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Unlocking Employment Choices: Navigating Social Norms and Beliefs with Behavioral Game Theory

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***Abstract*— This study investigates the intersection of behavioural game theory and its application in understanding individual behaviour, specifically in the context of societal employment and unemployment dynamics. Traditional economic models presume that people make decisions primarily for rational self-interest. However, behavioural game theory provides a more simplified method by including psychological aspects in the research, such as social conventions and beliefs. This study investigates how societal norms shape the decision-making processes of unemployed individuals and influence their job search techniques through empirical exams and theoretical discussions. This research contributes to a better understanding of the difficulties surrounding unemployment by shedding light on the interplay between behavioural elements and labour market dynamics. By adding psychological aspects that influence choices, behavioural game theory provides a framework for studying decision-making.**

Keywords*— *Behavioural Game Theory, Unemployment, Social beliefs, Social Norms

I. INTRODUCTION

The connection between social norms, individual beliefs, and economic behaviour has fascinated scholars for a long time. This behaviour of unemployed workers is significant in the field of labour economics. In the labour market, people's decisions are influenced by not only economic factors but also social factors. This research paper seeks to explore how behavioural game theory can simplify the complex dynamics behind the choices and actions of unemployed workers.

It is important to first explain the concept of game theory in order to understand the theoretical basis of this research paper. Game theory is a field of study that combines mathematics and economics to help us understand how people make decisions in strategic situations. It gives us a way to analyse and predict the choices that rational decision-makers might make when they interact with each other. The idea is based on the belief that when people have to make choices, they consider how others might react and make decisions based on what they expect others to do. Basically, game theory is all about studying how people make strategic decisions when the outcome of their actions is influenced by what others do.

In this framework, we think of individuals as players in a game, where each player has a variety of strategies they can use. The results of the game are determined by the strategies employed by all players. Game theory has been used in many different ways to understand how people behave in a wide range of situations.

This paper digs into a thorough examination of the behavioural game theory of unemployed and actively seeking employment individuals. It specifically explores how elements other than their individual features influence their decision-making processes. Notably, the study investigates the major influence of societal ideas and norms on these job seekers' decisions. The research attempts to shed light on the complicated interplay between human preferences and societal dynamics in the context of employment-seeking behaviour by analyzing these external elements. This study sheds light on the multifaceted character of unemployed decision-making and adds to a better understanding of the impact that broader social settings play in their choices.

The primary aim of this research paper is twofold:

a) To use behavioural game theory to understand how social norms and beliefs affect the actions of unemployed workers in the job market. We are specifically interested in understanding how these individuals decide whether to accept a job, choose a job, and participate in the labour force, taking into account the opinions and judgements of their friends and acquaintances.

b) To understand how these behavioural patterns affect the length of unemployment, especially long-term unemployment. We want to study how people search for jobs using a game-theoretic approach. Our goal is to gain a better understanding of why some people stay unemployed for a long time even when there are job openings.

II. Literature Review

John [1] states that game theory provides useful insights into the evolution of animal contest behaviour. The first qualitative prediction, that symmetric contests with costly escalation lead to mixed strategies, is difficult to substantiate in field investigations due to the difficulty of separating mixed evolutionarily stable methods from pure conditional strategies. The second prediction, that asymmetry in contests (e.g., ownership) functions as a conventional cue, is well supported by observation. The sharing of intention information during contests, when the role of 'evaluation' techniques is explored, is a critical subject. In summary, game theory provides a framework for understanding the evolution of animal contest behaviour, including mixed tactics in symmetric competitions, traditional cues in asymmetric contests, and the complicated dynamics of information flow during contact. Sarah [2] demonstrates that Game theory is a strategic decision-making technique that provides insights into players' behaviour in a variety of settings. However, practical implementation has lagged behind its potential. While traditional equilibrium analysis assumes rationality, behavioural game theory broadens the framework to include real-world human behaviour. This paper investigates how behavioural game theory, which recognizes constrained rationality, routinely outperforms classical models in a variety of applications. The anticipating of others' behaviours, often endlessly guessing, is central to game theory. It combines theory and experimentation to gain a better understanding of strategic behaviour in economic, political, and social contexts by incorporating concepts from behavioural decision theory. This advancement increases the practical relevance and forecasting accuracy of game theory. Lucas and Taylor [3] present that the goal of energy privatization was to introduce competition into the generation industry, with the expectation that generators will submit facilities to the pool at marginal cost, resulting in lower electricity rates. This study applies game theory to determine if generators prefer to bid at marginal cost or whether greater bids are preferable. The results show that in the absence of contracts, situations may cause bids to exceed marginal cost. With extensive contract coverage, however, a propensity for offers closer to marginal cost emerges. This demonstrates how contractual agreements shape bidding strategies in the power market, determining the potential profitability of various competing approaches. Camerer et al. [4] introduce a parametric approach to enhance the alignment between game theory and empirical data by relaxing rationality assumptions. It describes important game theory components such as games, strategic thinking, consistent beliefs and strategies, strategic foresight, and Bayesian updating of unobservable "types" in repeated games. The suggested four-parameter behavioural paradigm preserves much of the precision of game theory while relaxing limits on mutual consistency and foresight. One parameter measures the extent to which average players iterate their reasoning, producing predictions for one-shot games and acting as the foundation for a repeated game learning theory. The latter incorporates a parameter for response sensitivity and modifies learning parameters to environmental changes, resulting in better predictions than models such as fictional play and reinforcement learning.

Elvik's [5] work provides a comprehensive examination of game-theoretic models aiming to clarify the complex dynamics of road user behaviour within interactions amongst road participants. The study delves into various game-theoretic constructs, such as the general interaction model, which considers road users' responses to safety improvements, vehicle size choice as a prisoner' Dilemma, speed selection as a coordination game, and speed compliance involving drivers and law enforcement. It also investigates merging into traffic from acceleration lanes as a mixed-strategy game, attention allocation in a variety of settings as an evolutionary game, and the decision-making process behind departure timings to avoid

congestion as a form of the prisoner Dilemma. The models demonstrate how informal behaviour norms can emerge and survive among road users, even when they violate formal traffic restrictions. Although game-theoretic models may not be universally applicable to all road interactions, their potential utility goes beyond existing uses, implying a greater scope for their use in understanding road user behaviour. Olof and John [6] describe the time when Maynard Smith and Price developed the concept of an evolutionarily stable strategy (ESS) in game theory in biology 50 years ago. Their goal was to explain why battles between animals of the same species are frequently of the 'limited war' variety, with no significant injuries. They underlined that game theory is a viable alternative to previous theories on group selection, which ethologists used to explain limited aggression. Following that, the ESS concept was applied to a variety of phenomena involving frequency dependence in the evolutionary success of strategies, including sex allocation, different mating types, contest behaviour and signalling, cooperation, and parental care. Both the signalling and cooperation analyses were motivated by analogous challenges in economics and drew a lot of attention in biology. Ali et al. [7] address research that looks into the unexplored world of lane-changing models in the networked environment, leveraging real-time traffic data for sophisticated movements such as lane changes. The novelty of this setting, as well as data paucity, have stymied development. For both traditional and linked contexts, a game theory-based required lane-changing model (AZHW model) is created. The models are calibrated using a bi-level framework employing NGSIM and simulator data and high-quality vehicle trajectory data from the CARRS-Q driving simulator. A thorough examination based on several performance indicators continuously verifies the AZHW models' ability to appropriately capture mandatory lane-changing decisions. A comparison with existing lane-changing models in the literature demonstrates the superiority of the AZHW models. This study contributes to improving lane-changing models and highlights the utility of game theory in handling modern traffic. Bhattacharyya and Bauch [8] present a study that demonstrates the condition during the 2009 H1N1 pandemic, many people chose to "wait and see" rather than be vaccinated right away, hoping for further information on vaccination costs. Rising vaccination rates reduce both the perceived cost of vaccination and the risk of susceptible individuals being infected, introducing two strategic interactions. Using game theory and a disease transmission model, the cumulative impact of these interactions during an outbreak of a novel influenza strain is investigated. The model displays a Nash equilibrium with the "wait and see" approach, in which individuals delaying vaccination rely on early vaccinators to create herd immunity and provide safety data. In contrast to models lacking such adaptive behaviour, this strategic behaviour results in remarkably constant timing of the epidemic peak across varied transmission rates. The model includes both feedback and feed-forward mechanisms, in which early perceived vaccination costs influence subsequent perceptions, hence influencing vaccine coverage.

Panayides et al. [9] present a study in which the development and deployment of a 3-player game theory model incorporating two queueing systems and a service for guiding individuals to them is described. The model's goal is to examine interactions between these players. The first step is to design a queueing system with two consecutive waiting spaces that represent strategic managerial choices in their use. Discrete event simulation and Markov chains are used to accomplish this. Markov chain state probabilities offer queueing model performance measures such as average time and number of people in each room. Following that, a 3-player game theoretic model is introduced, defining it as a 2-player normal-form game impacted by a third player with separate strategies and aims. This model is useful in a variety of contexts, including healthcare, where it captures interactions between the EMS and the Emergency Department (ED). In addition, the paper investigates the impact of time-target measures on patient well-being. Bjornskau [10] demonstrates a study of Norway where cyclists are allowed to ride on pavements, and they frequently share designated urban paths with pedestrians. Crossings between pavement and road are often designated as zebra crossings, with separate laws for cyclists and pedestrians. When facing road traffic, cyclists have three options: yield (a) bike across the zebra crossing, (b) dismount and walk, or (c) force automobiles to yield. Drivers approaching have the option of following the law (x) or yielding (y). Officially, options a/x or c/y are suggested. Using game theory, however, reveals that neither of these solutions is a complete equilibrium; the game-theoretic answer is, surprise, b/y. This indicates that bicycles should ride through zebra crossings, expecting automobiles to yield - which is against traffic rules. This demonstrates game-theoretic

modelling's potential for understanding road user behaviours and providing suggestions for improved traffic safety. Zhu et al. [11] present a study of accidents due to red light violations. This research proposes a two-stage model to evaluate the risk of conflict as a result of such behaviour. The first stage takes a game-theoretic approach, considering pedestrian-driver interaction and incorporating perceptual errors. The theory of expected utility then assesses expectations. Following that, bivariate ordered Probit regression is used to model conflict risk depending on post-encroachment time. Outcomes highlight the characteristics of pedestrians (e.g., gender, walking pace) and vehicles (e.g., speed, distance, type) that influence expectations and risk. Faster male pedestrians, for example, anticipate crossing, whereas vehicle speed coincides with increasing yielding expectations. Male pedestrians suffer a higher risk of serious conflict, while faster walking and vehicle speeds minimize this risk. Insights suggest targeted solutions such as traffic management and enforcement to improve pedestrian safety by reducing red light running. Wang et al. [12] present a study where the main aim is to look into navigation techniques for two connected and autonomous vehicles (CAVs) crossing an unsignalized intersection. CAVs with high intelligence and automation can make independent judgments or cooperate with one another. Non-cooperative behaviour is represented by a Nash game with discrete decision strategies, whereas collaborative control is represented by a cooperative game. The results show that (i) non-cooperative pure-strategy Nash equilibria (NEs) always exist if at least one CAV employs its dominant strategy; (ii) multiple pure-strategy NE solutions may exist, but players reach at most two distinct payoffs at pure-strategy NEs; and (iii) the cooperative game's optimal solution lies within the NE solution set. These findings assist CAV operators and transportation authorities in developing a customized branch & bound algorithm for effective model resolution.

Mulazzani et al. [13] describe that humans play an active role in ecosystem service production and related benefits through management and economic activities. As different human groups have distinct goals, their activities can have an impact on each other's well-being. In ecosystem service modelling, Bayesian networks have gained momentum, with current literature seeking to address strategic behaviour. We show through simulations that incorporating game theory elements into Bayesian networks improves the modelling of stakeholders' strategic behaviour. This method assists in comprehending the reasons behind stakeholders' behaviour and forecasting their behaviour. Furthermore, comparing environmental results under cooperative and strategic behaviours raises questions about humans' role in ecosystem service creation and proper benefit pricing. As a result, this integrated approach sheds light on the complex interplay between human behaviours, environmental services, and social well-being. Howard [14] states that the NSW Government launched a regional governance strategy in 2000 to develop water management plans for the entire state. To make critical decisions on sustainable water consumption, committees comprised of varied stakeholders such as water users, environmentalists, indigenous organizations, and resource agencies were formed. Multiple committees worked concurrently, often focused on specific catchment regions. The effectiveness of these committees is dependent on their institutional arrangements, which include operational norms and procedures. This study applies game theory to understand participant behaviour under varied rule sets using interviews and document analysis. The research emphasizes the relevance of game theory in describing stakeholder behaviour and recommends its use to build robust operational norms for pre-establishing regional governance processes. This method provides insights into how to maximize stakeholder involvement in water resource management. Chou et al.[15] presents a study that examines the strategic interplay between a smaller inventive firm and a larger entrepreneurial counterpart as they seek to form a strategic partnership for commercializing a technical discovery via the prism of behavioural game theory. If the creative corporation has moderate confidence and the entrepreneurial entity is not overconfident, the scenario resembles a stag hunt with two alternative Nash equilibria. However, in addition to procuring critical financing for invention commercialization, both entities must invest substantial and complementary efforts in their collaborative endeavours. Furthermore, by taking a proactive cooperative strategy, the larger entrepreneurial firm can accelerate the commercialization process. This comprises launching financial and entrepreneurial assistance for the smaller innovative organization. This technique not only accelerates the commercialization process but also emphasizes the importance of cooperative dynamics

and complementarity among enterprises in obtaining successful outcomes.

III. PROPOSED METHODOLOGY

Behavioural Game theory reveals how people actually respond in strategic circumstances through experimental settings, therefore tying cognitive processes and procedures to game theory. Traditional game theory is based on the homo economicus, the human being who seeks to maximize his or her profit without regard for others. In this research paper, the main aim is to study the impact of social norms and beliefs on the decision-making of unemployed persons. This research paper tries to understand the behaviour of two unemployed workers using behaviour game theory. For this two cases were taken into consideration i.e., Worker can search for a job immediately (Strategy A) or wait for potentially better opportunities (Strategy B). The second step is Modeling Preferences and Beliefs i.e., both the players have 2 different strategies and they can adopt whichever they want to. For further elaboration of behaviour game theory, four parameters were taken and their weightage is specified and weightage is different for both the workers. Four parameters are Salary, Job Location, Job Availability (Believes that there is a moderate number of available jobs) and Job Competitiveness (Believes that the job market is moderately competitive). The next step is to formulate a Payoff Matrix. A payoff matrix is a table that contains the options that are available to players of a game. It illustrates all of the possible outcomes that are involved in strategic decision-making. The players have to decide how their choice will affect the other player's outcome, as well as taking into account the fact that the other player's choices will affect their own. A payoff matrix is a way to determine all the possible options that each player can choose in order to select the most optimal strategies. On the basis of these parameters, a Payoff matrix is generated :

	Strategy A	Strategy B
Worker A	(0.8, 0.2)	(0.6, 0.4)
Worker B	(0.7, 0.5)	(0.8, 0.3)

Fig 1. Payoff matrix

Here, the values inside the brackets represent the utilities for each worker when choosing Strategy, A or Strategy B, respectively. For example, Worker 1 would get a utility of 0.8 for salary and 0.2 for job location if they apply immediately (Strategy A).

The next step is to incorporate the social norms and beliefs into the job search behaviour of Worker 1 and Worker 2 which will add another layer to their decision-making process. Several norms were taken into consideration for Worker 1 social circle, there is a perception that waiting for better opportunities (Strategy B) might be seen as picky or unwilling to work whereas Worker 2 believes that waiting for better opportunities (Strategy B) is a wise decision, as it increases the chances of getting a job with a higher salary and better location. According to these situations, let's re-evaluate the scenarios based on modified social beliefs and norms. So overall four scenarios were made :

1. **Scenario 1: When both workers apply Immediately**
2. **Scenario 2: When both workers wait for better opportunities**
3. **Scenario 3: Worker 1 applies immediately and Worker 2 waits**
4. **Scenario 4: Worker 2 applies immediately and Worker 1 waits**

With the incorporation of social beliefs and norms, the perceived social approval or disapproval associated with each strategy affects the workers' decisions. In this case, Worker 1 might be more inclined to apply immediately due to the desire for social approval, while Worker 2 might lean towards waiting for better opportunities based on the perceived social wisdom of that choice. After the incorporation of social beliefs, norms and the payoff matrix, let's analyse how Worker 1 and Worker 2 might make their decisions and potential outcomes based on different scenarios. In this research paper, both worker's decision-making dynamics are guided by a critical insight: applying for jobs right away (Strategy A) regularly yields a higher potential payout than waiting for their applications (Strategy B). Importantly, regardless of the strategy selected by the other worker in this circumstance, this positive outcome remains unchanged. This means that both personnel have a vested interest in taking immediate action. They are naturally drawn to the strategy of looking for employment as soon as possible because it promises a

better outcome for each worker individually. This realization emphasizes the significant effect of self-interest as well as the inherent logic behind decision-making in this simplified paradigm.

The following stage in this analysis is to find the joint strategies, which are combinations of strategies chosen by both employees and to evaluate the related payoffs for each of these scenarios. This crucial stage of the study will help us to understand how both workers' decisions interact and affect their collective outcomes, shedding light on the dynamics of their choices in this model. The estimated payoffs for each scenario offer insightful information about the effects of choosing different joint strategies. They help us comprehend more deeply how the choices made by employees and their possible rewards vary depending on the particular activities they take and the influence of social ideas and norms shown in the variables of social approval and social disapproval. These payoffs act as a quantitative representation of the trade-offs and advantages associated with each strategy, allowing us to determine which methods best correspond with the goals and values of the workers and which may need to be reevaluated. The next and final step in this study is decision-making and Nash equilibrium.

The Nash equilibrium is a decision-making theorem within game theory that states a player can achieve the desired outcome by not deviating from their initial strategy. In the Nash equilibrium, each player's strategy is optimal when considering the decisions of other players. Every player wins because everyone gets the outcome that they desire. To find the Nash equilibrium in a game, one would have to model out each of the possible scenarios to determine the results and then choose what the optimal strategy would be. In a two-person game, this would take into consideration the possible strategies that both players could choose. If neither player changes their strategy knowing all of the information, a Nash equilibrium has occurred. Nash equilibrium is important because it helps a player in determining the best payoff in a situation based on not only their decisions but also on other circumstances as well. In this study also Nash equilibrium is calculated to make the optimal decision based on the parameters and preferences of individual workers.

Although the Nash equilibrium doesn't always lead to the most optimal outcome. It just means that an individual chooses the best strategy based on the information they have. In this research paper while calculating the Nash equilibrium to make an optimal decision. It has been observed that scenario 3 i.e., when worker 1 applies immediately and worker 2 waits gives the best payoff and both worker comes with their respective final decisions. In this instance, Worker 1 exhibits a proactive mindset by applying for positions right away, demonstrating a readiness to seize opportunities when they become available without delay. Worker 2 chose to wait for better opportunities, demonstrating a deliberate approach to job searching that places quality over quantity. The early application made by Worker 1 increases the likelihood that she will find employment fast, possibly resulting in earlier financial stability. While waiting, worker 2 may discover superior employment offers that fit their long-term objectives and preferences better. In the end, this situation shows how crucial it is to strike a balance while making decisions about your job hunt. While taking action right away can lead to quick results, strategically delaying action can lead to more rewarding and fulfilling opportunities, demonstrating the variety of techniques people can use to accomplish their professional goals.

IV. RESULTS

In this research paper, the result of a behavioural game theory experiment involving two workers has been studied. This study focussed on investigating strategic decision-making in games, with a particular emphasis on social beliefs and norms and the impact of information sharing. In this study, numerous decision-making scenarios were examined, and the research's findings show that Scenario 3 stood out as the most favourable course of action for job seekers. In this case, worker 1 elected to apply for jobs right away, exhibiting a proactive attitude to the job search process, whereas worker 2 opted to wait for better possibilities, exhibiting a more strategic and patient approach. The decision-making of the workers is also affected by the social norms and beliefs that are incorporated in this finding. These results highlight the value of taking into account a fair approach to decision-making during the job search. While taking fast action can result in swift outcomes, strategically waiting can lead to more satisfying and fulfilling chances, illustrating the variety of techniques people can use to accomplish their professional goals.

V. CONCLUSION

Behavioural game theory and the actions of unemployed workers have been examined in depth in this study, which has shed light on the considerable influence of societal norms and individual convictions. It has been shown that when it comes to choosing a job, people don't just base their choices on economic rationale, but also on how society views other professions. Nash equilibria and Sensitivity analysis are two examples of mathematical and economic concepts that have greatly aided the understanding of the causes of persistent unemployment for some people. Additionally, this study emphasizes the importance of societal norms and peer comparisons while highlighting the complexity of human decision-making in economic circumstances. To better understand the behaviour of the labour market by adding these findings into economic models. In summary, this study sets the way for a more comprehensive strategy to address the problems associated with unemployment in contemporary society.

This study emphasizes how important it is to consider social aspects when examining labour market dynamics. By incorporating this data into their models and plans, economists and policymakers might learn important lessons. This may ultimately aid them in creating policies that will lower unemployment and increase labour market effectiveness.

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