is equal to $n \times n$ stochastic matrix, then it has a distinctive limiting distribution or consensus vector σ^*. further, if $\mathcal{Y}(0)$ is an initial state and $\mathcal{Y}(t+1) = N\mathcal{Y}(t)$, then $\mathcal{Y}(t)\}$ will converge to σ^* as $t \to \infty$ (Lay, 2003)". Consensus can be reached when N^m are positive as $m = (n-1)^2 + 1$. While N is the matrix to determine ergodicity. If each state is accessible from each other in $n-1$ step, $where\ n\ equals\ number\ of\ states, known\ as\ irreducibility$. Then $Q = (I + Z)^{n-1}$ with strictly positive entries. I represents nxn identity matrix. The matrix $N\ is\ Z_{ij} = I(N_{ij} > 0), for\ all\ i,j$ (Horn and Johnson, 1991). The Perron-Frobenius theorem is a mathematical theorem that applies to ergodic processes, meaning they satisfy certain conditions of randomness and unpredictability. Suppose a process is also irreducible and aperiodic, meaning it cannot be decomposed into smaller parts and has no repeating patterns. In that case, the theorem guarantees a unique consensus distribution to which the process will converge over time, regardless of its starting point.

Certain conditions can prevent a process from attaining this consensus or uniform limiting distribution. One is when the process has more than one communicating class, which means subgroups within the process do not interact with

each other. Another is when there is a cycle among the subclasses within a single class. These conditions can cause the process to behave more complexly, and predicting the outcome may not be possible. When developing an econometric model, it is crucial to consider the asymptotic behaviour of the model, meaning how it will behave over time as it approaches its limiting distribution. The choice of the sample size (represented by "N" in the statement) can also impact the model's behaviour, so it is essential to consider these factors when constructing and analysing econometric models carefully (Rossi et al., 2013).

4.4 Theorization of Anticipatory Utility and Information-Driven Consumption Choices: Unraveling the Dynamics of Happiness and External Influences

Utility derived by anticipating about future is known as an anticipatory utility (Caplin and Leahy, 2001). This kind of utility is unexpected in the form of pre-enjoyment and excitement. Anticipatory utility induces behaviour patterns by choosing timing outcomes, beliefs, and information acquisition. The concept of delayed consumption was explained by (Loewenstein, 1987) to deduce that for pleasant favourable experiences, anticipatory utility is more robust and higher in events closer in time. For fearful, less pleasant experiences, individuals, on average, try to do it immediately (eliminating the anticipation period) or delay it for discounting reasons. The anticipatory utility impacts individuals' consumption choices through the channel of gathered information and beliefs formulated from their surroundings. The research found that when we are waiting for something and looking forward to getting it, an enormous amount of dopamine (the hormone of happiness) is generated inside our brains. Afterwards, when we compare the amount of famine generated in the anticipation stage and the amount of dopamine in the consumption stage, the consumption itself will not bring as much happiness as the anticipation (utility). Literature depicts that decision-makers with anticipatory feelings cannot ignore information because of its impact on happiness or emotions.

Few studies define *consumption choices* facilitated through social influence from advertisements, peers and our close networks. Also, individuals derive more satisfaction from spending on clothes and leisure rather than food (Noll and Weick,

2015). The subjective well-being of consumers increases imitation consumption (Kim et al., 2021). They have analysed the role of social media platforms on human choices, including Instagram and Facebook activities (browsing, interaction, and advertisement). Their findings suggest a positive effect of well-being on intimation consumption, and Instagram activity leads to more imitation consumption. (Campbell and Warren, 2012) assert that using celebrity endorsers in ads promotes spending on concerned products. Social influence acts as a balance between self-interest and the interest of others. Self-focus is often a necessary condition for the effects of social influence. We have deduced from the literature that happiness derived through purchases based on advertisement is associated with a further increase in consumption. This statement refers to the idea that when people experience high levels of happiness, they tend to feel a stronger loyalty to the brands that contribute to their happiness. As a result, they may be more likely to spend more money on products and services associated with these brands.

If we assume that higher consumption leads to higher happiness. U(H_c-) represents the utility of being in the high consumption state (H_c-) and U(R_c+) represents the utility of being in the responsible consumption state (R_c+). People are often over-optimistic about their probability of not having in higher consumption state (H_c) as compared to a responsible consumption state (R_c). Such over-optimism translates into behaviour as people react less to the likelihood of (H_c) in deriving their utility. The probability (p) reflects the individual's level of over-optimism about their likelihood of being in the high consumption state (H_c-) and in (R_c+) with (1-p). Further, we assume there is no discounting in period one, and nothing can be done for the individual's current state. This model assumes that individuals make decisions based on their expected utility in the present. Therefore, their over-optimism about the future will impact their behaviour in the present. If individuals overestimate the likelihood of being in a responsible consumption state (R_c+), *they may consume more in the present, resulting in a higher likelihood of being in a high-consumption state* (H_c-) in the future. The currently expected utility of the individual is given by

$$p.u(-) + (1-p).u(+)$$

Adding anticipation utility to the model allows us to understand the impact of individuals' beliefs about their future consumption state on their current happiness. In

other words, it considers the expected utility of being in a particular state and the individual's pleasure or displeasure from simply anticipating that state. It is assumed that individual beliefs are appropriate, and influencers tend to manipulate the individual's beliefs *about consuming commodities*. In real life, individuals' beliefs about their future state can be influenced by various factors, such as friends, neighbours, and social media platforms. For example, a person may be influenced by their friends to believe that they can easily afford specific brands, goods or services and maintain a responsible level of consumption. It may lead them to purchase, resulting in increased consumption and potentially a lower overall utility. It is assumed that $u(-) > u(+)$ and $f(.)$ is increasing[40]. In the case where individuals have appropriate beliefs about their future state, the anticipatory utility in period one is represented by the function $f(p)$, where p is the probability of being in the high consumption state (H_c-). If the individual believes they are more likely to be in the high consumption state, the anticipatory utility will be higher. However, if they believe that they are more likely to be in a responsible consumption state (R_c+) The anticipatory utility will be lower.

$$f(p) + pu(-) + (1-p)u(+).$$

If he finds out in which state he is happier, either through consuming more (H_c) or remaining in (R_c). If an individual is in (H_c -) state (with probability p), then so his utility function will be described $f(1) + u(-)$. If an individual is in (R_c+) state with probability, $(1-p)$ then so, his utility function will be described as $f(0) + u(+)$. Hence expected utility is,

$$pf(1) + (1-p)f(0) + pu(-) + (1-p)u(+).$$

In other words, the equation is a weighted average of the utilities in both states, where the weights are the probabilities of being in each state. If the value of $u\,(+)$ is greater than $u\,(-)$, then the individual has a higher expected utility from being in a responsible consumption state than being in a high consumption state. For decision-making regarding some outcome, an individual will seek information if the expected value from obtaining information is greater than the value of not seeking information. Moreover, there are chances that a person's beliefs can be manipulated to feel that the

[40] The assumption that f(.) is increasing means that as the probability of being in the higher consumption state (Hc) increases, the individual's anticipatory utility also increases.For example, consider an individual who is planning to purchase a new luxury car. If the individual believes that they have a higher chance of being able to afford the luxury car (p) and that the car will provide them with a higher level of utility (Hc), then their period one anticipatory utility (f(p)) will be high. If the probability of the individual being able to afford the car (p) increases, then their period one anticipatory utility (f(p)) will also increase.

person is driving enormous happiness from overconsumption. It is represented by inequality in the equation below.

$$pf(1) + (1-p)f(0) + pu(-) + (1-p)u(+) > \quad f(p) + pu(-) + (1-p)u(+)$$

Since the individual with a higher consumption state, the terms involving u (-) and u (+) will be irrelevant for the choice to seek information. There are two criteria; if the individual is information averse, he does not like taking information from another source, puts all weightage on his own opinions, and formulates consumption choices based on it. It is true if (f.) is concave as steeper for lower values due to certain factors and suspicion or lack of trust in peers or other social platforms. For example, the individual may be less likely to follow the consumption choices or recommendations of others, even if those choices or recommendations could lead to a more optimal outcome. It can lead to inefficient choices or a lack of consensus.

$$pf(1) + (1-p)f(0) < \ f(p)$$

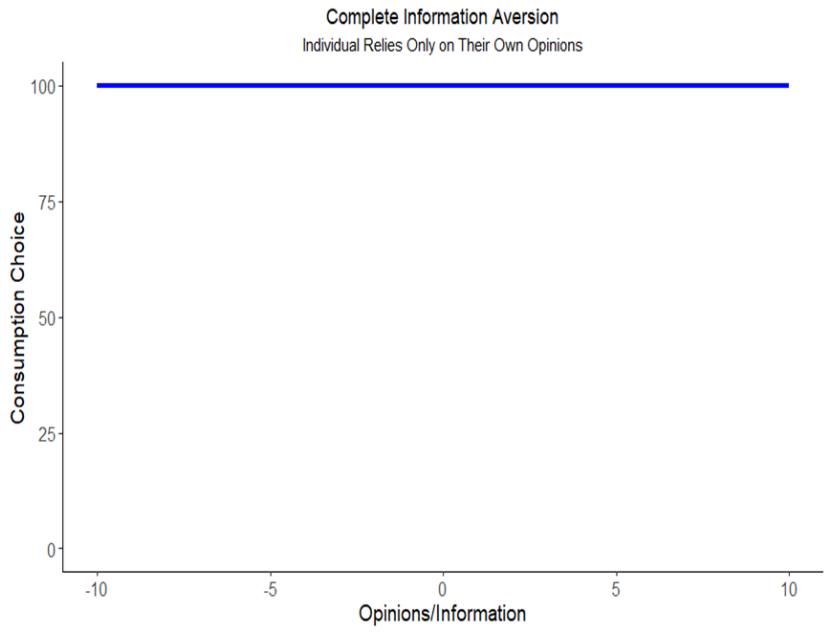


Figure 4.1: Complete Information Averse Individual

The utility function is flat, a person's preferences do not change with changes in the consumption state, and he or she is unaffected by new information. This type of individual is often called a "dogmatic" or "closed-minded" person who is resistant to change and not open to new ideas or information. For example, this person might believe that a particular car brand is the best, even though evidence suggests that it has poor safety ratings and low reliability. Despite this information, the individual will

continue to prefer the brand based on their opinions and biases. Some studies have found that people who are information averse are more likely to stick to their initial beliefs and are less willing to change their minds, even in the face of new information (see, for example, Jonas et al., 2001).

In the second case, the individual is information-loving, then

$$pf(1) + (1-p)f(0) > f(p)$$

This person f(.) is convex, meaning steeper for higher values. The person likes to be sure about his decision, so he deduces information from others to decide; e.g., for consumer choice, individuals rely on information from various sources, including friends, peers, and advertising platforms.

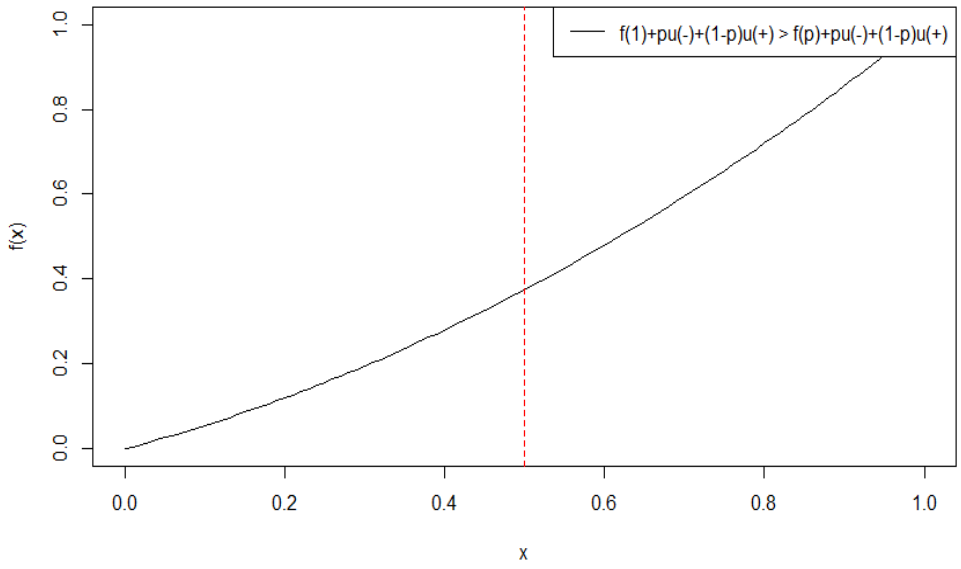


Figure 4.2: Information-loving person

Suppose an individual manipulates her beliefs to make himself feel better or happier. In that case, the happiness he deduced from being in a higher consumption state neglects the costs imposed on society. As the person receives more information, the weight they place on other sources of information increases, leading to a convex function

In this framework, we will individually want to hold correct beliefs.

$$f(1) + pu(-) + (1-p)u(+) > \quad f(p) + pu(-) + (1-p)u(+) \quad \text{For any p < 1.}$$

Incorrect beliefs about outcomes lead to wrong choices. In utility theory, positive beliefs are essential for economic outcomes. Individuals always want to believe that he is happy from remaining in their current state, e.g., they wrongly convince themselves that their consumption is not exceedingly beyond R_c. This process varies from individual to individual. However, over-optimism distorts decision-making and might lead to disappointment. Hence people drive utility from wrong beliefs with enormous external costs imposed on society.

Suppose an individual believes that climate change is not real or not caused by human activities. This belief may lead them to make choices that have enormous external costs on society, such as driving a gas-guzzling car or supporting policies that undermine efforts to reduce carbon emissions. Their incorrect belief about the outcome (climate change) leads to a wrong choice that imposes costs on others. With the rise of globalisation and social media, individuals are exposed to a broader range of products, lifestyles, and cultural norms. Suppose an individual believes owning a luxury car or designer clothing will bring them happiness and status, despite the external costs of such consumption patterns (e.g., environmental damage, social inequality). In that case, their belief may lead to a wrong choice that imposes costs on society. Suppose an individual believes that smoking is not harmful to their health or that healthy eating habits are unnecessary. This belief may lead them to make choices that have enormous external costs on society, such as increased healthcare costs or reduced productivity. Their incorrect belief about the outcomes of these health behaviours leads to wrong choices that impose costs on society

On the other hand, if the person does not know whether they have higher utility in the responsible consumption state $(Rc+)$ or the high consumption state $(Hc-)$, their utility will be a weighted average of the expected utilities of each state, reflecting their uncertainty. Here, the individual's overall happiness will be determined by their expected utility and level of uncertainty about their future state. In conclusion, including anticipation utility allows us to understand the impact of individuals' beliefs about their future state on their current happiness. It highlights the potential consequences of being influenced by external factors such as friends, neighbors, and social media platforms.

4.5 Consumer Decision-Making in the Age of Information: Empirical Insights from Different Societal Contexts

When shopping online, people sometimes don't have enough information about the products they want to buy. It can result in confusion and uncertainty about the product's quality, price, and overall value. To overcome these challenges, people often resort to the opinions and actions of others as a way to minimise risk and make more informed decisions (Chen, 2008). For example, if a product has many positive reviews, potential buyers may assume it is high quality and decide to purchase it. The influence of others' opinions and experiences can therefore be a powerful determinant of individual shopping behaviour in the online space (Lee et al., 2016).

The extent of the information obtained from others is informational influences, e.g., review and recommendation information of some online services. Another normative influence (social influence) derives from essential others manipulating people's actions and choices. Hence herd behaviour emerges from these two influences (Banerjee, 1992). Furthermore, to reduce the uncertainty of some choices, people emulate the same repetitive choices by diverse individuals (Bikhchandani et al., 1992). When many friends are present on the same platform, then an act of an individual can be regarded as a reference by others, making the connection more significant (Burke et al., 2009). Social influence mainly results from significant others (peers, social media advertisements, or influencers on social media, including pop stars, fashion leaders, and athletes). Meaning to a particular product is transferred through three stages: first, proficiency and trustworthiness of the endorser transfer meaning to his public image; afterwards, it transfers the significance to being recognised and ultimately transmitted to a consumer who conforms to their attitudes or attitudes choices.

Dynamics of social influence on consumption choices can be depicted through examples such as in Fashion Trends: The popularity of certain fashion styles and clothing brands is often influenced by social networks. For example, suppose a celebrity wears a particular outfit and posts about it on social media. In that case, many people may start to emulate their style, increasing demand for that particular brand or type of clothing. *Restaurant Recommendations:* Word-of-mouth recommendations from friends and family can influence where people eat. If a person's social network

frequently visits a particular restaurant, they are likelier to follow suit and try it for themselves. *Technology Adoption*: Social networks play a significant role in shaping technology adoption. For example, if a person's friends and family use a particular type of smartphone or other technology, they may be more likely to adopt it themselves. *Political Views:* Social influence can also impact an individual's political views and opinions. For example, if a person's social network holds a particular political view, they may be more likely to adopt that view, even if they previously held a different opinion. *Product Reviews*: Online product reviews can also be a source of social influence in purchasing decisions. For example, if many people in a person's social network have left positive reviews for a particular product, they may be more likely to purchase it themselves.

Social influence and exchange theory can determine consumer purchases during online shopping and physical retail. On the one hand, they find a social dilemma: consumers aspire to purchase Western services and commodities to meet social expectations. Exchange theory suggests that consumer behaviour is motivated to maximise benefits and minimise costs. Consumers weigh the perceived benefits and costs of purchase and decide based on this evaluation. For example, a consumer may consider a product's quality, price, and reputation when purchasing. Social influence and exchange theory can interact in complex ways in online shopping. For example, a consumer may be influenced by the recommendations of their friends on social media. However, they may also compare prices and product specifications from different retailers to make an informed decision (Chui et al., 2022). At the same time, others remain purchasing such products because of perceived superiority and the risk of disapproval. According to (Lewin, 1951), changes in the beliefs and attitudes of individuals can be exclaimed based on a quasi-stationary equilibrium where forces operate in a unidimensional quantum. (French, 1956) asserts that social influence might occur after some time slowly. Moreover, when one member tries to influence others toward his new point, this also leads to a shift in a central position.

In the influence process, time is mandatory for all influenced constituents to shift their opinion and attitudes toward equilibrium. When this complete opinion shift occurs, people start to place weight on new opinions. In a group defining consumption choices, every member tends to communicate with all other members on whom they

might have a direct influence or influence. Moreover, the achievement of consensus (uniformity) and speed of convergence change with the amount of connectedness of structure. E.g., the trendsetter in fashion design, automobiles, or the mobile phone industry can influence others directly and indirectly. Therefore, there are chances that leadership might be among many members or concentrated in the hands of a few who can exemplify as leaders. Similarly, if A is considered an influencer, then in the case of the weakly connected group, the attitudes, beliefs, and opinions of others diverge more from his viewpoint. Comparably for the unilaterally connected group, the choices of all other members converge towards A's opinion.

Social attitudes associated with several phenomena ranging from market to social life can be explained through this phenomenon. Moreover, this study provides not only the reason for compliance attitude for individuals but also the intuitions behind why the convergence of behaviour to social optimum[41] can be vulnerable to social progress. If convergence[42] is attainable in the least time, social equilibrium can shift. Furthermore, if choices are sequential, then a time will come when the decision becomes less productive for others. Therefore, external disturbance is always needed to update information patterns, which is provided in the form of technological progress.

How do consumers make judgments and decisions, particularly surprising or seemingly irrational? Why people might forget or lack information and fail to learn is a question. The answer is that attention is limited because of the abundance of information to attend to everything (Greenstone and Hanna, 2014). Then, individuals make wrong choices, and preferences are inconsistent. In the study we are referring to, the term "responsible" describes an individual who puts more weight on their own opinions than on the average opinions attained from other sources. Specifically, based on our chapter 3 analysis, an individual is considered "responsible" if they attribute more importance to their own opinions than to the opinions of others. Overall, being

[41] The convergence of behavior to the social optimum involves aligning with what's best for society. Social progress, changes in norms, can challenge existing optima. In environmental conservation, the old focus on economic growth is shifting to sustainability and responsible resource management, but this shift can be slow, leaving society vulnerable to environmental costs.

[42] *Convergence:* When individuals or groups adjust their behavior to be more in line with each other. *Social equilibrium:* A state where the behavior of individuals or groups is in balance and doesn't change unless there is an external force acting upon it. *Sequential choices*: When decisions are made one after another, with the later decisions influenced by the earlier ones. External disturbance: An outside force that disrupts the current state of affairs and forces individuals or groups to adjust their behavior.

"responsible" relates to self-reliance and the tendency to rely on one's judgment rather than distorted external sources of information or opinion.

4.5.1. Information Loving Society

Let there be 15 social agents in a community with 225 interactions indexed 1 through 15. and let $\mathcal{Y} = (\mathcal{Y}_1, \ldots, \mathcal{Y}_4)^T$ and $\mathcal{Y}_i \in \mathbb{R}$. *Real numbers generalised under continuous opinion dynamics can represent individuals or agents.* In the information-loving society, we assume the $\Omega_{ii} = 1 - \eta_{ii}\ \forall i\ (that\ is, \Psi = I - diagN)$. In that society, more individuals love putting weight on information from other sources (advertisements, social media leaders, peers) to formulate their choices. Moreover, they put no weight on their own opinion, meaning their choices are made with the most interpersonal influence. In the information-loving society, the self-weight $\eta_{ii} = 0, \eta_{ij} > 0$ $(\text{and}\ \Omega_{ii} = 1)$. Direct or indirect influence in a respective group with any communication is represented through matrix multiplication. The column represents the influence exerted by members, while a row represents the power applied to respective members (French, 1956). Zero corresponds to several locations. The respective entity has no power to influence others. Similarly, one represents strong power to influence others in decision-making—consequently, deficiency of synchronisation and reduced reliance on the choices of others are indicated by zeros in random locations. The transition matrix in the heat map Figure 4.3 below is,

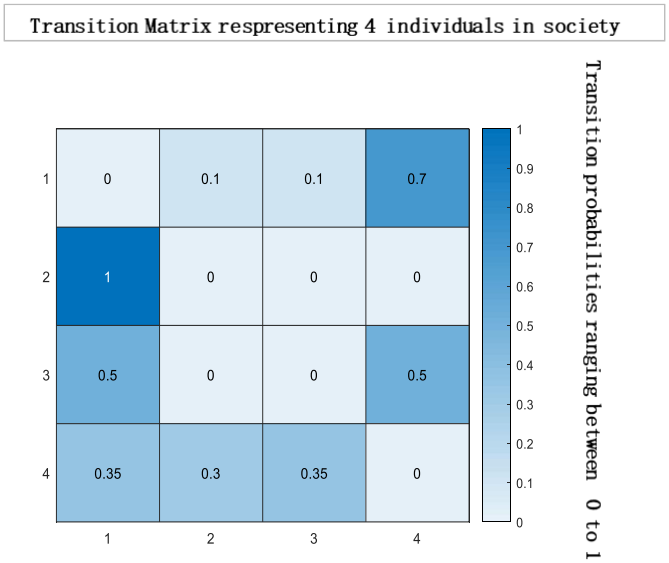


Figure 4.3: Matrix illustrating the representation of four individuals within a society, where each cell in the matrix corresponds to the interaction between two individuals. The symbol η_{ii} denotes the diagonal elements of the matrix, indicating the self-interaction of each individual. In this particular scenario, the value of η_{ii} is set to 0, implying that there is no self-interaction or influence exerted by an individual on themselves.

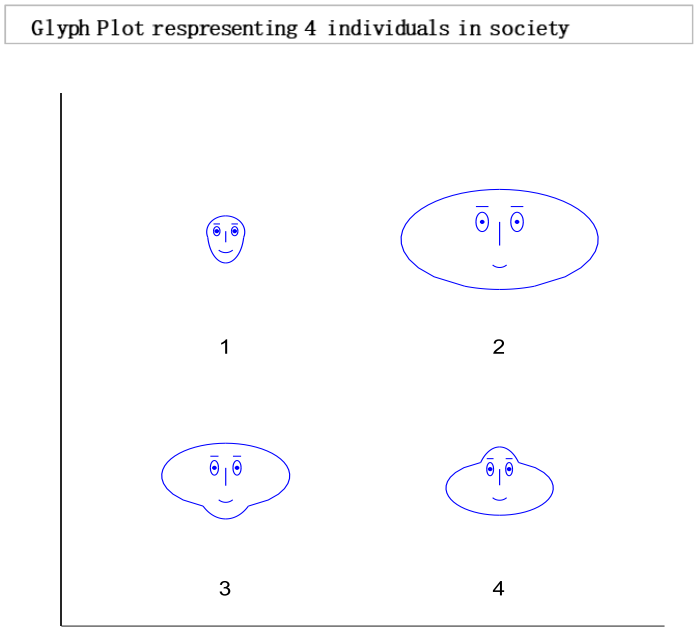


Figure 4.4: In the given context, if a glyph plot is being referred to, it typically represents visual representations (glyphs) used to depict data or information within a matrix or grid-like structure. It presents a visual representation of the interactions between the four individuals, with each glyph conveying information about their relationships or interactions within the society among four individuals.

The above matrix shows that individual 1 puts no weight on his opinion and is most influenced by individual four by allocating 0.70 weight to his opinion in formulating a choice. Moreover, Individual Two is entirely influenced by Individual 1. While individual 3 give 0.50 weight to the opinions of individual 1 and 4 to decide. This interactive mechanism represents a community or society of 15 individuals with 225 interactions represented below in a heat map and glyph plot where choices are influenced by persuasion from others. At the same time, the consensus is achieved in a short time. In literature and real life, this concept has been applied in various fields, including the study of consumer behaviour, political opinion formation, and the spread of disease in populations. In politics, the study of the spread of political opinions and the influence of political leaders on voters can also be modelled using similar concepts. In all of these examples, the transition matrix and continuous opinion dynamics provide a valuable framework for understanding the complex dynamics of influence and consensus formation in social networks.

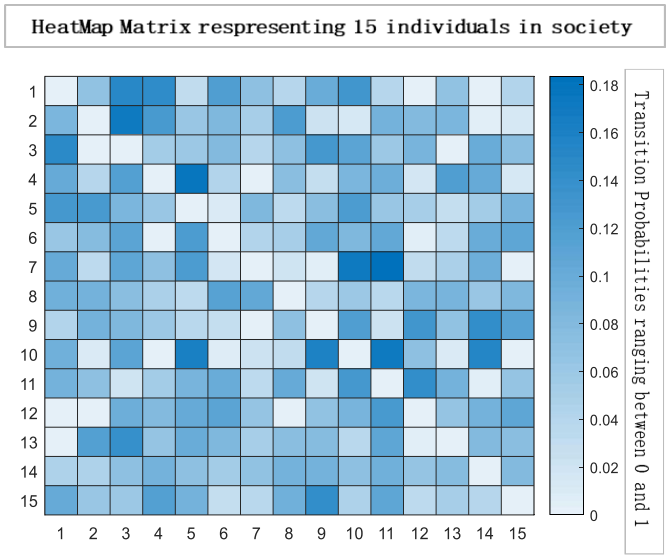


Figure 4.5: Heat map matrix depicting a society of 15 individuals, wherein each cell represents the interaction between two individuals. The colour intensity in the heat map signifies the degree of influence exerted by one individual on another. In this specific scenario, society is considered completely influenced, indicating a high level of interdependence among the individuals. The diagonal elements of the matrix, denoted by η_{ii}, have a value of 0, implying that there is no self-influence or internal effect exerted by any individual on themselves

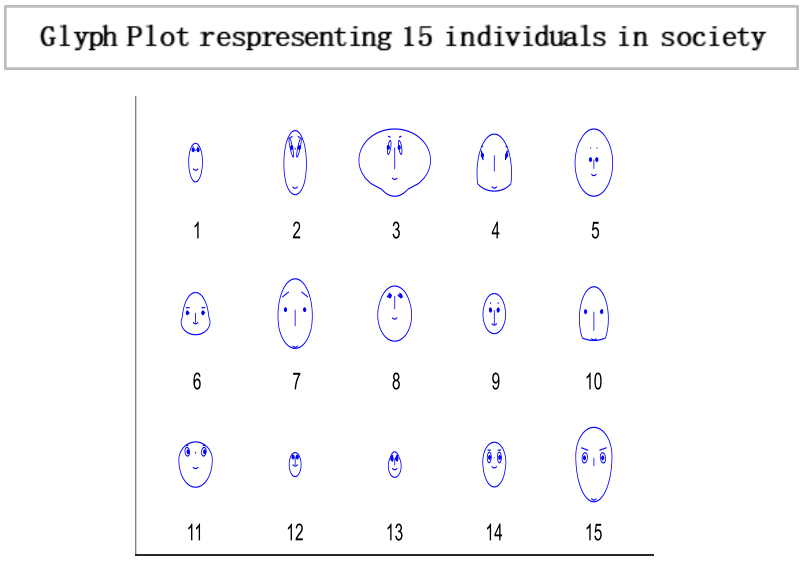


Figure 4.6: The Glyph plot presents a visual representation of the interactions between the 15 individuals, with each glyph conveying information in the form of face structure about their relationships or interactions within the society among 15 individuals that are completely influenced.

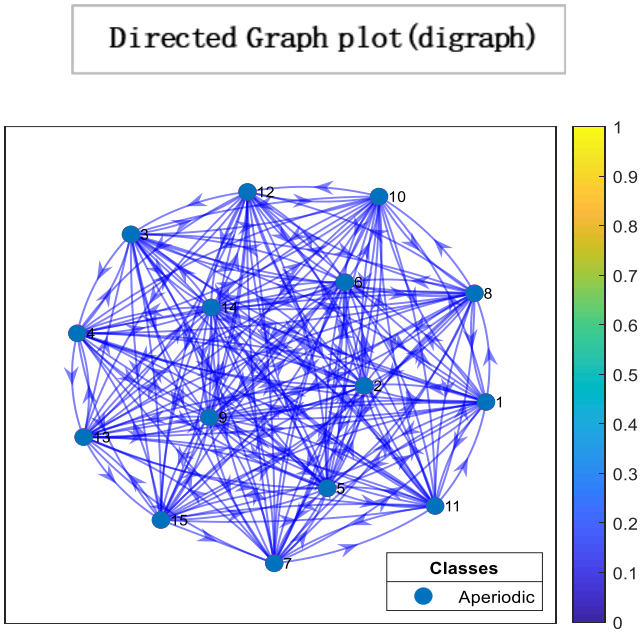


Figure 4.7: Directed Graph Plot illustrating the characteristics of our matrix. The plot visually represents the matrix as a directed graph, where nodes represent different states, and the edges between the nodes represent non-zero transition probabilities. The critical features depicted in the graph plot are the aperiodicity and irreducibility of the matrix. The strongly connected network nodes in the graph plot indicate that all states within the system are interconnected, with paths or transitions between them. This implies that each state can influence or be influenced by other states in the system. The edges, represented as arrows, symbolize the non-zero transition probabilities between states. These edges capture the likelihood or probability of transitioning from one state to another within the system.

In economics, ergodicity is often used to describe the stability of a system over time. If a system is ergodic, its statistical properties remain constant over time, and the system will eventually converge to a unique limiting distribution. From the results, a unique limiting distribution exists in the society under consideration, indicating that consensus is possible. However, the plot of eigenvalues on the complex plane in Figure 3.6 suggests that choices are made through persuasion and that individuals' opinions converge to society's opinion in the least amount of time. While this type of convergence can lead to stability in economic systems, it can also lead to irresponsible consumption patterns if individuals are not making choices based on reasoning and intellect. For example, suppose others' opinions heavily influence individuals and do not consider the long-term consequences of their choices. In that case, they may engage in unsustainable consumption patterns that might have consequences for the environment and society. It is important to note that while convergence and ergodicity can be desirable in economic systems, they are not always guaranteed. External factors

such as economic shocks, changes in policy, or technological advancements can disrupt the stability of an economic system and lead to unpredictable outcomes. As a result, it is essential to continuously monitor and analyse economic systems to ensure long-term sustainability and stability.

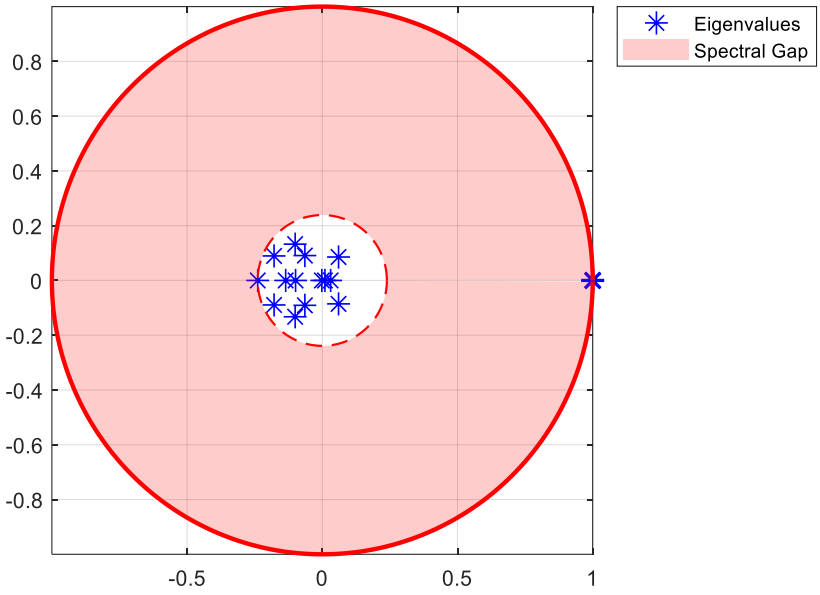


Figure 4.8: The spectral gap refers to the difference between the outer and inner orbits, which indicates how quickly the system converges to a stable state. In this case, the observed spectral gap is large, signifying a significant difference between the outer and inner orbits. The large spectral gap suggests the system exhibits rapid convergence, meaning it takes fewer iterations or time steps to reach a consensus. This indicates that the mixing time of the system is relatively fast. The term "mixing time" refers to the time it takes for the system to transition from its initial state to a state where the probability distribution of the states reaches equilibrium or stability.

Individuals may make decisions based on incomplete or inaccurate information. Additionally, herd behaviour can lead to market bubbles or crashes, as a large group of individuals may make the same decision simultaneously, leading to an artificially inflated or deflated market. Moreover (Banerjee, 1992) asserts that optimising individuals will follow others rather than use their information leading to inefficient equilibrium. One limitation of neo-classical economic theory is that it does not account for changing consumer preferences, such as fashion trends or social norms. It can limit its ability to predict consumer behavior in some contexts accurately. There is also a need to distinguish between material and social needs in consumption theory. While traditional economic theory assumes that individuals make decisions based solely on their material needs, *research has shown that social needs, such as the desire for social status or respect, can also play an important role in consumption decisions. By studying*

these phenomena, we can understand how markets and individuals behave in different contexts and design policies and interventions that promote efficient and sustainable economic outcomes.

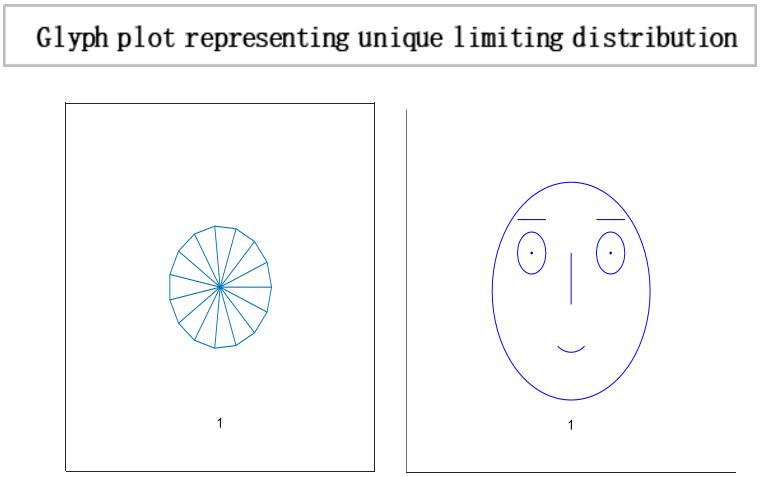


Figure 4.9: Glyph plot illustrating a unique limiting distribution, leading to a consensus among the entities or elements represented.

In *Figure 4.9*, each glyph within the plot corresponds to an entity or element within the system under consideration. This unique limiting distribution highlights the entities' ability to reach a consensus, implying a common understanding or agreement among them, regardless of their initial differences or positions. Localised conformity and vulnerability of behaviours of masses can be best interpreted as an information cascade (Bikhchandani et al., 1992). Individuals with a specific inclination for conforming may enter the bandwagon for irrational behaviour. The longer the bandwagon, the stronger it becomes, leading to uniform social behaviour. These mechanisms formulate rigid conformity that is unbreakable with small shocks. In literature, this scenario is often portrayed as a dystopia, where individuals have lost their ability to think for themselves and are controlled by a tyrannical government or religious institution. A complete information-loving society is one where individuals can access vast information. However, instead of using their intellect and reasoning to make decisions, they follow others blindly without evaluating the information for themselves. An example of such a scenario can be seen in the social media culture, where individuals are constantly bombarded with information. Instead of critically analysing the information, they often rely on the opinions of others and make decisions based on what is popular or trending.

In conclusion, a completely information-loving society can lead to blind conformity to societal norms and values without considering personal experiences and

thoughts. In religious contexts, this phenomenon can be seen in the strict adherence to religious doctrine and scripture without engaging in personal reflection and interpretation. For example, some religious sects prohibit questioning the teachings of the faith and encourage followers to blindly follow the teachings of religious leaders without considering their own experiences or thoughts. Literary references to this phenomenon can be seen in works like (Orwell 2021), where the government controls the information available to its citizens and manipulates their beliefs and actions through propaganda and manipulation. In "Brave New World," work (Huxley, 2022) argues that individuals are conditioned from birth to conform to society's norms and values without personal reflection or independent thought.

Based on the results, the Simplot and glyph plot indicates that consensus was achieved quickly in a certain community, which may have been highly influenced and prone to higher consumption and irresponsible behavior. The statement also suggests that individuals in this community may be more likely to follow others rather than use their information to make decisions, which can lead to an inefficient equilibrium, (Banerjee and Fudenberg, 2004).

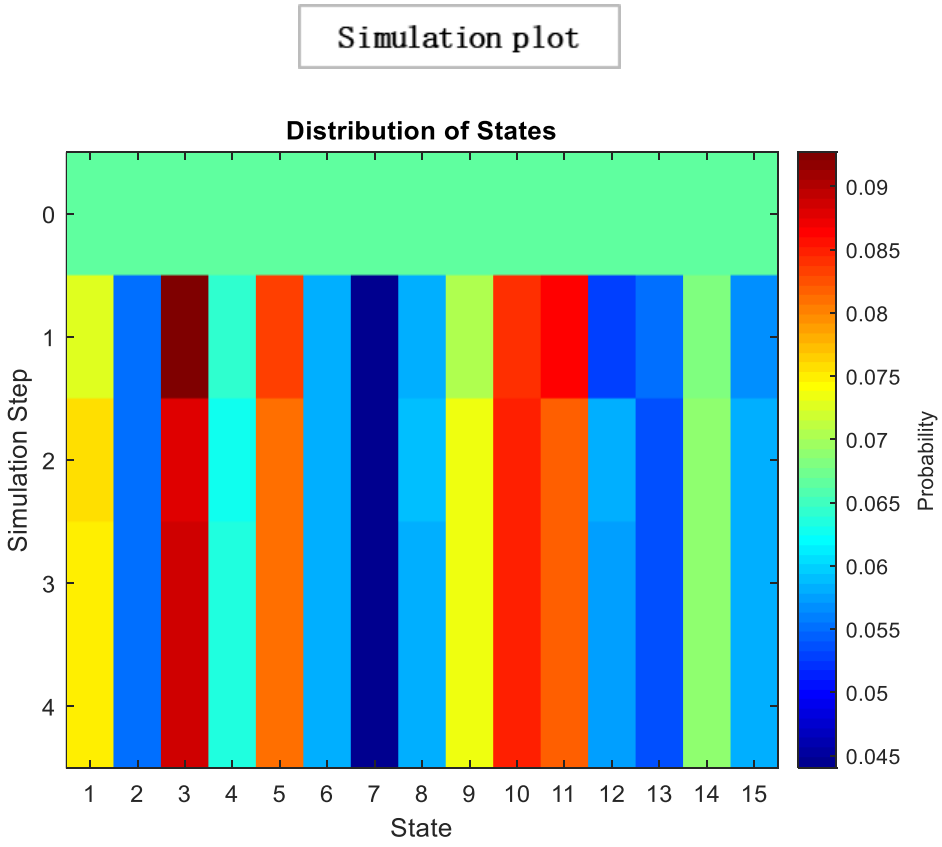


Figure 4.10: *Simulation steps* represent the number of interactions it takes for individuals to converge towards the majority's opinion

Figure 4.10 represents the number of interactions for individuals to converge towards the majority's opinion. In other words, arriving at a collective decision or agreement about a particular issue is accomplished more quickly. For instance, since fashion magazines have been around, kids have copied famous people's clothes. The number of social media influencers having millions of followers is growing in line with the growth of social media. At the same time, they generate their income through sponsored brand partnerships. Social media influencers significantly influence customer behaviour, particularly among younger generations (Zak and Hasprova, 2019). These are predicated on the idea that they are seen as reliable sources, straightforward ways to obtain information, and sources of inspiration. During decision-making, high value is placed on the influencer's opinion, taking consumer purchasing decisions, thoughts and attitudes (Bulte and Joshi, 2007).

Consumption choices have an influential role in sustainable development; with the increased number of social media platforms, people are more inclined to formulate their consumption choices using these platforms as information sources. It has a long-term impact on alteration in consumer actions. Results suggest systematic conformity prevails in an economy where individuals rely on the opinion of others before deciding. As a result, individuals consider their opinions and put all weight on other opinions, demonstrated by the concentration of connectivity in the system. *Such a system might be more prone to social, economic, and environmental challenges. On the one hand, relying on external sources of information can give individuals access to a wider range of perspectives and opinions, leading to more informed and well-rounded decision-making. However, this rapid convergence towards the opinions of the majority can also result in irresponsible attitudes towards consumption and production.*

In an "information-loving society," individuals are more likely to rely on external sources of information. *Fast Fashion:* In a society where advertisements and peer pressure heavily influence individuals, they may be more likely to engage in the overconsumption of fast fashion products. It can lead to adverse environmental and social consequences, as resources are consumed at an unsustainable rate, and waste products contribute to pollution and other forms of degradation. *Plastic Waste:* The widespread use of plastic products and packaging, driven partly by advertising and peer pressure, has contributed to a global plastic waste crisis. Despite increasing public

awareness of the negative impacts of this waste, many individuals continue to engage in practices that contribute to plastic pollution due to the influence of the majority. *Food Waste*: In a culture where people are encouraged to eat large portions, individuals may feel pressure to finish their plate, even if they are not hungry. It can result in significant food waste and contribute to environmental degradation and resource depletion. Unsustainable Energy Use: Individuals may be less likely to take steps to conserve energy, such as turning off lights when they leave a room if they perceive that the majority is not concerned about energy conservation. It is essential to examine the influence of external sources of information critically and to strive for a balanced approach that values both individual opinions and the perspectives of the majority.

4.5.2 Complete willful information-averse society

In a completely information-averse society, individuals rely solely on their own opinions $\eta_{ii} = 1$ and make decisions without considering the opinions or information of others; $\eta_{ij} = 0 \ \forall j \neq i, \ \Omega_{ii} = 0$. It means choices are made with no interpersonal influence. The figures below represent a community where there are 15 individuals where the diagonal represents $\eta_{ii} = 1$ all willful individuals. For example, consider a society where individuals make decisions about their *energy consumption*. In an information-averse society, individuals may not be aware of the environmental impact of their energy usage or the availability of alternative energy sources. They may consume energy inefficiently and wastefully without considering the long-term consequences for the environment or future generations. This scenario can have many negative consequences, such as increased carbon emissions, resource depletion, and environmental degradation. In addition, the lack of information sharing and collaboration can lead to duplication of effort and reduced efficiency in addressing energy-related challenges. Therefore, it is crucial for individuals and societies to actively seek out information and also consider the opinions of others to make informed and responsible consumption choices that benefit both the individual and society as a whole.

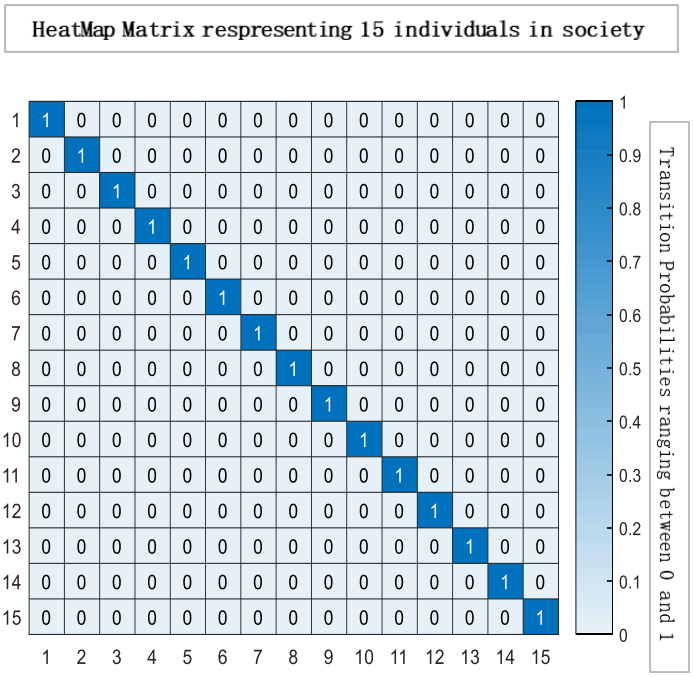


Figure 4.11: Matrix representation of a completely **willful information-averse society** consisting of 15 individuals $\eta_{ii} = 1, \eta_{ij} = 0$. In this scenario, each individual's self-interaction, represented by $\eta_{ii} = 1$, they are indicating a strong focus on self-interest or self-preservation. This suggests that individuals in this society prioritize their well-being and decision-making, placing a higher value on their interests rather than actively seeking or sharing information from others. Furthermore, the off-diagonal elements of the matrix, denoted as $\eta_{ij} = 0$, are set to 0, implying no individual interactions or information exchanges. This lack of interaction reflects a society where individuals intentionally avoid seeking or sharing information, resulting in an information-averse environment.

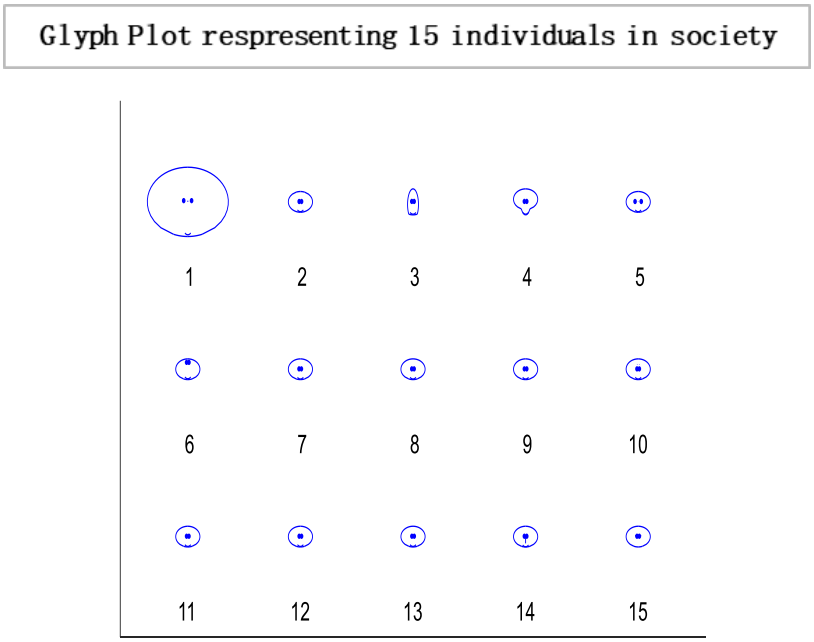


Figure 4.12: Matrix and glyph plot representing a completely willful society with 15 individuals having $\eta_{ii} = 1, \eta_{ij} = 0$

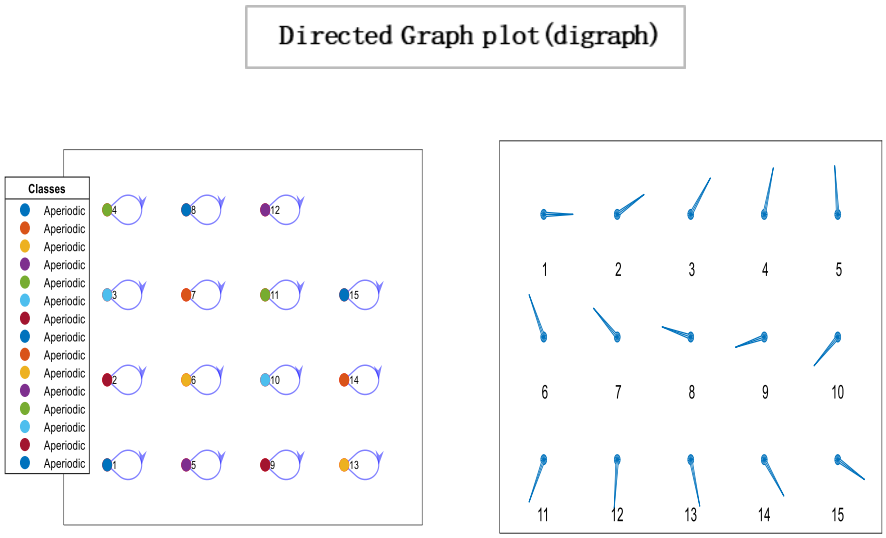


Figure 4.13: Directed Graph plot representing the aperiodic and irreducible systems, showing individuals are not connected.

In Figure 4.13, the directed graph plot visually represents a lack of repetitive behaviour. Notably, the directed graph plot reveals that individuals within the system are not connected. This implies that there are no direct transitions or influences between individuals. Each individual operates independently, without any direct interaction or impact on others. Consensus is based on two conditions irreducibility and aperiodicity. Through computing, the result is $logical\ 0$, demonstrating that consensus cannot be reached as individuals are self-reliant. So, it is confirmed through plotting the eigenvalue plot that there is no unique stationary distribution to compute mixing time, so ergodicity cannot be achieved. In psychology, the concept of "*confirmation bias*" refers to the tendency of individuals to seek out information that supports their preexisting beliefs and ignore information that contradicts those beliefs. It can result in individuals making decisions based solely on their opinions, even when presented with conflicting evidence. In sociology, "group polarisation" occurs when group members become more extreme in their opinions and beliefs after discussing and interacting. It can also result in a society where individuals make decisions based on their own opinions without being influenced by the opinions of others. Overall, the idea of an "information-averse" society is not uncommon and has been studied in various fields, often with negative consequences for decision-making and the functioning of society. This phenomenon has been widely studied in the field of consumer behaviour and has been referred to as "limited consideration of future consequences" (LCFC) (Oliveira et

al., 2022). It refers to the tendency of individuals to focus on the short-term benefits of consumption rather than considering the long-term consequences.

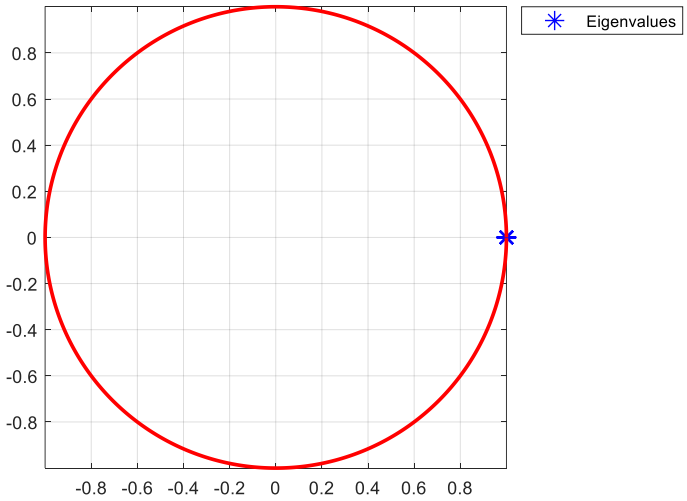


Figure 4.14: Outer and inner dotted orbit differences demonstrate mixing. Hence in this case of a complete willful society particular gap doesn't exist, which means there is no consensus.

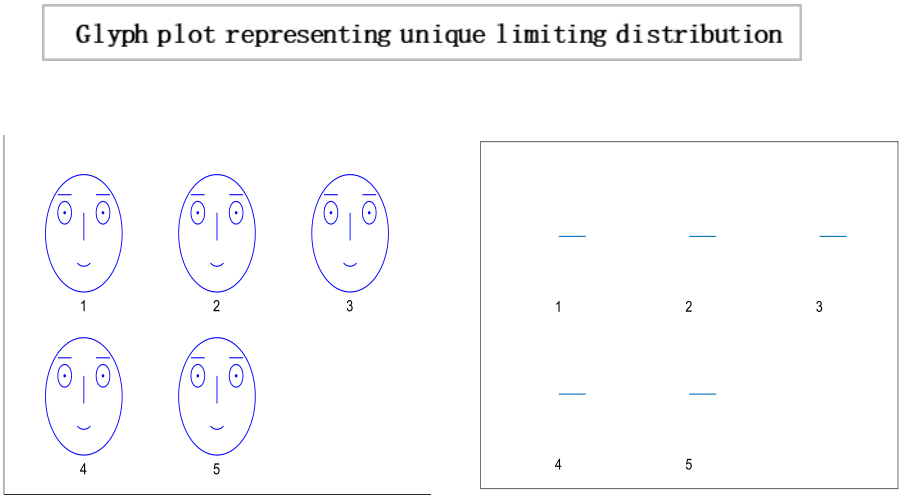


Figure 4.15: No limiting distribution exists as there is no consensus.

In an information-averse society, individuals make decisions based purely on their desires and impulses without considering the consequences and neglect reasoning and critical thinking. This type of society can lead to adverse outcomes, such as a lack of cooperation, social unrest, and ethical problems. An example of such society can be seen in the novel "Lord of the Flies" (Golding, 1962). In the book, young boys are

stranded on an uninhabited island and form their society. They initially try to govern themselves based on rules and order, but as time passes, they become increasingly driven by their desires and violent impulses. It leads to chaos, violence, and the eventual breakdown of their society. In reality, there are examples of societies or communities that prioritise individual desires over the common good. For instance, *organised crime networks* operate on a will-based model, where members act in their self-interest, often at the expense of others and the community. A society where individuals inefficiently utilise information and do not use intellect and reasoning to make choices in life can be described as a "willful society." In such a society, people may rely on their instincts, emotions, or cultural norms to guide their decisions rather than considering available information and applying critical thinking skills.

Examples of real-life scenarios in which a society may display this type of behaviour could include: Following a political ideology or leader blindly without examining their actions or policies critically; Making decisions based on preconceived notions or biases rather than considering all available evidence; Ignoring scientific evidence when making important decisions, such as those related to public health or environmental issues and Relying on superstitions or traditions to guide personal or communal choices, rather than rational inquiry. In religious contexts, there have been instances where religious beliefs have been used to justify actions that go against scientific evidence and reason. For example, some individuals may reject evolution and hold strict creationist beliefs, despite overwhelming scientific evidence supporting evolution. A society where individuals make decisions without relying on reason and critical thinking can lead to harmful outcomes, including spreading misinformation and implementing harmful policies. Individuals must question their beliefs and critically think to make informed decisions.

Irrelevant information leads to suboptimal decisions in life (Chadd et al., 2021). Such a society is also prone to challenges resulting from inconsistent preferences, delayed choices, and inaccurate decagons. The utility always converges back towards a steady-state level (However, an information-averse individual does not converge as more weight is applied to their own choices compared to a person who is an information lover and has influenced decisions). Individuals may make irresponsible consumption choices in an entirely information-averse society due to a lack of exposure to different perspectives and information. It can be particularly problematic in tight-knit cultural

communities, where social norms and traditions often dictate consumption patterns and discourage deviation from them.

For example, consider a tight-knit cultural community where unhealthy food consumption is a cultural norm and tradition. In this scenario, individuals may be averse to seeking information about healthier food options, which goes against their cultural norms and traditions. They may continue to consume unhealthy foods without considering the long-term impact on their health and well-being. Similarly, in a tight-knit cultural community where consumerism is highly valued, individuals may make irresponsible consumption choices based on the latest trends and fashions without considering their choices' environmental and social consequences. It can result in excessive waste, pollution, and the depletion of natural resources. It can lead to a more informed and responsible approach to consumption, benefiting both the individual and the community. Individuals and communities need to recognise the limitations of relying solely on their opinions and cultural norms, actively seek out information, and engage in respectful dialogue with those with differing perspectives.

4.5.3 A Responsible Society

Let there be a society in which individuals allocate more weight to their own opinions, $\eta_{ii} > 0.50$ to and put the least weight on information from other sources. We assume the "coupling condition." $\Omega_{ii} = 1 - \eta_{ii} \ \forall i \ (that\ is, \Psi = I - diagN)$. The figures below represent a community where there are 15 individuals where the diagonal represents $\eta_{ii} > 0.5$. In a responsible society, individuals are conscious of their actions and their impact on the environment, economy, and community. They make responsible consumption choices based on their values, beliefs, and knowledge of the products and services they use. For example, people may buy locally sourced products to reduce their carbon footprint and support the local economy. They may also consider the environmental impact of the products they purchase, opting for items made from sustainable materials produced by companies with environment-friendly practices. Another example of responsible consumption is when individuals choose products that align with their values, such as fair trade coffee or clothing made from organic cotton. In such a society, individuals also prioritise reducing waste by choosing products with minimal packaging, repairing items rather than buying new ones, and composting or recycling when possible. It helps reduce the amount of waste in landfills and minimises

the environmental impact. It supports ethical and sustainable practices and sends a message to the market that there is a demand for responsible products.

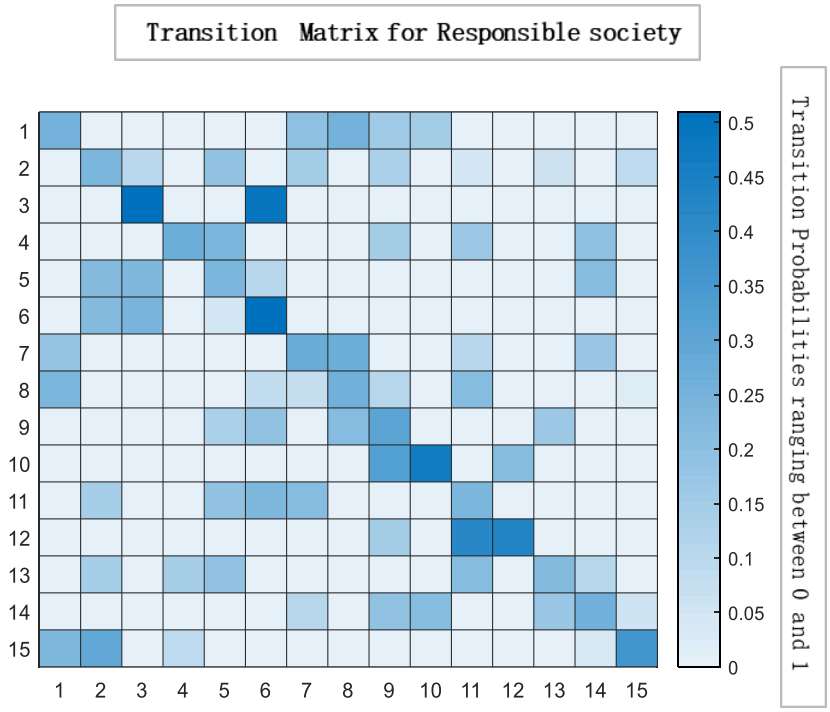


Figure 4.16: Transition Matrix illustrating a responsible society comprising 15 individuals. In this scenario, the diagonal elements of the matrix, denoted by η_{ii}, have values greater than 0.50. This indicates that each individual within the society possesses a high level of personal responsibility, with a significant tendency to maintain their current state or behaviour. Additionally, the off-diagonal elements of the matrix, denoted by η_{ij} Have values less than 0.50. This implies that the transitions between states or behaviours for individuals in society are relatively less likely.

In such a scenario, the probability of transitioning to other states and remaining in the current state is lower. Changes in the initial probability vector can also impact the final state and the likelihood of reaching equilibrium. For example, increasing the probability of transitioning to a new state may cause the system to move away from equilibrium and towards a new stable state. On the other hand, decreasing the transition probability can make the system more likely to reach equilibrium. There is a general tendency for individuals to exhibit consistency and stability in their actions or choices. The Transition Matrix provides a comprehensive overview of the responsible society, capturing the probabilities or likelihoods of individuals transitioning from one state to another. It highlights the collective conscientiousness of

the society's members, with a majority displaying a strong commitment to their current state while exhibiting limited inclination towards changing or adopting different states.

The slow convergence seen in the eigenvalue plot in *Figure 4.17* can be interpreted as a positive sign. It suggests that individuals are not making hasty decisions based solely on their personal opinions but are instead taking the time to educate themselves and also consider the opinions of others before making a rational decision. This slow convergence can be seen as a hallmark of a learning society, where people are continuously educating themselves and updating their beliefs. Moreover, the fact that there is a unique limiting distribution in the eigenvalue plot suggests a possibility of consensus in society. It means that despite the initial differences in opinions, individuals will eventually reach a shared understanding and agreement on what constitutes responsible economic and social choices. It is an important finding because it implies that responsible economic and social choices can become widespread in society and that people can come to a shared understanding of what these choices entail. These insights can be used to promote responsible decision-making and to build a more informed and educated society.

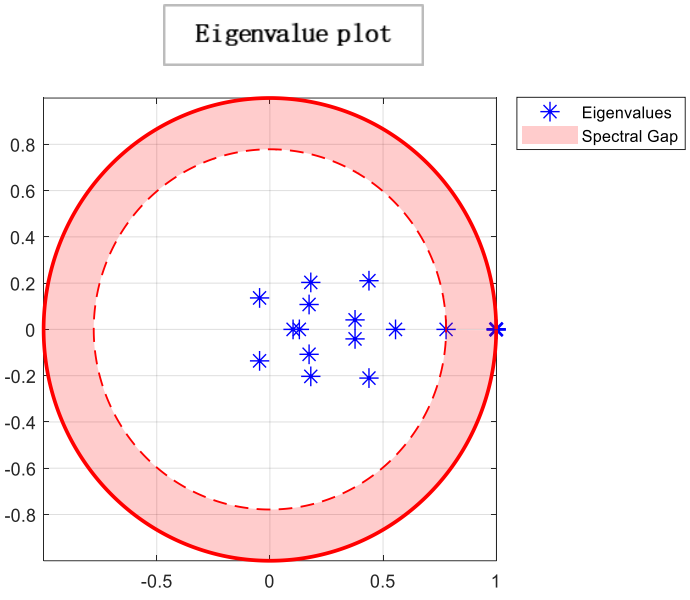


Figure 4.17: For a Responsible society, the Spectral gap is optimal, describing society's good concerning opposite choices. The presence of an optimal spectral gap implies that the responsible society benefits from the positive aspects of diverse and opposite choices. It signifies that individual within the society have the freedom to make their own decisions and select paths that align with their values and responsibilities

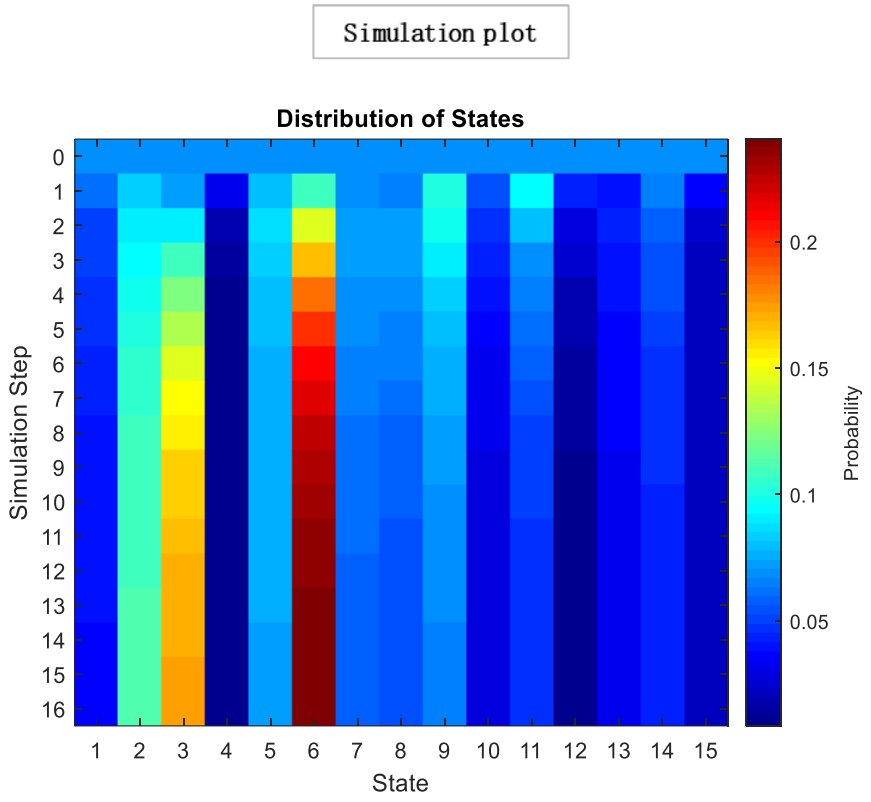


Figure 4.18: Simulation steps representing the number of interactions it takes for individuals to converge towards the opinion of the majority

It takes time for individuals to learn, understand, and incorporate new information into their decision-making processes, as depicted in our eigenvalue plot in Figure 3.17. While figure 3.18 represents the simulation steps to reach a consensus. In conclusion, the slow convergence rate seen in complete learning societies can indicate responsible decision-making by taking the time to educate themselves and understand the impact of their actions.

In a responsible society, individuals efficiently use information and reasoning to make informed choices. It can be characterised by individuals who are curious, critical, and discerning and evaluate information to improve the well-being of themselves and others. For example, consider a society where individuals use information and data to make decisions about their health. In this scenario, individuals may seek information about healthy lifestyles, dietary choices, and exercise and use it to make decisions about their health and well-being. They may also consult with healthcare professionals and consider the latest scientific research to make informed choices about their health. In real life, there are many examples of individuals and communities who use information and reasoning to make informed decisions. For

example, organisations such as Consumer Reports, 2023 provide information to consumers about products and services and help individuals make informed choices. Similarly, advocacy organisations such as the Environmental Defense Fund 2023 provide information and analysis to help individuals and communities make informed decisions about environmental issues.

One example of such a society was the city-state of ancient Athens, as described by philosophers such as Socrates, Plato, and Aristotle. In Athens, citizens were expected to engage in discussion and debate and to participate in the democratic process by making decisions collectively. They valued education and the pursuit of wisdom and strived to live in a way that was in harmony with the natural order and the gods. Similarly, in many religious traditions, individuals are encouraged to think critically, make moral choices, and act following their faith. For example, in Christianity, followers are encouraged to love their neighbours and to care for the poor and marginalised. In Buddhism, individuals are encouraged to develop wisdom and act in ways that lead to greater understanding and compassion for all beings. Literature also provides many examples of societies deviating from responsible choices in life. On the other hand, (Orwell, 2021), the citizens of Oceania live under a totalitarian regime that controls their thoughts and actions and discourages free will and independent thought. These works serve as cautionary tales about the dangers of societies where individuals do not think critically and make stubborn choices. In conclusion, a responsible society is one in which individuals use their intellect, reason, and knowledge to make informed decisions and strive to improve the well-being of themselves and others.

4.5.4 Limitations of the Study

This study contends for analysing and requiring new information regarding individuals' suboptimal behaviour during online purchases. While the study also has some limitations that open the venue for future research. The study focuses on social influence in the context of consumption choices. However, social influence may play a role in other aspects of human behaviour. This study utilises generalised context while employing data that can be further extended to several areas and cultures influencing individuals' choices. Moreover, we have incorporated only three scenarios to understand the behaviour of individuals. In Future expeditions, we can believe the

reasons behind herd behaviour by adding demographic influence information (age, gender, income).

Despite these limitations, our study provides a valuable foundation for further research into the impact of informational inducements and social influence on consumption behaviour. It highlights the importance of considering these factors in reducing environmental impacts. Future research could build upon our findings to further explore the role of informational inducements and social influence in shaping consumer behaviour and to develop practical strategies for reducing environmental impacts through responsible consumption behaviors.

4.6 Conclusion

This work highlights the role of social influence and informational inducements in shaping consumer behaviour and proposes a model to understand how individuals make decisions in different societies. The Friedkin-Johnsen model suggests that individuals place significant importance on information from others when making decisions in an information-loving society. However, they do not consider their own opinions to be as valuable as those of others. Instead, they make decisions based on the most meaningful information they receive from others. For example, in a society where social media influencers have a significant impact on consumer behaviour, individuals may make purchasing decisions based on the opinions of these influencers rather than their preferences or experiences. It can lead to homogenous preferences and conformism, as individuals may be swayed by the opinions and choices of those they are connected to in their social network.

In contrast, in an information-averse society, individuals place their opinions above all others and do not consider information from external sources when making decisions. In a responsible society, individuals strike a balance between their own opinions and the information of others. They would be open to new information and opinions but ultimately make their own decision based on personal preference, reason and external information. There will be more individual's majority that put reason and intellect above emotions. Overall, the model suggests that individuals with high self-confidence and self-control are more likely to resist peer pressure and make decisions

that align with their values and goals, regardless of the societal norms or influence of others.

Social influence acts as a balance between self-interest and the interest of others. *We have deduced that happiness derived through purchases based on advertisement is associated with increased consumption.* This statement refers to the idea that when people experience high levels of happiness, they tend to feel a stronger loyalty to the brands that contribute to their happiness. As a result, they may be more likely to spend more money on products and services associated with these brands. We have found in theorisation that people are often over-optimistic about their probability of not having in higher consumption state (H_c) as compared to a responsible consumption state (R_c). Such over-optimism translates into behaviour as people react less to the likelihood of (H_c) in deriving their utility. Our model assumes that individuals make decisions based on their expected utility in the present. Therefore, their over-optimism about the future will impact their behaviour in the present. If individuals overestimate the likelihood of being in a responsible consumption state (R_c+), *they may consume more in the present, resulting in a higher likelihood of being in a high-consumption state* (H_c-) in the future.

The inclusion of anticipation utility in our model allows us to understand the impact of individuals' beliefs about their future consumption state on their current happiness. It can be applied to decision-making scenarios, such as making financial investments, choosing a career path, or purchasing a product. Our results suggest that when individuals rely on a combination of their opinions and external information, they are more likely to make better decisions than rely solely on one source. The study also highlights the potential negative consequences of manipulating beliefs to achieve happiness or satisfaction in the short term, such as neglecting the costs imposed on society or the environment. It emphasises the importance of responsible consumption and decision-making to minimise the negative impact on society and promote sustainable practices.

Social influence can have both positive and negative effects on people's decision-making. On the one hand, it can lead to overconsumption if people blindly follow the opinions and choices of their peers without considering their own needs and preferences. On the other hand, social influence can also be a positive force if individuals use the information they receive efficiently and have high self-confidence

and self-control. *One way to reduce the problem of overconsumption caused by anticipation utility is using nudges.* Nudges are small, non-coercive interventions that encourage individuals to make choices in their best interest, such as choosing more sustainable products. This intervention can help reduce the anticipated utility of purchasing unsustainable products and promote more responsible consumption practices. By providing consumers with information about the environmental impact of their consumption patterns, they can be encouraged to make more informed and responsible decisions[43]. Social influence positively shapes responsible consumption: 1) Peer actions impact adoption; 2) Influencers endorse sustainable practices; 3) Community norms guide behaviors; 4) Group activities foster value integration. In sum, social influence is a potent tool for promoting responsible consumption.

While satisfying our basic needs and desires is essential, pursuing excess beyond that point may be counterproductive and lead to dissatisfaction. Ultimately, our lives are connected with others, and we must strive to find a balance between our desires and the needs of those around us. Online buying and selling platforms can implement environmental rating scales that allow individuals to rate the environmental impact of products and services, which can then be shared with their social network. It can help to reshape consumption patterns and encourage producers to adopt more sustainable production techniques. Consumers have the power to make choices that impact the environment; they often lack the resources, information, and incentives to make the right decisions. All sectors need to work together to create a more sustainable future. Consumers, governments, corporations, and the media all have important roles, and their efforts must be coordinated and complementary to achieve the best results.

Chapter 4 sheds light on the intricate dynamics of social influence and its profound impact on consumption choices, emphasizing the significance of understanding these influences. This chapter explores the role of information and external factors in shaping individuals' anticipatory behaviors and, consequently, their consumption decisions. It also underscores the importance of self-confidence and self-control in resisting peer pressure and making decisions aligned with one's values. Building upon these insights, Chapter 5, delves into the interplay between thrift, self-

[43] For example, a campaign highlighting single-use plastics' environmental impact can encourage consumers to choose more sustainable alternatives.

control, and delayed gratification. It investigates how these aspects influence responsible consumption and production choices, emphasizing their impact on individual values and ethical decision-making. This chapter, based on a comprehensive World Values Survey-based investigation, explores the connection between parents' teachings and the value of delayed gratification, underscoring the role of self-control in fostering responsible choices. In essence, Chapter 5 continues the exploration of factors that influence responsible consumption, shifting the focus from social influence to individual values, thrift, and self-control. It provides valuable insights into the impact of these factors on responsible decision-making and further emphasizes the need for promoting policies that encourage responsible consumption behaviors among children and youth.

Chapter 5

Thrift and Self-Control: Key Aspects of Responsible Consuming Behaviors: A World Values Survey-based Investigation

Executive Summary

In this chapter, we have investigated the interplay between thrift, self-control, and delayed gratification and their impact on responsible consumption and production choices. We have defined a utility function in which reliability is estimated by utilizing data from the World Values Survey encompassing 460,000 individuals across 90 countries. The study posits that when parents teach their children about thrift and saving money, they are helping to instill the value of delayed gratification. Children who learn to save their money and wait to make purchases until they have enough money to afford them are more likely to develop responsible financial habits and higher well-being levels as they grow up. The empirical findings strongly support this notion. Individuals prioritizing fate over self-control are less likely to make conscious choices, decreasing self-reported happiness. Conversely, those who believe in their ability to control their lives are more likely to take personal responsibility for their environmental impact and make ethical and sustainable choices. The research also demonstrates that materialistic values and aspirations can foster social comparisons and envy, decreasing happiness. In contrast, individuals who have reflected on the purpose and meaning of life are more likely to make responsible choices guided by their strong sense of values and purpose. From a policy perspective, these results underscore the need to promote policies and programs that encourage self-control, thrift, and delayed gratification, particularly among children and youth. Policymakers should prioritize policies that foster a sense of personal responsibility for environmental impact and promote sustainable choices.

5.1 Introduction

Understanding the factors that shape consumer behaviour is essential for promoting responsible and sustainable consumption patterns. However, consumer preferences are less evident in practice than predicted in theoretical models, and even with knowledge, customers mispredict their happiness (Kahneman et al., 1997). Some studies regard happiness as a brief subjective state of pleasure that develops from the brain's centre, measured based on a self-reported score gathered through a questionnaire (Lyubomirsky et al. 2005; Diener et al. 1999). Optimal consumption patterns under uncertainty are continually updated and revised. As a result, individuals do not always look for an optimal solution but choose a satisfactory one due to a lack of information, uncertainty, and time constraints. Saving and borrowing play an influential role in explaining consumption choices in changing periods. Thrift is associated with all psychological factors that affect savings, while savings here is a broader term. According to (Caplin, 2004), when establishing character, specific values are instilled inside children through parental instruction or societal pressure, and they discount the future readily. The economists agree on the fact that preferences do vary and are acquired through learning and genetic inheritance.

The concept of thrift has been associated with the efficient management of resources and money. Parental saving and responsible consumption behaviour have been found to help children learn and adopt responsible social and economic behaviours. However, the advertising culture has created a world in the individual's mind where material possessions are seen as the only source of happiness, leading to increased consumption and a shift in societal values towards material well-being. In the past, an individual's worth in society was determined by several factors, including religious faith, family values, and communal interactions. With the rise of consumer-oriented systems, the value of an individual has become linked to the amount, type, or quality of products they own. Organized religions, such as Buddhism, Islam, Christianity, and Judaism, direct their followers to consume and produce responsibly by providing guidance from spiritual life rather than acquiring worldly possessions to attain temporary happiness. The study of happiness has led social scientists to develop

a modern ethical regime, highlighting the source of responsibility for individuals' actions.

Our study through theorization highlights the importance of teaching children the value of thrift, saving money, and self-control to promote responsible consumption and production choices based on delayed gratification. Research in psychology and economics has shown that children who learn self-control and delayed gratification are more likely to make responsible decisions about their health, finances, and other vital areas of life (Mischel et al., 1989). For instance, children who are taught the benefits of delayed gratification are more mindful of spending and make more responsible choices when buying products with a lower environmental footprint. Responsible consumption behaviour encompasses a range of social and environmental aspects that can have varying degrees of influence on individuals. To explore the underlying triggers of these behaviours, we have employed panel data techniques using the latest World Values Survey data for over 90 countries. Country-level exploratory analysis is conducted to explore "Whether people who emphasize teaching their children about thrift, saving money and things score on a higher self-reported happiness scale than those who do not?". Parents are the crucial agents of child socialization, so the question posed in the form of a conventional projective approach highlights the priorities and preferences of parents (Inglehart, 1997).

The present research aims to investigate the relationship between happiness and consumption patterns, particularly emphasizing the role of thrift and self-control in promoting responsible consumer behaviour. In Section 1, we provide an introduction to the research and its objectives. Section 2 reviews the literature on the various cultural and social factors influencing individuals' happiness levels, including the impact of materialistic values and consumer culture. We also examine the role of socialization in shaping consumer preferences and behaviours. In Section 3, we develop a theoretical framework for analyzing the relationship between happiness and consumption, drawing on concepts such as delayed gratification, self-control, and utility theory. We argue that responsible consumption patterns that prioritize long-term well-being over short-term pleasure can lead to greater happiness in the long run. Section 4 describes the data, variables, methods, and econometric models used to analyze the relationship between happiness and consumption patterns. We draw on data from the World Values Survey and other relevant sources to examine individual consumption choices. Section 5

presents the results of our analysis, including the estimated relationships between happiness, consumption patterns, and other key variables. We identify the factors most strongly associated with responsible consumption behaviour and offer insights into the mechanisms that underlie these relationships. Finally, Section 6 concludes our research by summarizing our findings and discussing their policy implications. We argue that promoting thrift and self-control can be crucial in promoting responsible and sustainable consumption patterns. We suggest how policymakers, businesses, and individuals can work together to achieve these goals.

5.2 Literature Review

The role of emotions and affect in economic decision-making has been a subject of interest since the classical economic era, as noted by (Smith, 1759). The marginal revolution led to the development of mechanical rules and the adoption of the concept of utility. According to current economic theory, rational individuals seek to maximize their utility function, a weak ordering of commodity bundles subject to certain constraints without much consideration for emotions (Gilbert, 2007). In contrast, psychological and neurological research suggests that emotions play a significant role in decision-making. For instance, positive emotions, such as happiness, can motivate prudent consumption behaviour (Carte et al., 2011). Moreover, (Lebow, 1955) noted that purchasing and using goods has become a ritual embedded in our way of life. Excessive consumption beyond necessities results in a decline in overall well-being (Sirgy et al., 2013).

Economic development has traditionally been regarded as critical to national prosperity. With time, research skews toward studying socioeconomic aspects critical to comprehending people's well-being. Despite a tripling of wealth over the previous seven decades, the happiness trend in the United States stayed nearly unchanged after 2014 (Easterlin, 2017).[44] Happiness is influenced by how we see the people around us and their resources (Lyubomirsky et al., 2005). Individuals adjust to changes in life and acquire new expectations because of "hedonic adaptation." This effect heightened the desire to acquire more goods. However, realizing purpose and efficacy in resource management is more important than simply looking for money. If a person grows up in

[44] It is discovered that a flattening of the happiness curve may occur beyond a certain amount of money (Diener et al., 2013; Veenhoven and Vergunst, 2014) which was equivalent to $75000 (Kahneman and Deaton, 2010).

an area with limited access to essential resources such as food, housing, and clothes, having more money impacts their well-being and vice versa (Klontz et al., 2011). Moreover, "eudaimonia" is a kind of happiness that is inferred from performing good deeds and links to universalism (self-transcendence values), leading to responsible consumption choices (Baumeister et al., 2013). Therefore, it is essential to consider emotions and their effect on economic decision-making.

To discover the meaning of our lives, it is necessary to extend our gaze beyond ourselves and consider the well-being of others and the environment. (Miller, 2018) recounts the story of a young girl who worked as a "runner" at a toy factory in China, transporting sewn plush animals from one location to another for 12 cents per hour". According to the author, "she worked to death for manufacturing items with the lowest use value in life." Similar stories are widespread worldwide, with workers, particularly women and underage children, perishing from exhaustion, exploitation, and maltreatment to produce products with minimal utility value. In contrast, plush animals occupy the average American household in abundance. Consequently, all parties involved in manufacturing and distribution are rendered anonymous, and our roles are reduced to those of mere credit card swipers. We commence substituting our relationships with commodities, resulting in our alienation from those who diligently toil to create the goods we consume daily.

Consumer happiness in contemporary society is often centred around the pursuit of endless desires, with little regard for the well-being of others. The fast-food industry targets toddlers as young as two to create brand loyalty, as highlighted by (Schlosser, 2012). These corporations actively encourage children to recognize logos before they can even read. Identity is often tied to personal consumption, with the pursuit of freedom being another commodity. The agency is the ability to exercise one's will. Humanity has been gifted with reason, which allows us to pursue truth, and the will to pursue the good. God has gifted humanity with reason to pursue truth and the will to pursue the good. Through the combination of will and reason, we make choices. However, even if choices are made freely and without external persuasion, they may still be detached from reason. The conflict between will and reason can lead to chaos, as individuals may desire happiness but struggle with disordered desires. It is essential to acknowledge that no one desires to make bad choices, and pursuing disordered desires represses the quest for happiness in modern consumer culture.

Contentment is an enthusiastic condition of pride; a perceptual state is drawn from being at ease in one's position, body, and mind, and, further, a timid kind of happiness. In religious texts, a fortunate person's mental state can be regarded as contained if he is currently satisfied with what he owns. Likewise, Rupert (1998) quoted Buddha's words, "Health is the most valuable benefit, and contentment is the ultimate wealth". Furthermore, man's eyes were "opened" to distinguish between good and evil. Understanding this divergence generates emotional and physical tension (Genesis, 3). At the same time, thrift and self-control are two critical aspects of responsible consuming behaviours that have been widely studied in the literature. *Thrift* can be defined as efficiently utilizing money and other resources and avoiding waste. In contrast, self-control refers to the ability to regulate impulses and make decisions that align with long-term goals. These concepts are essential in responsible consumption, as they can help individuals make more sustainable choices that minimize their environmental impact and promote social welfare. One way thrift and self-control can influence responsible consumption is by encouraging individuals to prioritize long-term benefits over short-term gratification. It can manifest in various ways, such as buying high-quality, durable products that last longer or investing in renewable energy solutions that may have higher upfront costs but pay off in the long run (Kaygusuz, 2012). In addition, practising thrift and self-control can also help individuals avoid overconsumption and reduce their carbon footprint by minimizing waste and conserving resources (Lim, 2017).

Research has shown that thrift and self-control are closely related and that individuals who exhibit one trait are likely to exhibit the other (De Ridder et al., 2012). Furthermore, evidence suggests that these traits can be cultivated through education and training, particularly in childhood (Mischel et al., 1989). For example, teaching children the value of delayed gratification and the benefits of saving money can promote responsible consumption behaviours later in life. Several studies have investigated the relationship between thrift, self-control, and responsible consuming behaviours using data from the World Values Survey (WVS). For example, Haws et al. (2014) found that individuals who scored higher on measures of thrift and environmental concern were more willing to pay for environmentally friendly technologies. Similarly, (Anderson and Nevitte, 2006) found that self-control

significantly predicted pro-environmental behaviours such as recycling and using public transportation.

Teaching children thrift, saving money, and self-control through delayed gratification can promote responsible consumption and production choices and lead to long-term happiness. Studies have shown that individuals who practice responsible consumption tend to have a higher sense of life satisfaction and well-being (Kilbourne et al., 2002). A study of high school students in the United States found that those with higher self-control levels were likelier to have better credit scores and lower debt levels by their mid-20s (Mischel et al., 1989). Teaching children about the value of delayed gratification can lead to better financial outcomes in adulthood. Similarly, a longitudinal study of young adults in the United Kingdom found that those who had learned the value of saving money as children were more likely to accumulate wealth and have better financial outcomes than adults (Serido et al., 2013).

The importance of individual responsibility is also highlighted in the literature on responsible consumption. For example, a study by (Scholl et al., 2010) found that sustainable consumption requires a shift in values towards a more sustainable and responsible lifestyle, which can be facilitated by education and awareness-raising campaigns. By emphasizing individual responsibility for sustainable consumption, these campaigns can help promote a sustainability culture and encourage individuals to take action in their own lives. Furthermore, studies have found that individuals who perceive themselves as having personal control over their consumption choices are more likely to engage in sustainable behaviours (Bamberg & Möser, 2007; Gatersleben et al., 2014). It suggests that by emphasizing individual responsibility, individuals may be more likely to take ownership of their consumption choices and make sustainable decisions that contribute to sustainable development goals. The literature suggests that thrift and self-control are essential to responsible consuming behaviours. They encourage individuals to make choices that align with long-term goals and social welfare. Further research is needed to understand the mechanisms underlying these relationships and develop effective interventions for promoting these traits among individuals and society.

5.3 Theoretical Mechanism

Assume that a person's utility depends on their consumption of goods and services and their level of savings and self-control. The idea that utility depends on consumption and savings is well-established in economics. One early study in psychology by (Kahneman and Tversky, 1979) introduced the concept of "prospect theory," which describes how people make decisions based on the perceived value of gains and losses rather than the absolute value of outcomes. The concept of self-control has also been studied in psychology, with researchers exploring the relationship between self-control and various outcomes such as academic achievement, health, and financial success (Mischel et al., 1989; Tangney et al., 2004). One fundamental assumption in our work is that teaching children the value of thrift, saving money, and self-control can lead to responsible consumption and production choices based on delayed gratification. This assumption is supported by research in psychology and economics, which has shown that children who learn self-control and delayed gratification are more likely to make responsible decisions about their health, finances, and other vital areas of life (Casey et al., 2011). Therefore, we have defined a function that captures the relationship between consumption, savings, and self-control and how it affects a person's overall utility.

5.3.1 Assumptions

1. Based on the basic concept of utility theory, we have assumed that people make choices that maximize their overall well-being or utility.
2. A person's utility depends on their consumption of goods and services and their level of savings and self-control.
3. Teaching children about thrift, saving[45] money, and self-control[46] can help them develop the skills and habits necessary for delayed gratification[47], leading to more responsible consumption and production choices.

Based on these assumptions, we can derive a utility function as follows:

[45]Savings refers to the money that is not spent on consumption and is instead put aside for future use. It can be used to build wealth, create financial security, and achieve long-term goals.
[46] Self-control refers to the ability to delay gratification and resist immediate impulses or desires in favor of greater long-term benefits. It is a key component of responsible decision-making and can lead to positive outcomes in many areas of life.
[47] Delayed gratification refers to the practice of delaying immediate satisfaction or reward in favor of a greater reward later. It is based on the belief that sacrificing short-term pleasures can lead to greater long-term benefits.

Let U denote the utility function, C denote consumption, S denote savings, and G denote self-control which leads to delayed gratification. First, we start with the fundamental premise that the utility function for teaching children about thrift, saving money, self-control, and responsible consumption and production choices is a function of consumption (C), savings (S), and self-control (G). It is based on the idea that teaching children about the value of delayed gratification and responsible choices can lead to long-term benefits for both the individual and society. For example, research has shown that children who learn to delay gratification and make responsible choices tend to have better academic and social outcomes in the long run (Mischel and Ebbesen, 1970; Casey et al., 2011). It represents the maximum utility that can be achieved subject to the constraint on consumption's environmental and social impact.

$$U = U(C, S, G) \qquad (5.1)$$

We can assume that the utility function is increasing in consumption and savings since more consumption and savings are generally associated with higher satisfaction or happiness. We can also assume that the utility function is increasing in the degree of delayed gratification since the ability to delay gratification is a positive trait that leads to long-term benefits.

$$U1 > 0, U2 > 0\ U3 > 0$$

However, we must be careful in assuming that all three variables' utility function is strictly increasing. There may be trade-offs between consumption, savings, and self-control, and the degree of these trade-offs may depend on individual preferences. For example, some people may value immediate gratification more than long-term benefits, while others prioritize financial security over short-term pleasure. Therefore, we need to allow for individual differences in the utility function. Another assumption is that the utility function is increasing in consumption and savings since more consumption and savings are generally associated with higher satisfaction or happiness. This assumption is based on the idea that people generally enjoy consuming goods and services and that having more money and financial security can lead to greater well-being (Kahneman and Deaton, 2010). However, we must also be careful in assuming that the utility function is strictly increasing in all three variables.

Therefore, we can generalize the utility function as follows:

$$U = f(C, S, G)$$

In the above equation, f is a function that maps the three variables to an actual number representing the individual's level of satisfaction or happiness. To incorporate the notion of responsible consumption and production choices, we can add a constraint to the utility function that reflects the impact of consumption on the environment and society.

$$U = f(C, S, G) \; subject \; to \; E \leq E_0 \qquad (5.2)$$

E_0, is a fixed threshold for the acceptable environmental and social impact level. To do this, we introduce a constraint that the total impact of consumption and production environment and society (E) must be less than or equal to a fixed threshold (E_0), representing the acceptable level of impact. This utility function captures the idea that teaching children to delay gratification and make responsible choices can lead to long-term benefits for both the individual and society. This constraint reflects the idea that responsible consumption and production choices involve not only one's well-being but also the well-being of others and the environment. It also shows that overconsumption can have negative externalities, such as pollution, resource depletion, and social inequality, and that responsible decision-making should consider these externalities.

Delayed gratification is the ability to resist the temptation of immediate rewards to receive more significant benefits in the future. This concept has been studied in psychology, with the classic "marshmallow test" demonstrating that children who can delay gratification tend to have better outcomes later in life (Mischel et al., 1972). Teaching children about thrift, saving money, and self-control can help them develop the skills and habits necessary for delayed gratification, leading to more responsible consumption and production choices. This assumption is supported by research showing that financial literacy programs can improve children's financial knowledge and behaviours (Fernandes et al., 2014). The interventions to improve self-control can lead to better outcomes in various domains (Duckworth and Seligman, 2005). Using Lagrange multipliers, we can combine the utility function and the constraint into a single expression. Overall, the derivation of the utility function involves integrating several concepts from economics and psychology, as well as insights from research on

financial literacy, self-control, delayed gratification, and sustainable behaviour. The Lagrange is given by:

$$L = f(C, S, G) + \lambda(E_0 - E) \qquad (5.3)$$

λ is the Lagrange multiplier. We can then take the partial derivatives of the Lagrangian concerning C, S, G, and λ to find the optimal values that maximize the utility function subject to the constraint. The first-order conditions are:

$$\frac{dL}{dC} = \frac{df}{dC} - \lambda\frac{dE}{dC} = 0$$

$$\frac{dL}{dS} = \frac{df}{dS} - \lambda\frac{dE}{dS} = 0$$

$$\frac{dL}{dG} = \frac{df}{dG} - \lambda\frac{dE}{dG} = 0$$

$$\frac{dL}{d\lambda} = E_0 - E = 0$$

Solving these equations simultaneously, we can find the optimal values of C, S, and G that maximize the utility function subject to the constraint. These values can be expressed as functions of λ:

$$C = g1(\lambda)$$

$$S = g2(\lambda)$$

$$G = g3(\lambda)$$

g1, g2 and g3 are functions that depend on the Lagrange multiplier λ. Substituting these optimal values into the Lagrangian, we obtain the utility function subject to the constraint:

$$U = f\big(g1(\lambda), g2(\lambda), g3(\lambda)\big) \qquad (5.4)$$

It represents the maximum utility that can be obtained subject to the constraint on consumption's environmental and social impact.

5.3.2 An Example

Suppose a family tries teaching their children about thrift, saving money, self-control, and responsible consumption and production choices. They want to encourage their children to delay gratification and make choices that positively impact the environment and society. They set a goal to reduce their household's carbon footprint by 50% over the next year. The family's utility function can be expressed as:

$$U_f = f(C,S,G) \; subject \; to \; E \leq E_0$$

The constraint $E \leq E_0$ ensures that the family's choices have a positive impact on the environment. The Lagrangian for this utility function is: $L = f(C,S,G) + \lambda(E_0 - E)$. After solving for the first-order conditions, we can find the optimal values of C, S, and G that maximize the utility. However, we also want to ensure that the utility function considers consumption's environmental and social impact. Suppose a family wants to maximize their utility function while reducing their carbon footprint. In that case, they might reduce their consumption of goods and services with a high carbon footprint (e.g., air travel), increase their savings to invest in renewable energy, and practice self-control by avoiding wasteful habits (e.g., leaving lights on).

Solving these equations simultaneously, we can find the optimal values of C, S, and G that maximize the utility function subject to the constraint. These values can be expressed as functions of λ: C = g1(λ); S = g2(λ); G = g3(λ). Suppose λ represents the family's willingness to pay to reduce their carbon footprint. In that case, g1(λ), g2(λ), and g3(λ) represent the optimal levels of consumption, savings, and self-control that the family should adopt to maximize their utility while meeting their environmental goals. Substituting these optimal values into the Lagrangian, we obtain the utility function subject to the constraint as $U_f = f(g1(\lambda), g2(\lambda),$ g3(λ)). Afterwards Substituting the optimal values of C, S, and G (i.e., g1(λ), g2(λ), and g3(λ)) into the original utility function (U = f (C, S, G)), we obtain the utility function subject to the constraint.

5.4 Data and Methodology

5.4.1 The World Values Survey

In our study, we extracted longitudinal data from the World Values Survey comprising 1980-2020 with more than 460000 respondents to investigate the individual

determinants of self-reported happiness. Our primary dependent variable was self-reported happiness, which was measured on a 4-point scale: "very happy", "quite happy", "not very happy", or "not at all happy" *(Lyubomirsky and Lepper, 1999).* Our primary variable represents attitudes towards responsible consumption *Important child quality: thrift, saving money and things* (A038)**.** At the same time, other variables represent individual characteristics explaining, self-control and saving behaviour, such as thinking about the meaning and purpose of life, fate versus control, family savings and Individual vs. Government responsibility represented in table 1. We also included socioeconomic variables such as age, gender, and marital status as control variables. S003 is a country code, and S017 is a weight added to correct data under national estimates.

Name of variable	**Labels in World Values Survey**
S002	Wave
S003	Country/region
S017	Weight
A038	Important child qualities: Thrift saving money and things
A173	How much freedom of choice and control
C006	Satisfaction with the financial situation of household
E037	Individual vs Government Responsibility
E041	Wealth accumulation
F001	Thinking about the meaning and purpose of life
F198	Fate versus control
X001	Sex
X003	Age
X007	Marital status
X025	Education
X028	Employment status
X047	Level of income
X045	Socioeconomic class
X044	Family Savings during past years
X049	Town size
Y002	Post-Materialist index 4-item
year	S020

Table 5.1: Description of variables

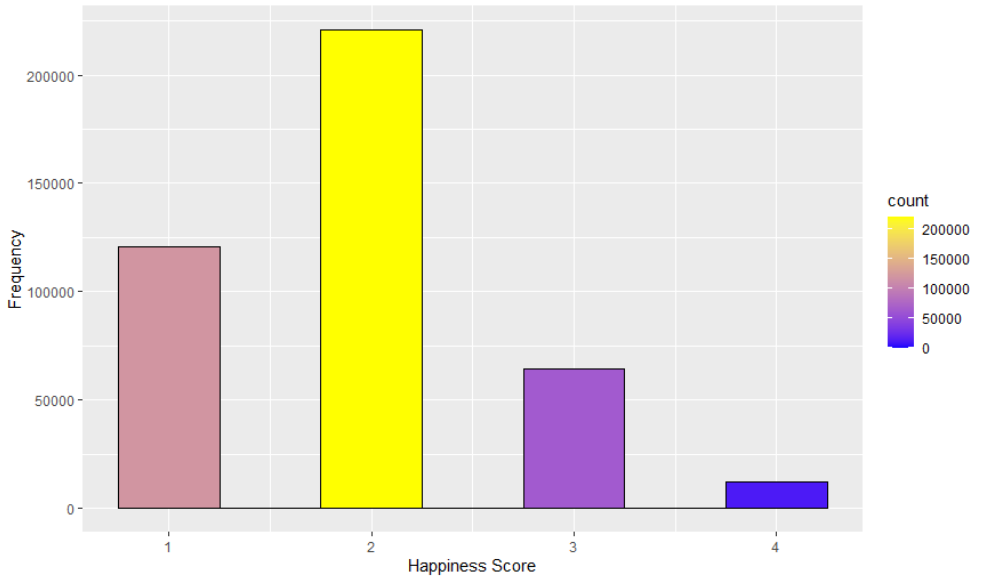


Figure 5.1: Self-reported happiness score (A008) extracted from World Values Survey

Some potential independent variables that could be explored in this investigation include thrift measures (e.g., saving money, avoiding unnecessary purchases), self-control (e.g. resisting temptation, setting and achieving goals), and demographic variables such as age, gender, income, and education level. For Wealth accumulation (E041), the scale ranges from 1 (indicating complete agreement with the statement "People can only get rich at the expense of others") to 10 (indicating complete agreement with the statement "Wealth can grow, so there is enough for everyone"). Regarding materialism, this variable can reflect one's beliefs about the relationship between wealth accumulation and social justice. Those who agree more with the statement on the left (lower values on the scale) may view wealth accumulation as a zero-sum game, where one person's gain necessarily comes at the expense of another's loss. This perspective may reflect a more materialistic view, where one's worth and happiness are tied to accumulating wealth more than others. On the other hand, those who agree more with the statement on the right (higher values on the scale) may view wealth accumulation as a positive-sum game where everyone can benefit from economic growth and development. This perspective may reflect a less materialistic view, where one is worth, and happiness is not necessarily tied to accumulating wealth for others but rather to having access to the resources and opportunities needed to thrive.

The Post-Materialist index is used in social sciences to capture an individual's values and priorities. It is typically based on questions designed to assess how much an individual's values are focused on material or non-material concerns. The 4-item

version of the post-materialist index categorizes individuals into three categories based on their responses to the questions: Materialist, Mixed, and Postmaterialist. The materialistic category refers to individuals prioritising materialistic values, such as wealth, status, and possessions. The post-materialist category refers to individuals who prioritize non-materialistic values, such as self-expression, social and environmental concerns, and quality of life. The Mixed category refers to individuals with a mix of materialistic and non-materialistic values.

Our study contributes to the literature on responsible consumption behavior and happiness by exploring the influence of thrift, savings and self-control variables on responsible consumption on self-reported happiness. Using fixed-effects models and robust standard errors, we obtained more accurate and reliable estimates of the relationship between these variables and contributed to the broader literature on sustainable consumption and well-being. Similarly, we estimated a fixed-effects model that included country-specific and year-specific dummy variables and controls for individual characteristics and socioeconomic variables to investigate the relationship among concerned variables.

5.4.2 Methodology

The present study mainly explores the relationship between facets of happiness and the adoption of responsible consumption behaviour (Thrift, saving money and things). Hence our work contributed to the literature on responsible consumption behaviour and happiness by expanding traditionally included determinants of happiness with more critical social and cultural factors. The methodology estimates regression models to investigate the relationship between responsible consumption behaviour (Thrift, saving money and things) and happiness while accounting for unobserved heterogeneity across nations and years. Mathematically, the regression model can be written as, $Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \ldots + \beta_k X_{kit} + \mu_{it}$

where Y_{it} is the dependent variable (facets of happiness), X_{1it} to X_{kit} are the independent variables (determinants of happiness and responsible consumption behaviour), α is the intercept, β_1 to β_k are the coefficients for the independent variables, and μ_{it} is the error term. To account for unobserved heterogeneity across nations, country-fixed effects dummy variables can be included in the model.

where θ_i is the country-fixed effect for country i, and captures the unobserved heterogeneity across countries that may affect the relationship between the independent and dependent variables. Unobserved heterogeneity across years can be accounted for by including year-specific dummy variables also be included in the model, which takes the form:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \ldots + \beta_k X_{kit} + \theta_i + \delta_t + \mu_{it} \qquad (5.5)$$

where δ_t is the year-specific effect for year t, and captures the unobserved heterogeneity across years that may affect the relationship between the independent and dependent variables.

Heteroskedasticity-consistent robust standard errors have been used in our model to correct for heteroskedasticity, which arises when the variance of the error term varies across the range of the independent variables. This problem is because standard errors are biased in heteroskedasticity, leading to incorrect hypothesis testing and confidence intervals. (Muradian and Martinez, 2001) Using data from the World Values Survey, use a similar regression model with country and year-fixed effects to examine the relationship between sustainable development and human well-being. While using the Sustainable Futures Survey data, (Zwadzka et al., 2021) explored the relationship between materialism, pro-environmental behavior, and well-being. Their regression model includes country-fixed and year-specific effects to account for unobserved heterogeneity across countries and years. The study by (Kasser et al., 2014) examines the relationship between materialistic values and psychological well-being over time. Also, it investigates whether a values-affirmation intervention can lead to a reduction in materialism and an improvement in well-being. The authors use fixed effects regression models and find that changes in materialistic values are negatively related to changes in well-being. They also find that the values-affirmation intervention leads to a reduction in materialistic values and an improvement in well-being. Some of the influential studies have suffered from endogeneity issues (i.e., the potential for unobserved heterogeneity to bias the results), and recommend the use of fixed effects regression models to account for this (Liang and Renneboog, 2017; Schmalensee et al., 1998; Kim et al., 2019; Costantini et al., 2017 and Dreher et al., 2009).

5.5 Results

In the present study, we have used data from the World Values Survey (WVS) to find the relation between facets of happiness and the adoption of responsible consumption behaviour. We have explored whether peoples' priority for teaching their children thrift and their savings behaviour is related to happiness. The results in Table 5.2 explain that people who emphasize teaching their children about thrift, saving money, and things score higher on the happiness scale than those who do not. One possible explanation is that thrift and savings behaviour is associated with greater financial security, leading to higher overall well-being and life satisfaction. For example, imagine two families with similar incomes and lifestyles. One family emphasizes the importance of thrift and saving, and as a result, they can maintain a healthy level of savings and financial security. The other family does not prioritize thrift or saving, and they tend to spend more than they save, often relying on credit cards or loans to make ends meet. Over time, the family that emphasizes thrift and saving may experience fewer financial stressors, such as unexpected expenses or debt, which can be a significant source of anxiety and unhappiness.

Thrift refers to the practice of being economical and avoiding wastefulness. Saving money is essential to thrift because it allows individuals to allocate their resources efficiently and avoid excessive consumption. Encouraging children to save money and practice thrift is essential for promoting responsible consumption and production. The equation "consumption = income - saving" suggests that the difference between income and saving determines the amount of consumption. In other words, the more a person saves, the less they consume, and vice versa. This equation highlights the importance of saving and thrift to control consumption and promote responsible use of resources. For instance, if parents teach their children the importance of saving money for important goals, such as a college education or a down payment on a home, this may motivate them to develop responsible spending habits, avoid debt, and save for their own financial goals. Teaching thrift and saving in China has been a focus of government efforts in recent years, particularly with the introduction of a national campaign called "National Savings Promotion Month." The campaign aims to promote financial literacy, encourage responsible spending, and cultivate saving habits among

Chinese citizens. One way thrift and saving are being taught in China is through school[48] financial education programs.

Thrift, Saving money and things and Self-control

	Dependent variable:				
	Self-reported Happiness (A008)				
	(1)	(2)	(3)	(4)	(5)
A038	0.021***	0.027***			
	(0.004)	(0.004)			
A173m	0.051***		0.051***		
	(0.001)		(0.001)		
X044	0.046***			0.051***	
	(0.002)			(0.002)	
E037	0.006***				0.008***
	(0.001)				(0.001)
X001m	-0.019***	-0.010***	-0.017***	-0.010***	-0.012***
	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)
X003	0.004***	0.004***	0.004***	0.004***	0.004***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
X007	0.030***	0.030***	0.029***	0.031***	0.030***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
X045	0.073***	0.089***	0.079***	0.083***	0.087***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
X047	-0.024***	-0.033***	-0.028***	-0.030***	-0.033***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
X025	-0.001	-0.004***	-0.002***	-0.003***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	2.355***	2.197***	2.517***	2.092***	2.162***
	(0.028)	(0.026)	(0.027)	(0.027)	(0.026)
Note:					*p**p***p<0.01

Table 5.2: *Self-reported happiness and Important Child Quality to have thrift, saving money and things (Responsible consumption).*Robust standard errors are in parenthesis. All regressions include controls age (X003), gender, education (X025), Social class (X045), and Income (X047). While some controls employed in all estimations but not reported in this table are town size, country, year

[48] China promotes financial education through the "China Youth Saving and Investment Education Program" in schools and offers financial counseling services in banks. However, the cultural value of "face" and the pursuit of luxury items can hinder savings. In summary, despite these efforts, cultural values and economic disparities pose challenges to fostering a saving culture in China, (Ngai, 2015; Jin, 2018; Wong, 2018)

Self-control is essential for achieving long-term goals and avoiding impulsive decisions that can lead to waste or unnecessary consumption. A study of households in Denmark found that those who practised more responsible consumption behaviours, such as buying locally produced goods and reducing waste, tended to have a higher sense of life satisfaction and well-being (Kilbourne et al., 2002). Teaching children the importance of responsible consumption behaviours can help promote a more sustainable future for all. Parents can teach children about sustainable agricultural practices in rural areas, such as crop rotation, composting, and water conservation. Similarly, a study in Ethiopia found that farmers who participated in a community-based program on sustainable land use were more likely to adopt practices that reduced soil erosion and improved crop yields (Seid et al., 2022).

Parents can teach children the importance of reducing waste and reusing materials in low-income communities. Similarly, a study in India found that children who participated in a school-based program on waste management were more likely to reduce waste and promote recycling in their households. In urban areas, parents can teach children about the benefits of using public transportation, walking or biking instead of driving, and reducing energy consumption in the household. Similarly, a study in the United States found that parents who talked to their children about the environmental impact of household energy use were likelier to have children who turned off lights and unplugged electronics when not in use (Miller and Senadeera, 2017). Teaching children the value of thrift, saving money, and self-control through *delayed gratification* can promote responsible consumption, production choices, and other Sustainable Development Goals (SDGs). Parents can help children develop the skills and habits needed to make sustainable life choices by instilling these values early in life. Parents can teach these values by encouraging children to set goals and prioritize long-term benefits over short-term gratification. For example, parents can encourage children to save money for a particular purchase rather than spending their allowance immediately or to choose high-quality, durable products that will last longer and reduce waste over time. Parents can also model responsible consumption behaviours by practising recycling, conserving energy, and minimizing waste in the household. Research has shown that children who learn self-control and delayed gratification are more likely to make responsible decisions about their health, finances, and other vital areas of life (Mischel et al., 1989; Duckworth et al., 2011).

These skills can benefit society by promoting economic stability, reducing waste and consumption, and supporting other SDGs such as health and education (UN, 2015). For example, in some communities in Africa and Asia, parents teach their children the importance of thrift and self-control through traditional savings practices, such as using "susu" or "tontine" systems to pool resources and invest in community projects (Fafchamps et al., 2009). In Western cultures, parents may use savings accounts, allowance systems, or other strategies to encourage children to save money and make responsible consumption choices. Moreover, Elliot, 2018 found that children who learn to save money early in life are more likely to develop good financial habits and have higher financial literacy as adults. Another approach is to help them set financial goals, such as saving up for a specific toy or activity and encouraging them to work towards those goals over time.

The variable "Family savings during the past year" (X044) in our results suggests a positive and significant relation with self-reported happiness. By saving money and forgoing immediate consumption, individuals demonstrate self-control and delayed gratification, which can lead to better financial stability and long-term well-being. By learning to value and take care of their possessions and avoiding excessive consumption, children can develop a greater awareness of the impact of their choices on the environment and the world around them. Moreover, saving money can lead to responsible consumption and production choices, allowing individuals to plan for the future and invest in goods and services with long-term benefits. For instance, saving money can help individuals purchase a home, start a business, or invest in education or training, leading to higher income and better quality of life in the long run.

Our results suggest that emphasizing individual responsibility[49] compared to government responsibility (E037) can lead to more self-reported happiness, as individuals feel greater control over their lives and actions. This sense of control can lead to greater satisfaction and a sense of purpose, leading to more responsible consumption and production. Individuals prioritizing intrinsic values such as personal growth, relationships, and community involvement over extrinsic values such as materialism and financial success report higher well-being and life satisfaction levels

[49] Individual responsibility refers to the belief that individuals are primarily responsible for their own well-being and success, while government responsibility refers to the belief that the government should take a more active role in ensuring the well-being and success of its citizens.

(Kasser and Sheldon, 2000). There is a growing movement towards sustainable living. Individuals are taking steps to reduce their environmental impact, such as reducing their single-use plastics, choosing local and organic food, and conserving energy. These actions are often motivated by a desire to take personal responsibility for their environmental impact and contribute to a more sustainable future.

On the other hand, individuals who prioritize government responsibility may be more likely to view external factors, such as social policies and economic conditions, as critical determinants of their well-being and success. They may be more likely to expect the government to provide support and resources to help them achieve their goals and increase their happiness. In this case, self-control and thrift may still be important qualities, but individuals may be less likely to view them as essential for success and happiness. It is also possible that cultural factors may play a role in shaping the relationship between individual vs. government responsibility and self-control and thrift. For example, in individualistic cultures, such as the United States, personal responsibility is often emphasized, and individuals are expected to take charge of their lives.

Regarding responsible consumption and production, research has shown that individuals motivated by intrinsic values are likelier to engage in environmentally friendly behaviours such as recycling and reducing energy consumption (Kasser et al., 2007). It suggests that focusing on personal values and self-improvement can lead to more responsible consumption and production. However, it is essential to note that individual responsibility alone may not be enough to address more significant social issues such as climate change. Research suggests that combining individual action and government policy is necessary to effectively address environmental issues (Steg and Vlek, 2009).

Our findings in Table 5.2 suggest that "Freedom of choice and control" (A173m) is an essential factor affecting responsible consumption, production choices, and, ultimately, long-term happiness levels. When individuals are free to choose and control their consumption and production choices, they are more likely to make responsible decisions that promote sustainable development and reduce the negative impacts on the environment and society. Studies have shown that individuals with greater control over their lives and choices tend to have higher levels of well-being and

happiness (Kashadan et al., 2008). They have a sense of autonomy and independence, allowing them to pursue their goals and interests. When individuals can choose and control their consumption and production choices, they are more likely to align their values with their actions and make choices based on reasoning. For example, when individuals have access to information about the environmental and social impacts of the products they consume, they can make informed decisions and choose products that have less negative impacts on the environment and society.

A growing body of research explores the relationship between materialism, wealth accumulation, and happiness. Materialism refers to the prioritization of material possessions and consumption to achieve happiness and well-being. One way materialism and wealth accumulation may relate to self-reported happiness is through the impact on social comparisons. Social comparisons involve evaluating oneself about others leading to envy and inferiority if one perceives others as having more wealth or possessions, which leads to decreased happiness (Graham et al., 2004; Twenge & Campbell, 2009). Our research results in Table 5.3 support this finding by employing the latest data from the World Values Survey.

Additionally, wealth accumulation may impact happiness through its effect on social capital, which refers to the resources and benefits of social networks and relationships. Some research suggests that materialism and wealth accumulation may undermine social capital by encouraging individualistic and competitive behaviour, which can decrease trust and social cohesion (Putnam, 2000). In contrast, prioritizing non-materialistic values such as community involvement and social relationships may increase social capital and promote happiness (Diener and Seligman, 2004). The relationship between materialism, wealth accumulation, and happiness is complex and multifaceted and may depend on individual values, social context, and other factors. However, our findings suggest that prioritizing non-materialistic values and social relationships may be more conducive to happiness than focusing solely on wealth accumulation (E041) and material possessions.

Wealth Accumulation, Post Materialism Index and Fate vs Control

	Dependent variable:					
	Self-reported Happiness (A008)					
	(1)	(2)	(3)	(4)	(5)	(6)
E041	-0.007***	-0.013***				
	(0.001)	(0.001)				
Y002	-0.004		-0.014***			
	(0.006)		(0.003)			
F001	0.010**			0.017***		
	(0.005)			(0.002)		
C006m	0.075***				0.068***	
	(0.002)				(0.001)	
F198	-0.007***					-0.012***
	(0.001)					(0.001)
X001m	-0.017**	-0.009**	-0.011***	-0.009**	-0.009***	-0.019***
	(0.007)	(0.004)	(0.003)	(0.003)	(0.003)	(0.007)
X003	0.004***	0.005***	0.004***	0.004***	0.005***	0.004***
	(0.0003)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0003)
X007	0.029***	0.030***	0.030***	0.029***	0.029***	0.029***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
X045	0.038***	0.087***	0.087***	0.088***	0.061***	0.068***
	(0.005)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)
X047	-0.014***	-0.036***	-0.033***	-0.033***	-0.014***	-0.043***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
X025	-0.003	-0.003***	-0.004***	-0.003***	-0.004***	-0.003
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Constant	2.083***	2.492***	2.248***	2.178***	2.523***	1.725***
	(0.044)	(0.035)	(0.027)	(0.027)	(0.026)	(0.040)
Note:						*p**p***p<0.01

Table 5.3: The relation of Wealth Accumulation, Post Materialism Index and Fate vs. Control and Self-reported Happiness.

Note: OLS estimates for variables. Robust standard errors are in parenthesis. All regressions include controls age (X003), gender, education (X025R), Social class (X045), and Income (X047R). Some controls employed in all estimations but not reported in this table are town size, country, and year.

Our findings suggest that individuals who emphasize "fate" over "self-control" (F198) are less likely to report conscious choices, which results in a decline in self-reported happiness. Regarding responsible consumption and production, individuals

who believe in personal control may make conscious decisions to reduce their environmental impact. Individuals who believe they have control over their lives tend to report higher levels of happiness and well-being than those who believe their lives are predetermined by fate or other external factors (Heine et al., 2001). Furthermore, the variable “post-materialist values (Y002)” was found to be negatively related to self-reported happiness. For example, a study by Oishi, (Diener, and Lucas, 2002) found that people who prioritize materialistic values, such as the pursuit of wealth and possessions, tend to be less happy than those who prioritize non-materialistic values, such as relationships, personal growth, and community involvement.

The results found that people considering "thinking about the meaning and purpose of life" had higher self-reported happiness. It means that individuals with some purpose in life and working for welfare for the community are happier than self-interested individuals. First, there is a need to understand what "purpose" and "meaning" mean in life, e.g., If one person helps others, works for the underprivileged in society, and provides education with the finest intentions for constructing a sustainable society, another person is self-centred and greedy. Then, by contrast, each can be content with their set expectations while having a different purpose and meaning in life. Regarding responsible consumption and production, an individual who reflects on the meaning and purpose of life may choose to live a more sustainable lifestyle that aligns with their values, such as reducing waste or supporting local businesses.

Other factors, such as personal values and beliefs, may also shape happiness and responsible consumption and production behaviours. These factors can contribute to more self-reported happiness, which may lead to more responsible consumption and production. However, it is essential to note that these relationships are complex and may be influenced by various individual and contextual factors.

5.6 Conclusion

This chapter investigates the interplay between thrift, self-control, and delayed gratification and their impact on responsible consumption and production choices. Drawing on data from the World Values Survey, the study examines 460,000 individuals across 90 countries. The study posits that instilling the values of thrift, saving, and self-control in children can promote responsible decision-making and consumption behaviours based on delayed gratification. Those who believe in their

ability to control their lives are more likely to take personal responsibility for their environmental impact and make sustainable choices. The research also demonstrates that materialistic values and aspirations can foster social comparisons and envy, decreasing happiness. From a policy perspective, these results underscore the need to promote policies and programs that encourage self-control, thrift, and delayed gratification, particularly among children and youth. Policymakers should prioritize policies that foster a sense of personal responsibility for environmental impact. However, it is essential to note that these relationships are complex and may be influenced by various individual and contextual factors that warrant further investigation.

Children learn behaviours from the adults and peers around them. Parents should instil in their children a sense of personal responsibility for making good social and economic choices if they wish to raise children who are considerate of others, the environment, and their finances. The next and current generations may learn from specific recommendations that will aid them in more ethically consuming and creating. There is no reason to shun gatherings fostering a never-ending buying and spending cycle. There is no need to shop offline or online until an absolute necessity arises. A child's ability to distinguish between a "desire" and a "need" is significantly reduced in the early years. Saving money and the environment is a lesson parents may begin imparting to their children early. Teaching children about delayed gratification can be used to encourage them to think before making impulsive purchases.

The practical implications of deriving the utility function help us understand the relationship between consumption and happiness. While consuming more goods and services may lead to temporary increases in happiness, the effect is likely to be short-lived. In contrast, saving money and practising self-control can lead to greater long-term happiness by enabling individuals to achieve their long-term goals and build financial security. This is consistent with the idea of delayed gratification, which is the ability to resist the temptation of an immediate reward in favour of a larger, more meaningful reward in the future. Policies that promote sustainable consumption and production can help reduce the negative impacts of overconsumption on the environment, public health, and social well-being. Several things have enormous value in the lives of individuals, but they cannot be entirely enlightened through GDP. There

is a need to realize the management of resources to attain sustainable development objectives. The means of attaining happiness are feeling contentment and experiencing peace of body, mind, and soul. Emphasizing individual responsibility for responsible consumption and production can be a powerful way to promote sustainable behaviour and achieve sustainable development goals.

Chapter 5 delves into the critical interplay between thrift, self-control, and delayed gratification and how these factors influence responsible consumption and production choices. It emphasizes the role of parents in instilling these values in children and highlights the positive impact on responsible financial habits and overall well-being. Moreover, it underlines the significance of self-control in taking personal responsibility for environmental impact and making responsible choices. As we transition to Chapter 6, we recognize that despite the valuable insights from previous chapters, there remains an essential element to address. Chapter 6, titled "Toward a Socioeconomic Interaction-Based Policy Framework," fills this gap by devising a comprehensive framework for socioeconomic interactions and policies. In this chapter, we categorize economic agents and introduce an algebraic model that systematically encapsulates various socioeconomic interactions among state, corporations, group and individual. It outlines an innovative strategy that harmonizes top-down and bottom-up hierarchical structures, emphasizing the role of government in facilitating meaningful interactions. The transition from Chapter 5 to Chapter 6 represents a shift from individual behavioral factors to a broader framework for fostering responsible consumption and production at a societal level. In Chapter 6, we focus on developing a comprehensive policy framework that leverages the attributes of vector spaces and mutual trust among economic agents to bridge the gap between intention and behavior, ultimately promoting responsible conduct on a larger scale.

Chapter 6

Socioeconomic Interaction based Policy Framework to Attain Responsible Consumption and Production[50]

Executive Summary

The current study categorizes economic agents into four distinct types, namely State (S), corporations (C), groups (G), and individuals (L), represented as such. Afterwards, we have introduced an algebraic framework that systematically encapsulates diverse socioeconomic interactions prevalent within and between individuals, organizations, businesses, and governmental entities. The governmental domain (State) S is symbolized by the finite algebra $\mathbb{Z}_p$, encompassing p functional categories (vectors) labelled $0,1,\ldots,p-1$, each signifying a distinct economic indicator. The proposed conceptual model expedites the comprehension that effective resource allocation within society emerges through harmonized efforts among economic agents. This chapter introduces an innovative interactive strategy that harmonizes both top-down and bottom-up hierarchical structures to maintain consumptive patterns within manageable thresholds. Furthermore, it underscores the role of the government in fostering meaningful interactions between individuals and groups by instituting frameworks and policies that are both facilitating and conducive.

Leveraging the attributes of vector spaces, we undertake an analysis to grasp the intricate interplay among economic agents, underlining the paramount importance of mutual trust. The concept of reflective equilibrium, amalgamating top-down and bottom-up methodologies, emerges as a potent mechanism to bridge the chasm between intention and behavior. This entails an ongoing discourse and introspection involving all economic agents, to collectively define responsible conduct and its achievable realization. By active participation in this deliberative process, economic agents can cultivate a shared dedication to responsible behavior, thereby narrowing the divide

[50] I acknowledge the invaluable contributions of Dr. Akhter Hussain Shah for providing practical examples related to socioeconomic problems in Pakistan drawing from his extensive experience as a member of the Planning Commission of Pakistan. Additionally, I express my gratitude to Prof. Dr. Tariq Shah for his expert guidance on algebraic vector spaces.

between intention and behavior. A foundation of trust among stakeholders reinforces their inclination to align with articulated intentions, grounded in the belief that others will similarly act in good faith. This, in turn, engenders enhanced collaboration and cooperation among stakeholders, thereby paving the way to effectively mitigate the intent-behavior disparity.

6.1 Introduction

Consumers' decision-making process is often performed unconsciously, without thorough reasoning, as these actions are deemed routine. These deep-rooted, taken-for-granted habits are a major driving force behind our consumption patterns. Therefore, it is imperative to reprogram the prevalent habits. Cultural and contextual factors play a crucial role in shaping our habits and attitudes towards consumption. This can be compared to an iceberg where only the surface-level behaviour is observable, while the values and beliefs driving this behaviour remain submerged. Hence, to change a person's habit, it is crucial to target the behaviour directly.[51] The values and beliefs that underpin our habits are communicated through stories in our culture, which shape and reinforce them. For instance, fairy tales are popular for transmitting values and beliefs to children. Historical societies such as the ancient Greeks and Romans were guided by complex mythologies and stories that influenced their behaviour in everyday life. However, different entities, including corporations[52], groups, and governments, are creating stories that manipulate the masses for short-term benefits, disregarding the environmental's negative consequences. It is, therefore, crucial to establish mutual trust among all stakeholders to bridge the gap between intention and behaviour[53] when formulating consumption and production choices.

Restricting access to information is unlikely to promote greater responsibility, but it will undoubtedly diminish our awareness of the consequences of our decisions

[51] When addressing habits like smoking, two methods are prevalent: directly targeting the behavior or indirectly addressing the underlying values and beliefs. The former is often seen in government regulations, while the latter demands understanding of cultural factors for lasting change.

[52] The tobacco industry is skilled at shaping consumer behavior through narratives. Teens are targeted with ideas of coolness and adulthood, while women are appealed to with notions of empowerment and allure, exemplified by campaigns like "Torches of Freedom" (Bernays, 2005; Murphree, 2015). These narratives connect tobacco use to positive cultural ideals, driving consumption.

[53] Decision-making by individuals, groups, corporations, or governments often leans towards self-interest, disregarding others' pain. Inaccessible environmental impacts and barriers to aligning actions with values worsen this. Recognizing this gap reveals the disparity between beliefs and actions.

and behaviours. We use publicly available resources, which are changing all the time. The challenges posed by climate change have presented a significant hurdle for the world, unlike any other faced in generations. However, mitigating the effects of climate change will require all stakeholders to participate actively, regardless of the scale of their contribution. Consequently, in this chapter, we propose a policy framework emphasising coordination among all stakeholders, including individuals, groups, corporations, and states, predicated on mutual trust to yield effective results. Governments are responsible for efficiently managing their development expenditures, ensuring that taxes collected from people are expended cost-effectively for the betterment of the population. Moreover, the consumption of certain commodities at a global level presents a zero-sum commodity problem. The lack of effective coordination between the government and individuals leads to a suboptimal outcome. Despite significant increases in renewable and energy efficiency technology, global emissions have soared during the last 40 years. It is not reasonable to hold individuals accountable for failing to adopt a low-carbon lifestyle; instead, this is a shared obligation shared by governments, businesses, communities, and people.

Historically, societies have been composed of heterogeneous people in their ethnic, cultural, religious and political characteristics. Such differences evoke the need for mutual trust between governments and individuals. In a trustworthy society, a state, group, corporation and individual cooperate and interact in allocating resources efficiently. In this context, access to information is crucial to this interaction. However, Lack of trust asserts a significant burden on the government through regulatory spending, such as rehabilitation costs, provision of security against violence, and theft, and laws for rent-seeking (Knack and Keefer, 1997). The efficient provision of public goods by the government promotes trust, enhancing the sense of citizenship and community among the population (Delhey and Newton, 2005). It is worth noting that not every social encounter has a positive societal purpose. Collecting helpful information and lobbying to achieve specific goals can be facilitated through social interaction based on trust. Our research defines responsible consumption as a decision-making process that employs the faculties of hearing, sight, and intellect, ensuring that choices are informed and reasonable.

Logical principles may be constructed on mathematical models based on certain assumptions and definitions. Often in the previous literature, the theory's capacity to

capture the genuine social complexity phenomena existent in civilizations was constrained by simple mathematical assumptions. Our model's assumptions are algebraic, this allows us to account for the empirical variables in the current model (Harary et al.,1965). Meanwhile, algebra and its concepts create a vector space by using its elements (vectors[54]) as a valuable analysis tool. Accordingly, to this representation, the inter-temporal accumulation starts with arbitrary economic activities among different stakeholders in the form of socioeconomic interactions. The present study classifies economic agents into four types, which are State[55] , corporations[56], groups[57], and individuals, denoted by S, C, G, and L, respectively. The state (government) S is denoted as finite algebra $\mathbb{Z}_p$, which has p functional categories (vectors) $0,1,\dots,p-1$, each representing a specific economic indicator. For example, with $p = 3$, the states 0, 1, and 2 may represent consumption, investment, and production activities, respectively. By assuming that a higher dimensional linear space $\mathbb{Z}_p^2$ represents a corporation C with p^2 a number of $C - vectors$ $(c - categories\ of carporation)$. Likewise, the linear spaces $\mathbb{Z}_p^3$ and $\mathbb{Z}_p^4$ respectively represent a group G with p^3 number of $G - vectors$ $(G - categories\ of\ Groups)$ and an individual L with p^4 several $L - vectors$ $(L - categories\ of\ Individuals)$ This more general representation of the forms of socioeconomic interaction facilitates a broader scope for the interpretation of social interactions with the possible choices ranging over $0,1,\dots,p-1$ as compared to only two choices, coded as 0 and 1.

RCP can be modelled using the proposed algebraic demonstration. The system coordinates serve as the economic indicators for the agents, in terms of which this behaviour is described. When two coordinates intersect, two distinct kinds of agents interact with one another; when two Common coordinates intersect, it means that two different kinds of agents interact. In addition, extra economic activity is generated at

[54]Community-supported agriculture programs, with consumers buying farm shares, can be represented as a vector depicting cooperation between consumers and farmers. The scalar signifies group size and influence, benefiting both. Circular economy principles, minimizing waste, involve a vector representing cooperation between corporations, states, and consumers. The scalar signifies investment, leading to resource efficiency. Energy efficiency programs involve a vector showing collaboration among individuals, corporations, and states. The scalar indicates investment, fostering energy conservation

[55] State is the umbrella term under which the government operates, which is the administrative bureaucracy in charge of the state machinery at any given moment.

[56] A corporation is a legal body controlled by its shareholders, who in turn choose a board of directors to manage the company's operations.

[57] People or objects may be said to form a group when they are grouped together in some way, whether physically or conceptually. For example, a religious group is a collection of people who identify as part of the same religious tradition. A consumer group may be defined as a collection of three or more individuals who have common tastes and habits.

the bottom of the agents' spectrum by any class of intra-actions of interactions. For instance, the government and individual top-down approach to consumption and production management (a case of intersecting joint coordinates) is anticipated to result in increased efficiency on the part of people (a case of intersecting different coordinates). Trusting one another in commercial exchange has a significant role in shaping public finance. In this case, the suggested algebraic model uses a specific structure to determine the presence and nature of potential interactions. Both rich and emerging nations may benefit from the suggested model's ability to help isolate environmental externalities from economic development. The research emphasises the significance of regulatory regimes in encouraging group collaboration. Economic efficiency may be achieved via social and economic interactions based on trust between diverse stakeholders, from the government to the individual level.

This chapter is therefore organised to offer a synopsis of the relevant literature and the research goals. Section 2 then elaborates on these interrelationships at a more granular level. However, we describe the fundamentals of modular algebra in Section 3 of our technique. Section 4's first half shows the mathematical model depicting societal and economic connections. Part 2 of Section 4 demonstrates how to apply the principles of sustainable consumption and production in the real world. The moving funnel and the interactive top-down and bottom-up structures have also been described in this section. In contrast, chapter five discusses managing resources through production, consumption, and regulation. Section 5 discusses policies related to the world's poorest nations. The last comments are provided as a conclusion.

6.2 Socioeconomic Interactions

Socioeconomics is a subfield of sociology concerned with the impact and effect of economic activities on social processes. It examines the effects of regional, national, and international economics on the overall development of contemporary societies. Furthermore, "Social Economics" might mean "the integration of economic analysis with the study of social phenomena" (Eatwell et al., 1989). The link between economics and social values is a primary focus of contemporary practice, focusing primarily on the interplay between individuals and groups (Benhabib et al., 2010). Our model's socioeconomic interaction framework is formed by the reciprocal influences

of the desires of individuals, groups, businesses, and the State.

6.2.1. Dynamics of Socioeconomic Interactions

In uncertain economic or social scenarios, people rely on others' experiences to adjust their perspectives. In highly homogeneous settings, this adjustment might be slower. Similarly, when linked individuals share environmental concerns, benefits become uniform. The ecosystem's state matters, including people and environment type. For homogeneous preferences, within-group links prevail. The recent global epidemic reshaped lives, affecting preferences, incomes, and practices. Authorities established norms and plans for safety. Barriers curtailed productivity, services, tourism, and income. Enhancing linkages through a structured interaction system could counter this. Societies often set up self-regulating rules for non-government entities, like payment controls and wage structures. Conversely, morally unified societies may use the state to uphold ethics. Different parts of an economic system interact to ensure resource efficiency. Yet, mismatched coordination among levels of administration can disrupt service delivery. Companies influence policy changes, like reducing environmental charges. Government-enterprise alliances promote responsible production. Mutual benefits result from these exchanges between the public and private sectors. Governments invest in diverse groups for political backing, fostering mutual trust. Businesses collaborate to garner support for common goals, such as environmental protection or disaster prevention. Programs meant to combat climate change are failing due to difficulties in collaborative governance. (Evans, 1996; Mukhlis and Perdana, 2022) argue that government and society coordination is important for maximising effectiveness in emergency situations.

Certain corporations can enhance their sustainability by leveraging their strong market reputation. Consider a company with a trusted brand and product quality. It can employ its reputation to educate the public about environmental impact reduction. Collaborative efforts, like social norms and information exchange, build trust and expedite shared goals (Coleman, 1990). People engage in various settings – markets, neighborhoods, workplaces, etc. (Lee et al., 2021). Small group interactions hold broader positive effects, transcending limited mediums. Even basic interactions within groups can yield significant social benefits for numerous individuals across groups.

When aiming for common goals, collaboration across diverse circles is valuable. Property rights and a functional legal system are crucial for seamless transactions, such as sales and loans. While informal interactions occur, formal regulations foster growth in valuable relationships. Governments don't always set all rules, especially for trade and labor exchange. Yet, a robust state framework supports local laws, enhancing stability. Similarly, a morally united community can collectively endorse ethical norms, influencing public policy.

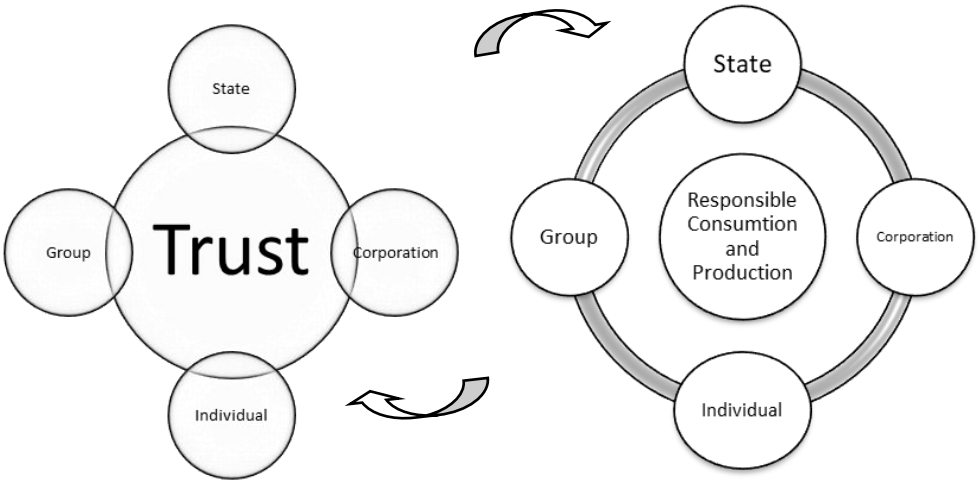


Figure 6.1: Trust-based Socioeconomic interaction framework for responsible consumption and production**.**

The government's constituents often work with a separate group to provide aid, collaboration[58], support, and pool resources. In addition, the lack of coordination between the federal, provincial, and district authorities sometimes leads to a convoluted delivery of urban services in developing nations like Pakistan. The volume and kind of interchange state institutions experience throughout a developmental event may vary. Trust and reciprocity are essential to developing collaboration among the State's most vital components, which cannot proceed only based on economic consideration. Individuals acting on behalf of corporations may spend time and money lobbying state

[58] The Pakistani Ministry of Finance and the State Bank of Pakistan have not been communicating well. As a result, there is not a consistent policy in place within the banking sector to deal with monetary and fiscal crises.

politicians and institutions to get favourable treatment in the form of changes to the policy. Therefore, (Varda, 2011; Evans 1996)) argues that state-society synergy may provide even more significant benefits. The efficacy of efforts to achieve the goals of responsible consumption and production may be enhanced if institutions, corporations, and the State dedicate resources based on trust-backed socioeconomic interaction. In addition to understanding the State's function as a rule-making authority with the ability to enforce its laws, citizens must also value the State's supply of public services. Do we think of sugar as a commodity or a public good? Then why does the government try to regulate this market if it does not need to? Healthcare, schools, and municipal water systems are examples of public goods. The State's responsibility here must extend beyond just making the rules. It must take the initiative, invest, and collaborate closely with the business sector to address these issues and periodically evaluate the results of its interventions.

The states often invest resources to gain political support with respective groups, including political, religious, and communities, while the latter initiate efforts to seek state patronage. The resulting reciprocity and trust between communities, groups and the State's constituents contribute to the accumulation of trust on both sides. At the same time, ineffective state policies imposed on groups can have devastating long-term consequences. In Pakistan, the interaction between *individuals and the state occurs, e.g., between* individuals living in a city, town or village and the corresponding local representatives of the State, such as members of federal and provincial parliaments, district administration and union councils. Although such interactions may not necessarily determine the overall direction of the state policy significantly, these often affect local policies and develop a sense of ownership of the state policy at the grass-root level. *The research reveals that those with much faith in the government are also the most* ***responsible citizens*** *(Evans, 1996).*

Corporations establish direct or indirect connections with counterparts, seeking mutual gain. Partnering with larger entities to build vertical networks at the state level benefits smaller groups, enabling influential collective action. This collaboration fosters trust between businesses and communities, with ripple effects on employees and customers. In fledgling democracies, community ties provide a sense of security and unity, driving these interactions. Organizations also gain power through public

acceptance. Hence, nurturing relationships based on trust, communication, and shared interests becomes essential. Investing in community ties enhances local cohesion. Coleman (1990) highlights economic cooperation within social norms, trust, and information sharing for cohesive societies. All social and economic interactions stem from personal relationships, expanding beyond initial public settings. Coleman (1990) highlights social structures and ease of interaction as key factors influencing engagement in activities. Simple interactions among small groups can profoundly impact individuals in diverse overlapping groups. Sustainable development relies on both individual efforts and organizational interactions. Participation in irrational or cascading groups and promoting wasteful consumption negatively affects society (Hobson, 2004)[59].

6.3 Modular Algebra

The interaction initiated by the government at the top to facilitate individuals at the bottom to achieve responsible consumption and production corresponding to cultural values needs to be coded for the proposed analysis. The distinctive algebraic structures are used to tabulate the concepts, type, and style of execution amongst different agents. Accordingly, we designate algebraic structures, groups, rings, integral domains, fields, and linear spaces. However, we emphasize the finite nature of these structures. We begin with the following definitions. A non-empty set G equipped with a binary operation $*$ (i.e., $a * b \in G$ for $a, b \in G$). A groupoid $(G,*)$ is a semigroup if the binary operation $*$ is associative. A semigroup$(G,*)$ is said to be a monoid if there exists $e \in G$ such that $e * r = r * e = r$. We refer to e as the identity element in G concerning the binary operation $*$. A monoid $(G,*)$ is said to be a group if, for each $g \in G$, there exists $h \in G$ such that $g * h = h * g = e$, where g and h are the inverses of each other. A non-empty set R with two binary operations. If $(R, +)$ is an abelian group (i.e., $a + b = b + a$) and $(R, .)$ is a semigroup with binary operation '.' which is distributive over the binary operation '$+$'.

A ring R is commutative if $a.b = b.a$, for all$a, b \in R$. A commutative ring $R$with identity is said to be an integral domain if $ab = 0$, where $a, b \in R$, implies either

[59] Sobel (2000) points out that egotism is irrational behaviour and not incompatible with attaining responsible consumption and production choices.

$a = 0$ or $b = 0$. An element a of commutative ring R with identity is said to be invertible or unit in R if there exists an element $b \in R$ such that $ab = ba = 1$. $U(R)$ represents the set of all unit elements in the ring R. A commutative ring F with identity is a field if $U(F) = F\backslash\{0\}$. A finite integral domain is a field. A nonempty subset $I$of a commutative ring R with identity is said to be an ideal of Rif $a - b \in I$ and $ra \in I$, for all $a, b \in I$, and $r \in R$. For instance, $n\mathbb{Z} = \{na : \ a \in \mathbb{Z}\}$,where$n \in \mathbb{Z}^+$, are ideals in the ring of integers $\mathbb{Z}$.

Given non-negative integers $0 < a$ and b, there exist $q \geq 0$ and r with $0 \leq r \leq a$ such that $b = aq + r$, where q and r are the quotient and remainder respectively, which are unique. If $r = 0$, we say a divides b (that is $a \mid b$). For a fixed $m \in \mathbb{Z}^+$, we say$a, b \in \mathbb{Z}$ are congruent modulo m, written $a \equiv b(modm)$ if $m|a - b$ or equivalently, if $a = b + mt$, where $t \in \mathbb{Z}$. Here m is called the modulus (plural; moduli). Note that $a \equiv 0(modm)$ means $m|a, a \equiv b \ (mod\ 1)$ for all $a, b \in \mathbb{Z}$. Therefore we consider the positive integer $m > 1$ and $\{b + mt \ : \ t \in \mathbb{Z}\}$ the set of integers for which $b \in \mathbb{Z}$ is congruent modulo$m$. Every integer is congruent modulo m to exactly one of the numbers in the set $\{0,1,2,..,m-1\}$.

Let $2 \leq m \in \mathbb{Z}^+$, be the modulus, which is fixed. Define the congruence class of $b(modm)$, written $[b]_m$ or just b as$[b]_m = \{a \in \mathbb{Z}: \ a \equiv b \ (modm)\} = \{a \in \mathbb{Z}: m$ divides $a - b\} = \{a \in \mathbb{Z}: a = b + mt, \ t \in \mathbb{Z}\}$. Thus $[a]_m = [b]_m$ if and only if $a \equiv b(modm)$.

Every congruence class mod m is equal to one of $[0]_m, [1]_m, [2]_m, .., [m-1]_m$ (or simply$\{0,1,2,..,m-1\}$) and clearly, all these classes are different. Thus, there is only m congruence classes modulo m. We represent the set of all congruence classes modulo m by $\mathbb{Z}_m$. For example $\mathbb{Z}_2 = \{0,1\}, \mathbb{Z}_3 = \{0,1,2\}, \ldots, \mathbb{Z}_m = \{0,1,2,..,m-1\}$.

In $\mathbb{Z}_m$, we have defined the binary operations $\oplus_m$and $\otimes_m$ (or take $\oplus$ and $\otimes$). If $n = 2$, then $\mathbb{Z}_2 = \{0,1\}$ and we define the binary operations as follows.

$\oplus$	0	1
0	0	1
1	1	0

and

$\otimes$	0	1
0	0	0
1	0	1

The ring $\mathbb{Z}_m$ is an integral domain if m is a prime integer; however, the ring $\mathbb{Z}_4$ is not

an integral domain. $U(\mathbb{Z}_m)$ represent the set of unit elements of the ring $\mathbb{Z}_m$. It is easy to verify that $U(\mathbb{Z}_m) = \{a \in \mathbb{Z}_m : gcd(a, m) = 1\}$. The ring $\mathbb{Z}_m$ is an integral domain (and hence a field) if and only if m is a prime integer.

An additive abelian group $V$is said to be a vector space over the field Fif the scalar multiplication map $F \times V \to V$, defined as $(a, v) \mapsto av$ satisfies: $a(v + w) = av + aw; (a + b)v = av + bv; (ab)v = a(bv); 1.v = v,$ for all $a, b \in F, v, w \in V$. A vector space $V$is said to be an algebra over the field F if V is also a ring and $a(vw) = (av)w = v(aw)$ for all $a \in F, v, w \in V$. A field is a vector space over itself with dimension 1. Furthermore, for a positive integer $n, F^n = \{(a_1, a_2, .., a_n) = a_1a_2..a_n: \ a_1, a_2, .., a_n \in F\}$ is an algebra over F with dimension$n$. If p is prime integer and n any positive integer then $\mathbb{Z}_p$ is a one-dimensional algebra over the field $\mathbb{Z}$ and $\mathbb{Z}_p^n$ is n dimensional algebra over the field $\mathbb{Z}_p$. Let V and Wbe finite dimensional vector spaces over the same field F. A linear transformation $\phi : V \to W$ that satisfies $\phi(x + y) = \phi(x) + \phi(y)$ and$\phi(ay) = a\phi(y)$ for all $x, y \in V, a \in F$. ϕ is an isomorphism if it is bijective. If ϕ is isomorphism then we say that V is isomorphic to $W$and we denote it as $V \cong W$. For more details on basic algebraic notions, one might consult (Dummit and Foote, 2002; Durbin, 1992; Wallace, 1998).

The hypothesis is that the four economic agents i.e., State, corporations, groups, and individuals have finite numbers of activities, which finite algebraic structures could represent. These agents are regarded as (algebraic) systems or players. Thus, the vectors of each system are called categories, and their coordinates are labelled as economic indicators.

6.3.1 Vector Space Properties within Socioeconomic Interaction Framework

The properties of vector spaces can be used to analyze and understand the complex relationships between individuals, groups, corporations, and state actors in responsible consumption and production choices, where mutual trust among all stakeholders is crucial. Here are some ways that the properties of vector spaces can be applied to this context:

Closure under addition and scalar multiplication: A vector space is closed under addition and scalar multiplication, which means that if we add two vectors or multiply a vector by a scalar, the result is still a vector within the same space. In the context of responsible consumption and production, this property suggests that the actions of all economic agents should be aligned with the equitable distribution of resources. By working together and coordinating their efforts, these agents can ensure that their actions do not undermine the overall goals of the socioeconomic system. It implies that actors must work together and pool their resources to achieve common goals rather than competing and wasting resources. For example, in climate change, individual actions such as recycling or using public transportation may not be sufficient to reduce carbon emissions. Instead, all stakeholders must coordinate their efforts to create large-scale solutions, such as investing in renewable energy or implementing carbon taxes. The collaborative effort is analogous to vector addition, in which the sum of two vectors represents a combined effort greater than the sum of its parts[60].

Commutativity of addition: This property can be used to model the non-hierarchical relationships between different actors involved. For example, the influence of a consumer on a corporation's production practices and vice versa can be modelled as equal and mutually reinforcing, leading to better outcomes for all stakeholders.

Associativity of addition: This property can be used to model the cooperative nature of the relationships between actors in a context of mutual trust. For example, how consumers, corporations, and state actors work together in a spirit of cooperation to achieve common goals of RCP can have a greater impact than if they were working in isolation. The addition in a vector space is associative and commutative, which means that the order in which we add vectors does not affect the outcome and can group vectors in any way we choose.

The associativity and commutativity of addition allow for more efficient and effective coordination among actors in a socioeconomic system. For example, in a collaborative project involving multiple stakeholders, the order in which tasks are

[60] A group of farmers in a particular region might collaborate to adopt sustainable farming practices that reduce their use of harmful pesticides and fertilizers. By working together, they can share knowledge and resources, reduce their costs, and improve the health and productivity of their farms.

completed might not matter if they are all completed promptly. This allows for more flexibility in project management and can help reduce waste and duplication of effort. One example of this type of collaboration is the Greenhouse Gas Protocol, which was developed through a collaboration between the World Resources Institute and the World Business Council for Sustainable Development. This protocol provides a standardized method for companies to measure and report their greenhouse gas emissions, allowing for easier comparison and analysis of sustainability efforts across different industries (WRI & WBCSD, 2015).

The sharing economy is a socioeconomic system where individuals share resources such as transportation, housing, and food. It relies on the associativity and commutativity properties of addition because sharing resources involves pooling resources and coordinating efforts among actors. By sharing resources, individuals can reduce waste, save money, and promote sustainability.

Existence of a zero vector: Every vector space has a zero vector, the additive identity. In other words, adding the zero vector to any vector does not change its value. In the context of responsible consumption and production, this property suggests that specific baseline standards must be met to ensure sustainability and equitable distribution of resources. For example, in a community, a minimum level of resources might be necessary to ensure everyone has access to food, shelter, and healthcare. A state might establish minimum standards for using renewable energy sources or treating workers in specific industries. These standards represent the zero vector, establishing a baseline that cannot be compromised in pursuing economic growth or profit.

Existence of additive inverses: For every vector in a vector space, an additive inverse exists such that adding a vector to its inverse results in the zero vector. In socioeconomic interactions, this property suggests that conflicts and disagreements can be resolved through negotiation and compromise. For example, a corporation might be required to pay a certain amount in taxes to support public infrastructure and services. While this requirement might be seen as a burden by the corporation, it can also be seen as a necessary contribution to the socioeconomic system. By accepting this responsibility, the corporation is acknowledging the existence of an additive inverse and working towards a more equitable distribution of resources. This property can be

used to model the concept of "counteracting" forces or actors, which can be used to offset adverse impacts on RCP choices in the context of mutual trust. For example, state policies promoting sustainable practices can counteract the effects of corporations' unsustainable production practices, leading to a win-win outcome for both actors.

Compatibility of scalar multiplication with field operations: This property can be used to model the importance of magnitude or intensity in the relationships between actors in a context of mutual trust. For example, the influence of a particular group of consumers on a corporation's production practices may depend on the group's relative size or purchasing power, and both actors can work together to achieve mutually beneficial outcomes.

The existence of an **additive identity** in a vector space ensures that actors have a starting point from which to build and coordinate their efforts. An additive identity promotes collaboration and cooperation among actors in a socioeconomic interaction framework. One real-life example of the existence of an additive identity is the circular economy. The circular economy is an economic system in which resources are used and reused in a closed loop rather than discarded after a single use. The circular economy relies on the existence of an additive identity because it involves the transformation of waste into new resources, which serves as a starting point for further production.

Distributivity of scalar multiplication concerning vector addition: This property can be used to model the distribution of impacts across different actors involved in responsible consumption and production choices in a context of mutual trust. For example, a state policy's effect on promoting responsible consumption and production may depend on how it is distributed across different stakeholders, such as consumers and corporations. All actors can work together to ensure that the benefits are equitably distributed[61].In conclusion, by using the properties of vector spaces to analyze

[61] The use of green labelling and certification programs, such as the Forest Stewardship Council (FSC) certification, can be modelled as a vector representing consumers' influence on corporations' practices. In this case, the scalar could represent the consumer demand level for environmentally responsible products. State actors' implementation of carbon taxes can be modelled as a vector representing the state's influence on corporations' practices. In this case, the scalar could represent the tax level and its impact on production costs. The development of cooperative purchasing agreements between consumers and corporations can be modelled as a vector representing the cooperative relationship between these actors. The scalar, in this case, could represent the size of the purchasing group and its bargaining power.

and understand the relationships between actors involved in responsible consumption and production choices, policymakers can develop more effective policies and strategies to promote sustainable practices.

6.4 Notions interpreting Socioeconomic Interaction for attaining RCP.

Here we consider p-elements (ground) algebra $\mathbb{Z}_p$. Hence the proposed setup can handle p number of economic indicators to provide multiple period analysis. It formulates a mathematical model which asserts that to produce and consume responsibly, there is a need for effective coordination between the State, corporations, groups, and individuals at each level of interaction. In the proposed model, four constituents are considered accountable for attaining RCP i.e., State, corporations, groups, and individuals who interact and develop their relevant financial and societal settings.

6.4.1 Tagging

The state S is represented by finite algebra $\mathbb{Z}_p = \{0,1,\dots,p-1\}$, which has p number of efficient categories (vectors) $0,1,\dots,p-1$. We refer to these categories as the $S-vectors$ of State activities. For example, category 0 may represent a regulatory framework for ensuring RCP, category 1 is consumption spending. We assume that a higher dimensional linear space $\mathbb{Z}_p^2$ represents a corporation C with p^2 number of $c-categories\,of corporation.$ Likewise, the linear spaces $\mathbb{Z}_p^3$ and $\mathbb{Z}_p^4$ respectively represent a group G with p^3 number $of\ Groups$ and individual L with p^4 $categories\ of\ Individuals.$ This more general algebraic representation of the forms of socioeconomic interaction facilitates a broader scope for the interpretation of social interactions with the possible choices ranging from $0,1,\dots,p-1$ as compared to only two choices, coded as 0 and 1.

The following shows the correspondence among algebraic structures and four systems.

$\mathbb{Z}_p$	↔	**State (S)**
$\mathbb{Z}_p^2$	↔	**Corporation (C)**
$\mathbb{Z}_p^3$	↔	**Groups (G)**
$\mathbb{Z}_p^4$	↔	**Individual (L)**

Table 6.1a: Correspondence of Algebraic Structures and Four Systems

That is possible to read as suggesting a top-down process in which the state is accountable for everything that happens because of its dealings with businesses, organizations, and, ultimately, people. Achieving sustainable goals using this approach requires open communication among all parties involved.

Interaction of Systems	$\mathbb{Z}_p$	$\mathbb{Z}_p^2$	$\mathbb{Z}_p^3$	$\mathbb{Z}_p^4$
$\mathbb{Z}_p$	$\mathbb{Z}_p \times \mathbb{Z}_p$	$\mathbb{Z}_p \times \mathbb{Z}_p^2$	$\mathbb{Z}_p \times \mathbb{Z}_p^3$	$\mathbb{Z}_p \times \mathbb{Z}_p^4$
$\mathbb{Z}_p^2$	$\mathbb{Z}_p^2 \times \mathbb{Z}_p$	$\mathbb{Z}_p^2 \times \mathbb{Z}_p^2$	$\mathbb{Z}_p^2 \times \mathbb{Z}_p^3$	$\mathbb{Z}_p^2 \times \mathbb{Z}_p^4$
$\mathbb{Z}_p^3$	$\mathbb{Z}_p^3 \times \mathbb{Z}_p$	$\mathbb{Z}_p^3 \times \mathbb{Z}_p^2$	$\mathbb{Z}_p^3 \times \mathbb{Z}_p^3$	$\mathbb{Z}_p^3 \times \mathbb{Z}_p^4$
$\mathbb{Z}_p^4$	$\mathbb{Z}_p^4 \times \mathbb{Z}_p$	$\mathbb{Z}_p^4 \times \mathbb{Z}_p^2$	$\mathbb{Z}_p^4 \times \mathbb{Z}_p^3$	$\mathbb{Z}_p^4 \times \mathbb{Z}_p^4$

Table 6.1b: Interaction of Systems

6.4.2 Components in Types of Systems

Based on the cardinality of the systems, *we may say that S is smaller than* $C, whereas,\ C$ *is smaller than G, and G is smaller than L.* As $\mathbb{Z}_p^l \times \mathbb{Z}_p^m \cong \mathbb{Z}_p^{l+m}$, where $1 \leq l, m \leq 4$, is $l + m$ dimensional linear space over the field $\mathbb{Z}_p$.Table 2 indicates the categories and number of components in the systems

System V	$\mathbb{Z}_p$	$\mathbb{Z}_p^2$	$\mathbb{Z}_p^3$	$\mathbb{Z}_p^4$
No. of categories	p^1	p^2	p^3	p^4
No. of components in a category	1	2	3	4

Table 6.2: Number of Categories and Components in a Category for System

Table 6.1b yields the following three findings.

6.4.3 The top row and first column of the interactive systems

The State $\mathbb{Z}_p$, corporations $\mathbb{Z}_p^2$, groups $\mathbb{Z}_p^3$ and individual $\mathbb{Z}_p^4$ have respectively the p, p^2,p^3 and p^4 number of categories. Moreover, the components of a category of any of the systems represent the economic indicators from the set, $\{0,1,\ldots,p-1\}$. In some sense, this is an established ground. We may refer to it as stable (canonical/natural) systems (N-systems), i.e., these are on the top row and first column.

	$\mathbb{Z}_p$	$\mathbb{Z}_p^2$	$\mathbb{Z}_p^3$	$\mathbb{Z}_p^4$
$\mathbb{Z}_p$				
$\mathbb{Z}_p^2$				
$\mathbb{Z}_p^3$				
$\mathbb{Z}_p^4$				

Table 6.3: Columns and rows of an interactive system

6.4.4 The main diagonal

This system explains the intra-action of the systems or D-Interactions (diagonal-interactions), i.e., these activities are on the main diagonal, and components of the system interact with themselves. It may be observed as follows.

$\mathbb{Z}_p \times \mathbb{Z}_p$			
	$\mathbb{Z}_p^2 \times \mathbb{Z}_p^2$		
		$\mathbb{Z}_p^3 \times \mathbb{Z}_p^3$	
			$\mathbb{Z}_p^4 \times \mathbb{Z}_p^4$

Table 6.4: The main socioeconomic intra-action diagonal

For $1 \leq m \leq 4$, define a function $\delta : \mathbb{Z}_p^m \times \mathbb{Z}_p^m \to \mathbb{Z}_p^m$ by $\delta(a_1..a_m) + (b_1..b_m) = (c_1..c_m) \in \mathbb{Z}_p^m$, for any$(a_1..a_m), (b_1..b_m) \in \mathbb{Z}_p^m$, whereas $c_i = a_i + b_i$, $1 \leq i \leq 4$. We may call δ, the intra-active function, which is interpreted as the economic trade-off among the categories of an N-system. Consequently, one can earn again a category of the same system, which may have m!.

If we use,$m = 3$, then the intra-active function $\delta : \mathbb{Z}_p^3 \times \mathbb{Z}_p^3 \to \mathbb{Z}_p^3$ is defined as

$$\delta(a_1a_2a_3, b_1b_2b_3) = c_1c_2c_3 \in \mathbb{Z}_p^3, \text{ where } c_i = a_i + b_i, 1 \leq i \leq 3.$$

Since $\mathbb{Z}_p^3$ represent the group. Therefore, δ explains the group-group intra-action. In this type of intra-action, all components of one group category interact with the corresponding components of another category. It also reflects that the possessions of interactive categories of the community fully operationalized their resources in the given period. The intra-action of any system provides a *reliable mechanism* during disastrous situations among categories of the same system, which might reduce economic and social losses.

6.4.5 Lower and Upper Diagonals

Various off-diagonal elements have the following interpretations.

1. The Interaction of State $\mathbb{Z}_p$with individual $\mathbb{Z}_p^4$ and or conversely, the interaction of individuals $\mathbb{Z}_p^4$ with State $\mathbb{Z}_p$ has the model $\mathbb{Z}_p \times \mathbb{Z}_p^4$ or $\mathbb{Z}_p^4 \times \mathbb{Z}_p$.

2. The Interaction of State $\mathbb{Z}_p$with community $\mathbb{Z}_p^3$, (or vice-versa) has the model $\mathbb{Z}_p \times \mathbb{Z}_p^3$ or $\mathbb{Z}_p^3 \times \mathbb{Z}_p$.

3. The Interaction of State $\mathbb{Z}_p$ with corporations $\mathbb{Z}_p^2$, has the model $\mathbb{Z}_p \times \mathbb{Z}_p^2 = \mathbb{Z}_p^2 \times \mathbb{Z}_p$.

4. The Interaction of corporations $\mathbb{Z}_p^2$ with individual $\mathbb{Z}_p^4$, and it has the representation $\mathbb{Z}_p^2 \times \mathbb{Z}_p^4$ (respectively, the Interaction of Individual $\mathbb{Z}_p^4$ with corporation $\mathbb{Z}_p^2$, and it has the representation $\mathbb{Z}_p^4 \times \mathbb{Z}_p^2$).

5. The Interaction of corporation $\mathbb{Z}_p^2$ with respective group $\mathbb{Z}_p^3$, and it has the model $\mathbb{Z}_p^2 \times \mathbb{Z}_p^3$ (Separately, the interaction of group $\mathbb{Z}_p^3$ with corporations $\mathbb{Z}_p^2$, and it has the representation $\mathbb{Z}_p^3 \times \mathbb{Z}_p^2$).

6. The Interaction of group $\mathbb{Z}_p^3$with individual $\mathbb{Z}_p^4$, and it has the model$\mathbb{Z}_p^3 \times \mathbb{Z}_p^4$ (respectively, the Interaction of Individual $\mathbb{Z}_p^4$ with groups $\mathbb{Z}_p^3$, and it has the representation $\mathbb{Z}_p^4 \times \mathbb{Z}_p^3$).

	$\mathbb{Z}_p \times \mathbb{Z}_p^2$	$\mathbb{Z}_p \times \mathbb{Z}_p^3$	$\mathbb{Z}_p \times \mathbb{Z}_p^4$
$\mathbb{Z}_p^2 \times \mathbb{Z}_p$		$\mathbb{Z}_p^2 \times \mathbb{Z}_p^3$	$\mathbb{Z}_p^2 \times \mathbb{Z}_p^4$
$\mathbb{Z}_p^3 \times \mathbb{Z}_p$	$\mathbb{Z}_p^3 \times \mathbb{Z}_p^2$		$\mathbb{Z}_p^3 \times \mathbb{Z}_p^4$
$\mathbb{Z}_p^4 \times \mathbb{Z}_p$	$\mathbb{Z}_p^4 \times \mathbb{Z}_p^2$	$\mathbb{Z}_p^4 \times \mathbb{Z}_p^3$	

Table 6.5: Socioeconomic Interaction in Lower and Upper Diagonals

Lower Diagonal and Upper Diagonal interactions are symmetric, which occurs due to the nature of the model. For instance, the symmetry between $\mathbb{Z}_p^l \times \mathbb{Z}_p^m$ and $\mathbb{Z}_p^m \times \mathbb{Z}_p^l$, $1 \leq l, m \leq 4$, is alike in an algebraic perspective. First, it is noticed that if 0 represents$\{0\}$, the zero-vector space consists of 0 only. So, for $l \leq m$, $\mathbb{Z}_p^l \to \mathbb{Z}_p^m$ indicates embedding of the space $\mathbb{Z}_p^l$ into the space $\mathbb{Z}_p^m$, i.e., $\mathbb{Z}_p^l \cong \mathbb{Z}_p^l \times 0 \times..\times 0 \subset \mathbb{Z}_p^m$, which means $a_1..a_l = a_1..a_l 0_{l+1}..0_m \in \mathbb{Z}_p^m$. Correspondingly, for $m \leq l$, $\mathbb{Z}_p^m \to \mathbb{Z}_p^l$ is the embedding of $\mathbb{Z}_p^m$ in $\mathbb{Z}_p^l$, i.e., $\mathbb{Z}_p^m \cong 0_1 \times..\times 0_{l-m} \times \mathbb{Z}_p^m \subset \mathbb{Z}_p^l$, which is$a_1..a_l = 0_1..0_{l-m} a_1..a_l \in \mathbb{Z}_p^l$.

Now we define functions $\delta_{m \leftarrow l}$ and $\delta_{l \to m}$ as follow:

$\delta_{l \leftarrow m}: \mathbb{Z}_p^l \times \mathbb{Z}_p^m \to \mathbb{Z}_p^m$, where $1 \leq m \leq 4$, and $m \leq l$

by $\delta_{l \leftarrow m}(a_1..a_l, b_1..b_m b_{m+1}..b_l) = c_1..c_m c_{m+1}..c_l \in \mathbb{Z}_p^m$

for any $a_1..a_l \in Z_2^l, b_1..b_m \in \mathbb{Z}_p^m$ and $b_{m+1} =..= b_l = 0$.

Similarly,

$\delta_{l \to m}: \mathbb{Z}_p^l \times \mathbb{Z}_p^m \to \mathbb{Z}_p^m$, where $1 \leq m \leq 4$, and $l \leq m$

by $\delta_{l \to m}(a_1..a_l a_{l+1}..a_m, b_1..b_m) = c_1..c_l c_{l+1}..c_m \in \mathbb{Z}_p^m$,

for any $a_1..a_l \in \mathbb{Z}_p^l, b_1..b_m \in \mathbb{Z}_p^m$ and $a_{l+1} =..= a_m = 0$,

whereas $c_i = a_i + b_i$, $1 \leq i \leq 4$. We call $\delta_{m \to l}$ and $\delta_{l \leftarrow m}$ the inter-active functions are understood as the economic trade-off among the categories of dissimilar N-systems. Because of this trade-off, again, a category is obtained, belonging to the larger across interactive systems.

By across interactive function $\delta_{l \to m}, l \leq m$, we conclude that the system $\mathbb{Z}_p^l$ interacts with $\mathbb{Z}_p^m$, provided that the $l+1, l+2, .., m$ component of the larger system (in size and dimension) $\mathbb{Z}_p^m$ remains inactive during the interaction, i.e., the only first l number of components interact with their corresponding l members in the smaller system (in size and dimension) $\mathbb{Z}_p^l$. Similarly, across interactive function $\delta_{l \leftarrow m}, m \leq l$, we conclude that the system $\mathbb{Z}_p^l$ interacts with $\mathbb{Z}_p^m$, provided that the $1,2,..,m$ components of the larger system (in size and dimension) Z_p^l remains inactive during the interaction, i.e., the only last m number of components interact with their corresponding m members in the smaller system (in size and dimension) $\mathbb{Z}_p^m$.

Suppose we consider$\delta_{2 \to 3}$: $\mathbb{Z}_p^2 \times \mathbb{Z}_p^3 \to \mathbb{Z}_p^3$, then.

$$\delta_{2 \to 3}(a_1 a_2 0, b_1 b_2 b_3) = c_1 c_2 c_3 \in Z_p^3, \text{ where } c_3 = b_3$$

Similarly, across inter-active function$\delta_{m \to l}$, $m \leq l$, we conclude interaction of the system $\mathbb{Z}_p^m$ with $\mathbb{Z}_p^l$, provided that the $m+1, l+2, .., l$ components of the larger system (in

size and dimension) $\mathbb{Z}_p^l$ remains inactive during the interaction, i.e., the only first m number of components interact with their corresponding m members in the smaller system (in size and dimension) $\mathbb{Z}_p^m$.

Now, if we consider $\delta_{3\leftarrow 2}$: $\mathbb{Z}_p^3 \times \mathbb{Z}_p^2 \to \mathbb{Z}_p^3$, then.

$$\delta_{3\leftarrow 2}(a_1a_2a_3, 0b_2b_3) = c_1c_2c_3 \in \mathbb{Z}_2^3, \text{ where } c_1 = a_1$$

Recall that spaces $\mathbb{Z}_p^2$ and $\mathbb{Z}_p^3$ represent the organization and community, respectively. For the function $\delta_{2\to 3}$ explicates the corporation/companies vs groups' first two components of the category of the group interacting with the corporation's components. It means the group does not operationalize the total assets; rather, a part is left for subsistence for survival. In the extreme scenario, groups or individuals that consume/spend all their assets/resources in one period do not exist for the next. Furthermore, it is not like the intra-action of an N-System.

Similarly, if $\delta_{3\to 2}$: $\mathbb{Z}_p^3 \times \mathbb{Z}_p^2 \to \mathbb{Z}_p^3$, then

$$\delta_{3\to 2}(a_1a_2a_3, b_1b_2b_3) = c_1c_2c_3 \in \mathbb{Z}_p^3, \text{ where } c_3 = b_3$$

Table 6.6 represents $SCGL$for $p = 2$ and Table 6.7 represents $SCGL$ for $p = 3$.

L	1010	0110	1000	1100	0110	0100	0010	0000	0001	0011	0101	0111	1010	1110	1101	1111
G					110	100	010	000	001	011	101	111				
C							10	00	01	11						
S								0	1							

***Table 6.6*:** Socioeconomic interaction between, State (S), corporations (C), groups (G), and individuals (L) *for p=2*

L	1101	0101	0100	0000	0001	0010	0011	0002	0020	0012	0021	0022	0202	0212	0222	2222
G		101	100	000	001	010	011	002	020	012	021	022	202	212		
C				00	01	10	11	02	20	12	21	22				
S							0	1	2							

***Table 6.7*:** Socioeconomic interaction between (SCGL) for p =3

Figure 6.2, may be seen reflected as a funnel shape. This cone, representing the interplay between several systems, spins on its vertical axis. However, embedding from smaller to more complete systems interacts in the same way as any other pair of systems. No herd can exist if individuals are forced to depend only on their information because of a lack of social cues. However, more information is revealed via social observation of choices, and eventually, individuals start to favour one activity over another[62].

6.5 Socioeconomic Interactions: A Rotating funnel

The current research identifies several connections between different systems. Consumption, production, and the regulatory apparatus are all set by these social and economic dynamics. The major diagonal indicates that the system's parts work together coherently within their design and with one another. The lower or higher diagonal represents cross-system interaction, which embeds a smaller system inside a bigger one. The horizontally rotating funnel in Figure 6.2 (derived from Table 6.7) is defined by the combined effects of intra and interactions. The funnel moves up and down as the lower tier's economic activities connect with, the higher tier's, creating a virtuous economic and social activity cycle. The more closely interwoven the power structure of a group is, the greater the "funnelling effect," or the tendency for people's ideas to converge toward one another. Asymptotic learning and other social aggregate outcomes

[62] During the Fertility Transition in Bangladesh, women's responses to changing social norms and contraceptive use within their religious group were significant (Munshi and Myaux, 2006). In a study on higher-yielding farming practices in rural Indian households, the authors found that community learning is as crucial as individual study in adopting such practices (Foster and Rosenzweig, 1995).

are affected by the overall topology of the observation network. Because of this, policy interventions to improve well-being may be informed by the structure of networks, which in turn gives evidence-based insights into behaviour. Similarly, as the majority rule, if we live in a consumer-oriented culture, people are more likely to conform to the norms of that society.

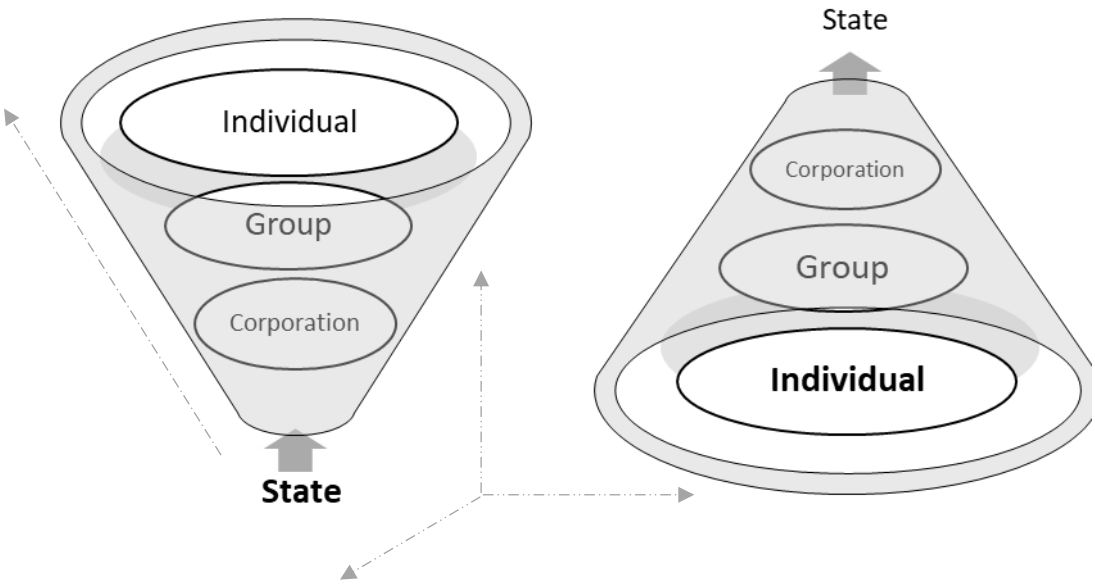


Figure 6.2: Rotating Funnel, State initiate Push-start in Economic activities (left), Individual initiates economic activities (right).

6.5.1 Implementation

Fiscal indicators permit the government (State) to deliver services, reallocate incomes and influence economic activity. They are one of the State's tools to regulate the economy. Fiscal repute and trust in the judiciousness of government help react to fiscal shocks. Therefore, it is simple for well-respected governments to adopt measures that reduce income loss during economic downturns. Therefore, a government that is not trusted must deal with tax and debt imbalances, the effects of which are manifested in inefficient socioeconomic interaction at all levels. Therefore, there are often three categories of governmental expenditure. One category includes businesses catering to consumer demand for products and services. The second kind involves spending money on public infrastructure like roads, bridges, and dams. Spending on regulatory operations such as protecting property rights and consumers, enforcing the rule of law and preventing corruption, encouraging public engagement, and holding officials accountable are all examples of the third kind of government spending—supply of data,

prevention of monopolization, and management of product quality. Government waste in this area of expenditure may seriously affect the economy.

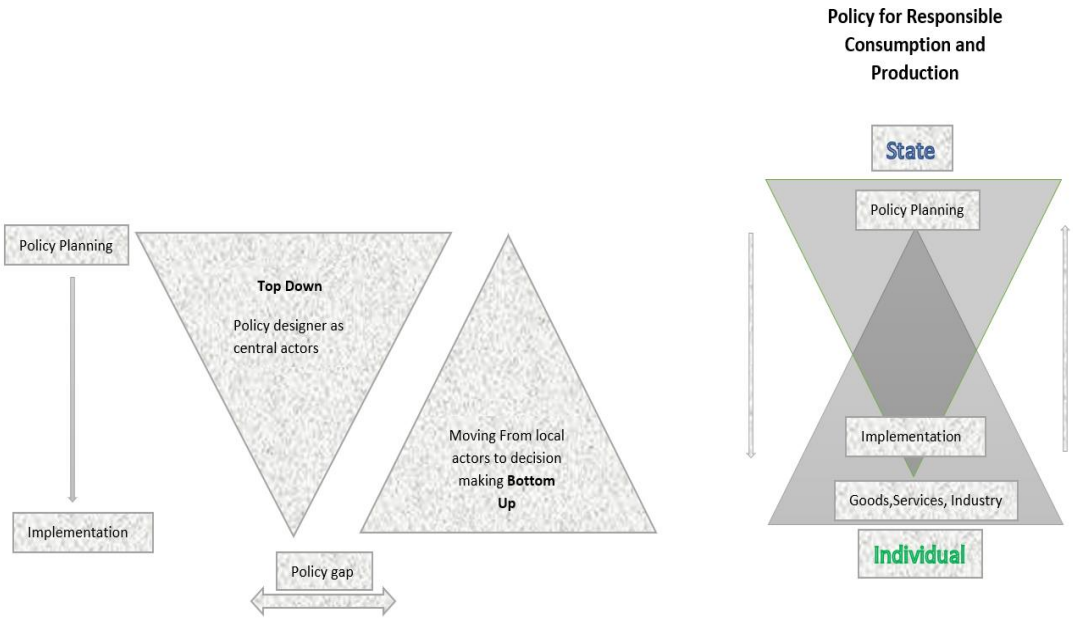


Figure 6.3: Top-down and bottom-up policy for responsible consumption and production (right). While less effective classical top-down and bottom-up policies (left).

While top-down approaches focus on institutions, bottom-up approaches look to people and groups inside the system to discover climate change pressures, effects, and adaptation responses (Dessai and Hulme, 2004). Using universally applicable concepts as a starting point, the responsible individual then applies those principles to specific circumstances. In bottom-up reasoning, the reasoner makes situation-specific, intuitive judgments as a starting point before applying general concepts. Top-down and bottom-up perspectives interact and reach *reflective equilibrium*[63] when in harmony. For example, in Clothing production: A top-down approach to responsible consumption and production might involve regulations requiring clothing manufacturers to reduce their water and energy use during production. A bottom-up approach might involve individual consumers purchasing clothes made from sustainable materials, leading companies to adopt more sustainable production methods. The interaction of these

[63] Maintaining reflective equilibrium involves purposeful and reciprocal adjustment between one's overarching principles and evaluations. Referred to as "Goodman's method" (Anna et al., 2018), this process, even if Rawls accepts momentarily fixed positions, sees a shift as one reflects on specific themes or principal consequences (Rawls, 1971). Philosopher Norman Daniels introduced "wide reflective equilibrium," aligning a person's moral judgments, principles, and background theories for coherence. Achieving balance means adjusting principles and beliefs based on situations and evaluations..

approaches can result in a reflective equilibrium where clothing manufacturers choose to use more sustainable production methods due to both regulatory pressure and consumer demand. That is when it can be shown that particular intuitive judgements are consistent with generalizable abstract ideas. A cognitive split occurs when rationalists try to find common ground between top-down and bottom-up methods, changing one another's thinking until they reach the best possible mix of principles and situational judgments. In the bottom-up method, however, each person plays a pivotal role in shaping how society views consumption. Furthermore, individual-level policies impact firms, which base their product decisions on consumers' desires. Then, in a group with many people, a few careless decisions might seriously harm the ecosystem.

Amidst a new focus on community prosperity and individual achievement, emerging bottom-up economies emphasize local contributions, ecological considerations, and dynamic regional networks. Small businesses play a key role, in prioritizing customers, employees, and communities, while public debate and participatory politics drive policy priorities towards citizens' well-being and community success. This shift results from a concerted effort to replace stifling corporate media coverage with lively public debate and a shift from lobbyist and donor-driven politics to people-powered politics of participation. The State allocates resources for public goods and services, benefiting people, groups, communities, institutions, and itself through investment and consumption. Varying degrees of these systems lead to diverse shapes of indicators like investment, consumption, and welfare. These permutations, modelled as categories or vectors, yield various growth outcomes with significant economic repercussions. Economic growth relies on investments' effects on sectors, regions, and entities. Double-loop learning, acknowledging that problem framing and solutions can perpetuate issues, utilizes initial objectives in the first loop and permits their refinement in the second. This approach fosters creativity, enabling stakeholders to proactively drive and navigate change.

Global governments have made significant strides in advancing development, promoting equality, and enhancing public services. Despite achievements in reducing poverty and expanding access to technology and services, persisting challenges include inadequate social protection, corruption, and governance issues. The failure of leadership compounds these problems, necessitating more effective responses to events

like COVID-19, climate change, and conflicts. Societal shocks reveal the need for balanced individual rights and collective actions, prompting governments to regulate more strictly and expand aid to citizens and companies. Governments worldwide oversee countries, exhibiting distinct organizational styles across levels, ministries, departments, and agencies. These entities serve varying roles and collaborate with frontline workers like military personnel, teachers, and nurses. Amid historical variations, a transformative government of the future prioritizes public needs, fulfills promises, and navigates crises effectively. Reimagining government entails reshaping the social compact with constituents, acknowledging evolving demands and elite-driven power dynamics. A revitalized social contract necessitates developmental elite agreements to enhance society beyond privileged circles.

Here our attention is to sorting out three fundamental terms (socioeconomic indicators) explaining the State components for the case whenever S is taken to be $\mathbb{Z}_3 = \{0,1,2\}$. Fiscal indicators are related to government revenue and expenditure, influencing the circular flow of incomes. Duties and taxes are the leakages, whereas spending is an injection. Fiscal indicators permit the government (State) to deliver services, reallocate incomes and influence economic activity. They are one of the State's tools to regulate the economy. Trust in the government's fiscal responsibility and responsible spending helps the economy recover from economic downturns. As a result, weak socioeconomic interaction at all levels directly results from a government lacking confidence in its population, which leads to tax and debt imbalances. A highly trusted government easily adheres to policies for minimizing revenue loss during economic downturns. Our state serves as a regulator, managing property rights, consumer protection, the rule of law, corruption control, and more. Industries handle production while emerging economies strive for efficiency within universal resource limits. Addressing inefficiencies in workforce, procurement, and public expenditure is crucial for success. Governments direct resource allocation and pursue private sector productivity to meet citizens' needs amid limited funds. The encompassing concept of value for money involves cost-effectiveness, efficiency, and economic considerations.

6.6 Optimizing Resource Management: Synergizing Production, Consumption, and Regulatory Activities

We contend that our proposed algebraic approach to social and economic interaction holds the potential to revitalize hindered economic activities both presently and, in the future, all while upholding environmental sustainability. The categories encompassing the State, and by extension, all interconnected systems can be interpreted across diverse dimensions and configurations. A study indicates that even the most energy-intensive nations could reduce per-capita energy consumption by 95% through efficient technologies and alternative lifestyles, without compromising living standards. Defining an individual as an engaged user of diverse resources, the feasibility of Responsible Consumption and Production (RCP) hinges on robust positive coordination among stakeholders, fostering enhanced welfare through conscientious manufacturing practices by firms and industries. This distinctive approach permits a free market, contingent upon government regulation to ensure sustainable outcomes, while constraining consumer and producer actions. However, the foundation of this socioeconomic interaction framework rests firmly on a foundation of mutual trust. As an illustration of the intra-action and cross-action of the systems (state S is $\mathbb{Z}_3 = \{0,1,2\}$, organisation, group, and individual) Based on mutual trust, we will now take an example with three components of activities to understand Table 6.7 and Figure 6.2.

- Production ($Prod$)
- Consumption (Con)
- Regulation (Reg)

The following interprets the relationship between the indicators; Production ($Prod$) Consumption (Con) and Regulations (Reg).

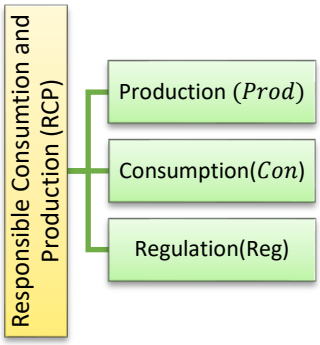


Figure 6.4: Resource management through production, consumption, and regulatory activities

Presumptions

The socioeconomic indicators and the field $\mathbb{Z}_3$.

We have to establish the compatibility of socioeconomic indicators; Regulation, Production, and Consumption with elements in the field $\mathbb{Z}_3 = \{0,1,2\}$.

0	~	**Regulations (Reg)**
1	~	Production ($Prod$)
2	~	Consumption (Con)

Table 6.8: Socioeconomic Indicators and the field $\mathbb{Z}_3$

Here we assume that other factors affecting these indicators are fixed.

Rules of the game

We have to set the rules for socioeconomic interactions. The interactions among the four systems are based on the binary operation addition modulo three between the elements 0,1 and 2 of the field $\mathbb{Z}_3$. The following Tables provide just one example of a sequence where the State could gear socio-economic activities at the organizational level.

$\oplus_3$	**0**	**1**	**2**	**+**	**Reg**	**Prod**	**Con**
0	0	1	2	**Reg**	Reg	Prod	Con
1	1	2	0	**Prod**	Prod	Con	Reg
2	2	0	1	**Con**	Con	Reg	Prod

Table 6.9: Rules of Socioeconomic Interactions (Binary Operation Addition Modulo 3)

The table is based on three key categories: regulation, production, and consumption, and their interactions., the numbers 0, 1, and 2 represent different states or actions of the systems. The binary operation addition modulo three is used to determine the resulting state of the system based on the interaction between two systems. For example, if the regulatory system interacts with the production system, the resulting state of the production system would be determined by adding the states of the regulatory and production systems modulo three. Suppose the regulatory system is in state 1, and the production system is in state 2. To determine the resulting state of the production system, we add 1 and 2 modulo three: 1 + 2 = 3. Since three is not one of the states in the system, we take the remainder of the sum when divided by three = 0. Therefore, the resulting state of the production system is 0. Let us take the state system and suppose it is in state 0, representing a neutral state. Now, let us look at the table and consider the interactions between the state system and the other systems. If the state system interacts with the regulatory system while in state 0, the resulting state of the regulatory system would also be 0, indicating no change in the regulatory framework. For example, if the production system is in state 2, then 0 + 2 modulo three is 2, which means that the production system remains in state 2. This model fosters responsible consumption and production RCP through two avenues: incentivizing sustainable production practices and promoting eco-conscious consumer behavior. The regulatory framework can offer tax breaks or subsidies to businesses adopting renewable energy and sustainable practices, mitigating production's environmental impact. Similarly, consumers are encouraged to recycle, reduce waste, and choose sustainable products through incentives. Ultimately, the model's balance between production and responsible consumption may ensure long-term environmental and socio-economic sustainability.

Example: Energy Crisis in Pakistan

Pakistan has faced persistent energy shortages, resulting in frequent power outages and hindering economic growth and daily life for its citizens. We can use the same simplified model: Elements: 0, 1, and 2 and Labels: "Reg" (Regulation), "Prod" (Production), and "Con" (Consumption).

Application

Element 0: This element represents a strategy primarily focused on Regulation. In the context of Pakistan's energy crisis, this could involve stricter regulations and standards for energy production and consumption, with a focus on reducing energy waste.

Element 1: This element represents a strategy primarily focused on Production. In Pakistan, this could entail investing in the construction of new power plants, increasing renewable energy sources, and improving energy production infrastructure.

Element 2: This element represents a strategy primarily focused on Consumption. In this context, it could involve energy conservation campaigns, promoting energy-efficient technologies, and encouraging responsible energy use.

Interactions

Using the model to explore potential solutions:

"0 ⊕ 0" (Regulation focused on Regulation) implies a heavy emphasis on regulatory measures to improve energy efficiency and reduce wastage.

"1 ⊕ 1" (Production focused on Production) suggests that an approach heavily centered on increasing energy production would result in more power plants and a boost in energy supply.

"2 ⊕ 2" (Consumption focused on Consumption) indicates a focus on encouraging energy-efficient technologies and responsible energy use among consumers.

"0 ⊕ 1" (Regulation focused on Production) could signify that a regulatory approach combined with efforts to increase energy production might result in a balance between energy efficiency and expanding supply.

"0 ⊕ 2" (Regulation focused on Consumption) suggests that regulation combined with encouraging responsible energy consumption practices could lead to stricter standards alongside sustainable energy use.

Using this model, policymakers in Pakistan can explore different strategies and their potential outcomes in addressing the energy crisis. The goal would be to find a balanced approach that combines elements of regulation, production, and consumption

to effectively manage and meet the energy demands of the country while minimizing energy wastage and improving access to reliable electricity.

Socioeconomic status of categories

Now we may use the State's initiative for long-term economic development to identify the resulting socioeconomic position.

- A trust-oriented regulatory framework can promote a disciplined socioeconomic order whereby both production and consumption are maintained within the limits required to achieve (RCP). For instance, a regulatory mechanism that encourages sustainable consumption practices by limiting resource use and waste generation can lead to a sustainable socioeconomic system in the long run.

- The production-oriented regulatory approach may lead to a socioeconomic system characterized by efficient savings and smooth consumption over the consumer's lifetime. For example, a regulatory framework that encourages investment in long-term assets and encourages saving behaviour can create a stable socioeconomic system with sustainable outcomes.

- The third and most desirable position is one where production and consumption are in harmony, and the socioeconomic system can achieve sustainable outcomes (RCP) in the long run. This balance can be achieved through a regulatory framework that encourages sustainable production and responsible consumption behaviour. For instance, policies that incentivize the adoption of renewable energy sources and discourage wasteful consumption can lead to sustainable outcomes in the long run. The hierarchy dynamics of whole phenomena are exemplified as under:

6.6.1 CASE I: Intra-action

"The undeniable ontological inseparability of intra-acting agencies" is evident in all occurrences. In an intra-acting pair, each entity contributes to the whole,

challenging the notion of individual choice existing independently. The power to act originates within connections, dynamically evolving and adapting through engagement in new activities. Intra-action denotes interconnectedness and interdependence among entities within a system, influencing each other's behaviors (Chalari, 2016). Everything facilitating engagement with others is part of our intra-action (Chalari, 2016). Intra-action differs from interaction, rooted in the debate on structure and agency's relationship. b) Some view agency as shaped by social context and structure, considering the relationship between intra- and inter-action as a 'dualism' or two sides of the same coin.

The intra-action of the systems (Table 7.4); State, corporations/companies, group, and Individual is represented by the funnel rotation around the vertical axis (Figure 2). However, take $\{(Reg, Reg, Prod, Prod), (Prod, Reg, Prod, Prod), Reg, Prod, Con, Reg)\} = \{0011,1011,0120\}$, the set of categories of individuals having different combinations of socioeconomic indicators. Similarly, $\{(Reg, Prod, Prod), (Reg, Prod, Prod(Prod, Con, Reg)\} = \{011,011,120\}$; $\{(Prod, Prod), (Prod, Prod), (Con, Reg)\} = \{11,11,20\}$ and $\{Prod, Prod, Reg\} = \{1,1,0\}$ are respectively the segments of categories of Community, Organization, and State having similar and dissimilar socioeconomic interactions. For example, A company that implements sustainable production practices, such as reducing waste and using renewable energy sources, can benefit financially while also reducing its environmental impact. The company's internal systems, such as its supply chain and production processes, can be optimized to reduce waste and energy consumption, resulting in cost savings and improved efficiency

6.6.2 CASE 2: Across interaction

Interaction involves communication or exchange between separate entities, while intra-action highlights the interconnected nature of entities within a system. For instance, a company can interact with stakeholders like customers, suppliers, employees, and the community, causing ripple effects across systems, and influencing other entities. Interactions extend to various product life cycle stages; e.g., production affects the environment, impacting community health. Product consumption, too,

affects the environment and community, interconnecting systems: State, Community, Group, and Individual, spurring economic activities.

we consider $\{0011, 1011, 0120\}$ $\{(Reg, Reg, Prod, Prod), (Prod, Reg, Prod, Prod), (Reg, Prod, Con, Reg)\}$, the set of categories of Individual having different combinations of socioeconomic indicators. However, $\{011, 011, 120\} = \{(Reg, Prod, Prod), (Reg, Prod, Prod), (Prod, Con, Reg)\}$, $\{11, 11, 20\} = \{(Prod, Prod), (Prod, Prod), (Con, Reg)\}$ and $\{1, 1, 0\} = \{Prod, Prod, Reg\}$ are respectively the segments of the categories of Group, Community and State may share both similar and distinct socioeconomic indicators. Linear decision-making can lead to "information cascades," where later actors mimic earlier decisions, driven by their peers' knowledge. In a circular economy, waste becomes a resource; for instance, a company's food waste can benefit a local farm as compost material. Key figures' preferences, like community leaders, influence adoption rates, showcasing the importance of social learning (Miller and Mobarak, 2015). While educating children about overconsumption's consequences is a valuable long-term strategy.

The interaction of groups with individuals is represented as the function: $\delta_{3\to4}: \mathbb{Z}_3^3 \times \mathbb{Z}_3^4 \to \mathbb{Z}_3^4, \delta_{3\to4}(a_1a_2a_3a_{3+1}, b_1b_2b_3b_4) = c_1c_2c_3c_4 \in \mathbb{Z}_3^4$, for any $a_1a_2a_3 \in \mathbb{Z}_3^3, b_1..b_4 \in \mathbb{Z}_3^4$ and $a_{3+1} = a_4 = 0$. **Thus** $\delta_{3\to4}$(011, 1011)=1121 $\delta_{3\to4}$(011,0120)=0200 and $\delta_{3\to4}$(120,0120)=1020.

While the Corporation interacts with Individuals based on the function

$\delta_{2\to4}: \mathbb{Z}_3^2 \times \mathbb{Z}_3^4 \to \mathbb{Z}_3^4,$

then $\delta_{2\to4}(a_1a_2a_{2+1}a_4, b_1b_2b_3b_4) = c_1c_2c_3c_4 \in \mathbb{Z}_3^4$, for any $a_1a_2 \in \mathbb{Z}_3^2, b_1..b_4 \in \mathbb{Z}_3^4$ and $a_{2+1} = a_4 = 0$. $\delta_{2\to4}$(11,1011)=2111 ~$\delta_{2\to4}$(11,0120)=1220

The State interacts with individuals based on function,

$\delta_{1\to4}: \mathbb{Z}_3 \times \mathbb{Z}_3^4 \to \mathbb{Z}_3^4, \delta_{1\to4}(a_1a_{1+1}a_{1+2}a_4, b_1b_2b_3b_4) = c_1c_2c_3c_4 \in \mathbb{Z}_3^4$, for any $a_1 \in \mathbb{Z}_3, b_1..b_4 \in \mathbb{Z}_3^4$ and $a_{1+1} = a_4 = 0$. $\delta_{1\to4}(1,1011)=2011$, $\delta_{1\to4}(1,0120)=1120$, $\delta_{1\to4}(2,0120)=2120$.

The corporation interacts with some groups that can be represented as,

$$\delta_{2\to3}: \mathbb{Z}_3^2 \times \mathbb{Z}_3^3 \to \mathbb{Z}_3^3,$$

$\delta_{2\to3}(a_1a_2a_{2+1}, b_1b_2b_3) = c_1c_2c_3 \in \mathbb{Z}_3^3$, for any $a_1a_2 \in \mathbb{Z}_3^2, b_1..b_3 \in \mathbb{Z}_3^3$ and $a_{2+1} = a_3 = 0$; $\delta_{2\to3}(11,011)=121$; $\delta_{2\to3}(11,011)=121$; $\delta_{2\to3}(20,120)=020$

The state interacts with different groups and corporations present in the country depicted by function,

$$\delta_{1\to3}: \mathbb{Z}_3 \times \mathbb{Z}_3^3 \to \mathbb{Z}_3^3,$$
$$\delta_{1\to3}(a_1a_{1+1}a_{1+2}, b_1b_2b_3) = c_1c_2c_3 \in \mathbb{Z}_3^3,$$

for any $a_1 \in \mathbb{Z}_3, b_1..b_3 \in \mathbb{Z}_3^3$ and $a_{1+1} = a_{1+2} = 0$.

$$\delta_{1\to3}(1,011)=111$$

$$\delta_{1\to3}(1,011)=111$$

$$\delta_{1\to3}(2,120)=020$$

Here we consider the function.

$$\delta_{1\to2}: \mathbb{Z}_3 \times \mathbb{Z}_3^2 \to \mathbb{Z}_3^2,$$
$$\delta_{1\to2}(a_1a_{1+1}, b_1b_2) = c_1c_2 \in \mathbb{Z}_3^2,$$

for any $a_1 \in \mathbb{Z}_3, b_1b_2 \in \mathbb{Z}_3^2$ and $a_{1+1} = 0$.

Environmental Compliance Checks ($\delta 1\to2$): Environmental agencies (state) interact with manufacturing companies (corporations) regarding pollution control and compliance. State attributes (a_1a_{1+1}) represent environmental regulations, emissions limits, and reporting requirements. Corporation attributes (b_1b_2) include emission data, pollution control measures, and waste disposal practices. The function processes these attributes and determines whether the corporation complies with environmental regulations or needs to take corrective actions. . *Interaction of the State with Individuals ($\delta 1\to4$):* Think of the state's social welfare department and a citizen applying for financial assistance. The state's attributes ($a1$) could represent eligibility criteria and available assistance programs. The individual's attributes ($b1b2b3b4$) might represent their income, family size, and specific needs. The function processes these attributes based on the conditions ($a_{1+1} = a_4$ and $a_{1+1} = 0$) and provides an output ($c_1c_2c_3c_4$) indicating whether the individual qualifies for assistance and, if so, the amount they are eligible to receive. *Interaction of the State with Corporations ($\delta 1\to2$):* Imagine a state's regulatory agency and a corporation seeking permits. The state's attributes (a_1a_{1+1}) could represent the regulations and permit requirements. The corporation's attributes

($b_1 b_2$) might represent its application and compliance status. The function processes these attributes based on the condition (a_{1+1}= 0) and provides an output ($c_1 c_2$) indicating whether the corporation's permit application is approved.

Resource management transactions encompass more than simple market trades; they involve negotiations around values, goals, and sustainability agreements, often incurring additional costs due to engagement with authorities. Falconer's (2000) research illustrates how British farmers, despite financial incentives, hesitated to adopt voluntary conservation methods due to perceived high transaction costs tied to government contracts. Policy mechanisms aim to align transaction costs, like collective negotiation or government covering expenses, to facilitate participation in voluntary programs. Effective cross-scale interactions, involving policymakers and scientific discourse, demand learning to communicate using technical language and understanding various stakeholders' goals. Initial search and network setup costs pose barriers to such interactions. Institutionalization occurs when interactions are established and their associated costs are reduced. Maintaining regular connections builds trust and shared understanding. Information gaps across government levels, due to costly links, exacerbate power disparities and hinder equitable access to critical information. Addressing these disparities is essential for robust governance (Agrawal, 2001). We contend that certain linkages may serve institutions' interests without necessarily enhancing trust or adaptability in the management system.

Categorizing individuals is often based on their varying levels of trust towards different groups. Bjornskov (2008) underscores the significance of confidence in political, and legal institutions, reduced corruption, and property rights protection for nurturing social trust. These elements are often lacking in undeveloped economies or during development stages. Schor (2016) notes that lower government trust impedes robust social safety nets due to underreported income and business transactions. Uslaner and Rothstein (2005) argue that limited government intervention in inequality exacerbates low economic confidence. Emerging countries grapple with corruption risks due to closed systems, breeding government-citizen distrust.

Instances exist where the State bolstered productivity and reduced expenses effectively. Even within inefficient systems, effective procurement strategies have succeeded, particularly with technology adoption (Bandiera et al., 2009). Enforcing

existing rules, as observed in Brazil through imprisoning corrupt state firm management and audits (Bajpai and Myers, 2020; Zamboni and Litschig, 2018), could boost output. However, it necessitates authorities to initiate, expend political capital, and challenge privilege. While e-government has advanced, many countries still grapple with inefficiencies and red tape (Othman and Razali, 2018). Government fiscal policy and regulatory hurdles heighten private sector asset inefficiency and deployment issues, as seen in bankruptcy cases. Integrating e-government systems across agencies could mitigate redundancy concerns, but this challenge involves limited resources, system instability, capacity gaps, and future policy alignment needs. Enhanced government productivity, though substantial, faces coordination challenges across departments and levels, accentuated by the COVID-19 crisis. Governments must enhance interdepartmental collaboration to mitigate isolation-driven inefficiencies.

6.6.3 Budgetary Problems of the State of Pakistan

Budgetary choices significantly impact policy success. Governments favor politically appealing new initiatives over maintaining current investments. Some governments prioritize raising compensation for employees over actual service provision. Initiating new programs often takes precedence over downsizing existing ones. Resource distribution neglects underrepresented groups in favor of organized interest groups, perpetuating disparities. Expenditure rises steadily, solidifying inefficiencies. For instance, politicians and the public may prefer new schools over efficient teaching strategies, clinics over hospitals, and direct provision over-regulation (Opalo, 2022). Low-income countries like Pakistan resort to inefficient methods, bypassing market-based incentives for direct employment generation, and hindering growth. Recent government overhead expense increases may stem from income shortages, spending pressures, and macro-fiscal disruption. The following definitions of moderation may be used in various contexts: Consumption is deemed moderate if it (a) is acceptable from the standpoint of the relevant socioeconomic level and (b) is utilised for its intended purpose. Public expenditure plans Modest public expenditure is spending that (a) stays within the allotted budget and (b) serves the stated objective. Poor resource allocation due to government action is a public sector failure that harms economic prosperity.

The Government's Final Consumption Expenditure (FCE) is the amount the government spends to provide goods and services to the general public. Governments spend much money on producing and procuring goods and services (including defence, education, and healthcare) and redistribution programmes (e.g. pensions and unemployment insurance). In certain countries, the national government may primarily ensure high-quality education for all citizens. On the other hand, local and regional governments may have a more significant bearing. Monitoring these variables over time may show how policymakers reallocate resources in response to changing circumstances. The government needs to cut down non-development expenses by 90 per cent, and the beaurucracy needs to abolish some of its ministries instead of seeking a bailout package from the International Monetary Fund (IMF) for paying debt instalments of the country, which is already at the brink of being "bankrupt".

Pakistan, once a food-producing hub, now imports essential commodities due to poor decisions draining foreign reserves. This, combined with inefficient expenditures, widens the state-individual gap, causing economic and social turmoil. Obstacles to quality public services include a small civil service, privatisation, and lack of responsibility across sectors. VIP expenses further strain resources. Meanwhile, it might become a helpful asset if this cash was used toward investments, social programmes, education, innovation, or anything else beneficial. This conduct is deeply rooted in Pakistani cultural norms and beliefs. Respect and esteem are shown to one another based on one's perceived social status or financial means. Changing cultural norms could save billions, fostering trust between government and citizens for improved relations. There is a lack of responsibility in the Pakistani economy on the part of people, businesses, and even the government.[64]

In the public sector, incentives for efficiency and waste reduction may be lacking compared to the private sector, impacting government effectiveness. Bureaucracy and conflicts between political and economic goals contribute to this issue. Individual extravagance[65] within public institutes hampers resource conservation

[64] Pakistan grapples with discussions about government and state-owned business corruption and inefficiency, with potential annual losses of Rs250bn across eight public sector firms. Despite challenges, well-managed state-owned enterprises (SOEs) can contribute to national development. Historical successes include Emirates Airlines, Singapore Airlines, Bombay Transport Authority and others, while companies like Renault and Embraer originated as SOEs before becoming global industry leaders. Developing countries are revisiting state capitalism and SOEs as a potential response to the current global crisis

[65] As an example, students in government university, don't care about resources of respective university. Therefore, misusing of resources of government especially (electricity) lead to higher costs imposed on that institute. Their behavior is shaped by attitude that "Why should we care, as we don't have to pay for it, rather by government". It represents squandering resources. At individual

efforts, even when introducing sustainable technologies. Wealth disparities result in power imbalances and negative outcomes favouring the powerful, as observed in resource allocation choices. Unequal incentives and rewards lead to winners and losers, affecting institutions at various levels. Cooperation, driven by unequal wealth and power dynamics, influences outcomes within management systems. There is an intentional behaviour gap in which individuals show intentions to show pro-environmental behaviour, but when it comes to taking action (saving government resources at public institutes) never demonstrate such a responsible attitude regarding consumption. Additionally, public officeholders mostly misuse tax-collected funds through extravagant spending.

Unequal wealth distribution, as theorized by Boyce (1994), often results in negative outcomes due to uneven power dynamics. The powerful gain advantages from ecologically harmful actions, while compromise tends to favor them over less fortunate groups, leading to less cooperation and undesirable results. Inequity in wealth and resources hampers cooperation, particularly when tied to power at individual and collective levels. Young's (2004) spectrum of interactions highlights unequal incentives and rewards, prevalent when one group dominates institutions. Institutions at all levels use connections to advance their interests within management systems. Based on our approach, there are ways to prevent government agencies from failing. Preventing government agency failures involves adopting profit incentives and performance objectives in the public sector. Accountability for results is essential, achieved by paying public sector workers piecemeal to motivate efficiency. However, implementing profit motives faces challenges in sectors not easily commercialized. While competitive tendering promotes efficiency, quality assurance remains crucial. Inherent monopolies in many government services hinder competition, requiring effective oversight for quality. Private sector entry, as seen in Pakistan's bus industry, can lead to redundancies without coordination[66]. The lack of trust in Pakistani government institutions is a primary factor contributing to lower tax revenues. Improving taxpayer compliance requires addressing this issue. Streamlining administrative processes is pivotal to

level if someone try to be moderate in their consumption patterns, but corporations creating negative environmental costs on individual than, efforts of individual will become ineffective.

[66] Private enterprises, such as coaches, entered the market when public bus companies in Pakistan lost their legal monopoly. Unfortunately, this often results in redundant bus services and increased wait times. Moreover, private firms' profit margins grow as fares rise, rather than the communities they serve. That is because service providers tend to work in silos rather than coordinating their efforts with one another.

optimizing the utilization of taxpayer funds. However, it's essential to balance efficiency gains with employee well-being, as excessive workload and paperwork can adversely affect employee morale. Consequently, an effective strategy for maximizing taxpayer morale involves not only process optimization but also maintaining a conducive work environment for employees and increasing mutual trust among all stakeholders.

6.6.4 Environmental Deprivation in Pakistan

When discussing the interplay between social and economic forces at the regional level, we talk about the socioeconomic system. Deforestation, pollution, natural catastrophes, and the production and use of energy are only a few ways these systems negatively affect the environment. *Responsible and successful socioeconomic engagement among all stakeholders may alleviate local economies, and reduce food hunger, and environmental dangers*. Population increase, shifting family dynamics, and inefficient use of resources all contribute to deforestation, one of the leading causes of environmental change. Although forests are typically state-owned, *t*he percentage of land covered by trees fell by 20.6% between 1970 and 2011 (Rehman et al., 2021). Community growth and greater resource use are likely causes of the decline[67]. Between 2001 and 2021, commodity-driven deforestation and urbanization were Pakistan's primary causes of forest loss, accounting for 4.6% of the country's total forest area lost[68]. Two urgent concerns are the supply units for the populace and the preservation of forests. The Pakistan Environmental Protection Ordinance of 1983 and the Pakistan Environmental Protection Act of 1997 are now in effect in the country[69].

The destruction of natural habitats and ecosystems due to unlawful house development in green areas is a significant concern in Pakistan. Food insecurity and economic contraction are exacerbated by soil degradation, often when agricultural techniques deteriorate. Since we import food goods instead of manufacturing them in our nation, we are losing billions of dollars. Food security is far more vital than

[67] In 2010, tree cover in Pakistan was 648 hectares (ha), or 0.74 per cent of the country's total land mass. 63.2 hectares of tree cover were lost there in 2021, resulting in 23.8 metric tons of carbon dioxide being released into the atmosphere. (Forests throughout the world: a keeper of the forest's future, 2022).

[68] The timber mafia in North and South Waziristan is chopping down trees at an alarming rate to meet the high demand for charcoal in neighboring Afghanistan. In certain parts of Afghanistan, particularly those that are near to Pakistan, charcoal is the sole source of cooking fuel. One of the major causes of tree cutting is the growing number of housing complexes around the nation.

[69] Any building work in a green area that might harm the environment is strictly forbidden under the Pakistan Environmental Protection Act of 1997, section xxxv (a), (b), and (c).

creating a housing authority in Pakistan. The first quarter of the current fiscal year 2022 saw an increase of 9.06 per cent in oil and food product imports into Pakistan, from $6.95 billion in the first quarter of the previous fiscal year 2021 to $7.58 billion (PBS, 2022). However, exports of textiles and garments could only increase by 3.68 per cent annually to $4.58 billion owing to sluggish demand and the *high cost of local manufacturing* due to costly electricity. In the period under examination, the cost to import food increased to $2.72 billion, a 15.21 per cent increase over the $2.36 billion spent during the same period a year earlier. Wheat, sugar, edible oil, spices, tea, and pulses contributed to this food category. To make up for a shortfall in domestic output, Pakistan imported *856,813 tonnes of wheat* in the first quarter of this year. Under examination, the wheat import value was $408.65m. From July through September 202, the amount imported of palm oil was $1.13 billion, up from $891.15 million the previous year. From all this data, it is evident that there is a lack of coordination and trust among all stakeholders, including individuals, corporations, groups and the State.

Small fishing communities all across the globe have felt the effects of water pollution. Most of Pakistan's 250 million tons of rubbish is made up of plastic bags, pet bottles, and leftover food that washes up on Pakistani beaches. Companies with a large footprint generate this pollution through a spillover system, immediately impacting fish populations and communities in their immediate vicinity. Estimates place the fatalities at 40%, all due to drinking water tainted with sewage, industrial waste, arsenic, and other harmful contaminants. *Banning plastic bags alone will not solve the problem of plastic waste. We need innovative approaches to manage consumption and production patterns. The polluter-pays* approach is needed in Pakistan to assist local communities to thrive. As the climate changes, natural catastrophes are becoming worse. Hillside locations vulnerable to human involvement tend to collapse as towns grow and develop (Schuster and Highland, 2001).

Alterations in the composition of nuclear families can contribute to societal and economic shifts. The interconnectedness of human and ecological systems manifests in phenomena as diverse as deforestation, natural catastrophes, pollution, and energy usage. Government policies and surrounding circumstances exacerbate their effect on the environment. The effects of human activity on the natural world might be considered a domino effect. *The consequences of changes in any of these socioeconomic systems may be felt up to the global level.*

6.7 Policies based on the Socioeconomic Interaction Framework

In our interconnected global society, environmental services are recognized as vital public goods, benefiting various stakeholders. For instance, clean water distribution and biodiversity preservation serve as prominent examples (Stern and Dietz, 1994). Integrated resource systems exhibit greater resilience due to their extensive connections, while weakened links between resources, governing bodies, and infrastructure reduce resilience (Anderies et al., 2004). Collaborative approaches are evident across international treaties and local governance, underscoring the importance of stakeholder communication for successful community-based management (Berkes, 2004). These strategies are advocated in place of traditional resource utilization techniques because they provide positive incentives for responsible consumption. A traditional top-down approach, on the other hand, may be seen as the imposition of a "standard" resource usage strategy by government bodies that outline social and environmental objectives for resource management. Unfortunately, those who want to impose a regulatory framework on resource users are not always open to hearing the perspectives of the regulated and the general public.

In Figure 5.5, we see how various community members are linked together. Decentralizing power from government agencies to organisations and committees is the norm and encouraged all over the globe as a means of fostering community-based administration. Through co-management, social-ecological resource systems can be made more resilient, information can be shared, and enforcement costs can be lowered. All of these increase the system's adaptability and longevity in its current condition of providing resources and services to users. Increased direct links between government agents and resource users, information and learning processes that flow between them characterize a system with a robust governance framework for sharing rights and duties for managing resources.

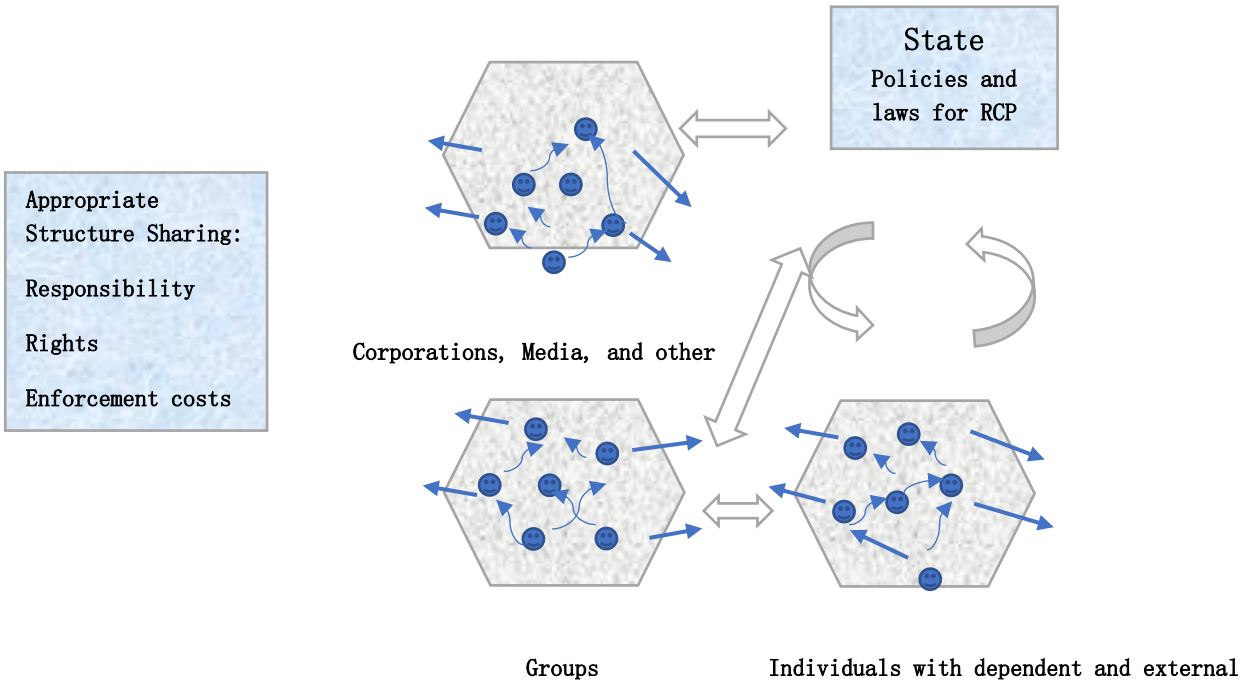


Figure 6.5: A policy framework for RCP

The framework suggests considering the interactions between various stakeholders in the governance of shared resources, such as natural resources or public goods, that a robust governance system involves direct links between government agents and resource users and information and learning processes flowing between them. It advocates for community-based administration, co-management of resources, and decentralized power from government agencies to organizations and committees.

Accordingly, the structure of the vertical and horizontal interplay between actors, the characteristics of the consumption and production being managed, aspects of an agency such as the emergence of leadership and the translation of knowledge at different levels, and the social construction of crisis to overcome inertia and trigger change all impact the connections between stakeholders at various scales regarding that resource. The size of the resources, the strength of physical pressure against exploitation, the cost of enforcement, and whether or not the resources are fixed or movable all play a role in the governance systems of shared resources. These qualities are essential for designing robust social-ecological systems, and they will likely play a role in defining the interactions that constitute governing institutions. People on the

ground join forces with neighbouring communities facing similar challenges to pool resources, raise standards, and bargain more effectively with the state. These are shown as horizontal ties between resource protectors and the communities who employ those protectors' services, as well as between those communities and scientific organisations, the media, and advocacy groups within and beyond the region.

The social construction of crises influences stakeholder connections across different resource scales. While a local water source might be managed by a small community, a larger river system requires collaboration among multiple communities and government agencies. Co-management entities can strengthen regulatory and user networks, bolstered by advocacy groups and media to pressure companies towards responsible practices. Power dynamics play a role, impacting interactions between communities, agencies, and higher-level governments demonstrated in Figure 5.5. Regulatory and user networks may be strengthened via the efforts of co-management entities. They also encourage vertical links to access information, resources, and credibility. The powerful and the powerless rely on their information to guide their actions and decisions. The price of information is the second factor in socioeconomic interactions. Information costs, or "transaction costs," encompass efforts to find and assess information sources, establish partnerships, draft contracts, enforce agreements, and build social capital.

Boosting government efficiency is challenging due to misaligned incentives, corruption, and powerful interests. Changing established practices can be difficult for public servants. Government agencies often take on excessive responsibilities and lack a central focus on efficiency. Efficiency is rarely ingrained in the civil service ethos, and traditional transformation methods may not consider cultural norms (World Bank, 2016). Public sector human resources are frequently inefficient, with uninspired employees and suboptimal skill mixes. Allocation of personnel across service facilities is ineffective. While modern technology can help track employee absences, reforms in developing countries have stalled (Duflo et al., 2007; Banerjee et al., 2008). Waste of resources is a persistent issue for both wealthy and emerging nations. Public sector inefficiencies encompass ineffective human resource deployment, service overlap, high input costs, and industry-specific problems. Inefficiencies can impact entire economies or specific sectors. In low-income countries, over 50% of public infrastructure spending

is wasted, and emerging markets experience over 30% resource loss (Cohen 2006). Addressing government efficiency hurdles requires tackling bureaucratic inertia, corruption, entrenched interests, planning, resource allocation, financial management, and inter-group collaboration challenges in Pakistan. Despite good intentions, efforts to eliminate inefficiency may yield unintended consequences.

Traditional community-based practices like Japan's "suisan kumiai" associations for fisheries, Nepal's forest management, and South Africa's Working for Water program showcase successful co-management approaches. These methods involve government collaboration with local communities, resulting in sustainable resource management[70]. In Japan, fisheries yield better results with reduced conflicts, Nepal's forests benefit from improved health and biodiversity, and South Africa addresses invasive plants threatening water resources through local engagement (Buch and Dixon, 2009). New public management approaches haven't consistently reshaped resource allocation effectively. Adding results-based decision-making to the public sector often comes with limitations. Introducing new e-government systems for procurement and finance might automate issues and not improve compliance. In developing economies like Pakistan, coordinated efforts among stakeholders can enhance resource allocation.

The proliferation of social media platforms, rating systems, scales, and recommendation engines has imposed a new imperative on producers to adopt responsible practices. Companies, governments, and individuals must curtail their consumption of gas, electricity, and water. The evolution of technological and informational platforms, exemplified by collaborative consumption[71], offers a pathway to alleviate environmental burdens. In such an economic model, individuals and companies optimize both their tangible and intangible resources. Developing nations like Pakistan hold considerable untapped potential to attain responsible consumption

[70] Nepal's community-based forest management has successfully reduced deforestation and promoted sustainable forest management. The government has devolved management rights to local communities through a co-management approach, where community forest user groups work in partnership with government agencies to manage the forests. Water management in South Africa, the Working for Water program (WfW), is a community-based approach to managing invasive plant species that threaten the country's water resources. The program employs local people to remove invasive plants while providing training and education on water management

[71] Individuals "receive" and "provide," either temporarily or permanently, valuable goods or services through trades with other consumers or a third-party facilitator in a system known as "collaborative consumption." This is typically associated with the concept of the "sharing economy." Collective shopping experiences (such as those provided by flea markets, swap meetings, garage sales, car boot sales, and consignment stores) are nothing new. (Botsman and Rogers, 2010)

and production standards through collaborative consumption. Redistribution systems facilitate enduring resource acquisition by individuals. By instilling responsibility within consumption patterns, we imbue value into our everyday decisions as consumers across various goods and services. Individuals demonstrating responsible consumption behaviors can also engender positive humanistic values in others, prompting considerations for the labor rights of those involved in the production process. This phenomenon may catalyze a shift from materialistic values towards communal ones.

6.7.1 Function of the Place of Worship to Achieve RCP

In Pakistan, religious institutions and community-based service providers collaborate with the government to achieve societal goals through shared resources and assistance. Key questions arise: How can government efficiency be improved? How can limited resources be optimally allocated for essential services and citizens' needs? How can the government foster public trust and confidence, aligning citizen-state interactions and social contracts? Religion plays a role in shaping economic behaviors like trust, honesty, hard work, charity, and social networks. For instance, the US religious economy generates substantial revenue, around $1.2 trillion annually, driven by the role of places of worship in societal engagement (Stark, 2012). These establishments function as community hubs, offering education, childcare, training, and charity, fostering strong social bonds (Lin, 2002). The religious sector bolsters local economies by creating jobs and reducing social costs associated with negative behaviors like crime, ultimately nurturing trust and cooperative norms. This sector catalyzes positive societal transformation, connecting individuals, organizations, businesses, and the state.

Houses of worship are increasingly acknowledged as vital community centers, fostering social cohesion and a sense of belonging among diverse individuals. These spaces provide an opportunity to cultivate responsible consumption behaviors and sustainable practices. At these venues, representatives from various sectors can converge to share expertise on environmental concerns and advocate responsible consumption. Moreover, houses of worship can serve as catalysts for community-driven initiatives that promote sustainability, such as community gardens and recycling programs. These endeavors not only encourage responsible consumption but also nurture a shared commitment to

environmental stewardship within the community. Leveraging religious congregations, which encompass over 80% of the global population, presents a unique avenue for disseminating information on responsible consumption, climate change, and socio-economic matters. Engaging individuals within the context of their worship environment facilitates comfort and receptivity to new ideas. By discussing these topics within religious spaces, individuals are reminded of the significance of responsible choices, fostering enduring behavioral shifts and contributing to a more sustainable future.

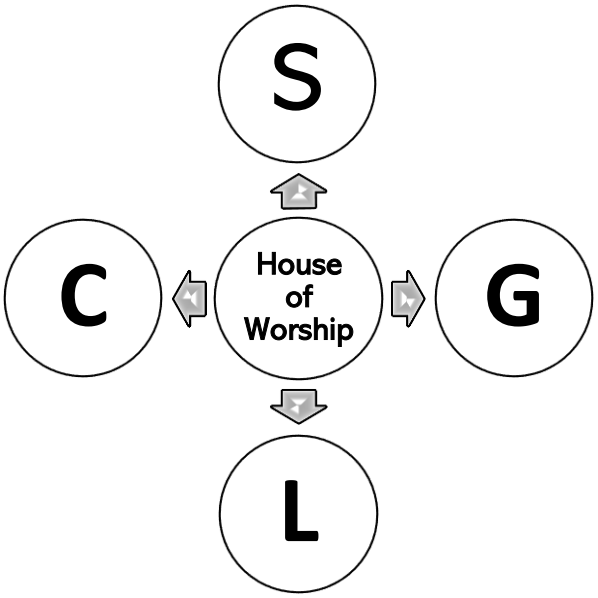


Figure 6. 6: Function of the house of worship to achieve RCP

In addition, it is noteworthy that these sacred sites function as community hubs that can impart education relatively cheaply. For instance, if a single venue imparts knowledge on environmental degradation to a gathering of 100 individuals, this information can be disseminated to their respective social networks, perpetuating a multiplier effect for learning. Pakistan is a nation steeped in religiosity, with nearly 98% of its populace identifying with a faith tradition. Accordingly, leveraging religious values can be an effective way to shape attitudes regarding consumption and production. This paradigm can potentially bridge the gap between local faith communities and policy-makers. It is conceivable that these communities can play a

decisive role in educating people about responsible consumption and production based on tenets enshrined in their respective religious texts.[72]

Religion-dependent social capital refers to the networks, norms, and trust that exist within a religious community. This social capital can be harnessed to promote responsible consumption and production and reduce the intention-behavior gap in several ways. Religious communities often have strong norms and values that promote social responsibility, ethical behavior, and care for the environment. These norms and values can be leveraged to encourage RCP.

Religious institutions can serve as pivotal educators in promoting sustainable living and consumption practices. They can impart teachings on waste reduction, resource conservation, and environmental impact mitigation. Leveraging the strong social networks within religious communities, collective action on environmental concerns can be facilitated. Regular congregations at places of worship offer a captive audience for discussions on responsible consumption and sustainability. With over 80% of the global population identifying with a religion, targeting this demographic at their places of worship becomes a strategic approach for conveying information about efficient resource utilization, climate change consequences, and pertinent social and economic issues. The foundation of trust and accountability within religious communities addresses the intention-behavior gap by fostering a supportive peer network that encourages and enforces sustainable living practices. The inherent social capital in religious circles offers a potent means to promote responsible consumption and production, ultimately bridging the gap between intention and action. By harnessing religious norms, values, and networks, we can forge a more sustainable and equitable future.

6.8 Conclusion

The intricate interplay of needs often leads individuals to make decisions that may not align with their best interests. Choices between environmentally beneficial and harmful actions are guided by established norms within societies. Regulation of diminishing resources is imperative, as values are intertwined with cultural practices

[72] In Pakistan, which is a country of majority Muslims worships at mosques. These mosques are present in each village, town, and cities, where people pray five times a day. While these places of worship also act as representator of equality where rich, poor, state representatives, or individuals from corporations gather at on one place of worship. However these places of worship need to spread peace, harmony and teaching about thrift, saving behaviors and economy.

and conventions that shape consumption patterns and object creation. Consumerist societies pose significant environmental risks through resource depletion and climate change. The central concern lies in the lack of effective interaction among key stakeholders, leading industries to prioritize production that caters to unlimited consumer desires. The absence of culturally grounded formulations for responsible consumption and production further compounds the issue. Generalized consumption theories, not tailored to specific economies, fail to consider variations in values, culture, and institutions. This gap between theoretical predictions and actual ecological impact underscores the inadequacy of current economic institutions.

This designed framework might stimulate people to make RCP. Thus, we have used the language of finite algebra to symbolise the underlying geometry of economic and social exchange. It describes the interplay between the State, businesses, organisations, and individuals under a system of governance (RCP). The economic development reached in the long run depends on the beginning phase of social activity. Furthermore, different socioeconomic patterns might evolve due to the nature of the activity impulses at different levels. To simplify algebraic representation, we refer to it as the system that maps economic activity categories of any finite number p. Assuming any one of the four types of economic agents can independently choose the same number of possible socioeconomic indicators, say p, the algebraic structure is set in a top-down framework to yield p, p^2, p^3 and p^4 numbers of composite indicators at the levels of State, corporations, groups, and individuals.

As a result, the suggested algebraic model suggests that the State may use a variety of policy instruments to deploy material resources, sensemaking, and moral capital. Therefore, it is possible to exercise intimidation in communities thanks to the strong widespread power of the State and cultural conformity. In light of this,$\mathbb{Z}_n$ As a state S when n is not prime allows us to extend our findings; in this case, $\mathbb{Z}_n$. It is not an integral domain since it acts like a commutative ring with identity. Examining the systems in an unbiased manner is a natural and practical solution. Since the ring, $\mathbb{Z}_n$. Having no divisors, this broader approach might serve as a starting point for thinking about and analysing the absence of optimal circumstances for the interaction of

categories. This comprehensive framework could explain why socioeconomic interaction is more common than in others in some instances.

The policies initiated from the state level reach individuals through a bond of mutual trust that has a long-lasting impact across several economic transactions. Therefore, a typical state typically undertakes three types of spending activities. The first type is the consumption activity, which provides goods and services to the public. The second type is an investment that includes, for example, the construction of railroad infrastructure, hospitals, schools, and dams. The third type of spending activity at the state level includes regulatory activities like providing property rights, consumer rights protection, the rule of law, control of corruption, voice and accountability, provision of information, monopoly control, and quality control. Government inefficiencies in these spheres can lead to significant economic challenges.

The responsible person begins with generalizable ideas and then applies those ideas to concrete situations. When using bottom-up thinking, one first uses situation-specific, intuitive judgements before moving on to more abstract ideas. Interaction and reflective equilibrium are achieved when top-down and bottom-up viewpoints are in sync when localised intuitive assessments are shown to be congruent with generic theoretical frameworks. The cognitive variation arises when thinkers work to settle disagreements between top-down and bottom-up methods, fine-tuning their approaches until they are confident that the best conceivable combinations of principles and situational judgments have been found. In the bottom-up method, however, consumers play a central role in shaping societal norms. In addition, rules started at the individual level trickle down to businesses, which subsequently base their product decisions on what customers desire. Then, when there are more careless decision-makers in a group, the community suffers. Individuals' wasteful behavior can have significant adverse impacts on the natural environment.

Pakistan exhibits fiscal imbalances in terms of consumption, investment, and regulatory frameworks. The pervasive lack of mutual trust has significantly disrupted socioeconomic interactions across all strata: state, organizations, communities, and individuals. As a developing economy with weakened systemic trust, Pakistan's monetary and fiscal proficiency is at risk of being adversely impacted. Additionally,

economic institutions face issues of independence and are susceptible to rent-seeking behaviors. The lack of government expense transparency and a weakened adherence to the rule of law, as indicated by the World Governance Indicators (2018), contribute to reduced trust in the government among individuals. This environment may also contribute to a substantial portion of the economy remaining undocumented resulting in a loss of government revenues.

The world is currently at a pivotal moment, grappling with a unique convergence of crises: the ongoing COVID-19 impacts, the existential threat of climate change, and persistent conflicts. Two contrasting future scenarios emerge: one envisions economic stability, equitable wealth distribution, poverty reduction, responsible resource management, and climate action. The other scenario foresees heightened uncertainty, inequality, poverty, and distress exacerbated by health crises, climate shifts, and conflicts. Navigating these challenges requires innovative technology-driven solutions. Governments can catalyze collaboration through intergovernmental and industry dialogues, while communities and local governments must unite to protect livelihoods in both urban and rural settings. Promoting dialogue among conflicting communities is crucial.

Chapter 7

Conclusion

In the ever-evolving landscape of societal dynamics and consumer behavior, the culmination of this study sheds light on a path forward towards a more responsible and sustainable future. Through an intricate journey of exploration and analysis, this thesis has delved into the complex interplay between individual values, social learning, and consumption choices. The journey began with an introduction that set the stage for the inquiry, elucidating the significance of the research question and objectives within the broader context. As the chapters unfolded, each layer of understanding was meticulously revealed. The literature review chapter unveiled the historical evolution of economic thought and the intertwining of rationality and emotions in decision-making. The subsequent chapters were built upon this foundation, establishing theoretical frameworks that intricately intertwined social learning, value-based choices, and consumption patterns. The constructed models not only illuminated the underlying mechanisms of consumption decisions but also navigated the diverse landscapes of social influence, highlighting the potential for both positive and detrimental impacts.

The empirical exploration provided empirical grounding to the theoretical constructs, shedding light on the intricate connection between individual values and responsible consumption choices. The examination of the interplay between thrift, self-control, and delayed gratification underscored the role of early value inculcation in shaping responsible behavior. The algebraic framework introduced in Chapter 6 synthesized the intricate tapestry of insights garnered throughout the study. It not only encapsulated the essence of responsible consumption and production but also paved the way for policy implications and potential pathways for governments, corporations, and individuals to collaboratively steer society toward sustainable outcomes.

In the contemporary landscape, individuals possess access to an unprecedented wealth of information, facilitated by technological progress, the internet, and social media. This accessibility enables informed decision-making through rational analysis and evaluation. Global connectivity fosters interactions, idea exchange, and cross-

cultural learning, enhancing knowledge and decision-making. Technology also empowers access to educational resources for developing critical thinking skills and informed choices. Studying social learning's influence on consumption and production choices aids responsible decision-making and environmental impact awareness. Recognizing information's role in shaping resource value encourages disseminating accurate data for rational choices. Emphasizing diverse, independent, decentralized decision-making minimizes persuasion bias and irresponsibility. A rational society, valuing individual and collective rationality, strives for sustainability, considering economic, social, and environmental aspects in choices.

Integrating hearing, sight, and intellect enables a comprehensive grasp of choices and their repercussions. For instance, when contemplating a purchase, hearing aids in gathering opinions, sight aids in feature and price comparisons, and intellect aids in decision analysis aligned with values. Embracing diverse viewpoints broadens perspectives, fostering responsible choices considering environmental impact. Furthermore, it mitigates persuasion bias and stubbornness, enhancing informed consumption and production decisions. When more individuals opt for wise choices, diminishing the influence of the most dominant figures in a group or society, positive environmental effects can occur. This cultivates rational and responsible consumption and production across society. Conversely, a homogenous, centralized society fosters persuasion bias, stubbornness, and imprudent attitudes, culminating in wasteful spending and environmental harm. Thus, nurturing responsibility across individuals, groups, corporations, and states is crucial. The learning curve is gradual when reasoning guides responsible consumption. However, collective wisdom forms as more individuals adopt such choices, paving the way for sustainability and enhanced quality of life. Attaining complete societal wisdom necessitates ongoing education, awareness, and commitment from all members.

Our findings further suggest that elevating reasoning over emotions enhances informed and rational decision-making. Emotions can cloud judgment, prompting impulsive choices misaligned with long-term interests. Utilizing critical thinking enables objective evaluation of information, systematic pros-and-cons assessment, and evidence-based decisions. Such an approach yields optimal outcomes for individuals and society. Moreover, in cases where emotions may result in harmful or biased actions,

relying on reasoning and rationality fosters fairness and equity. Relying on others' opinions rather than reasoning can introduce biases and heuristics, fostering irrational choices. Neglecting efficient use of sight, hearing, and intellect may result in vital information oversight for rational decisions. When excessive or inadequate consumption becomes prevalent, equilibrium aligns with less wise decision-makers, potentially undermining sustainability efforts.

People derive pleasure and satisfaction from the actual consumption of goods and services and the anticipation of consuming them, especially in online shopping. The anticipation of a future state of enjoyment can affect people's current happiness and well-being. However, this anticipation can also be influenced by external factors such as the behavior of friends, neighbours, and social media platforms, which can lead to unrealistic expectations and over-optimism.To reduce the adverse effects of over-optimism[73] caused by anticipation utility, educating people on the potential biases and limitations of their expectations is essential. Achieving this involves awareness initiatives promoting critical thinking and rational choices based on thorough analysis. Individuals can prioritize their goals and resist external influences. Realistic expectations, avoiding comparisons, and fostering positive outlooks through mindfulness, gratitude, and self-reflection bolster contentment. Companies and platforms can contribute by sharing accurate product/service information, including drawbacks, minimizing expectation-reality disparity. Thus, individuals can make informed, responsible decisions, fostering responsible consumption.

Social influence can drive overconsumption due to factors like conspicuous consumption, social comparison, herding behavior, and information gaps. However, this mechanism can be harnessed positively for sustainable consumption shifts. Fostering sustainable norms, offering accurate impact information, and promoting autonomous choices aligned with values are vital. Public figures—experts, celebrities, athletes—raising awareness of excessive consumption's repercussions is crucial.

[73] Consider the example of someone who is saving up to buy a new car. They have been browsing online and in-person, looking at different models, features, and prices, and have finally settled on a particular car that they want to buy. In the meantime, they are experiencing anticipation utility - they are excited about the prospect of owning a new car and imagine how happy and satisfied they will be once they have it. However, if they start seeing advertisements or social media posts about newer or more expensive cars, or if their friends and neighbors start showing off their own new cars, they may start to feel less satisfied with their own choice and experience a decrease in anticipation utility. This can lead to disappointment and regret, even though they were initially happy with their decision.

Leveraging social influence positively involves shaping norms, education, peer pressure, campaigns, and community action. Collaboration empowers individuals to create a sustainable, socially responsible society. While individuals impact change, governmental, corporate, and media involvement is crucial in addressing environmental challenges. A holistic approach ensures a more sustainable future.

Values are influenced by societal norms and leaders, shaping behaviors and choices. Parents play a pivotal role in teaching thrift, self-control, and delayed gratification, fostering responsible decisions in children. Learning delayed gratification helps develop self-control and responsible behaviors. This practice promotes happiness, as those who control impulses achieve long-term goals, leading to satisfaction. Practicing virtue is a collective endeavor involving families, communities, and institutions, shaping character and responsible choices. Our families, our communities, and our religious institutions all play a role in shaping our character.Houses of worship play a crucial role in modern society, serving as community hubs that foster unity and cohesion. These spaces can also promote responsible consumption and sustainable practices through education and collaboration. Representatives from the State, corporation, group, and individual can all come together at these places to share their knowledge and expertise on environmental issues and promote responsible consumption. Leveraging religious settings for education on responsible consumption, climate change, and other social and economic debates can effectively reach a substantial portion of the global population. Discussing these topics within places of worship not only informs but also reinforces the importance of responsible choices, facilitating lasting behavior change.

Climate change and overconsumption have spurred various stakeholders, including governments, corporations, activists, scientists, and individuals, to seek ways to mitigate their environmental impact. Achieving sustainable futures necessitates collaboration among all parties involved – governments, producers, and consumers. Despite consumers' heightened awareness and interest in sustainable practices, these intentions[74] don't always lead to corresponding changes in purchasing behavior or

[74] Thirty-three per cent of Europeans, for instance, think that shifting our buying habits is the most effective way to tackle environmental challenges. Twenty-one per cent of those people claims to have engaged in seven or more eco-friendly behaviours in the preceding six months. Ninety-two per cent of Europeans support a worldwide guarantee of fair treatment for garment

lifestyle. This gap between intention and action highlights the need to align behaviors with intentions, fostering a balance between supply and demand. Our socioeconomic interaction framework, as detailed in Chapter 5, depicts the interconnected relationships of individuals, groups, corporations, and the state within an economic system. These entities' interdependence influences resource allocation, as seen in scenarios like community recycling programs. Cooperation among all agents is crucial for effective outcomes. The socioeconomic interaction framework can help bridge the intention-behavior gap, where people's intentions don't match their actions. For instance, if recycling becomes a social norm within a community, individuals, corporations, and the state may align efforts, narrowing the gap between intending to recycle and doing so. The success of such initiatives reinforces the norm and encourages sustained participation.

We have also utilized Reflective equilibrium, which combines top-down and bottom-up approaches[75]and can effectively bridge the intention-behavior gap. By engaging in this process, economic agents can develop a shared commitment to responsible behavior, which can help to bridge the gap. Furthermore, the mutual trust resulting from the reflective equilibrium process can also help reduce this gap. When stakeholders trust each other, they are likelier to act following their stated intentions, as they believe others will act in good faith. Additionally, it can create opportunities for community engagement and cooperation towards a common goal. Responsible consumption and production yield financial benefits for individuals, states, corporations, and groups. For example, Individuals can save costs through energy-efficient choices and reduced waste. States benefit from lower waste management expenses and job growth in the green sector. Corporations save by efficient production and gain consumer support for sustainability. This synergy between responsible practices and financial gains creates a win-win scenario for all stakeholders. Responsible consumption and production practices have a pivotal role in achieving financial stability for both individuals and the state. These practices lead to significant

workers. Despite this, almost half of respondents said that apparel should be offered at the lowest price possible regardless of the circumstances under which it was made.

[75] To encourage individuals to use sustainable transportation options, there can be a combination of top-down and bottom-up approaches. This can include government policies such as investing in public transit infrastructure or implementing policies that promote active transportation, as well as bottom-up approaches such as providing education and training to individuals on how to use sustainable transportation options effectively and supporting community-led initiatives.

cost savings through resource conservation and reduced environmental impact. Notably, energy-efficient infrastructure and streamlined supply chains reduce operational costs for corporations, while governments benefit from lowered expenditures on energy, waste management, and transportation. The resulting financial resilience enables governments to allocate resources to critical areas like healthcare, education, and public services. Encouraging responsible practices through regulations and incentives establishes a sustainable financial trajectory while fostering societal and economic well-being.

In recent times, the narrative surrounding overconsumption has revealed its profound consequences. Zooming out to a societal perspective unveils the cumulative environmental repercussions of individual excesses. A disheartening future of submerged towns, melting ice, dwindling forests, and increased strife emerges. Amid this dual narrative—one of perpetual jubilation and the other of apocalyptic foreboding—lies the need for inclusive tales that cast us as active participants. We require narratives where our choices shape the course of events and our happiness is intrinsically linked to the planet's well-being. A new restaurant opening nearby might elicit joy, or some may remain indifferent. Achieving responsible consumption and production demands recognizing that collective impact stems from individual choices. Paving the way towards a sustainable future necessitates weighing the long-term consequences of our actions. This shift entails heightened awareness of our influence on natural resources, and climate, and the commitment to prioritize the health of both the planet and its inhabitants. Ultimately, fostering responsible consumption and production mandates a paradigm shift in societal values—one that embraces sustainability and acknowledges the intricate interconnectedness of all life on Earth.

As we navigate the complexities of a world grappling with environmental challenges, economic dynamics, and societal aspirations, this study serves as a testament to the power of knowledge, awareness, and collaboration. It resonates with a call to action, imploring us to recognize the potential for change and the role each individual and entity can play in shaping a responsible and harmonious future. The exploration of values, social influence, and responsible consumption patterns has not only enriched academic understanding but also extended an invitation for collective transformation. In an era where the interconnection of global systems calls for mindful

decision-making, this thesis contributes to the growing body of knowledge that seeks to guide us toward a future where values, rationality, and sustainability intertwine seamlessly. As this journey concludes, it leaves us with a profound sense of possibility. Armed with insights, understanding, and a collective commitment to responsible choices, we embark on a new chapter—a chapter where responsible consumption and production choices are not just theoretical constructs, but a lived reality that shapes the world we pass on to future generations.

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