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The Strategy of the Islamic Azad University in Relation to its Available Academic Fields and their Alignment with the Labor Market (Game Theory Approach)

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Abstract:
In our country, a large number of university graduates are unable to leverage their higher education and enter the workforce. It is evident that at present, there is no coherent qualitative and quantitative linkage between the educational system and the labor market, leading to resource wastage. Furthermore, there exists a fundamental ambiguity regarding the rationale for the significant upward trend in higher education within the country compared to global and regional trends. In this article, game theory and static games with complete information have been employed to model the interaction between the Azad university and students. To this end, the strategies of the university and students have been examined within four distinct scenarios, and their outcomes have been analyzed to ascertain the equilibrium in the aforementioned games. The results demonstrate that, for students, the strategy of pursuing studies in a field with available job opportunities that align with the student's preferences dominates over other strategies (irrespective of the choices made by other players) in all games. As for the Azad university, the strategy of offering a field with existing job prospects or establishing new ones supersedes alternative strategies, and the absence of such fields is pervasive within the university. Ultimately, it is recommended that the Azad university continues its approach if there are fields with available job opportunities, and if there are no practical fields that correspond to the region, necessary policies should be implemented to create these opportunities.

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1. Introduction

Today, with the entry of many world countries into post-industrial or knowledge-based economies, there is an increasing need for highly skilled labor. Consequently, most high-income and socially prestigious occupations now require university education (Safari et al., 2019). The primary mission of universities worldwide is to provide up-to-date knowledge to contribute to the development of society at regional, national, international, and global levels in economic, social, cultural, and political dimensions. Achieving this mission is only possible through the development of human, social, and cultural capacities, and the use of innovative and entrepreneurial initiatives (Entezari, 2017). The expansion of higher education from the perspective of human capital theory and within the framework of functionalist theories believes that human capital needed for economic development is provided through higher education. This implies that the demand for university graduates in a country increases as the need for skilled labor grows (Windolf, 1997). On the other hand, employers expect that by hiring university-educated individuals, they can improve their own activities, productivity, and ultimately achieve higher profits. Therefore, given the above conditions, it seems that the university has clear responsibilities towards its economic environment, and its ultimate goal is to educate graduates who are expected to play a role in enhancing the economic prosperity of their country in the future (Stevenson et al., 2009).

Supervision and guidance of skilled human resources for growth and development corresponding to the goals of the country's higher education system is one of the primary goals of higher education institutions (Sharifzadeh, 2018). A necessary condition for the development of the higher education system is a thorough examination of the past and current situation, as well as an investigation of the influential factors and forces in the university development process. This understanding is crucial for the university as it leads to the direction of the university and also fosters creativity and innovation in university activities (Samari et al., 2012). On the other hand, in our country, a large number of university graduates are unable to utilize their university education and enter the job market. It is evident that there is currently no logical qualitative and quantitative connection between the education system and the labor market in the country (especially in border areas), and this mismatch will be a catalyst for resource wastage (Entezarian and Tahmasebi, 2011). In recent decades, based on the country's macro policies, significant resources have been allocated to the education of human resources, especially at the higher and postgraduate levels. However, evidence indicates that most of these resources and efforts have been devoted to the quantitative expansion of the mentioned education, and have not been widely used to meet the country's needs. This is clearly evident in the growing unemployment rates (especially among postgraduate graduates), which is the most important reason for this high unemployment rate among university

graduates in the economic literature, referred to as the education-job mismatch, which occurs in both horizontal and vertical forms. Vertical mismatch indicates a situation where the level of education of the workforce is either higher or lower than the society's needs, and horizontal mismatch pertains to a situation where the type of education of the workforce does not align or correspond with the society's needs (Dartomi et al., 2016).

Ultimately, it should be noted that although higher education impart a high percentage of the necessary skills to students, the appropriate and calculated combination of these skills requires comprehensive studies on the interaction of education with professions and labor market needs. Therefore, the issue of graduates' employment, especially considering the determining role of educated human factor in technology development and its strategic implications, appears to be very important. Moreover, given the emergence and spread of the brain drain phenomenon, failure to pay sufficient attention to this important issue will cause irreparable damages and losses to the country. This phenomenon has raised various questions, some questioning the higher education system, some attributing the lack of national-level coordination and some others to the relationship between industry and university as the main factor of this crisis, where any delay in this matter will widen the gap between us and other countries. The prerequisite for tackling this issue is the presence or establishment of highly practical fields in universities relevant to each region and providing employment opportunities for these students after completion of their studies, which could pave the way for the development and prosperity of various regions based on their capacities, and also help solve many socio-economic problems.

The employment of university graduates is closely linked to the higher education system and the labor market, making it one of the most critical indicators of university effectiveness. Therefore, in discussions of human resources, it is crucial to establish a match between the needs of the job market and the educational offerings while also improving the recruitment methods for graduates (Hinman & Linfer, 2010). Furthermore, it is possible to leverage the existing capacities of universities and develop new fields that could create opportunities for unique regional employment through entrepreneurship, even in areas where jobs may be scarce, such as technical, agricultural, horticultural, and other domains, by phasing out less practical disciplines.

Now, let's proceed to review a few studies in the area of research:

Bagherinejad (2010) study titled "The Entrepreneurial University as a Ground for Job Creation, Technological Development, and Welfare" examined the interaction of educational and research activities with university-surrounding organizations. This research presented a framework for expanding entrepreneurial activities within the university environment for technology development, employment, and welfare, by articulating the new roles of

entrepreneurs in university environments, describing changes in knowledge production styles and global experiences, entrepreneurial models in university environments, and effective mechanisms. The results demonstrated that if the mentioned approach is well-organized and effective, it leads to job creation, increased efficiency of human and non-human resources, and ultimately welfare.

Samari et al. (2013), in their study on the influential factors in the process of "university development" in Iranian government universities, selected a sample of 16 key experts (7 individuals) and university presidents (9 individuals) with management and scholarly experience in this area. The results indicated that factors such as political considerations in the local and regional environment, responsiveness to the needs and demands of society, government considerations, decision-making processes in university development, interaction of higher education macro plans and socio-economic systems, management and leadership, government financial credits and resources, and university autonomy are the factors with the highest frequency and greater importance in university development compared to other factors.

Safari et al. (2010) investigated the topic of higher education and employment in universities after the Islamic Revolution. Their results indicated that there is no consistent trend in the relationship between the increasing trend of university graduates and their employment rate in different years after the Islamic Revolution, especially when considering gender differences. While in the period 1365-75, the human capital theory may explain the expansion of higher education in our country, in the years after 1375, especially regarding women, this theory fails to provide a convincing answer to the question of why the expansion of higher education is not correlated with the employment of university graduates, highlighting a different logic for male and female university graduates.

Mohammad Shafie et al. (2019) investigated the improvement of teaching quality in technical and vocational higher education with an emphasis on the approach of employment generation and skill-oriented. They analyzed a sample of 230 individuals through semi-structured interviews and researcher-made questionnaires. The research results in the qualitative section suggest that using teaching methods based on experiential activities, applying theoretical knowledge in practice, teaching in real work environments, utilizing group-based learning, employing experienced workshop technicians, and interactive communication between teachers and students are solutions that can effectively impact teaching quality. Furthermore, the quantitative results demonstrate that the outlined strategies are effective in enhancing teaching quality.

In a research conducted by Harvey (2010), the focus was on examining the connection between the empowerment of university graduates and their employment status. The findings revealed that continuous concentration on educational skills is essential for the empowerment of these graduates, instead of relying on episodic training in individual processes.

Shah et al. (2010) study in Pakistan revealed that instability, inadequate oversight, insufficient budget, and a lack of communication between education and industry, along with the absence of a modern and practical national plan, are among the most critical factors influencing technical and vocational education. Moreover, Li and et al (2014) investigated the correlation between higher education and employment, as well as strategies for enhancing them. Their findings showed that as the per-student expenditure and the faculty-to-student ratio in universities rise, the prospects for post-graduation employment increase, and vice versa.

Idris and Mubodai (2018) delved into the challenges of empowering youth in vocational and technical education for the labor market. They found that while technical and vocational curricula are rich in content, their implementation falls short in contributing to national objectives. Piero and Sergio (2020) conducted a study in Italy to explore the role of various types of educational mismatch in explaining the labor market transition of workers with secondary and tertiary education. Their findings revealed that among workers with tertiary education, the risk due to educational mismatch is significant, while for workers with secondary education, over-education is the primary risk factor for unemployment. Therefore, both demand-side and supply-side policies are necessary for companies to better utilize this human capital.

Alanazi and Benlaria (2023) investigated the correlation between different factors influencing employment outcomes among JUAF university graduates to address the gap between higher education outcomes and labor market needs by 2030. Their results demonstrated that enhancing job services, counseling, skills, competencies, and curriculum design could improve graduates' employability.

After careful examination, it is evident that the studies conducted have predominantly utilized descriptive and econometric methodologies. Until now, the interaction between the government and students has not been explored through the lens of game theory. Thus, this constitutes the innovative and pioneering aspect of this research.

This article is organized into four sections. After the introduction, the second section presents game theory. The third section provides modeling of theThis article is structured in 4 sections. After the introduction, the second section presents game theory. The third section provides modeling of games in two sub-sections, and the final fourth section concludes and offers recommendations.

1. Game Theory

Game theory delves into the analysis of strategic decision-making among economic actors by employing mathematical models. By considering the preferences of these actors, game theory aims to understand how their mutual choices culminate in outcomes that need not align with the individual

preferences. This field seeks to model the mathematical underpinnings of strategic situations, characterized by conflicts of interest, involving rational and intelligent entities (Owen, 2012). Due to the potentially diverse repercussions of games, it is unfeasible to make conclusive estimations about their final outcomes. To predict the results of a game, it becomes essential to employ methods and algorithms that condense the entire range of potential consequences into a more restricted set known as equilibrium outcomes (Shy, 1996).

One of the most common types of games is static games with complete information, in which players simultaneously choose their strategies and each player is fully aware of the payoffs of the other players in the game. The fundamental assumption in these games is that each party to the game is unaware of the choice of the opponent and, in fact, it is as if they simultaneously make their own choice. Another fundamental assumption in these games is that all consequences of the game are known to all players, meaning that each player knows what payoff they and their opponent will receive for each of their choices. Many games in the real world are of the type static games. The equilibrium resulting from these types of games is called Nash equilibrium and is defined as follows:

$$u_i(\sigma_i, \sigma_{-i}) \geq u_i(\sigma_i', \sigma_{-i})$$

The strategy of a player is to have the best response to the performance chosen by other rivals (Maskin et al., 1999).

In the context of game theory, when the aim is to provide a unique solution for a game, that solution will be the Nash equilibrium. Certain games exhibit the presence and adoption of strategies and decisions that have a comparative advantage over other strategies, as the resulting outcome and benefit from these strategies outweigh those of others. In such scenarios, a player, irrespective of the opponent's chosen strategy, will consistently opt for the same desirable strategy. Such strategies are termed dominant strategies for the player and dominated strategies for the other players. The selection of a dominant strategy by the players in the game is evident, thus the set of strategies formed by dominant strategies is known as the dominant strategy equilibrium (Osborne, 1998).

2. Modeling Game

Before delving into game modeling in various scenarios, it is important to note that generally, students prioritize having a job (after graduating), studying in their preferred field, and ultimately enrolling in available programs at their local university. As for the Azad university, the priorities are having practical fields (that lead to employment) available at the university, creating them if they don't exist, and ultimately, not having practical fields at the university and not creating them. In scenario 1, it is assumed that only the Azad university exists in the region, while in scenario 2, it is assumed that both the Azad university and the

government university exist in the region. Now, we will proceed to address game modeling in these different scenarios.

2.1. Government 1: The game between Azad University and students in the situation where there is only Azad University in the region

In this scenario, it is assumed that only the Azad university exists in the region. For the first case, students will have four options: 1) studying in a practical field that has job opportunities and the student is interested in that field (A). 2) studying in a practical field that has job opportunities but the student is not interested in that field (B). 3) studying in a field that has no job opportunities but the student is interested in that field (C). 4) studying in a field that has no job opportunities and the student is not interested in that field (D).

In the next stage, the Azad university can have three options: 1) the presence of a field at the university (α). 2) Establishing a new field at the university (β). 3) Non-existence of a field at the university (γ). Hence, the game matrix is presented in Table 1 below:

Table 1: A game between the university and the students in the conditions of the desired field in the university

		University					
		α		β		γ	
A	**Student**	**12**	**8**	**11**	**6**	**10**	**-4**
B		**9**	**7**	**8**	**5**	**7**	**-3**
C		**6**	**4**	**5**	**2**	**4**	**-2**
D		**3**	**3**	**2**	**1**	**1**	**-1**

In the matrix form of the game between the Azad University and the students, in order to obtain the consequences of each strategy, the priorities of the players need to be ranked.

The initial condition is that students major in a field for which there is either a job available or they can become entrepreneurs after graduation, and it is their preferred field of study and available in the same region. In this scenario, students achieve the highest payoff indicated by the number 12. Additionally, in this case, the payoff for the university will be 8 because this situation creates both employment and students are studying in their preferred major and also in the same region, leading to reduced costs.

The second scenario describes a potential future where the university creates a new program to meet the demands of the job market and student interests. The payoff for the students and university is influenced by factors such as job prospects, student preferences, regional appeal, and the costs associated with establishing the new program. The decision-making process in this scenario involves considering the incentive structures for both students and the university, incorporating elements from game theory and economics to analyze the potential

outcomes and trade-offs. This highlights the complex interplay between student demand, labor market dynamics, and institutional decision-making in the context of educational program development.

In Cell 3, students in a field for which there is a job and they are interested, but the field is not available in the university in the same region, choose to study. In this case, the consequence for students is indicated by the number 10. Also, in this case, the consequence for the university will be -4 because in this situation, the university has been unsuccessful in attracting students and the students prioritize the job over their interest and staying in their own region. This is the worst possible outcome for the university.

The fourth scenario involves students pursuing a field for which there are post-graduation employment opportunities, even if they lack interest in that particular field of study at the university in their region. In this scenario, the students' outcome is denoted by the number 9. Additionally, in this case, the university's outcome will be 7, given that this scenario creates employment and results in students studying in the same region (thus reducing costs). The university's outcome is lower compared to the first scenario due to students not pursuing studies in their preferred field, which diminishes the attractiveness of the university (as lack of interest in the field could have consequences for the university).

In the fifth scenario, students in a field for which there is little interest after graduation but with existing job opportunities are supposed to pursue studies in that field in the near future as the university plans to establish a new program. In this case, the outcome for the students is indicated as 8. Furthermore, the outcome for the university in this case will be 5, as the university creates employment and students continue their education in the same area, leading to cost reduction. However, the cost of establishing a new program for the university entails additional expenses, resulting in lower outcomes compared to the previous scenario.

The sixth cell is characterized by students majoring in fields with post-graduation employment prospects but choosing to pursue studies without genuine interest, particularly when the field is not offered by local universities. Under these conditions, the students' payoff is denoted by the numerical value of 7. Moreover, the university's payoff in this scenario amounts to -3, given that it has avoided incurring expenses (owing to the absence of the relevant field in the region) and has not facilitated job creation.

In the seventh cell, students in a field that has no job prospects after graduation, but is of interest to them, may choose to study in a program offered by a university in the same region. This scenario results in an outcome value of 6 for the students. Additionally, in this scenario, the payoff for the university is 4 because the program exists in the university but has no job prospects.

In the context of economic decision-making and game theory, this scenario exemplifies the concept of payoff matrices and strategic decision-making, where both students and the university are rational decision-makers aiming to maximize their outcomes. The students are choosing to pursue a field of interest despite the lack of immediate job prospects, while the university is making strategic decisions about creating new programs while considering the financial implications. This situation highlights the interplay of individual preferences, institutional strategies, and future payoffs in the decision-making process.

The ninth cell is structured to accommodate students who choose to pursue a field of study that does not offer employment prospects post-graduation but aligns with their passion and is not available at any local universities. In this scenario, the anticipated outcomes for the students are denoted by the value 4. Furthermore, the expected impact on the university in this case will be negative, at -2, given that although the students are passionate about their chosen field, there are no employment opportunities for them, and the university faces financial strain.

In the tenth scenario, the cell is characterized by students enrolling in a discipline with no post-graduation career prospects or personal interest, provided that the same discipline exists at a university within the same region. Under these conditions, the outcome for students is assigned a value of 3. Additionally, the outcome for the university is also 3 in this instance, as despite overlooking the employment and interest of the students, the university avoids incurring additional financial burden due to the availability of the discipline in the region.

In the given scenario, the eleventh cell of the model represents a dynamic decision-making situation where rational individuals are faced with choosing the best course of action considering the payoffs associated with different strategies. This highlights the intersection of game theory and educational economics, shedding light on the motivations and incentives of students and universities in response to market dynamics and the emergence of new academic fields.

The twelfth cell is defined as follows: students in a field that has no job prospects or interest post-graduation, and if that field is not available in the local university, study there. In this scenario, the outcome for the students is denoted by the number 1. This situation represents the worst outcome for the students because there are no job prospects in that field, they have no interest in it, and the field is not available in their local area. In this case, the outcome for the government will be equal to 1- as well. The university's higher outcome in this situation compared to the three previous scenarios is due to the fact that for fields with no job prospects or interest, no costs have been incurred and no additional financial burden has been assumed.

The strategies for both players can be defined as follows:

$$S_{\text{Students}} = \{A, B, C, D\}$$

$S_{\text{University}} = \{\alpha, \beta, \gamma\}$

The combination of strategies employed by two players is as follows:

$S = S_{\text{Students}} * S_{\text{University}}$

$= \{(A,\alpha),(A,\beta),(A,\gamma),(B,\alpha),(B,\beta),(B,\gamma),(C,\alpha),(C,\beta),(C,\gamma),(D,\alpha),(D,\beta),(D,\gamma)\}$

The implications of the game for students (S) and universities (U) can be logically ranked as follows:

$U_S(A,\alpha) = 12$, $U_U(A,\alpha) = 8$

$U_S(A,\beta) = 11$, $U_U(A,\beta) = 6$

$U_S(A,\gamma) = 10$, $U_U(A,\gamma) = -4$

$U_S(B,\alpha) = 9$, $U_U(B,\alpha) = 7$

$U_S(B,\beta) = 8$, $U_U(B,\beta) = 5$

$U_S(B,\gamma) = 7$, $U_U(B,\gamma) = -3$

$U_S(C,\alpha) = 6$, $U_U(C,\alpha) = 4$

$U_S(C,\beta) = 5$, $U_U(C,\beta) = 2$

$U_S(C,\gamma) = 4$, $U_U(C,\gamma) = -2$

$U_S(D,\alpha) = 3$, $U_U(D,\alpha) = 3$

$U_S(D,\beta) = 2$, $U_U(D,\beta) = 1$

$U_S(D,\gamma) = 1$, $U_U(D,\gamma) = -1$

In the following table (Table 2), the Nash equilibrium is illustrated:

Table 2: Solving the game matrix between the university and the students and finding the Nash equilibrium in the conditions of the existence of the desired field in the university

		University					
		α		β		γ	
A	**Student**	**12**	**8**	**11**	**6**	**10**	**-4**
B		**9**	**7**	**8**	**5**	**7**	**-3**
C		**6**	**4**	**5**	**2**	**4**	**-2**
D		**3**	**3**	**2**	**1**	**1**	**-1**

In this game for the university, the strategy of having a major in the university prevails over both strategies of creating a major in the university and not having a major in the university. This means that regardless of the other player's (students') choice, they always select it because it yields a higher outcome. For the students, the strategy of studying in a major where there is both job opportunities and personal interest dominates over other strategies (regardless of the other player's choice). Therefore, in any case, they choose it and achieve a higher outcome.

Based on the results obtained, which indicate a non-cooperative game equilibrium, it is observed that a Nash equilibrium occurs at (A, α), representing the same Nash equilibrium. As previously mentioned, in a Nash equilibrium, deviation from the corresponding outcome does not benefit any player, under the

assumption that other players do not deviate from the strategy played in the Nash outcome (Salimian & Shahbazi, 2017).

Government 1-1: The game between the university and the students in terms of creating the desired field in the university (there is only an Azad university in the region).

In this context, we consider a scenario in which the desired academic program (leading to employment or entrepreneurship) is not available at the university, and the university is presented with two strategic options. Similar to the previous assumption, let us consider that students will have four choices: 1) pursuing studies in a practical field with existing job prospects and aligned with the student's interests (A). 2) enrolling in a practical field with job opportunities but lacking the student's interest (B). 3) opting for a field without immediate job prospects but reflecting the student's interest (C), and 4) choosing a field without job prospects and also lacking the student's interest (D).

In the next stage, the university can have two choices: creating a new (costly) field at the university (β), or having an absence of majors in the university (γ).

Therefore, the game matrix will be in the form of the following table (Table 3):

Table 3: A game between the university and the students in the absence of the desired field in the university

		University			
		β		γ	
A	Student	**8**	**4**	**7**	**-4**
B		**6**	**3**	**5**	**-3**
C		**4**	**2**	**3**	**-2**
D		**2**	**1**	**1**	**-1**

We will now delve into the details of the game matrix and provide explanations for the specific cells. The implications of the university's strategy in the scenario of not creating a new academic field, similar to the previous game matrix, are as follows. The optimal outcome for the university within this matrix is located in the first cell, as it involves the creation of jobs through the establishment of a new academic field, allowing students to pursue their interests while studying in their local region (resulting in cost reduction). Building upon the insights from the previous game matrix, this outcome is also the most favorable for the students. Additionally, the strategies of the players, their combinations, and their rankings are left unaddressed for the sake of avoiding redundancy and will be exclusively covered through the resolution of the game matrix in the subsequent section (Table 4).

Table 4: Solving the game between the university and the students in the absence of the desired field in the university

		University			
		β		γ	
A	**Student**	**8**	**4**	**7**	**-4**
B		**6**	**3**	**5**	**-3**
C		**4**	**2**	**3**	**-2**
D		**2**	**1**	**1**	**-1**

In this game, the strategy of creating a field at the university prevails over not having a field at the university. This means that the university always chooses to have a field, regardless of the choices of other players (students), because it yields a better outcome. Additionally, for students, the strategy of studying in a field that offers job prospects and aligns with their interests prevails over other strategies, irrespective of the choices made by others. Therefore, in any case, selecting this option leads to better results.

Based on the results obtained, which indicate a Nash equilibrium, it is evident that the equilibrium outcome occurs at (A,β), representing the Nash equilibrium. As previously noted, in a Nash equilibrium, no player gains from deviating from the respective outcome, given that other players do not deviate from the strategy played in the Nash equilibrium.

Government 2: The game between Azad universities and students in the presence of both government and Azad universities in the region

Here, it is assumed that there are both Azad and government universities in the region. As in the previous cases, students will have four options: 1) study in an applied field for which there is a job and the student's interest in the field (A). 2) Studying in an applied field for which there is a job and the student's lack of interest in the field (B). 3) Studying in a field for which there is no job, but the field of interest of the student (C) and 4) Studying in a field for which there is no job and also the student's lack of interest in the field (D).

In the next stage, Azad University can have five choices and their priority is as follows: 1) The absence of a field with a job in the government university of the region and the presence of this field in the Azad University of the region (α). 2) Absence of a field with a job in the government university of the region and the creation of this field in the Azad University of the region (β). 3) The existence of a field in both universities (γ). 4) The existence of a field with a job in the government university of the region and the establishment of this field in the Azad University of the region (θ). 3) Absence of majors in both universities (students tend to go to other universities) (φ).

Therefore, the game matrix will be in the form of the following table (Table 5):

Table 5: A game between the university and the students in the conditions of the desired field in both universities

		University									
		α		β		γ		θ		φ	
Student	A	18	20	17	19	20	16	19	15	16	4
	B	13	18	12	17	15	14	14	13	11	3
	C	8	12	7	11	10	8	9	7	6	2
	D	3	10	2	9	5	6	4	5	1	1

Similar to the previous game-theoretic matrix model involving the Azad University and students, in order to ascertain the outcomes of each strategy, it is imperative to prioritize and rank the players' preferences.

Here, for brevity's sake, the strategies of the players are explained generally. The best outcome for students is when there is a relevant job field available in both universities and the student is interested in that field. This outcome is represented as 20 for students. The next best outcome for students is in the case that the desired field (for which there is a job) exists in the government university of the region (resulting in cost reduction) and is going to be created in the Azad University. This result is represented as 19 for students. The subsequent best result, indicated by the number 18, occurs when the desired field exists in the regional Azad university and does not exist in the regional government university. The following best result, indicated by the number 17, arises when the desired field is going to be created in the Azad university of the region and does not exist in the government university of the region. The next best outcome, indicated by the number 16, is when the desired field is not available in the Azad and government university of the region, and the student chooses other universities outside of their region. Students prefer this strategy over the next strategies because, as mentioned, they prefer having a job related to their interest and studying in their area. Other matrix numbers are prioritized in a similar manner. In short, Azad University's priorities are as follows:

1. The desired field (leading to students' employment) exists in Azad University and does not exist in government universities.
2. The desired field does not exist in the government university, and the Azad University creates it.
3. The desired field exists in both universities.
4. The desired field should exist in the government university, and that field should be created in the Azad University.
5. Finally, there is no field with a job in any of the two government and Azad universities of the region, and the students of universities in other regions should choose for the desired field. In the following table (Table 6), the balance of the game is shown.

Table 6: Solving the matrix of the game between the university and the students and finding the Nash equilibrium of the game under the conditions of the presence of the desired field in both universities

		University									
		α		β		γ		θ		φ	
Student	A	**18**	**20**	**17**	19	**20**	16	**19**	15	**16**	4
	B	13	**18**	12	17	15	14	14	13	11	3
	C	8	**12**	7	11	10	8	9	7	6	2
	D	3	**10**	2	9	5	6	4	5	1	1

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In this case, for the university, the strategy of not offering a major with job opportunities at the government university of the region, while having a major at the Azad University of the region, prevails over other strategies. Regardless of the choice of the other player (students), the university always chooses this strategy because it results in a higher status for the university. For students, the strategy of studying in a major relevant to job opportunities and aligning with their interests prevails over other strategies, regardless of the choices of other players. Therefore, in any case, choosing this strategy leads to better results.

Based on the results obtained, which indicate the existence of a Nash equilibrium, it is observed that a Nash equilibrium occurs at (A, α), which is indeed the Nash equilibrium. As previously mentioned, in a Nash equilibrium, no player has an incentive to deviate from the corresponding outcome, assuming that other players do not deviate from the strategy played in the Nash outcome (Salimian and Shahbazi, 2017).

Government 1-2: The game between Azad University and students in terms of creating the desired field in the university (both types of universities exist in the region).

Section 1.1 is also about finding the best strategy (Nash equilibrium) for the Azad university to create a new field in which job opportunities exist. The first assumption is that the desired field (which creates jobs or entrepreneurship) does not currently exist at the university, and that the university has four possible strategies to consider. First, we assume that students will have four options:

1) Study in an applied field where there are job opportunities and the student is interested in the field (Option A).

2) Study in an applied field where there are job opportunities but the student is not interested in the field (Option B).

3) Study in fields where there are no job opportunities, but that are of interest to the student (Option C).

4) Study in fields where there are no job opportunities and the student is also not interested in the field (Option D).

In the next stage, the university can have four choices: The absence of a field with a job in the government university of the region and the creation of this field in the Azad University of the region (α). The existence of the field in both universities (β). Absence of majors in both universities (students tend to go to other universities) (γ). The presence of a field with a job in the government university and the absence of the desired field in the Azad University (θ). Therefore, the game matrix will be presented in Table 7.

Table 7: A game between the university and the students in the conditions of the desired field in both universities

		University							
		α		β		γ		θ	
Student	A	14	16	16	15	10	-4	15	-8
	B	11	14	13	13	9	-3	12	-7
	C	6	12	8	11	2	-2	7	-6
	D	3	10	5	9	1	-1	4	-5

Here, for brevity's sake, the general strategies of the players are explained. The best outcome for students occurs when there is a job available in the desired field at both universities and the student is interested. This outcome is represented by the number 16. The next best outcome for the student is when the desired field (for which there is a job) exists in the government university of the region (resulting in cost reduction) and does not exist in the Azad University, represented by the number 15. The third best outcome, indicated by the number 14, occurs when the desired field does not exist in the government university of the region and is supposed to be created in the Azad university of the region. Other matrix numbers are prioritized in a similar manner. In summary, Azad University's priorities are that the desired field does not exist in the government university and Azad University will create it; the desired field exists in both universities; the desired field does not exist in any of the government and Azad universities of the region, leading students to choose universities in other regions for the desired field; and finally, the presence of the desired field in the government university and the absence of the field in the Azad university. The game matrix solution will be presented in Table 8.

Table 8: Solving the game between the university and the students in the conditions of the desired field in both universities

		University							
		α		β		γ		θ	
Student	A	**14**	16	**16**	15	**10**	-4	**15**	-8
	B	11	**14**	13	13	9	-3	12	-7
	C	6	**12**	8	11	2	-2	7	-6
	D	3	**10**	5	9	1	-1	4	-5

In this case, for the university, the strategy of not having a field with a job in the government university of the region and creating in the Azad university of the region dominate to other strategies and regardless of the choice of other players (students), the university always select this strategy because it gives her a higher result. For students, the strategy of studying in a field with job prospects and aligning with their personal interests prevails over other strategies, regardless of the choices made by other players. Therefore, in any scenario, choosing this strategy results in a more favorable outcome.

Based on the obtained results, the Nash equilibrium of the game occurs when the equilibrium outcome is (A, α), making it the Nash equilibrium of the game. As mentioned earlier, in the Nash equilibrium, deviating from the relevant outcome is not in the interest of any player, assuming that other players do not deviate from the strategy played in the Nash outcome.

3. Results and Recommendations

Due to the formation and expansion of the brain drain phenomenon, if not enough attention is paid to this important issue, irreparable damage will be caused to the country. This phenomenon has raised various questions; some question the higher education system, some consider the lack of coordinated planning at the national level, and others view the relationship between the industry and the university as the main cause of this crisis. Furthermore, this issue will result in a greater gap and distance between us and other countries. This article discussed the modeling of the game between Azad University and students using game theory and presenting a series of static games between players regarding the possible strategies of each party. The strategies of the university and students in different situations were considered for this purpose, and the results were analyzed. Finally, the Nash equilibrium of the two games was discussed.

The results showed that in all games for students, the strategy of studying in a field with job prospects and the student's interest prevailed over other strategies, regardless of the choice of the other player. For Azad University, in Game 1, the strategy of offering a field with job prospects prevailed over both the strategies of creating a field and not having a field in the university. In game 1 and the second case, for the university, the strategy of creating a field in the university prevailed over the strategy of not having a field. In game 2, for the university, the strategy of not offering a major with job prospects at the regional government university and the presence of a major in the regional Azad university prevailed over other strategies, and in game 2 and the second case, for the university, the strategy of not offering a major with job prospects at the regional government university and creating a field at Azad University of the region prevailed over other strategies. Finally, it is suggested that Azad University adopt relevant policies to create new majors that align with the labor market and the status of the majors.

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استراتژی دانشگاه آزاد اسلامی در رابطه با رشته‌های تحصیلی موجود و انطباق آن‌ها با بازار کار (رویکرد نظریه بازی‌ها)

چکیده:

در کشور ما عده بسیار زیادی از فارغ‌التحصیلان دانشگاهی قادر نیستند که از آموخته‌های دانشگاهی خود بهره برده و وارد بازار کار شوند. آنچه که مسلم است در حال حاضر بین نظام آموزشی و بازار کار کشور از لحاظ کیفی و کمی ارتباط منطقی وجود نداشته و این امر زمینه‌ساز اتلاف منابع خواهد بود. از سوی دیگر این ابهام اساسی وجود دارد که اساساً چه منطقی می‌تواند روند به شدت افزایشی آموزش عالی در کشور را نسبت به جهان و منطقه توجیه کند. در این مقاله با استفاده از نظریه بازی‌ها و بکارگیری بازی‌های ایستا با اطلاعات کامل به مدل‌سازی بازی بین دانشگاه آزاد و دانشجویان پرداخته شده است. لذا برای این منظور استراتژی‌های دانشگاه و دانشجویان در چهار حالت مختلف در نظر گرفته شده و به تحلیل پیامدها و نهایتاً یافتن تعادل نش در بازی‌های مطرح شده پرداخته شده است. نتایج نشان داد که در تمامی بازی‌ها برای دانشجویان استراتژی تحصیل در رشته‌ای که برای آن شغل وجود دارد و مورد علاقه دانشجو بر سایر استراتژی‌ها (بدون توجه به انتخاب بازیکن دیگر) غالب است. برای دانشگاه آزاد نیز استراتژی وجود رشته‌ای (یا ایجاد آن) که برای آن شغل وجود دارد بر سایر استراتژی‌ها ایجاد رشته و عدم وجود رشته در دانشگاه غالب است. نهایتاً به دانشگاه آزاد پیشنهاد می‌شود که در صورت وجود رشته‌ای که برای آن شغل وجود دارد به رویکرد خود ادامه داده و در صورت عدم وجود رشته کاربردی متناسب با منطقه، سیاست‌های لازم در جهت ایجاد این رشته‌ها را اتخاذ نماید.

کلمات کلیدی: نظریه بازی‌ها، بازی‌های ایستا با اطلاعات کامل، دانشگاه آزاد، دانشجویان، تعادل نش.