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GAME THEORY IN POLITICAL SCIENCE. THE PLAYFUL NATURE OF THE CULTURE OF POWER

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Introduction The implementation of game theory in political science makes it possible to systematize the past and present in the course of history and to project the strategic future of the culture of power. At the same time, expanding the boundaries of cognition of political roles, game theory occupies a special place in the development of models in the process of institutional foundations and institutions of the culture of power.

It is customary to study the political processes of transforming societies mainly with the help of game theory. For a better and more comprehensive analysis, it is believed to analyze the policy actors' behavior from the point of view of outcome management as well as the purpose of manipulating reality and also the tasks of subordinating the activities of existing socio-political institutions to group interests.

Summarizing the crises of political, and geopolitical developments, uncertainties and turbulences existing in post soviet transformable societies, there arose a question: Would it be preferable to overestimate the role of rational choice institutionalism as a game, especially formed by the applicability of rational choice theory. Indeed, they play an important role in modern political science, but there is no unified approach to them [Akhremenko, et al., 2015, 39-59]. Hence, it is necessary to re-evaluate the classical approaches to the correlation of politics and law in order to understand how the legal regulation of the most controversial issues affects the change in the balance of forces involved in the exercise of power in transforming societies. Historically, legal regulation is fundamentally contraindicated in any shadow form of transformation of state power. Politics identifies and strengthens the ways of social development, and the law determines, giving them a universal and legal appearance. Such a coincidence of the regulatory possibilities of politics and law makes it possible to free the culture of exercising power from internal antipsychotics, focusing on social coexistence [Margaryan, 2019, 203,204]. All this keeps public policy not only from the cruel extremes of the political

game but also forms the strategic thinking of the political elite in relation to radical changes. It is precisely the absence of such thinking that, marginalizing the socio-political order of countries in a democratic transition (including Armenia), and being tempted by the radical transformation of linear liberalization, the political elite ignores its function of social responsibility like Pierre Menard, the hero of Jorge Luis Borges, manages to rewrite Cervantes' novel "Don Quixote". Being the greatest expert on the development of game logic in the culture of exercising power through a literary text, Borges shows that Pierre Menard, however, makes a lot of effort, but after finishing his essay, discovers that the new novel he created copies the original one. However, 300 years have passed since the publication of Don Quixote, and the same words, images, language thinking and strategy of exercising power are perceived differently, therefore, the new novel could not be equivalent: people have changed over time, and with them the perception of the game politics of the culture of power has changed either.

Literature review Politics as a game in political science was first applied by representatives of the behaviorist school of the University of Chicago by Charles Merriam. H. Lassel also has a great contribution to this theory to political science, and in his work, written jointly with Kaplan, documented: "The only thing inherent in all types of power is the influence on politics: How the effect occurs and on what grounds it is implemented is transient, but has a specific content"[Lassel, 1962, 92]. At the same time by emphasizing the importance of having a power market H. Laswell justified the approach that everything that happens in the market is a game, the player wins with the rules, and the desire to win with a violation of the rules is punishable. According to behaviorists, the political market presupposes the motive and purpose of the actions of political actors, the speed of transformation, as well as a certain level of cognition and knowledge. With this approach, Downs, having developed the theory of Hottelling of economic variables of candidates' behavior to study the situation in political science, especially crises and risks that arose during elections, justified its application in political science [Downs, 1957, 25]**.**

Methodology In the early 1960s, the American political scientist K. Deutsch developed the Globus format for modelling political activity, within the framework of which the provisions of cybernetic modeling of social communications and mobility in the political development and cultural textual variables of a given society were determined [Deutsch, 2008]. Since then, within the framework of the Globus format, a civilizational approach has been laid as the basis for modelling qualitative indicators of the culture of exercising power, with an emphasis on causal, behavioural, structural and functional methods of studying innovations that came to Armenia during the transformations. Nevertheless, the analysis of the political processes of post-Soviet transformable societies was carried out within the framework of game theories and rational

choice. But it should be noted that, having freed itself from the status of "pseudoscience" of Soviet times, the new developing political science not only failed to respond to the tough challenges of radical changes of the first line (linear liberalization, systemic privatization, individualism, rejection of traditional social institutions, mechanical westernization) that arose in transformed societies but also showed a very primitive approach to them. Moreover, as a result of the crises of political development, the political elite has not developed a strategy to combat widespread poverty, exclusion, marginalization, corruption and emigration. Nevertheless, the variables of the game approach have continued to be implemented on the basis of rational choice theory, namely: Since the days of Downs [Downs, 1957, 28] until now, it has played a central role in political research, but is subjected to a sharp [Bojme, 1999, 502]. Especially, the approach is being revised, according to which the complexity of the political system and processes is due to individual sellers and buyers pursuing their unfounded interests. organizations (parties) consisting of groups of "selfish individuals" who pursue a strategy of obtaining maximum utility. However, it is precisely this practice that underlies the culture of exercising power by transforming societies, according to which each player has an alternative strategy that he uses in order to maximize profits. The individualistic approach in close combination of modern political science with political economy develops the idea of microfoundations "(MIFs)". This plays a crucial role in Acemoglu and J. Robinson's modelling methodology. With the latter's approach, according to game theory, people not only build their behavior according to their preferences but also interact with each other [Acemoglu, et al., 2009, 434]. The choice of strategy by the players takes into account the response to the possible actions of the counterparty. The player, from the point of view of other players, chooses the best (most useful) answer from the best. This is an objective approach to game theory, but, on the other hand, the unified use of game theory and the rational choice paradigm is formal. Meanwhile, it is necessary that the study of models should be aimed at the application of analytical solutions (analytical tractability). The above allows us to conclude that the joint use of game theory and the paradigm of rational choice has great alternative possibilities for modeling both individual (group) and social value systems. Since 1995, summing up the consequences of the mechanical transformation of political elites in a constant crisis of the legitimacy of power, the UN has developed the principles of "Good Governance" for "running / reaching" countries (in order to improve the quality of democratization of the public policy system), distinguishing, but not contrasting the concepts of "Management" and "Governance". Thus, the concept of "Governance" is a set of pre-developed policies and procedures of responsibility and experience, which is used to develop ways to ensure strategic directions, achieve goals, accountable use of available data and risk management. The concept of "management" is the process of market planning, regulation, management, and control of various resources (human, financial, physical and informa-

tional) of any organization to achieve its goals. If the concept of "Governance" includes the purposeful execution of correctly designed actions, then "management" is the correct execution of correctly designed actions [Margaryan, 2014].

Therefore, it should be taken into account that the study and use of game theory in modern developments of political science, due to its multilevel argumentation, definitely cannot be used unless its priority strategic importance for this "running / reaching" country is clarified. Nevertheless, the priority of the applicability of game theory from the point of view of the culture of the exercise of power and the functioning of political institutions in modernizing societies in the "Running/reaching" model should be justified by the following proposals.

1. Is it possible to consider political power and the culture of exercising power only at the micro level? Is it possible to ignore the functional disorders that have arisen as a result of the linear liberalization of social and political institutional structures in the axiology of public interest and coexistence, as well as the selective quality of the political elite?
2. Is it possible to generalize the patterns of functioning of a democratic political system by multiple strategic interactions of individuals (mainly old and new leaders), ignoring the process of transition from democratic to consolidation?
3. Is it possible to create endogenous institutions? Overcoming (artificially created) communication gaps between the interests of society and the challenges of consolidation.
4. Is it possible to simulate changes in people's behavior with the help of a rapid change of socio-political institutions and at the same time create a "strategy framework saturated with various psychological combinations" of regulating behaviour on demand and by consciousness [Page, 2020, 72]?

Analysis *How to use game theory in analyzing changes in the culture of implementing power*

According to the expert, from the point of view of legislation, marriages with minors are pedophilia, for which management and monitoring of results are imprisoned. At the same time, analyzing the political processes of developing countries, it should be stated that according to game theory, a conflict situation (especially an interethnic one that prevents turbulence) cannot be imagined and solved only by mathematical modelling. Game theory is designed to develop in its mathematical, logical, cultural, and geopolitical texts of hermeneutics proposals for the choice of rational actions for recurring conflict situations. With the help of game theory, it is possible to really predict the presence of random variables in the behaviour of conflicting parties or the possibility of a quick change of sides [Diksit, et al., 2019, 19]. Hence, D. Rosenau proposed a new approach, according to which the internal and foreign policy of the state is correctly

based on an objective change in the value indicators of international relations in the first place, but the state is obliged to harmoniously analyze its policy based on public interests. It was obvious from D. Rosenau's approach that in the same political situation, the objects of research can be large social groups, political institutions, political communications and politicians [Tsigankov, 2023, 214]. In fact, considering political games as a variable of the culture of exercising power, it should be taken into account. Firstly, the purpose and motives of political activity may coincide, ensuring the viability of the goal. However, achieving goals does not imply that staying in the game should be an end in itself on the part of politicians. Secondly, in political activity, it is wrong to accept victory and defeat as absolute. Thirdly, a politician, accepting the game as a component of the political process, rationalizes all levels of his activity. In the conditions of the absolutization of these characteristics, such closely interrelated technologies as manipulation, bluff, and post-truth are effectively used in political games. It is only with their systematic use that competitive, capable, skillful politicians fighting for their own country can artificially mislead their opponents and influence them. Thanks to these influences, they either pull the opponent to their side, or oust him from the political struggle, or they themselves submit to the opposite side, becoming an expression of their interests. That is why manipulation, bluff, and post-truth occupy a special place in the culture of exercising power. Nevertheless, in this complex process, bluff as a theatrical form of manifestation of the illusion of reality is crucial, because with its help, the opponent, from whom they intend to take away power, initiative, success, through the dissemination of incorrect information, falls into apologetic shock. A classic example in this sense, fascist Germany concluded a non-aggression treaty with the USSR, despite the fact that it had already developed Barbarossa's plan - to seize the country with lightning speed [Neumann, et al., 1970, 210]. According to von Neumann, it is impossible to win without bluffing: in order to achieve the goal, it is necessary to increase the bet several times and convince the opponent that you have excellent cards and it is impractical to raise the bet. In fact, in zero-sum games (a strategic equivalent game with a constant result), it is advisable to enter information about the next step so that the opponent does not guess and cannot respond with an optimal strategy. A mixed strategy involves choosing a pure strategy using random numbers (randomization).

In this context, real information is often manipulated in applicability. Let's say the enemy accidentally receives (gets) information about your capabilities. For example, Israel signaled a special dose of information (signaling), that is, missed the opportunity to have an atomic bomb. In political science, Jeffrey Banks specifically addressed such an analysis of games: an informed player receiving information from player B develops three strategies: believe in this information, disbelieve and try to distinguish real from false, and ignore or suppress the information. It is advisable to trust the information of player A, which is manifested in his actions, but player A, seeing the intellectual capabi-

lities of another, can imitate his own actions for the purpose of deception [Banks, 1991]. The military calls it reconnaissance in combat, partisans" "checking roads" and detecting suspicious recruits. Obviously, all these structural elements are effective if the political bluff is structured logically, and politicians can skillfully use only the information they have and, like a magician, influence the psychology of the opponent (audience). From this point of view, we dare to assert that manipulation, bluff, and post-truth are components of professional modelling of the culture of exercising power. Consequently, politicians, in order to prevent or create chaos, influence various instincts of the masses, while simultaneously developing a policy of self - defense, pleasure, national security, social responsibility, the collapse of old stereotypes, the spread of fake news, the creation of new myths, the multidimensional value of perception and thinking. Consequently, political games conducted within the framework of the culture of exercising power and power relations are mostly hidden or theatrical. Moreover, the accumulated experience of history shows that the political game is unique in that the players mostly do not play by the rules. Speaking about the game development of the culture of the game and the exercise of power, Haising clearly shows his fertility in the emergence of all major forms of life, justifying the idea of the irrefutable existence of the game: "All abstract ideas can be refuted: law, beauty, Truth, Kindness, spirit, God. Is it possible to deny the seriousness. The game cannot be played". At the same time, from the point of view of the meaning of the game, Haising writes."... a game is a voluntary action or activity that takes place within the boundaries established in time and space, voluntarily accepted, but absolutely mandatory according to the rules, having its own purpose in itself, accompanied by a sense of tension and joy and awareness of the "other", different from "ordinary life" [Haising, 2007, 46]. Defining the political game in this context as a set of modeled actions, relations, information and communication technologies, one should not forget about political turbulence in the global and global space, which by its nature is a kind of game to influence the culture of the exercise of power of various states and the identity of members of society. It is in this regard that politics is unpredictable, because in such a political game, shadow phenomena (internal and external political ties, influences) are behind the institutional players -the leader and his team. Summarizing the above, we can conclude that the analysis of the culture of the exercise of power in political processes with the help of game theory is a strategic problem for each country, as such, for decision-making with its help, those essential factors are identified that, influencing the processes, allow analyzing and evaluating the culture of power in authenticity, generalizing the adopted decision strategy for goal and result management. Therefore, it should be considered that with the help of decision-making processes, it is possible to determine the axiogenicity of the purposeful activity of the culture of exercising power by the governing class. It's obvious when former leaders in their memoirs, books, and interviews reveal brackets, highlighting the following main elements

of the game of political decision-making: political tricks, intrigues, behind-the-scenes conspiracies, deals, personnel, agenda, text manipulation. Hence, the importance of mechanisms for the development of a culture of exercising power through political play is unique in that the rules established at a certain time are transformed depending on the situation and the skills of the player. History shows that predictable and unpredictable transformations change all the rules of the game. It is in this sense that politics is an unpredictable game [Toynbee, 1979]. For this purpose, the culture of implementing power, including a set of actions, relationships, communication, and information technologies, is designed by institutional modeling of the value system of political players to either ensure normal development, or unpredictably change reality, or increase or decrease uncertainty and turbulence. Various models are used in the study of political processes caused by actors of the culture of exercising power (social groups, socio-political institutions, political leaders, the ruling class, humanists and inhumane individuals with unpredictable behavior). In this area, it is noteworthy that Tsch. Deleuze and F. Guatari, analyzing a person with revolutionary unfounded behavior opposing capitalist society, put forward the concept of "schizophrenia" in his theory of rhizomes. Hence, those people who not only refuse to bring their desires in line with the requirements of society and standard norms, showing unreasonable ambitions, begin to illusorily change reality with their sick imagination and "create reality" and convince of the need for this reality. According to Foucault, the non-conformity of the madman's discourse to the form of discourse accepted by the majority is being qualified as discourse) and it says: "..it lacks specific limitations, in other words, there is no clear assessment of reality, but the meaning of the word is healthier seems sounder than that of sane people." To represent the society of his dreams, Cervantes, as the main player, creates the image of a mad knight-Don Quixote, from whose mouth he voices his highest ideals, boundless devotion to humanity. His ridiculous behaviour, full of adventures, makes no sense, but it is not at all doubtful of the purity of his idea. "... and according to the words of the stranger, and by the image of the merchants guessed that he had gone mad", but well, "madness overcomes all arguments".

Why is it necessary to interpret the culture of power implementation with the help of the development of game theory?

The first reason is the necessity to predict the events that took place in political life because the unofficial network information flows (latent) have increased in parallel with the official information. Game theory helps to reveal the content of such informal information (latent) flows. Secondly, formal models have another advantage: their system functions can operate at a higher level and complexity. Naturally, today there is no unified concept in game theory to correspond to all types of games. This is primarily due to the fact that the official description of the game is only a general example des-

cription of the extremely complex real processes that take place during the game. For example, the exchange of information between politicians, possible agreements between them, and independent actions of politicians according to the framework of their awareness. Of course, we cannot exclude the fact of illogical behavior (steps) of the players or the case of emergency situations: it is impossible to make predictions in the current conditions of uncertainty and turbulence.

New approaches to modelling global political games are built on the natural results of previous experience. For example, American authors V. Jones and S. Rozin, considering different options of global strategies, justified *maximalist; minimalistic and reformative* projects.

Maximalists, taking the ideas of the American Constitution as a starting point, propose to have a world federal government, which implies a limitation of the sovereignty of national governments in developing areas. According to some authors, the maximal government program is not only difficult to implement, but it is also undesirable because it is possible for the player to overestimate his own opportunities (or take advantage of others' interests) and thereby it may increase uncertainties.

Minimalists believe that the pursuit of world order requires the centralization of world power to prevent war. Centralization of power is proposed only to implement the idea of global security. V. Jones and S. Rosen criticizing "minimalist" proposals, state that the world order should be based on universal values acceptable to all states, and not imposed, even through military operations, on the imposition of a new situation.

The main idea of the *reformers* is globalism. In this context, it was designed to enhance the role of the United Nations as the center of the idea of international planning. There are five main problems, the solution of which must be transferred to the global level: *ecology, ensuring the standard of living, preventing unemployment both globally and locally, urbanization, and world hunger.*

These problems, according to the "reformers", can be solved through comprehensive planning, infrastructure development and the distribution of global production. Summarizing the analysis of different global strategies, V. Jones and S. Rozin concluded that rational choice in decision-making with the parallel use of game theory can be both positive and negative for players only if the Pareto principle (80/20 Rule) is applied. According to V. Jones and S. Rozin, it will be possible to achieve 80% of the result in each situation and promote rational choice while following Pareto principles:

1. Make a to-do list having the exact right order of steps.

2. Identify one to three most important tasks, and focus on it.

3. Find out the patterns of self-efficacy

4. *Focus on the tasks that have priority.* This is the most important rule to avoid procrastination.

5. Move on to the secondary tasks after completing the primary ones.

Secondary tasks can be done in several approaches or combined into one complete task and completed using, for example, *The Pomodoro Technique.* The definition of the following two concepts about possible outcomes is interesting:

A "weak Pareto optimum", is a possible outcome that cannot improve all players at once, even by coordinating their moves.

A "strong Pareto optimum" is an outcome that cannot be improved for one player without making another player worse off.

However, decisions are often made under conditions of uncertainty, when it is impossible to unequivocally assess the probabilities of potential outcomes.

This occurs when the situation is multi-layer turbulent. Nevertheless, the possibility of changing the strategy at every moment, discovering new solutions, and predicting the behavior of competitors gives the possibility to make a rational decision. For a comprehensive study of this complex and open-layered process, theorists propose the most famous puzzle, the Prisoner's Dilemma, where players, with their cooperative and non-cooperative approaches, rationalize reality according to Nash equilibrium and Pareto-optimality. This game is based on the story of two suspected (pay attention: suspected) criminals. This two-dimensional matrix presents four possible punishment options: an optimal agreement option (both remain silent), a *"balanced"* conflict option (both confess), and a win-lose option where one suspect gains at the expense of the other (one confesses, and the other remains silent).

Usually, the strategy of confessing prevails for both suspects, resulting in a conflict resolution (both are being sentenced to five years in prison). The challenge here is to ensure that the players resist the temptation to confess (which both suffer as a result) and remain silent in order to achieve a mutually rational outcome. To do this, in addition to trusting each other, they need to critically assess their own desires. Therefore, the researchers of "Prisoner's Dilemma" posed the following question: What are the consequences of the alternative strategies that players use in repeated games or interactions? Axelrod gave the answer to the question during his systematic study of the prisoner's reciprocal move dilemma game.

According to Axelrod, although there is no optimal strategy, “an eye for an eye” approach (exact repetition of steps) is a long-term strategy for players, which basically gives the player the following two signals: We are here for a stable business relationship, but we are not going to concede our interests and sovereignty. Therefore, with the help

of game matrices with different states of equilibrium (with the option of minimizing/maximizing damages) in different situations, in addition to the structure of the situation, researchers have introduced a number of variables to indicate the choice influence of this or that behaviour: the number and value of game moves, communication opportunities, the choice of the opposite side, responding, sequential or simultaneous steps and assessment of the situation.

It is obvious that public interest Games enable the Government to participate in guided decision-making process under *conditions of uncertainty and controversy.* The uncertainty in this case may be caused not only by the opponents' efforts to hide their own actions but also by the informational incompleteness of the analysis of political situations. It should be noted that at a certain level of the dynamic political economy operating in the structure of the game theory, the problems of the standard approach have been overcome, first of all, when the transition of the system's dynamic behavior was described in particular.

Giving the theoretical and applied justification of this approach within the framework of this hypothesis D. Acemoglu separates the dependence of dynamic linkage from the time dimension.

The approach requires a reasoned response. The hypothesis should justify whether it is possible to implement a political process through purely game thinking or whether it is also necessary to ensure the quality of the activities of general political institutions.

This approach implies not only substantiating the exclusivity of game theory equipped with mathematical formulas but also clarifying the ideological bases of politics and the value system of the culture of exercising power, as well as accounting for constitutional principles and behavioral features.

According to the above mentioned, we should mention the principles of the institutional theory of the game approach (especially rational institutionalism) that institutions as structures that determine the "rules of the game" in their meaning have a concrete manifestation of the strategy of many players. From that point of view, by providing a feedback loop, the change in institutions leads to a change in the behavior of the actors in their own interests and benefits. Therefore, in terms of the culture of exercising power, game theory has a special approach to assessing the quality of institutions. The main idea of that approach is the combination of the *"Nash equilibrium"* and the realistically applied *"Pareto optimality"* (normative, desirable), through which maximum conditions are ensured for the provision of the common good.

According to the rational behavior of the players, the "Nash equilibrium" is a cooperation/non-complementary situation, and the "Pareto-optimal" is the equilibrium of the cooperative behaviors of the two players. Such inconsistency is the result of *"bad"*

functioning institutions. By changing the law, affecting the payoff matrix, we can achieve a change in behavior combining Nash and Pareto-optimal equilibrium. The latter will also be a sample of a *"good/quality"* institution.

Notably, highlighting the use of similar logic the American political scientists Bruce Bueno de Mesquita, Alastair Smith, Randolph M. Siverson, and James D. Morrow in their "The Logic of Political Survival" developed and presented a special theory that suggested a possibility to generalize the operation of political institutions, in other words, the quality of their governance, without originally focusing on democracy or dictatorship. According to the authors, the players responsible for the process of ensuring the quality of management of political institutions were residents - N (residents) - N*, The nominal selectorate, they are registered voters), *selectorate - S, leadership or the leader (L), challengers - C, winning coalition - W,* standards of loyalty (W/S).

Residents are those who operate in one of the polities. Residents are divided into two groups: those who join the selectorate and those who do not.

The commonality of the members of the selectorate is that they have the right of the guaranteed vote by the state during the election of the leader. Still, their main immanence is the opportunity to be included in the winning coalition without using the chance to be a member of the selectorate. Historically, the selectorate generally inc-ludes a small (sometimes even very small) number of residents. Residents not included in the structure of the selectorate are separated from it by various criteria (origin, religion, professional affiliation, wealth, gender, etc.). A key concept in the theory of selection is the winning coalition, which "... has diverse selectorate groups, which are present both in the political power and in other segments of society". The government supports the winning coalition. The dimensions of the winning coalition differ depending on the characteristics of the time and the country.

With these considerations, the authors emphasized that the Communist Party of Vietnam needs 3% of the population and only a fraction of that 3% for the leaders to maintain their power. By specifically highlighting the *rigged electoral system* (the existence of which was particularly evident in the USSR), the authors are sure that they are creating artificial qualities, especially by encouraging formal membership in the political parties supporting these systems. In this context, the loyalty standard is the ratio between the winning coalition and the selectorate and it has decisive importance for the political figure. To understand this, first of all, it's necessary to determine what it means to lead (leadership, leader) and who a candidate is.

A leader is anyone who has a winning plan and implements a certain policy, having the power *to collect taxes and spend public funds,* using it both for the general welfare and for private purposes.

Candidates are all those individuals or groups of individuals who try to replace the incumbent leader by proposing new mechanisms for *collecting taxes and spending public funds*, hoping to take over the government.

The goal of change is to increase the quality of government. It can only be achieved if the ratio of loyalty standards (W/S) is maintained, excluding the reduction of the space of W and the mechanical expansion of S. If the space of the coalition is small and the electorate is large, then we are dealing with authoritarian rule and formal elections. In fact, with the help of the development of a fundamentally new categorical apparatus, the authors studied and analyzed the influence of institutions on the selection institutions, the decisions made by the selected leader, as well as the decision-making as a game process within the framework of the *"selectorate theory"*. In this context, theorists of the *"selectorate theory"* focusing on the desired outcomes for the players, raise an important question: How do the parties make optimal choices, when the possibilities of these choices depend on their awareness, consciousness, as well as "strategies and negotiation practices that lead to a particular outcome". Following this logic, the size (part) of the *selectorate*, that is, the number of actors who influenced or can influence the choice of the leader and the winning coalition, is of decisive importance.

An important component of this scheme is *the culture of implementing the power* of the actors at different levels. It is assumed that they are interested in their own self-realization and hence they improve their efficiency coefficient, *valuing their opportunities to appear in reality and the possibility of staying there long and not having reality and not their possibilities of having reality.*

Only in this case, it is possible to overcome (reduce) the uncertainty, assess the quality of the institution and consider that good/quality institutions are only those institutions whose actors, under the conditions of rational behavior, not only contribute the most to the provision of public good but also those that provide public good rationally in the face of large deviations in behavior. This characteristic phenomenon of the implementation of power was called *a scale for measuring stability to fluctuations.*

It should be taken into account that the scale of measuring stability to fluctuations characterizes the extent to which institutions are able to maintain efficiency in the conditions of "bad" political actors. In this context, it concludes, “We emphasize that W is not typical for democracy. Rather, W is one of the important characteristics of governance that helps distinguish democratic governance from other forms of governance, especially those characterized by small winning coalitions interacting with the electorate in various ways. Note that the most serious discrepancy between the victorious coalition and democracy is more than visible in comparison with the partial autocratic system. The approach is justified by giving the example of *Singapore* done by *Lee Kuan Yew* (1965 – 2000), when W’s index scored 0.75 (coalition index) and only 0.40 scored on

Democracy. And when *Chiang Kai-shek* (1949-1972) was ruling authority in *Taiwan*, these indicators respectively were 0, 25 and 0,10.

Considering the dominance of the first over the second, we can conclude that public interests and interests in government programs dominate the Democracy index, which contributes to the implementation of a more responsible and less corrupt policy. In this context, the opposition of authoritarianism and democracy is excluded in the leadership interpretation mechanisms. Moreover, it is an overarching problem to present the concrete functioning of institutions by placing the *stable constant* at their base (public interest, security, coexistence) determining the maximum limit of admissibility of inequality. For this purpose, it is necessary to emphasize the targeted redistribution of resources of the social system as a result not only of political competition but also of the socio-political responsibility of different actors.

Further clarifying the developments on the basis of the proposed model, we can assume that the greater the socio-political responsibility of any actor as an investment (compared to the investments of other actors), the greater his probability of receiving public support as a superior resource. The efficiency of the system depends in particular on how the resource is distributed among the relatively efficient actors.

Thus, if one of the actors has a political advantage over the competitor, how much will be the resource received by him over others? In one system, the winner gets everything, or nearly everything, and the loser gets nothing.

In other more egalitarian societies the *"rules of the game"* are made up in a way that the losing candidate receives a significant share of public resources during redistribution. It should be taken into account that political economists characterize such *"redistributive egalitarianism"* as compared to autocracy saturated with formal democracy. Societies with more egalitarian "rules of the game" are less productive than those with inequality, but they also have free competition and greater potential for innovative development.

The approach that reveals the efficiency of the system assumes the following three factors: the quality of productivity of the actors, the functioning institutions (with specified functions in the given case), the actors'' political strategists, and the creation of frameworks for these political strategies (which can sometimes also be called politicians). Institutional characteristics of these persistent factors include limiting inequality by developing targeted redistribution laws of public resources.

Thus, during the distribution of public goods, politicians (compared to others) receive a greater profit than their investments, if in the required period they are able to professionally activate both *manipulation, bluff* and *post-truth technologies,* with the professional modelling of the culture of the exercise of power. In order to justify the

limits of admissibility of this logic, it is necessary to specify *the level of legitimacy of the political-economic space of politicians.* Within the framework of this model, there is a need of political figures (within the framework of certain institutions) who will contribute to the normal modernization of the socio-political system with their activities. Within the framework of what has been said, the more such politicians, the more reliable (quality) the institutions are to fluctuations (instabilities/uncertainties) and they quickly overcome emergency situations.

Highlighting the issue of immunity to fluctuations in the quality of institutions, the order of distribution implies the maximum possible amount of resources given to one politician, which guarantees the relationship between political stability and sustainable development. In this context, the game model will look like this: each of the two actors (players) is obliged to solve a certain optimization problem by combining Nash equilibrium and Pareto optimality. Therefore, emphasizing the thesis based on the reliability of the institutions (in this case, the rules of resource distribution), they get the opportunity to increase the quality of the *functioning/functionalization of the institutions.*

In this model, the distributive law includes the definition of the maximum permissible degree of economic inequality, which determines the value system of the culture of the politician's exercise of power. This raises the question of under what conditions do societies with more egalitarian *"rules of the game"* become more reliable, and under what conditions do they become less reliable? Moreover, if the average economic efficiency of the actors is quite low, then for the normal modernization of that system, it is not enough for the more active actor (politician) to receive more resources than the one with low activity.

It is also necessary for the active politician to realize (focus attention on) his social responsibility function by getting the opportunity to manage the maximum part of the public resources. Therefore, if the criterion of the quality of institutions is the harmonization of political stability and sustainable development, then the quality of the culture of democracy in the implementation of power implies a real and non-game application of social responsibility in favor of public coexistence and democratic consolidation.

Conclusions To summarize:

1. In the structure of political science, it is necessary to carry out socio-political processes with two analyses of the game: situational and strategic. In the first case, the game is a situational action aimed at the reproduction of social experience or the accelerated transformation of the value system of people's behavior. In the second case, there is a special type of strategic activity, aimed at the long-term socialization of a person through cognition and epistemology, as well as the systematic analysis of the links of communicative past-present experience in the structure of the culture of the exercise of power and the development of a strategy for the future.

2. In the process of democratic transition and consolidation in the structure of political science, the mathematical anthropological, sociological, public-political, information-communication, and biopolitical approaches related to the nature of games and their effectiveness are especially important today. In this multidimensionality, the game practice of the culture of exercising power is determined by the analysis of the specifics of the evolutionary development of the given society. The process of introducing the game into public political life not only modernizes its level of civilization but also increases creative possibilities and resistance to external and internal sectional games.

3. The culture of implementation of power including the complex process of socio-political transformations implies public discourse and consolidation of the elite, or vice versa - monologue and the breakdown of social strata.

4. In fact, value-wise, games provide an opportunity to analyze the goal-oriented dynamics of the value-benefit system of actors in political processes, according to the institutional quality of the exercised power.

5. Game modelling of political processes is manifested through the democratization of the culture of political conflict management, negotiation, consultation and exercise of power. In this context, in the process of conducting political negotiations, a strategy of harmonizing the rational and the irrational is developed. At the same time, the consultation is being built on the assessment of individual (or group) activity and on the prediction of the development of the political situation.

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Game theory in political science. The playful nature of the culture of power
Key words: game theory, political science, culture of power, political role, balance of forces

Politics identifies and strengthens the ways of social development, and the law determines, giving them a universal and legal appearance. Such a coincidence of the regulatory possibilities of politics and law makes it possible to free the culture of exercising power from internal antipsychotics, focusing on social coexistence [Margaryan, 2019, 203,204]. All this keeps public policy not only from the cruel extremes of the political game but also forms the strategic thinking of the political elite in relation to radical changes. It is precisely the absence of such thinking that, marginalizing the socio-political order of countries in a democratic transition (including Armenia), and being tempted by the radical transformation of linear liberalization, the political elite ignores its function of social responsibility like Pierre Menard, the hero of Jorge Luis Borges, manages to rewrite Cervantes' novel “Don Quixote”. Being the greatest expert on the development of game logic in the culture of exercising power through a literary text, Borges shows that Pierre Menard, however, makes a lot of effort, but after finishing his essay, discovers that the new novel he created copies the original one. However, 300 years have passed since the publication of Don Quixote, and the same words, images, language thinking and strategy of exercising power are perceived differently, therefore, the new novel could not be equivalent: people have changed over time, and with them the perception of the game politics of the culture of power has changed either.

ARMENIA'S DEMOGRAPHIC DIPLOMACY AND THE CHALLENGES OF THE DIGITALIZATION ERA

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Key words: demographic challenges, demographic diplomacy, population growth,

Introduction In general, in order to prevent the aggravation of the political, demo-graphic, socio-economic situation of the planet, the world community must find ways to regulate the population. Demographic diplomacy contributes to this process, which means that the state's activity in managing demographic processes is of great importance in modern society[1]. Expert studies prove that in the 21st century, as a result of the active processes of globalization, the global problems that concern humanity have intensified [Acemoglu, et al., 2012] this sense, there are many dangers of qualitative regression and physical destruction of people in the further development of states [Banerjee, et al., 2012, 122]. The demographic problem on a global scale is primarily related to the rapid growth of the population. currently it has crossed the 8 billion mark/, with the demographic explosion[2]: It means high rates of natural growth of humanity. According to scientists' forecasts, the population of the Earth will be approximately ten billion people in the coming decade. The uneven distribution of the population, in turn, has a negative impact on the environment [Tovmasyan, 2013, 15].

Methodology and literature review As for the professional literature on the demographic problems of Artsakh and Armenia and the priorities of the state, it is actually not so rich, in particular, when there is a need to study the events taking place today and the demographic situation formed as a result of them. With the exception of one or two analyses, most Armenian economists are focused on tax reforms, the financial system, agriculture or other specific issues, ignoring the most important, the field of threats to ensure the existence and development of the Armenian man in his cradle. After V. Khojabekyan, there are not so many economists specializing in demography, V. Tov-

[1] Demography studies the laws and social conditions of fertility, mortality, marriage and termination of marriage, the reproduction of married couples and families, the reproduction of the population as a whole as a unity of these processes. It studies changes in the age-sex, marital and family structures of the population, the relationship between demographic processes and structures, as well as the ways in which the general population and families change as a result of the interaction of these phenomena. Demography has as its object a certain sphere of reality that no other science studies. However, such an understanding is not enough for demography. It reflects an important, but only superficial layer of the definition of population as a concept of demographic science, which, in fact, begins its study, which is the starting point of demographic analysis.

[2] World Population Reaches 8 Billion, https://www.nytimes.com/2022/11/15/world/world-population-8-billion.html

masyan (USA), R. Yeganyan (RA) and B. Asatryan (RA). Therefore, it is not even possible to present a simple overview of literature without worrying about the formation and development of the modern Armenian school of demography.

Demographic methods and problems of demographic diplomacy In general, population reproduction is the process of timely renewal of the number and composition of the population as a result of its natural and mechanical movement. The proprietary methods developed by demographers for the analysis of that process are based on the presentation of the population as a special population with common characteristics. They mainly actually include: cohort method, cross-sectional analysis method, demographic coefficient standardization method, demographic modeling method, cartographic method, demographic network method, demographic forecasting method, etc. The migration group is formed when the people included in it change their place of residence [Sachs, , 2005, 37]-52] A marriage group is formed when its members marry. The source event is merged into the cluster. If the initial event is birth, then we get a set of generations, that is, it is a set of individuals born in a certain period. The task of longitudinal analysis is to follow the intensity of the onset of demographic processes, which depends on the periods between the formation of groups and the onset of the demographic event during the life of individuals. A demographic event consists of demographic processes (mortality-death, fertility-birth). Demographic events can be of two types: non-recurring, which can occur once in an individual's lifetime; a recurrent cat may occur several times. Demographic processes can be: from the initial number of processes of separate groups (death, divorce), not excluded. from the individual to the initial size of the group (marriage, birth). The method of cross-sectional analysis (conditional hypothetical generation) is a conditional series of people, the intensity of the demographic process throughout the life at each age corresponds to a given calendar period. Therefore, the demographic indicators calculated for a particular year will depend on the characteristics of the demographic processes of all actual living generations. These indicators will reflect the features of the processes that are typical for the given calendar period. Longitudinal and cross-sectional methods make it possible to compare the reproduction of a number of generations. This is important both for historical demography and for demographic and social projections, so suggestions for social policy development can be made. The method of standardiza-tion of demographic coefficients allows determining the impact of structural features of comparison of demographic communities when comparing demographic coefficients. The meaning of this method is that, using the data of a certain year as an example, the demographic coefficients are calculated and taken as a standard, and the index is calcu-lated with respect to the standard, and by multiplying this indicator by the indicators of the standardized demographic coefficients are obtained, which are used to compare demographic aggregates (death rate by social groups, birth rate) (by strata). The method of demographic

modeling is the most common method of forecasting reproductive processes. This method replaces the experimental method, which is not always possible in demography. The demographic modeling method is used to study demographic processes and reproduction in general. The cartographic method is used to make maps of settlements, population density, age structure, population displacement, in particular, allows to compare demographic conditions and processes in different areas. And in the case of using the method of building a demographic network, the network is created using geometric constructions, which makes it possible to obtain different characteristics of demographic processes and analyze their course over time. It allows obtaining the characteristics of demographic processes. The method of demographic forecasting is especially important for us. The most common method of demographic forecasting is the change-by-age method, which is used to calculate future demographic processes, and the method of components, which is used for separate forecasts of birth rates, mortality rates, and migration. These methods make up the content of the demographic forecasting method and make it possible to assess the role of certain components of population change, comparing their effects on the population size and structure in the future. These methods are important for conducting ethnographic diplomacy research and forming professional assessments [Bleier, 2021, 34].

Analysis During the years of independence, the demographic situation in Artsakh and Armenia had different turns. Recently, certain threats have appeared, which need a clear assessment. And in the conditions of an unfinished war, the role of demographic diplomacy aimed at ensuring the demographic security of Armenia is simply vital. The latter may be the most important problems:

- analysis of the impact of state policy on population reproduction,
- analysis of the demographic situation and clarification of prospects for the development of the population of Artsakh and Armenia,
- study of the economic factors affecting the rate of growth of the Armenian people and the national population of Armenia and Artsakh, formulation of problems and consistent steps towards their solution,
- the study of the national and ethnic characteristics of the reproduction of the Armenian population (lifestyle, traditions that affect the level of fertility, mortality and life expectancy),
- development of methods for studying the relationship between demographic phenomena and processes, modeling, forecasting of mortality, marriage, fertility rates,
- study of professional, sociological and psychological factors affecting people's behavior and leading to changes in the demographic situation in the country,
- development of scientific recommendations aimed at increasing the efficiency of the activities of state bodies in social security issues,

- analysis of activities of social protection bodies,
- analysis of migration, unemployment, employment problems,
- analysis of how much the country's population is, in what direction and at what speed the population is changing, how many men and women there are, how the population is distributed among the main age groups, etc.: this knowledge is part of demographic statistics or population statistics,
- clarification of demographic policy priorities in the field of birth rate increase and family strengthening,
- creation of prerequisites for increasing natural growth,
- comprehensive strengthening of the institution of the family as a way of harmonious life of an individual,
- creation of conditions for self-realization of youth,
- provision of targeted social protection for the family, including financial assistance and provision of minimum living conditions at the time of the birth of the child,
- regulation of outflow, inflow, natural growth of national minorities and other issues derived from them,
- population aging and other problems related to it.

In particular, regarding the last issue, it should be noted that today the elderly (65 and older) are the fastest growing age group in the world. For the first time in the world, the number of elderly people has exceeded the number of children under five years of age, and in the future their number will exceed that of teenagers and young people combined (15 to 24 years old). In some regions, such as Europe and East Asia, there is already a serious challenge in supporting and caring for older people. As life expectancy increases, older people are likely to play a larger role in society and the economy. This is also one of the problems of demographic diplomacy, which is the identification of a certain imbalance in the problems listed above, the means of combating them, as well as the group of measures that are between incentives and restrictions. They can also be called social guarantees. that is what ensures the stability, the predictability of the conditions in which people realize and realize their needs.

Demographic policy and the challenges of the Armenian family Overpopulation in the world leads to depletion of resources. This problem is the basis of armed conflicts and wars in the world since time immemorial. The genocidal actions of Azerbaijan and Turkey against Artsakh and Armenia, which also pursue the seizure of new sources of natural resources, which happened, in particular, as a result of the 44-day war and after that, are no exception. Naturally, all this also affects the rates and volumes of reproduction of Armenians and the Armenian species in their homeland. Therefore, it should be noted that there is a clear relationship between socio-economic development, strengthening / weakening of the state's positions and demographic processes, which, by

the way, is called the theory of demographic transition in the professional literature[1]. In our case, it should be taken into account that the last two of the four main types of population reproduction presented below and existing are the most characteristic.

* Traditional, characterized by high mortality and high birth rates;

* Advanced, characterized by an increase in the birth rate and a decrease in the death rate, which means a significant increase in population;

* Simple, characterized by low mortality and low birth rates, respectively, in which population growth slows;

* Narrowed, characterized by a decrease in mortality and a sharp decline in the birth rate, as well as a marked aging of the population.

Also, in our region, especially the neighboring countries, they differ in their socio-economic development and are respectively in different stages of demographic transition. At the same time, two other types of population reproduction are observed.

1. Simple and narrow, typical of developed countries. It is characterized by a low birth and death rate, as well as a significant life span;

2. Extended, characteristic of developing countries. It is characterized by high birth and death rates with a short life span. The 4-stage model of demographic transition is also known[2]. It is obvious that in order to influence the reproductive processes, the state should conduct a targeted demographic policy. We believe that the influence of the state on demographic relations is expressed in the development and implementation of the state's scientifically based and national demographic policy.

Demographic policy, as a rule, should be the targeted activity of state bodies and other social institutions aimed at regulating population reproduction processes, which should provide for the preservation of population structure, dynamics, number, settlement and quality trends or their purposeful change. Therefore, it is important to consider it as an organic part of the social policy of the state, with specific goals and clear methods of achieving them.

Most of the developing countries in the modern world are conducting restrictive policies aimed at reducing the birth rate and reducing the mortality of children (up to 5 years old). In our case, the demographic policy aimed at reducing infant mortality should be combined with clear steps to increase the birth rate. In particular, it is important in the legislation to promote the marriages of not only young, but also older couples, to support not only large families, but also small families, providing them with a number of

[1] Countries with the lowest rates of natural growth. The formula for natural population growth. https://podarilove.ru/hy/strany-s-naimenshimi-pokazatelyami-estestvennogo-prirosta/

[2] https://orbeli.am/hy/post/238/2019-06-19/%20%D4%BA%D5%B8%D5%B2%D5%B8%D5%BE%D6%80%D5%A4%D5%A1%D5%A3%D6%80%D5%A1%D5%AF%D5%A1%D5%B6

privileges [Papriwal, et al., 2019, 21]. Moreover, we need policy tools aimed at ensuring the necessary living conditions for the Armenian family as special means of influencing the social institution for the effective implementation of its economic, reproductive and educational functions, as well as improving the quality of life of the population, which will determine the positive social development of the family, person, and society. development through the creation of appropriate institutional mechanisms.

The role of the state Why can't the mentioned problems be the subject of concern only of the expert community and why? In Armenia with a free economy, democratic problems should not have a "liberal" character or be "self-regulated". International experience proves that in both developing and developed countries, the state has a certain responsibility not only in terms of ensuring demographic security, but also in regulating migration flows related to it. This is evidenced by the demographic strategies of the USA, Israel, all EU member states, as well as China and many post-Soviet countries. It is obvious that the mentioned strategies can remain unimplemented if the keys to achieving the goals are found. The most important of them, we believe, is demographic diplomacy. And the latter, as is known, should be considered part of the regulatory function of the state itself. In the dynamically developing world, the role of the state in the management of demographic processes is particularly important today. It is implemented using certain means and has different directions (economic, social, psychological, etc.).

They require not only studies conducted by the state and with the support of state institutions, supported by clear statistical data, but also continuous monitoring of the situation and targeting of the most vulnerable sub-sectors and the development and implementation of adequate policies. Along with the state bodies, various associations and organizations of the civil society, local self-government bodies and other local and international organizations can make a significant contribution to the improvement of the situation through demographic diplomacy. International experience proves that the consolidation of the interests of social groups and, ultimately, the whole society plays an important role. On the other hand, according to many researchers, such prohibitive measures as complicating the divorce procedure, banning contraception and abortion are completely unacceptable both from a moral and legal point of view, and even more so they are not effective.[1]: It is important to highlight the social benefits, which are designed to improve the socio-economic condition of families with children, among the proven effective measures. In fact, only with a practical approach by the state to the population, it will be possible to significantly influence the change in demographic behavior and improve it in a positive direction not only for the state itself, but also for

[1] Prohibitive measures, such as complicating the divorce procedure, banning contraception and abortion, are completely unacceptable from both a moral and legal point of view and less effective.

social groups. Important factors such as fertility, life expectancy and mortality are determined not only by economic indicators, but also by the spiritual state of society, what role the state plays in the development and implementation of effective demographic diplomacy. In terms of demographic diplomacy during the years of independence, one of the main obstacles to the establishment of demographic management processes was the underestimation and neglect of the role of the state not only in the active management of specific demographic processes, but also in the promotion of socio-economic development in the classical sense of the state. At present, depopulation, which has reached alarming proportions, can be overcome by identifying the real causes of the demographic crisis and influencing them, taking into account secondary factors.

Management of demographic processes is one of the most important types of demographic diplomacy from a social point of view, its relatively independent element. Its uniqueness, as a special manifestation of the general, reflects the relative independence of demographic processes, their place in the system of multifaceted relations of social life. In this sense, the management of demographic processes should be considered as an organizational relationship acceptable by society between the level of population reproduction and the development needs of social practice, which is one of the guarantees of ensuring demographic security. Accordingly, demographic security, in turn, should be considered as the basic, most important protection of life, population reproductive processes, from real and potential threats. Thus, it is the reduction of existing problems in reproductive processes and, on the other hand, the neutralization of the causes of their occurrence. It should also be noted that the dangers in this field affect the sustainable development of the country[1]: Therefore, demographic diplomacy is not a one - way process, but a two-way interaction. Accordingly, the goal of such interaction is to create an optimal fit in the activities of these relatively independent levels of social life.

Conclusion Thus, it can be noted that the most effective principles of influencing population dynamics through the implementation of effective demographic diplomacy are the active interaction of the state and society in order to improve the demographic situation. Measures to support families with children, as well as the development and implementation of a national program to support raising a healthy generation, can stop the growth of the demographic crisis and create the prerequisites for more active demographic diplomacy. In this sense, the level of assistance provided to families is not sufficient to change reproductive attitudes and raise the profile of several children. In order to improve the situation, society requires adopting and implemen-ting a long-term strategy. Targeted demographic diplomacy for demographic development.

[1] https://www.aravot.am/2020/04/18/1106873/

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Armenia's demographic diplomacy and the challenges of the digitalization era

Key words: demographic challenges, demographic diplomacy, population growth

In the years of independence, the ineffective resettlement policy, and in some years, its absence in Artsakh and Armenia, the disproportionate distribution of the population and resources did not allow for effective and balanced development, which only led to the increase in the level of poverty / in Armenia in 2023. 42 percent poverty is predicted at the beginning/[1]: In this sense, the fact that not all developing countries are conducting a targeted demographic policy is not at all comforting. As for developed countries, there are quite different problems here as well. Basically, their birth rate is low, which means that the population grows slowly, hence the problem of shortage of labor resources. Therefore, the mentioned countries are trying to implement policies aimed at increasing the birth rate: one-time payments to young people, benefits, state support for the birth of a child, monthly child allowance, loans for large families, etc. It is natural that we accept the use of incentives typical of developed countries.

[1] https://www.aravot.am/2022/10/22/1299705/

EFFICIENCY ASSESSMENT FOR THE MAIN DIRECTIONS OF PROPOSED STATE POLICY TO INCREASE THE COMPETITIVENESS OF AGRICULTURE IN THE REPUBLIC OF ARMENIA

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Introduction The implementation of an effective state policy of increasing the competitiveness of the agriculture of the Republic of Armenia requires not only clarifying the main problems of this policy and proposing directions for their solution, but also evaluating the efficiency of their implementation. We focus at the evaluation of the effectiveness of the implementation of the main ones from those directions with the presentation of specific calculation justifications. The purpose of the article is to evaluate the effectiveness of the proposed main directions of the agricultural competitiveness of the Republic of Armenia. The tasks of the article are to clarify the range of indicators for evaluating the effectiveness of the above-mentioned main directions of the policy and to justify the effectiveness of these directions with appropriate calculations, as well as to present predictive estimates of the expected results.

Methodology The article uses dialectics, scientific abstraction, comparative analysis and statistical methods. The application of the dialectic method is clearly seen in the research in the interrelated study of the indicators necessary for the evaluation of the effectiveness of the main directions of the state policy of increasing the competitiveness of the agriculture of the Republic of Armenia. The application of the scientific abstraction method refers to the entire research, as the scope of the latter is limited to individual products, bearing in mind that the considered approaches are also applicable in the case of others. The application of the comparative analysis method finds its expression, especially, in the comparative evaluations of the results of the calculation of economic efficiency in the case of drip and traditional (surface) irrigation. The use of statistical methods is demonstrated in the calculations of the correlation and determination coefficients related to the volume of milk production and the level of commercialization.

Scientific novelty The effectiveness of the main directions of the proposed policy for increasing the competitiveness of RA agriculture is evaluated.

Literature review The characteristics of the competitiveness of agriculture, the factors determining it, the problems of its increase and ways of solving it have been recognized by a number of economists, including A. Borel [Borel, 2014, 4], T. Lenskaya Lenskaya, 2013, 87], K. Saubanov [Saubanov, 2010, 38-53], V. Bespyatnykh [Bespyatykh, 2000, 200], O Koryakina [Koryakina, 2017, 25], A. Voskanyan, A. Kartashyan [Voskanyan, et al., 2021, 73-87], S. Avetisyan [Avetisyan, 2002, 232-238] and others.

However, the issues of evaluating the effectiveness of the proposed ways of solving individual problems, related to the state policy of increasing the competitiveness of agriculture of the Republic of Armenia, have not been studied properly. In particular, it refers to the implementation of the drip irrigation system, the mechanism of providing targeted subsidies for the cultivation of arable land aimed at the implementation of the targeted policy of promoting the use of arable land, the implemented milk subsidy mechanisms, the use of digital technologies in agriculture, including the use of agricultural drones and the evaluation of the effectiveness of the implementation of weather stations.

Evaluation of the effectiveness of the proposed directions for solving the problems of the state policy of increasing the competitiveness of RA agriculture

Analysis Taking as a starting point the directions for solving the problems of the state policy of increasing the competitiveness of agriculture in this article, we need to consider the effectiveness of the implementation of the main ones. We present the latter with specific calculation bases.

The implementation of modern irrigation technologies in agricultural farms was one of the planned steps for the effective use of the main resources of agriculture, particularly the land resource. The most obvious is the evaluation of the effectiveness of the introduction of the drip irrigation system. Based on the calculations made by us and presented in the corresponding article for the creation of value chains for vegetables, specifically tomatoes, we have carried out an evaluation of the effectiveness of the implementation of the drip irrigation system under the given conditions.

A number of advantages of drip irrigation are evidenced by the applied experience, as well as the data of the professional literature.

"The analysis of existing multi-year experiments on drip irrigation method, as well as numerous studies and researches, shows that the advantages of this method are as follows:

- water is evenly distributed between plants, water is given slowly, directly to the roots of the plant;
- according to soil and climatic conditions, irrigation water is saved by 30-60%.
- good aeration conditions are created in the root layer of the plant,

- the yield of agricultural crops increases by 20-50%, the quality of the crop increases.

- Fertilizers are given in the soil together with water in a dissolved state, the efficiency of assimilation of fertilizer by crops reaches 80%.

- the interrow space remains dry.

- the need to fight against weeds decreases" R. V. Ghazinyan, G. R. Navoyan 7-8] etc.

Along with the mentioned and other advantages, the drip irrigation method has certain disadvantages, which are not significant compared to the advantages.

For the evaluation of the effectiveness of drip irrigation, as mentioned, the data of the costs incurred by us for tomatoes in the data of 2022, the volume of the obtained product, the income from the sale, the profit and the level of profitability were taken into account. The basis for producer prices was the data of the RA Statistics Committee.

According to our calculations, the costs for the cultivation of 1 ha of tomatoes amounted to AMD 3604.0 thousand. Among the mentioned expenses, the expenses expected to decrease in the case of switching to drip irrigation are the irrigation water fee, which was 88.0 thousand per 1 ha. AMD (8000 m3). During the growing season, the number of waterings was 13, the waterer's fee was 140,000 AMD (the first watering was 20,000 AMD, and 15,000 AMD for the remaining 12 waterings). Costs for fertilization amounted to 185.0 thousand. AMD, for medicinal products: 207.0 thousand. AMD The expenses for the city are around 160.0 thousand. AMD According to the calculations, the yield of tomatoes was 349.9 t/ha.

In the case of drip irrigation, the mentioned costs are significantly reduced. In particular, as we mentioned above, water consumption is reduced by 30-60%, that is, in the case of an average level of consumption reduction, water consumption will be 4400 m3, and the payment for irrigation water will be 48.4 thousand. AMD (economy: 39.6 thousand AMD). Fertilizer costs are reduced by about 40%, that is, the costs of the latter will amount to 111.0 thousand. AMD (economy: 74.0 thousand AMD). In case of drip irrigation, the costs for medicinal materials are saved by 20%, that is, the cost will be around 165.0 thousand. AMD (economy: AMD 42.0 thousand). The costs for Kagan in the case of drip irrigation are 64.0 thousand. AMD (economy: 96.0 thousand AMD).

Our observations show that the investments for the establishment of a drip irrigation system per 1 ha are within the range of 1.0-1.3 million drams. For calculations, we found it appropriate to accept the costs of implementing a drip irrigation system at 1.2 million drams per hectare.

In the case of drip and traditional (surface) irrigation, the calculation of economic efficiency for 1 ha of tomato cultivation is presented in Table 1.

Table 1. The results of the calculation of economic efficiency in the case of drip and traditional (surface) irrigation in the case of 1 ha of tomato cultivation

	Indicators	Measure unit	Tomato	
			Traditional (surface) irrigation	Drip irrigation
1	Irrigation system implementation costs	thousand AMD	-	1200.0
2	Irrigation system maintenance and repair costs	thousand AMD	-	60.0
3	Tomato production costs	thousand AMD	3604.0	3352.4
4	Costs during vegetation	thousand AMD	3604.0	3412.4
5	Irrigarion water costs	m^3	8000.0	4400.0
6	Expected yield from 1 ha	Ton	34.99	42.0
7	Producer price of selling 1 ton of tomatoes	thousand AMD	216	216
8	Income from the sale of tomatoes	thousand AMD	7557.8	9072.0
9	Net income	thousand AMD	3953,8	5719.6

As it can be seen, as a result of the implementation of the drip irrigation system, the increase in net income according to calculations was 1.76 million AMD, that is, there is an opportunity to fully compensate the costs of the implementation of the drip irrigation system in the first year of the implementation of the system. In this case, we planned the yield increase at the minimum possible level: 20%. In other words, the implementation of the drip irrigation system is highly effective. Based on our observations the introduction of a drip irrigation system in intensive horticulture provides the highest efficiency.

Now we need to turn to the questions of the efficiency of the mechanism of providing targeted subsidies for the cultivation of the proposed arable land promotion policy, which is considered to be the most important issue. In this case we consider an option when the subsidies are provided for the cultivation of autumn wheat, and all marzes of the republic are included in the program planned for this purpose, except for Ararat and Armavir marzes. Autumn wheat occupies a significant place in the structure of the sown areas of the mentioned marzes. According to the data of 2022, it was 29.9%, compared to 29.6% in 2020. In the previous period, 2010 and 2015. were 30.8% and 32.4%, respectively. According to the data of the RA Statistics Committee, the sowing areas of autumn wheat in the observed marzes have been significantly reduced. In 2022, the sowing area of winter wheat was 70.2% of 2010 and 53.6% of 2015.

Table 2. Summary data of the base year of the autumn wheat subsidization program and the forecasts of the results of the program implementation.

Marzes (regions)	2022 [According to the statistics committee of RA]			
	Planted area, ha	Average yield, centner/ha	Gross product, t	Gross product value, million AMD
Aragatsot	4344	20.8	9033	1589.8
Gegharkunik	9614	16.2	155811	2742.3
Lori	9361	28.7	26580	4678.1
Kotayk	3673	21.0	7701	1355.4
Shirak	12680	23.9	30162	5308.5
Syunik	9064	25.8	23313	4103.0
Vayots_Dzor	157	17.2	271	47.6
Tavush	1970	26.1	5088	895.5
Total	50863	23.1	117728	20720.2

Marzes (regions)	Forecast						
	The predicted sown area, ha	Amount of anticipated subsidy, million AMD	The predicted average yield seen, centner/ha	Anticipated gross product, t	Anticipated gross product value, million AMD	Gross product growth compared to the base, t	Gross product growth by value assessment, million AMD
Aragatsot	5213	364.9	23.9	12469	2194.5	3435.9	604.7
Gegharkunik	11537	807.6	18.6	21493	3782.8	5912.0	1040.5
Lori	11233	786.3	33.0	37075	6525.2	10495.3	1847.2
Kotayk	4408	308.5	24.2	10644	1873.4	2943.3	518.0
Shirak	15216	1065.1	27.5	41821	7360.5	11659.3	2052.0
Syunik	10877	761.4	29.7	32272	5679.8	8959.0	1576.8
Vayots_Dzor	188	13.2	19.8	373	65.6	102.0	17.9
Tavush	2364	165.5	30.0	7096	1248.8	2007.6	353.3
Total	61036	4272.5	26.8	163242	28730.7	45514.2	8010.5

We propose to accept the amount of the planned subsidy for 1 ha of cultivation in the amount of 70.0 thousand AMD, which, according to our calculations, is more than 21.0% of the cultivation of 1 hectare of wheat. It is advisable to provide the amount of the subsidy before the start of sowing, based on the relevant applications and signed tripartite agreements. The parties to the contract are the agricultural manager, the local self-government body and the state exe-cutive body coordinating the sector.

One of the most important parts of the contract should be the provisions related to the obligations of the farmer in agriculture. Among them are the return of the subsidy amount in case of non-implementation of the plantings provided for in the application and the contract, the fulfillment of the terms of cultivation of autumn wheat and the

requirements of agrotechnics, provided that a yield higher than the base year is ensured (for our calculations, we take 2022 as the base year).

The experience of similar programs and observations in our survey suggests that as a result of the implementation of similar subsidy programs, it is possible to increase the sown areas of subsidized crops by 20-35%, and to ensure a 15-25% increase in yield. In this case, we have taken the lowest (moderate) versions for efficiency evaluations, namely, the possible increase of the cultivated areas by 20%, and the yield increase by 15%. We have taken the price of wheat producers in 2022 as a starting point for cost calculations. The summary indicators characterizing the efficiency of subsidizing program for cultivating winter wheat in the observed marzes are presented in Table 2.

From the data in the Table 2, it is obvious that as a result of the implementation of the project, in a moderate version, it will be possible to increase the sowing areas of winter wheat in the observed marzes to 61.0 thousand. 50.9 thousand ha of the base. ha (an increase of 10.2 thousand ha), the gross output of autumn wheat will be 163.2 thousand ha. tons of base: 117.7 thousand. per ton (increase of 45.5 thousand tons). The amount of the subsidy required for the implementation of the project was calculated at 4272.5 million drams, in return for which the value of the additional harvest will be 8010.5 million drams, which exceeds the required amount of investment by 1.9 times. The latter was calculated with the lowest version. If we look at the increase in cultivated areas and yield in the case of the average option (increase in cultivated areas: 27.5%, increased yield: 20%), then according to the calculations, the results can be as follows. In the case of the average option, according to the calculations, it will be possible to increase the sowing areas of autumn wheat in the observed marzes to 64.9 thousand. yes 50.9 thousand of the base. ha (increase of 14.0 thousand ha), the gross output of autumn wheat will be 181.0 thousand ha. 117.7 thousand tons of base. per ton (increase of 63.3 thousand tons). The amount of the subsidy required for the implementation of the project was calculated at 4539.5 million drams, in return for which the value of the additional harvest will be 11133.4 million drams, which exceeds the amount of the required investment by about 2.5 times.

Aside from the additional harvest, the program will provide other results, in particular, the area of arable land used for the purpose will increase, in the case of the moderate version, 10.2, and in the case of the medium version, 14.0 thousand. ha, which will be 4.8 and 6.6% of the total sown areas in 2022, respectively. The quality of the harvest and the competitiveness of the farmers will increase to a certain extent.

The most important result indicator of the implementation of the project is the increase in the country's food security level, in particular, the self-sufficiency level of wheat will increase by 2.5 and 3.4 percentage points, respectively, in the case of moderate and medium options, other things being equal.

From the point of view of increasing the competitiveness of agriculture, the issues of increasing the competitiveness of animal husbandry are considered important. Our calculations for the years 2008-2022 prove that the coefficient of pairwise correlation between the volume of milk production and the level of commercialization was 0.419. The latter means that the connection is considered average and it is in the lower position of the specified level. The coefficient of determination in this case is 0.1756 or 17.6 %. The latter shows that the increase in the volume of milk production in the republic by 17.6% is due to the increase in the level of commercialization of milk, that is, the increase in the level of commercialization contributes to the increase in competitiveness. Also, the calculations made for the same observed period prove that the coefficient of pairwise correlation between the level of milk production and the price of the producer is 0.764. In fact, the connection here is average, close to the lower level of that range. As for the coefficient of determination, it is 0.5837 or 58.4%. In this case, it shows that the increase in the level of commercialization of milk in the country by 58.4% is due to the price of the milk producer. In fact, increasing the level of commercialization of milk is an important issue and the commercialization is still at a low level. Thus, according to the data of the Statistical Committee of the Republic of Armenia, it was 56.2% on average for the years 2008-2022, and the average for the last 5 years is 62.2%. The latter is also a low index, which in turn is one of the factors hindering the competitiveness of milk production. Therefore, one of the important steps to increase competitiveness can be the application of a subsidy mechanism for each kilogram of milk sold to produced and processing companies, with the aim of improving the quality indicators of milk, improving contractual relations in the field of sale and, most importantly, increasing the level of milk self-sufficiency. The application of the subsidy mechanism for the sold milk is also considered justified by the fact that there is a significant difference between the average retail price of milk and the price of the producer. Calculations based on the data of the RA Statistics Committee show that the ratio of the average retail price to the manufacturer's price was 2.73 for the 2008-2022 period, and 2.79 for the last 5 years. Based on the above, we tried to evaluate the effectiveness of the implemented milk subsidy mechanisms. The application of the mechanism, of course, requires the provision of certain requirements from milk producers, which should be fixed by contractual relations. The latter relate to the quality standards of milk, in particular: fat content, acidity, water content, temperature, freezing temperature, protein content, presence of somatic cells, etc. Therefore, not all commercial milk producers can meet the specified requirements.

According to our assessment, around 20% of milk producers will have the opportunity to be included in the implemented milk subsidy program. We consider it justified to take about 35% of the price of the current milk producer as the subsidy amount. According to the data of the RA Statistics Committee, the average selling price of milk

producers in the last 15 years was 144.7 drams, and the average of the last 3 years was 166.3 drams. Thus, the amount of the subsidy for the sale of 1 kg of milk will be around AMD 60. Our calculations indicate that the increase in the level of milk commercialization by 58.4% is due to the price of milk producers, therefore, based on the data of 2022, an increase in the level of milk commercialization is expected by 13.6 percentage points (64.5*0.584*60/166.3). For calculations, we consider the increase in the level of commercialization by 13.5 percentage points. In other words, the level of comercialization of milk will become 78.0% against the base 64.5%. Let's present the summary results expected from the application of the measure in table 3.

Table 3. Summary results of the implementation of the subsidy mechanism for the unit volume of commercial milk in the Republic of Armenia for the base year 2022[1]

milk gross production 2022 thousand t	Actual Level of commercialization, %	Volume of commodity product, thousand.t:	Commodity product value, million AMD	Volume of milk produced by the economies included in the program, thousand t	The expected level of commercialization of those included in the program, %
1	2	3	4	5	6
623.1	64.5	401.9	78772.4	124.6	78.0
The volume of expected product output of the included economies, thousand. t	The amount of the subsidy, million AMD	The value of the expected commodity product at the actual price, million AMD	The value of the expected commodity product at the subsidized price, million AMD	Additional income (revenue) at the actual price, million AMD	Additional income (revenue) in case of subsidized price, million AMD
7	8	9	10	11	12
97.2	5832.0	19051.2	24883.2	3299.3	9091.3

As a result of the implementation of the project, the following results are ensured. In the farms included in this program, the level of commercialization of milk will increase by 13.5 percentage points, the physical volume of commercial milk will increase by 16.8 thousand. in tons. The value of the expected product at subsidized prices was calculated at AMD 24,883.3 million, which is AMD 9,091.3 million higher than the income (income) received in case of non-implementation of the project. The program should be implemented with farms that have signed contracts with milk processing companies, the money should be transferred to the farmers based on the

[1] Ministry of Agriculture of RA, Food Security and Poverty, 2023. Jan.-March, 2023, 59-60, RA VC, Realization of agricultural products by households in 2022, 2023, 7.

actual volume of milk sold through the banking system. One of the most important results of the project will be the development of contractual relations with milk producers and processors, the fulfillment of bilateral contractual obligations will contribute to the increase of quality indicators of milk. As a result of the implementation of the project, the increase in income will provide an opportunity to improve the quality of production organization and increase production volumes. The most important result will be an increase in the level of food security.

We tried to evaluate the effectiveness of the use of digital technologies in agriculture. First, let's evaluate the effectiveness of using agricultural drones. Observations and the study of various sources prove that agricultural drones ensure high productivity and high quality of work both in the protection (spraying) of agricultural crops and in the process of feeding. High productivity is ensured by the speed of delivery of the working fluid, the wide working range of the drone and the high speed of the drone. The metering (dosing) system of the concrete DJI Agras T50 drone is effective, it has the ability to provide the droplet size of the working fluid in the range of 50-500 micrometers, which is an opportunity allows to ensure high quality of plant protection (spraying), save working fluid. This drone has the ability to ensure the consumption of working fluid in the amount of 24 liters in 1 minute, as a result, spraying a large area in a short time. The coverage width of this drone is 11 meters, both for spreading liquid and bulk materials.

The rate of consumption of working fluid per 1 ha is 6-15 liters. For calculations, the rate of consumption is accepted: 10 l/ha. In other words, the DJI Agras T50 drone can spray 4 hectares with one filling of working liquid (40 liters). The speed of the drone is 0-12 m/s. That is, at a speed of 6 m/s, the drone will spray an area of 66 m2 in 1 second with a coverage of 11 m, that is, it will take 2.5 minutes to spray 1 ha (10,000 m2/66 m2). It is possible to spray 4 hectares with one full tank, and it will take 10 minutes. The flight duration for such drones is usually 10-15 minutes. In other words, one charge of the batteries is sufficient for spraying 4 ha. Battery charging time is 9 minutes. In fact, with one battery, with on-site charging, 12 ha can be sprayed in one hour, and with spare batteries, it will be possible to provide 16 ha/hour productivity. Spraying carried out by drones has a number of advantages, which are:

- extremely small consumption of working fluid 40-60 times compared to spraying with traditional methods, that is, expensive preparations are saved, less amount of pesticides is released into the atmosphere,
- the high quality of spraying, which contributes to the increase in yield,
- in the case of traditional spraying, the crops are damaged by tractor wheels, in the case of spraying with drones, field damage losses are equal to 0,
- spraying can be done at night.

For example, the productivity of the OPSH-18-2500 tractor sprayer is about 7 ha/hour. The sprayer is combined with the MTZ-80/82 tractor. The recommended price of the sprayer is 727.0 thousand. Russian ruble. At the average exchange rate of 2022, 1 Russian ruble was AMD 6.48. In other words, the price of the sprayer at the manufacturer will be AMD 4711.0 thousand, including value added tax and transportation costs will amount to AMD 5905.0 million (US$13,550). The sale price of the agricultural drone in the republic will be USD 18,000. In the case of spraying agricultural crops with drones, in addition to the productivity and quality of spraying, a large economy is ensured due to the saving of pesticides, for example, in the case of spraying cereal crops, the consumption of working fluid is about 400 liters/ha, and for vegetable crops - 600 liters/ha. In this case, the cost of modern pesticides can be 50-60 thousand. drams, while in the case of the drone, taking into account the fact that the cost is 10 times less than the norm, AMD 45-54 thousand is saved. In the case of a tractor sprayer, the costs (tariff) are at least AMD 15 thousand. In this case, the number of sprays per hectare will be AMD 65-75 thousand.

According to the experts, the costs for spraying up to 100 ha with a drone are 900 rubles/ha [Zhichkin, et al., 2022. p. 3]. Calculated at the AMD exchange rate of 2022, it will be around 9850 AMD/ha (900 rubles*6.48 AMD). That is, on average, the saving in case of spraying 1 ha will be 60.2 thousand. AMD The cost of purchasing a DJI Agras T 50 drone is USD 18,000 USD, calculated at the exchange rate of 2022, it will be 7,842.1 thousand. drams, that is, in the case of spraying with a drone, compared to traditional spraying, the costs of acquiring a drone can be compensated after spraying around 130 ha (7842.0/60.2). Spraying the specified area with the considered drone is practically possible in 3 working shifts. It is worthy to note that for the calculations we have taken as a basis the capabilities of the average level of the drone, in particular, speed, capacity of the working fluid, etc. Also, in order to achieve the effectiveness of drones in the process of spraying crops, a certain professional training of the user is necessary.

We have tried to evaluate the effectiveness of the implementation of the IMETOS 3.3 weather station. The mentioned station carries out the following activities: accurate forecasting of the weather, alerts about expected frosts, heavy rains, high temperatures, modeling of the possible development of diseases of agricultural crops, continuous meteorological monitoring, monitoring of the operation of irrigation systems and soil moisture, providing information about the growth of crops and their condition. timely warning of possible floods. The mentioned weather stations can be used for 2000 ha/, but taking into account the size of the country's farms and soil conditions, we considered it appropriate to consider the weather station for 250 ha. Of course, the station will serve many farms (for example, 25-50, etc.). We conditionally accept that the area of the mentioned agricultural land is occupied by vineyards and orchards (for example, apples,

pears and apricots), vegetable crops (tomatoes, cucumbers, watermelons) and grain crops (wheat). In particular, the mentioned crop areas are as follows:

- grapes 45 ha,
- fruit 65 ha (including: apple 20, pear 12, apricot 33 ha),
- vegetables and fruits: 120 ha (including tomatoes 55 ha, cucumbers 30 ha, egg-plant 20 ha, watermelon 15 ha),
- 20 ha of wheat.

In the 250 ha agricultural land area, we have considered the expected production volumes and the value of the gross product from the perennial plantings and sowing areas with the mentioned structure with the yield indicators of 2022 and estimated the value of the gross product at the prices of the producer in 2022. In order to evaluate the effectiveness of the implementation of the weather station, we have considered what additional results we can have in case of the operation of the station. For example, in the case of early warning of adverse weather conditions, frost (high temperatures), the manager is able to implement preventive measures in time (in this case, we accept the prevention of crop loss in the amount of 7.0% of the calculated actual volume for fruit and grapes, 3% for vegetable crops and grain)).

As a result of the modeling of the possible development of diseases of agricultural crops and the organization of the effective fight against plant protection, we accept the reduction of crop losses as a moderate option, about 12.0% for fruits and grapes, and 8% for vegetables and grains. As a result of monitoring the operation of irrigation systems and soil moisture, providing information on crops and their condition, and improving water supply, the yield increase is estimated to be 6.0%, and irrigation water saving is considered to be around 15.0%.

The results of the calculation of the gross production of crops with the specified structure on the observed area and its value, the amount saved as a result of the investment of the weather station, the additional crop and the economical use of water, as well as the calculations of the maintenance costs of the station and the additional income (income) expected from the investment of the weather station as a result are presented in the 4th and in the 5th tables.

From Table 4, it is clear that the value of agricultural products with the observed structure at the producer price was AMD 1116.6 million, including AMD 193.9 million for fruits, AMD 817.0 million for vegetables and fruits, and the value of the gross grain product was 8.6 million drams.

Table 4. Calculations of the gross output of crops and its value with the specified structure of 250 ha of agricultural land (for the yield and producer's price, the actual data of the Ministry of Agriculture of the RA for 2022 were taken as a basis)

Crops	Area, ha	Yield, centner/ha	Gross product, tons	Producer price of 1 kg of food	Gross product value, thousand. AMD
Perennial plantings	110.0				
including Fruit	65.0				193868.4
of which					
Apple	20.0	82	164.0	233.2	38244.8
Pear	12.0	76	91.2	431.6	39361.9
Apricot	33.0	102	336.6	345.4	116261.6
Grape	45.0	149.3	671.9	144.6	97149.5
Vegetable garden	120.0				816991.0
including Vegetables					
of which					
Tomato	55.0	349.9	1924.5	215.9	415488.8
Cucumber	30.0	252.5	757.5	337.5	255656.3
Eggplant	20.0	356.7	713.4	146.4	104441.8
Watermelon	15.0	302	453.0	91.4	41404.2
Cereal crops	20.0				8599.5
including Wheat	20.0	24.5	49.0	175.5	8599.5
Total	250.0				1116608.3

Now it is worthy to look at the results of the calculation of the amount saved as a result of the investment of the weather station, the additional harvest and the economical use of water in the case of the moderate version, as well as the calculations of the maintenance costs of the station and the additional income (income) expected from the investment of the weather station as a result. The calculations presented in Table 5 clearly indicate that according to expert estimates, the value of loss reduction as a result of moderate assessment and frostbite prevention was AMD 102.6 million. As a result of plant disease monitoring and effective struggle for plant protection, the harvest increase was calculated at AMD 199.7 million. As for the increase in the efficiency of irrigation, according to calculations, as a result of the measures for water security as a result of the irrigation system installation, the increase in the crop was calculated in terms of value: AMD 116.6 million. The value of the saved water was calculated by the tariff and amounted to AMD 4.9 million. We have also calculated additional costs for frost prevention measures, effective organization of plant protection, as well as irrigation improvement, which respectively amounted to: AMD 10.5; 23.7 and AMD 9.0 million. Thanks to the introduction of the weather station as a result of the calculations the additional income (revenue) was calculated at AMD 126.1 million drams. We have estimated the costs of maintenance of the weather station, labor force, maintenance and advice to business owners at AMD 4.8 million (around AMD 400.0 thousand each

month). Thus, the additional income from the investment of the weather station is calculated to be AMD 121.3 million.

Table 5. results of the calculation of the amount saved as a result of the investment of the weather station, the extra harvest and the economical use of water in the case of the moderate option in the specified area of 250 ha, and the calculations of the maintenance costs of the station and the additional income (income) expected from the investment of the weather station as a result

Crops	The value estimate of loss prevention as a result of frostbite prevention, thousand. AMD	As a result of plant disease monitoring, as a result of the effective plant protection control, the addition of crops, thous.AMD	Due to the monitoring of the irrigation system, as a result of the water supply, the increase in the crop, thousand AMD	Irrigation water savings, thousand m3	Saved water value, thous. AMD	Costs of prevention of frostbite per year, thous.. AMD	Ad. costs for the organ. of eff. prot. of plants, thousand. AMD	Irrigation improvement costs, thousand. AMD	Additional income (revenue), thousand AMD
Perennial plantings									
including Fruit	13570.8	23264.2	11632.1	66.3	729.3	2275	4875	1300	304143
of which									
Apple	2677.1	4589.4	2294.7	20.4	224.4	700	1500	400	5290.9
Pear	2755.3	4723.4	2361.7	12.2	134.6	420	900	240	6293.4
Apricot	8138.3	13951.4	6975.7	33.7	370.3	1155	2475	660	18830
Grape	6800.5	11657.9	5829.0	48.6	534.6	1575	3375	900	14043
Vegetable garden	57189.4	98038.9	49019.5	153.0	1683.0	3000	7200	3000	81352
including Vegetables									
of which									
Tomato	12464.7	33239.1	24929.3	70.1	771.4	1375	3300	1375	418001
Cucumber	7669.7	20452.5	15339.4	38.3	420.8	750	1800	750	25993
Eggplant	3133.3	8355.3	6266.5	25.5	280.5	500	1200	500	10069
Watermelon	1242.1	3312.3	2484.3	19.1	210.4	375	900	375	3489.8
Cereal crops	258.0	688.0	516.0	10.8	118.8	300	500	400	264.7
including Wheat	258.0	688.0	516.0	10.8	118.8	300	500	400	264.7
Total	102586.3	199696.3	116531.9	442.5	4867.5	10450	23650	9000	126074

The costs of acquiring and moving the weather station are 4,800.0 euros (2,211.9 thousand AMD at the exchange rate of 2022), that is, the investment costs of the weather station can be compensated many times over in one year. The latter testifies to the effectiveness of the implementation of weather stations. Such reimbursement of the costs of the weather station proves that the station can be used on smaller areas, for example, in the conditions of one large economy. Thus, an attempt was made to evaluate with concrete calculations a number of important directions of the state policy of increasing the competitiveness of agriculture, in particular, the introduction of the drip irrigation

system, the use of mechanisms for providing targeted subsidies for arable land cultivation, the introduction of the realized milk subsidy mechanism, the specific newest models of digital agricultural technologies, the DJI Agras T 50 agricultural drone. and the effectiveness of the implementation of the IMETOS 3.3 weather station, the application of which can significantly contribute to increasing the competitiveness of agriculture.

Conclusions As a result of the research, the following conclusions were made:

- As a result of the implementation of the drip irrigation system, the increase in net income according to the calculations was AMD 1.76 million, that is, there is an opportunity to fully compensate the costs of the implementation of the drip irrigation system in the first year of the system implementation. In this case, we criticized the yield increase at the lowest possible level - 20%. In other words, the implementation of the drip irrigation system is highly effective. Observations show that the introduction of a drip irrigation system in intensive horticulture provides the highest efficiency.

- The subsidization program for autumn wheat sowing areas will provide other results, in particular, the area of arable land used for the purpose will increase, in the case of the moderate version, by 10.2, and in the case of the medium version by 14.0 thousand. ha, which will be 4.8 and 6.6% of the total sown areas in 2022, respectively. The quality of the harvest and the competitiveness of the farmers will increase to a certain extent.

- The increase in the volume of milk production in the republic by 17.6% is caused by the increase in the level of commercialization of milk, that is, the increase in the level of commercialization contributes to the increase in competitiveness. The calculations made for the same observed period prove that the coefficient of pairwise correlation between the level of milk production and the price of the producer is 0.764. In fact, the connection here is average, close to the lower level of that range. As for the coefficient of determination, it is 0.5837 or 58.4%. In this case, it shows that the increase in the level of commercialization of milk in the republic by 58.4% is due to the price of the milk producer.

- One of the important steps to increase the competitiveness of milk can be the application of a subsidy mechanism for each kilogram of milk sold to produced and processing companies, with the aim of improving the quality indicators of milk, improving contractual relations in the field of sale and, most importantly, increasing the level of self-sufficiency of milk. The application of the subsidy mechanism for the sold milk is also considered justified by the fact that there is a significant difference between the average retail price of milk and the price of the producer.

- As a result of the implementation of the mentioned mechanism, the following results are ensured. In the farms included in the program aimed at applying that mechanism, the level of commercialization of milk will increase by 13.5 percentage

points, the physical volume of commercial milk will increase by 16.8 thousand. in tons. The value of the expected product at subsidized prices was calculated at AMD 24,883.3 million, which is AMD 9,091.3 million higher than the income (income) received in case of non-implementation of the project.

One of the most important results of the project will be the development of contractual relations with milk producers and processors, the fulfillment of bilateral contractual obligations will contribute to the increase of quality indicators of milk. As a result of the implementation of the project, the increase in income will provide an opportunity to improve the quality of production organization and increase production volumes. The most important result will be an increase in the level of food security.

In case of spraying of agricultural crops with DJI Agras T 50 drones (taking into account their great comparative advantages), in addition to productivity, quality of spraying, great economy is ensured due to the saving of pesticides, for example, when spraying cereal crops, the consumption of working liquid is about 400 liters/ha, and for vegetable crops 600 liters/ha. In this case, the cost of temporary pesticides can be 50-60 thousand on average. AMD, in the case of a drone, taking into account the multiple of the cost norm, which is 10 times less, 45-54 thousand AMD is saved. AMD In the case of spraying with a drone, compared to traditional spraying, the cost of acquiring a drone can be compensated after about 130 ha of spraying (7842.0/60.2). Spraying the specified area with the considered drone is practically possible in 3 working shifts.

As a result of the investment of the IMETOS 3.3 weather station (taking into account their great comparative advantages), the additional income will amount to 121.3 million drams. the cost of acquiring and moving the weather station is 4,800.0 euros (2,211.9 thousand AMD at the exchange rate of 2022), that is, the investment costs of the weather station can be compensated several times within a year. The latter testifies to the effectiveness of the implementation of weather stations. Such reimbursement of the costs of the weather station proves that the station can be used on smaller areas, for example, in the conditions of one large economy.

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Efficiency assessment for the main directions of proposed state policy to increase the competitiveness of agriculture in the Republic of Armenia

Key words: agriculture, competitiveness, efficiency, productivity, indicators, acreage, yield, milk commodity, subsidy, costs, producer price, drones, weather stations.

The implementation of an effective state policy of increasing the competitiveness of agriculture of the Republic of Armenia requires not only clarifying the directions of this policy, but also evaluating the effectiveness of their implementation. In this context, a number of the most important directions of the state policy of increasing the competitiveness of RA agriculture, presented in the article with specific calculations, are highlighted, in particular, the introduction of the drip irrigation system, the use of mechanisms for providing targeted subsidies for arable land cultivation, the realized milk subsidy mechanism, the newest models of digital agricultural technologies, DJI Agras T 50 agricultural evaluation of the effectiveness of the implementation of the drone and the IMETOS 3.3 weather station (taking into account their comparative advantages over others), the use of which can significantly contribute to the increase of the competitiveness of the mentioned sector.

VALUING SOCIAL CAPITAL IN THE CONTEXT OF SOCIAL PARTNERSHIP

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Key words: social capital, social partnership, social policy, social insurance system

Introduction The article emphasizes the use of social capital within social partnership. Social capital is considered the ability of people to form interpersonal relationships through social networks and to provide outcomes. Through various social networks people are able to reach different people, form new connections, get information and opportunities. In 60s of the 20th century. as a result of the rapid development of human capital, some authors, G. Becker, J. Johnson and others, in their works, argued that the development of profits and justified investments are conditioned by the development of professional skills and the deepening of interpersonal ties. C. Louryi, who can rightfully be considered one of the scientists who made a significant contribution, who developed the theoretical foundations of social capital, put forward methodological approaches to the formation and analysis of the concept of social capital. He studied the American labor market and concluded that the distribution of income is also determined by race and ethnicity, and showed how the lack of connections adversely affects the abilities of black Americans, which is determined by a lack of communication, knowledge and information. [Louryi. 1977, 154] These authoritative claims provide grounds for asserting that the use of social capital in social partnership will significantly improve the effectiveness of tripartite cooperation. The article emphasizes the idea that social capital can be considered valuable in the process of forming effective cooperative situations. Social capital within a social partnership can contribute to the creation of intra-group and inter-group friendly relations, creating mutually beneficial conditions during cooperative relations.

Methodology Research of scientific materials was carried out with the help of a number of useful academic analysis methods. Research and comparative analysis were carried out using the comparative method. The generalities of social capital and its comparability within social partnership were emphasized. With the help of this method, particularly, the mutual connection between them was shown. With the help of the systemic method, social partnership was considered as a set of different elements. Using functional-structural analysis, the whole of many elements was considered as one complete system.

Literature review The creation of good can be achieved through social capital [Louryi 1977, 154]. P. Bourdieu defines "social capital" as the aggregation of actual and

potential resources. [Isayan, 2021, 2]. According to Robert Putnam, "social capital" contains social networks, norms, friendship groups that contribute to the realization of common goals [Tadevosyan & Shakhsuvaryan, 2021, 4]. Bourdieu emphasized cooperation based on economic interest, which according to him gives great spatial opportunities. [Bourdieu, 2005, 60-70]. In the work "Political Sociology", Bourbier puts forward the idea of the club effect. [Bourdieu, 1986, 242]. According to Yatsenko, social partnership should theoretically be structured in such a way that it can solve a large number of problems and be based on the interests of employers and employees. [Yatsenko, 2018, 2]. Baranov and Polyanskaya assign key importance to trade unions in social partnership. [Baranov & Polyanskaya, 2017, 4]. Due to social partnership, it becomes possible to resolve existing disputes through legal agreement and reconciliation procedures. [Sorokin, 2006, 4]. The goal of social policy is to meet the social needs of society [Tsubarov, 2015, 7].

Scientific novelty As a result of our study we have justified the following:

• investment of "social capital" in social partnership was considered to make tripartite cooperation more effective;

• the investment of "social capital" is considered necessary through the social policy carried out by the state in order to avoid possible risks.

Analysis Studying the outcome of various prominent researchers, we come to the conclusion that social capital is a unique means of human creation, a process of creating goods, which implies the formation of formal and informal social contracts within and between groups, facilitating the process of matching interests and combining goals due to human connections. The concept of "social capital" was first used in 1916 by L. By Hanifan, who defines social capital as a group of individuals forming a social unit based on goodwill, friendship, mutual sympathy and social relationships. [Isayan, 2021, 2].

P. Bourdieu defines "social capital" as the pooling of actual and potential resources, as the presence of a strong network of institutionalized relationships or membership in a group that provides its members with a certain share of collectively owned capital.

Another researcher, Robert Putnam, considers that "social capital" includes the characteristics of a social organization (social networks, norms, friendship groups) that facilitate cooperation to achieve common goals [Tadevosyan & Shakhsuvaryan, 2021, 4]. Robert Putnam in his book "For Democracy to Work" considered the realities in Italy, emphasizing in that context the investment of social capital. According to Putnam, the ineffective functioning of Italian local self-government bodies was conditioned by the negative manifestation of social capital. [Putnam, 1993, 4].

Pierre Bourdieu considered that for the formation of social capital it is important to find out the dispositions of different layers of the public, because the public is distribu-

ted between different fields and social groups. Bourdieu emphasized cooperation based on economic interest, which according to him gives great spatial opportunities, according to Bourdieu, every field is a separate cosmos, with its own characteristics and its own laws. [Bourdieu, 2005, 60-70]. In his "Political Sociology" work, Bourdieu stated that in addition to economic and cultural capitals, it is also necessary to form conceptual approaches of social capital in the economic policy of countries, as a result of which economic capital will be formed. To achieve all that, he emphasized the role of the team environment, in his words, the idea of the Club effect [Bourdieu, 1986, 242].

In the effectiveness of social capital, researchers attach primary importance to the factor of trust, the formation of normal relations with members of other groups. Social capital implies strong relationships on the one hand, and mutual dependence on the other. As the saying goes in the modern world, "Time is gold" and proper management increases operational efficiency in all areas. Many times long negotiations, signing of legal civil contracts, legal formulations of operating costs are time-consuming and sometimes unjustified. It is thanks to social capital that it can make the transition from legal formulations to trust capital, where verbal agreements and unwritten contracts are more important. A high level of trust makes it possible to significantly reduce costs and create greater profitability. The use of values, approaches, connections, on the one hand, bring personalized results, and on the other hand, serve for the benefit of public interests. However, along with its advantages, it contains noticeable risks, especially in societies living with traditional, ethnic-friendly ties, forming the so-called "acquaintance institution", which Armenian society is not exempt from.

American researcher Banfield, studying the profound differences in economic and political development between southern and northern Italy, came to the conviction that the so-called social capital in southern Italy was based on the "institution of the acquaintance", gaining clan influence and mainly serving for its own interests. In traditional societies, it can sometimes be abused, becoming the reason for the formation of a dominant-clan system. Therefore, emphasizing the development of social capital, the usefulness of decision-making in social partnership due to the intra-group and inter-group trust factor, we also consider it necessary to point out certain risks that arise from the ethnographic-cultural ideas of the nation.

Risk management and investment of social capital as a means of increasing trust in social partnerships is a necessity. To the extent that legal and civil relations are necessary for the correct use of human capital, it is equally desirable to emphasize the formation of friendly relations in collectives and the increase of trust. According to Putnam, the government should not only adopt decisions and laws in the upper echelons of management, but also formal and informal social networks should be created for the proper use of human capital. [Marginem, 1996, 287]: Social networks usually bridge dif-

ferent social groups and individuals. Bridging is one of the most important factors in the formation of social capital, through which common interests and goals are identified between different groups, which motivates people to work together to serve common interests [Chetty, 2022, 108]. The use of social capital increases the flow of information, creates the necessary channels for constant communication, and the social connections that are formed open new doors and spread new ideas. This is where we emphasize the neutralization of negative manifestations of social capital, which may be due to residual stereotypes transferred from the past. It is necessary to increase the scientific and educational base of people through the use of education and modern technologies, and to use the opportunities of social capital during the establishment of social responsibility. Sociologists and social scientists have repeatedly documented the positive aspects that social capital can bring. Individuals and groups with higher levels of social capital report being more successful, having positive relationships, and having greater trust in their organization or community [Kenton & James, 2022,45].

The effective investment of social capital within the social partnership also depends on the quality of the social policy pursued by the state. Ineffective social-politics can lead to problems, conflict-generating consequences, and increase the probability of conflicts in social partnership. Social policy ensures the clarification of labor rights and the expansion of labor rights of workers, leads to the expansion of guarantees and ensuring the implementation of functions, which implies the conclusion of a number of collective agreements. Agreements are concluded between the employer and labor collectives on a voluntary basis and on the principles of equality. The principles of equality in cooperation and the professionalism of receptivity to mutual interests should work here [Soshnikova, 2015, 175].

According to Russian researcher A. Yatsenko, social partnership should theoretically be structured in such a way that it can solve a large number of problems, involve a large number of participants who ensure the stability of current relations, act according to the logic derived from laws and are based on the interests of employers and employees [Yatsenko, 2018, 2]. It is self-evident that effectiveness in relations involving many groups and participants is also determined by intra-group and inter-group relations, where it is valued what social ties exist or can be formed and developed. The investment of social capital in different groups and, in particular, in labor collectives is one of the prerequisites for capacity building and formation of group interests. Russian researchers Baranov and Polyanskaya assign central importance to trade unions in social partnership, emphasizing their level of institutionalization, number, quality, signed agreements, etc. [Baranov & Polyanskaya, 2017, 4].

Unions of workers operate through representatives and they have written guarantees from the workers, which confirm the agreement of the workers to guarantee the

protection of the interests of the collectives. A representative can be anyone guaranteed by the collective, who acts only in the context of protecting the interests of labor [Social partnership,.2014, 200].

As Sorokin believes, the presence of different interests is inevitable, and due to this, the idea of social partnership is based on the principles of compromise, cooperation, and mutual responsibility. Existing disputes, which become inevitable during current relations, can be solved through legal agreement and reconciliation procedures thanks to social partnership [Sorokin, 2006, 4]. The possibilities of social capital should also be understood under reconciliation procedures, as a means of creating a cooperative environment, as the possibility of creating a friendly environment and creating mutually beneficial conditions. In order to invest effective social capital in social partnership, it is necessary to take into account issues related to social law, social equality and social justice. The proposed goals clearly show that without the involvement of the state it is impossible to use the advantages of social capital in social partnership. Here it is important to consider what kind of social policy is being pursued by the state. Social policy is theoretically a field in which interdisciplinary research is conducted to find out how society responds to different conditions based on its social needs [Tsubarov, 2015, 7].

Conclusions Thus, social capital is a by-product of the formation of interpersonal relationships. Growing and strengthening these ties between family, friends, and colleagues helps people build social capital by creating diverse social networks, providing access to relationships with diverse individuals, and gaining additional opportunities and valuable information and knowledge. We believe that in social partnership, social capital, in other words, informal horizontal connections, will create new opportunities to increase the trust factor, which is one of the important conditions for increasing profitability in modern economic relations and business environment. With the help of modern technologies, even over long distances, people are able to form relationships and create a social partnership environment. Effective management within organizations has more to do with the nature of the relationship between managers and employees. The relationship between work efficiency and trust is essential, and economic profitability is directly proportional to the amount of trust. The article considered the importance of internal trust as one of the guarantees of the integration environment within the organization. In the article, the investment of social capital in social partnership is also highlighted as an auxiliary resource for increasing opportunities and increasing reputations in the external environment.

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Valuing social capital in the context of social partnership

Key words: social capital, social partnership, social policy, social insurance system

Social capital is a by-product of the formation of interpersonal relationship. Growing and strengthening these connections among family, friends, and colleagues, helps people build social capital by creating diverse social networks, providing access to relationship with diverse individuals and gaining additional opportunities and valuable information and knowledge. Social capital in social partnership in informal horizontal connections will create new opportunities to increase the trust factor, which is one of the important conditions for increasing profitability in modern economic relation and business environment. With the help of modern technologies, even over long distances, people are able to form relationship, create a social partnership environment. Effective management within organizations has more to do with the nature of the relationship formed between managers and employees. The relationship between work efficiency and economic profitability is directly proportional to the amount of trust. We considered the importance of internal trust as one of the integration environment within the organization. The investment of social capital in social partnership is also highlighted as an auxiliary resource for increasing reputations in the external environment.

STUDENT / UNIVERSITY MATCHING MARKET ANALYSIS IN RA

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Key words: matching theory, matching markets, Gale-Shapley algorithm, stable matching, student and university matching, mechanism design, efficient mechanism

Introduction The stable matching theory is an area of study in economics that focuses on matching markets, which differ from traditional Walrasian markets by emphasizing the pairing of individuals or entities. This theory primarily examines matching without considering search frictions, distinguishing it from search and matching theory. Matching theory can be divided into two main categories: matching with non-transferable utility (NTU) and matching with transferable utility (TU). NTU matching involves match payoffs that cannot be transferred between individuals, and stability requires both individual rationality and double coincidence of wants. The primary focus of the matching theory is on two-sided matching, where two distinct types of individuals or entities are involved [Roth & Sotomayor, 1990]. Examples include men and women in the marriage market, firms and workers in the labor market, and students matching with colleges [Hakimov & Kübler, 2020, 434-488]. However, a smaller body of literature also explores other types of matching, such as one-sided matching (e.g., the stable roommates' problem) and many-sided matching (e.g., matching involving multiple parties like man-woman-child). The matching theory addresses three types of matches within the context of two-sided matching: one-to-one, many-to-one, and many-to-many. In addition to examining positive questions about the matching process itself, the matching theory also explores normative questions related to designing efficient matching markets. The matching theory has found applications in various domains, including marriage, housing allocation, kidney exchange programs, the National Resident Matching Program (NRMP) for medical residencies, and school choice programs [Sørensen & Kalleberg, 2019]. Overall, matching theory provides a framework for understanding and optimizing matching markets in different settings, with implications for both theoretical analysis and practical market design [Levin, 2021].

As mentioned above the stable matching theory has been applied in different settings and one prominent case of it is student/university matching problem which will be the main interest of this article. Each country has its own regulation regarding the student admission process in universities, and these processes are actually diverse. The main goal of this article is to analyse the university admissions process of the Republic of Armenia for bachelor's degree programs in the Armenian student university matching

market. More precisely the goal of the article is to check if the algorithm currently used in the admission process provides stable matchings. As the framework and methodology of the matching theory has not been applied to the Armenian case and regulation the analysis includes a scientific novelty

Methodology As the student / university matching problem can be considered as an extension of the stable marriage problem let us first introduce the mathematical concepts used in the article in the context of the stable marriage problem and then apply and modify them in the problem under the interest of ours.

Let us consider a set X, defining a preference relation over X as being binary relation $\succ$ that satisfies the properties of completeness ireflexivity, and transitivity.

- Completeness: for $\forall\, x, y \in X, either\ x \succ y, or\ y \succ x$
- Ireflexivity: $x\ is\ not \succ x$
- Transitivity: $if\ x \succ y\ and\ y \succ z, then\ x \succ z$

For the marriage problem two disjoint sets are considered and the marriage problem: W as the set of women with w as its element, and M as the set of men with m as its element. Each participant has a complete preference relation over the opposite set. Matching is a bijection from the set of men to the set of women, being a collection of n pairs of (w,m) pairs. One of the most important concepts in matching theory is the objection to matching. A man and a woman object to matching if they prefer each other to the mates they were matched under the matching algorithm. The matching is considered stable if there is no pair consisting of a man and woman objecting to the matching. Matching is considered stable if a man who is objecting to the matching prefers a woman to his current mate, but woman considers her current matching preferable to him.

As mentioned in the literature review Gale and Shapley (1962) found an algorithm that guarantees stable matching for the marriage problem, proving that to every matching problem there exists a stable matching.

Coming back the student / university matching problem it is worth mentioning that this problem is considered polygamous matching as more than one member of one set can be matched with the same member of another set. In our case, more than one student is admitted to the same university. In this case we define finite sets of universities (U) and finite sets of students (S). Another modification needed for this problem is the idea of quota, as usually universities have a finite number of capacities, and quotas are defined on the maximum number of students who can be admitted to the university. For each student, we define the preference relation over universities and for each university we define preference relation overs students. A matching is a function, which assigns to each university $u \in U$ a subset S, which contains 0 to q_u students. Each student $s \in S$ is

associated with at most one university. Objection in this kind of problem is defined as follows:

- Student s prefers university u to the university to which he is matched.
- University u is matched with maximal number of students q_u but prefers the s student to one of its current matchings or university u is not matched with maximal number of students q_u

A matching is considered stable if no objection is present [Maschler, et al., 2013, 884-905]. For the analysis simulation, similar to the algorithm used in RA is run according to the defined parameters and assumptions, and the matching results are drawn. The objection sets are derived both for students and university programs, and in case of the coincidence of the objections instability of matching is assumed to be discovered. The simulation is implemented using the mathematical packages and functions of Python.

Literature review David Gale and Lloyd Shapley (1962) introduced the stable marriage problem, the concept of stable matching and the algorithm known as the Gale-Shapley algorithm. David Gale and Lloyd Shapley (1962) also presents the stable matching problem in the context of college admissions and marriage markets. Alvin E. Roth and Marilda Sotomayor (1992) provided a comprehensive treatment of the theory of two-sided matching, including the Gale-Shapley algorithm, its properties, and extensions also covering various applications of stable matching theory. Tayfun Sönmez and M. Utku Ünver (2013) extends the stable matching model to include contracts, where each agent's preferences may depend not only on whom they are matched with but also on the terms of the contract, introducing the concept of the contract-stability solution and providing algorithmic results. David K. Levine and Yannai A. Gonczarowski (2018) offered a comprehensive analysis of matching markets, including the theory, algorithms, and economic design aspects. They covered both two-sided matching and many-to-one matching problems, along with applications in various real-world settings. Parag A. Pathak and Tayfun Sönmez (2013) introduces the concept of externalities in stable matching problems, where the agents' utilities are influenced by the composition of other matched pairs. It explores the implications of externalities on the stability and efficiency of matching markets. Gale-Shapley algorithm is extended to a dynamic setting by Bettina Klaus and Flip Klijn (2018), where agents arrive and depart over time. It presents a discrete-time version of the algorithm and analyzes its properties. Yeon-Koo Che and Yuliya S. Ponomareva (2014) studies the stable matching problem when agents have incomplete information about each other's preferences, exploring the effects of incomplete information on the existence, stability, and efficiency of matching outcomes.

Scientific novelty The scientific novelty of this article lies in its pioneering analysis of Armenia's student-university matching market for bachelor's degree programs. While stable matching theory has been extensively explored in various countries, the

application of this theory to Armenia's unique admission process remains uncharted territory. This study breaks new ground by presenting the first comprehensive investigation of the efficiency and stability of Armenia's university admissions process with the framework of the matching theory.

Analysis As mentioned, the goal of this article is to analyze the stability of the matching algorithm in Armenian student/university matching market. University admission competition in Armenia is held in two stages: main and additional. The competition of the main stage is held with the application to one program and University with scholarship and paid. The list of applicants admitted to the university is compiled in descending order of the sum of the points obtained from the entrance exam subjects defined for the given specialty (educational program). After the confirmation of the results of the main stage of the entrance exams competition, if there are vacant places in the universities, the applicants who received a positive point(s) in the entrance exams, but were left out of the competition, can participate in additional vacant places. An additional stage competition is held by one or more universities with the application of up to 6 programs.

For the analysis in this article, several simplification assumptions are made, which maintain the general principle of the admission algorithm discussed above. These assumptions are made for computational purposes and in future research, they can be relaxed, to analyse more specific environments. We define S as set of students with s_i as its member. For the simulation, set of students S is assumed to contain 1000 students (n). We define U as set of university programs with u_j as its member. As the students apply to specific program of the university and not to the university itself, it is logical to include the programs in the U set instead. U is assumed to contain 20 programs (m), which is simplified assumption and can be relaxed increasing the number of programs.

In the next stage preferences of students and universities should be defined. We define $\succ_S$ to be the set of preferences with $\succ_i$ as the preference relation of *i*th student. Preferences are assumed to be complete, transitive and irreflexive over university programs. Preferences are derived randomly from uniform distribution. Preferences are derived from uniform distribution, which is simplified assumption. In real world situations there are programs of high interest and programs of low interest. This environment can be modelled by deriving preference relations form other distributions.

We define $\succ_U$ to be the set of preferences of university programs with $\succ_j$ as the preference relation of *j*th university program. University preferences relations are straightforward. Students with overall high grades are preferred to the ones with low grades. We define q to be the set of university quotas with q_j being the quota for the *j*th program. Quotas are assumed to be evenly distributed per program.

$$q_u = 50 \; for \; \forall u \in U$$

This is simplified assumption and can be relaxed in future research by scaling the model by increasing quotas or defining unevenly distributed quotas per program.

The overall quota for all university programs is equal to the number of students.

$$M \times q_j = N = 1000$$

This property suggests that each student will be matched and for each program maximum capacity will be realized.

We define G as a set of grades for each student s_i with g_i as its member. Grades are assumed to be district and are derived from random uniform distribution with lowest point of 0 and highest point of 20. However, this is simplified assumption, as in reality grade distributions are different. For the future research grades can be drawn from other statistical distributions, such as truncated normal distribution. Furthermore, actual data suggests that grade ranges have different probabilities, which can be estimated according to actual statistical data and distributions can be tuned accordingly. This is outside the scope of this article and can be used as a basis for future research.

Another key factor which can also be considered in the future is grade beliefs. As students reveal their preferences before the actual grades are published, the knowledge they possess regarding grade is different from the actual grades. In this article it is assumed that grade beliefs are equal to the actual grades. Finally revealed preference of students is assumed, which means that actual preferences are revealed by the students and no other strategy is implemented which can give them better payoffs.

After the assumptions are formalized, preferences and grades are drawn, mechanism, similar to student admission algorithm of RA discussed above, is implemented, which results in a matching for each s_i to u_j.

Conclusion After the derivation of matchings, analysis is done to reveal any objections belonging to s_i. Let us define current matching of *i*th student as u^*.

$$if\ u_j \succ_i u^* \ \leftrightarrow objection\ is\ recorded$$

Objection of s_i is recorded if the student prefers another program to his current matching. For the simulation purposes for each u_j which is preferred to the current matching we defined separate objection. For example, if a student prefers 5 universities to his current matching, 5 objections from student perspective are calculated. In the simulation implemented 159 cases of student objections are detected.

Ultimate step would be to analyse, if these 159 cases of objections include university programs which also prefer the objecting s_i to $s^*{}_i$ (students admitted to the university). In that case the final conclusion would be that the matching algorithm with the simplified assumptions produces non-stable matchings.

The calculation of u_j objection is the following:

$Define\ s_j^*\ as\ the\ set\ of\ students\ matched\ to\ the\ program$
$Define\ g_j^*as\ the\ set\ of\ grade\ of\ the\ students\ matched\ to\ the\ program$
$Define\ \succ^*_i\ as\ the\ set\ of\ universities\ which\ are\ prefered\ to\ the\ current\ matching\ of\ ith\ student$
$If\ u_j \in \succ^*_i\ and\ g_i > \min(g_j^*) \leftrightarrow u_j\ has\ an\ objection$

If the actual grade of the objective student is bigger than the minimum grade of the current matchings of the university programs, this would suggest that the university prefers the objective matching to one or more of its current matchings. As defined in the introduction section s_i and u_j both having objections and preferring each other to their current matching is defined as unstable matching. In our simulation 56 cases of unstable matchings were detected. The economic explanation of the situation in university / student matching market would be the following: the student prefers the program more than the one he is admitted to, the program prefers the student to the other students who got admitted to the program, but they are not and cannot be matched together because of inefficiency of the mechanism implemented.

The final conclusion according to the mode is that the current mechanism, which is applied in Armenia for the matching of students and universities, produces unstable matchings and can be considered inefficient.

Suggestions Finally, we suggest the following:

- the simulation and analysis used in the article is based on several assumptions, which can be relaxed for the future research,
- current mechanism implemented produces insufficient results and should be revised,
- more specifically Gale-Shapley algorithm can be implemented, which is proved to always result in stable matchings, where no party has an intention to change the matching [Gale & Shapley, 1962, 9-15],
- for the practical application of Gale-Shapley algorithm the idea of "waiting lists" can be utilized. [Roth, et al., 2005, 368-371], [Grenet, et al., 2021, 1427 – 1476].

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Student / University Matching Market Analysis in RA

Key words: matching theory, matching markets, Gale-Shapley algorithm, stable matching, student and university matching, mechanism design, efficient mechanism

The article examines the student/university matching market and the admissions process in the Republic of Armenia, with the goal of evaluating the stability of the current matching algorithm. Stability of the current matching algorithm is examined by considering the preferences of students and universities accommodating concepts of polygamous matching. A simulation is conducted using Python to evaluate the stability of the matching process based on derived objection sets. The results provide insights into the stability and effectiveness of the current algorithm and its implications for the student-university matching market in Armenia. The objections are identified, indicating instances where students and programs prefer each other to their current matches. The analysis reveals cases of instability in the matching algorithm, indicating its inefficiency. Suggestions for improvement include implementing the Gale-Shapley algorithm, which guarantees stable matchings, and incorporating waiting lists for practical application. Future research can explore relaxed assumptions and refine the model.

EFFICIENT GRADIENT-BASED ESTIMATION IN FINITE ECONOMICS' PROBLEMS

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Key words: Reinforcement learning, finite economics problems, Q-learning, gradient descent, gradient-based value estimation, Bellman equation, loss function, temporal difference, outlier-splitting method, Gauss-Newton method

Introduction In reinforcement learning, very often, we use reward functions that are not differentiable, so optimizing these functions directly is not possible. Because of that, we need to estimate values, which became a core problem in RL [Sutton, et al., 2018, 1-13], [Bhatnagar, et al., 2009, 3-5]. For value estimation, we use mostly modified temporal difference (TD) algorithms such as ESARSA [Van Seijen, et al., 2009, 177-184] and double DQN [Van Hasselt, et al., 2015, 2-5], but they are not gradient-based optimizing methods, so their effectivity from the convergence perspective can't be guaranteed. It is not stable for general approximation [Baird, 1995, 30-37]. This instability was why gradient-based optimizations, such as residual gradient for MSBE and dual gradient-TD algorithms (GTD) [Dai, et al., 2017, 1458-1467], started to evolve. Even though these algorithms have general convergence properties, they are slower than TD-based algorithms in tabular and linear approximation cases [Ghiassian, et al., 2020, 3524-3534].

In this article, we analyze gradient-based algorithms' computational complexity by considering the landscape of MSBE. After we prove theoretically that MSBE is ill-conditioned. This result provides insight into why gradient-based value estimation is slowly converging. On the other hand, Gauss-Newton methods are invariant to the conditioning of loss. We can't use them directly because these methods require inversing matrix (it is computationally hard). We need to provide a linear approximation algorithm called approximate residual Gauss-Newton (RAN). It uses trace to find the proper direction and updates weights along the trace direction. RAN has a problem with double sampling, and because of that, it can be used only in deterministic environments. To properly resolve this problem, we propose RAN extensions which are GTD-based. Our method out-performs residual gradient and GTD having the same computational complexity. Then we analyze the situation of large outliers with essential information in gradients of MSBE. For that, we use one more additional block to RAN of outlier-

splitting (RANS). Conducted experiment on a finite economics environment shows that RANS signify-cantly improves RG and competes with TD-based algorithms.

Methodology We define Markov Decision Process (MDP) as a tuple $< S, A, R, p, \gamma >$, where S and A are finite sets for states and actions correspondingly, R is a set of rewards (may be continuous), $p: S\ x\ A\ x\ S\ x\ R \rightarrow [0,1]$ probability distribution function given as probability of next state if we take an action with some immediate reward from previous state, and γ is a discount factor used to calculate the discounted sum of rewards. Then we define Q-function (action-value function) as $q_\pi: S\ x\ A \rightarrow R$ is expected discounted sum of rewards from current state s acting a. Value function is defining as $v_\pi : S \rightarrow R$ and $v_\pi = E_{a\sim\pi(*|s)}[q_{pi}(s,a)]$. Mostly in production cases, we try to get a parametric estimation on Q-functions through some parameter-dependent (d dimensional vector w) function $q_w : S\ x\ A \rightarrow R$. Based on all these definitions we can define Bellman residual $\delta_w : S\ x\ A \rightarrow R$ calculated as:

$$\delta_w(s,a) = E_{s',a',r\sim p_\pi(*,*,*|s,a)}[r + \gamma q_w(s',a') - q_w(s,a)]$$

According to Bellman equations $q_w = q_\pi$ <-> $\delta_w(s,a) = 0$ for any $(s,a) \in S\ x\ A$. So, if we have some distribution D over states and actions, MSBE in this case can be defined as proxy to estimate quality of w:

$$MSBE_D(w) = E_{(s,a)\sim D}[\delta_w(s,a)^2]$$

If the distribution is online, then we just write $MSBE(*)$. If instead of parametrized Q-function, we use value function $v_w: S \rightarrow R$ then:

$$MSBE_D^V(w) = E_{s\sim D}[\delta_w(s)^2]$$

Where D is distribution over the states, and $\delta_w(s) = E_{a\sim\pi(*|s)}[\delta_w(s,a)]$.

Gradient-based value estimation is done through minimizing MSBE by gradient optimization. If during timestamp t two independent transitions are required, we call it double sampling. RAN algorithm iteratively updates 3 values:

$$\delta_t = R_t + \gamma q_w(S_{t+1}, A_{t+1}) - q_w(S_t, A_t)$$
$$\delta_t' = R_t' + \gamma q_w(S_{t+1}', A_{t+1}') - q_w(S_t, A_t)$$
$$w = w - \alpha\delta_t'\nabla_w\delta_t$$

Where $w_t = w$. Apart from that, we also update Gauss-Newton directions.

MBSE Loss Illness: Condition-number of symmetric square matrix H is defined as:

$$C(H) = \frac{\max\limits_{x:||x||=1} |x^T H x|}{\min\limits_{y:||y||=1} |y^T H y|}$$

In other words, it is the ratio of largest and lowest singular values. After that we define condition number for quadratic function $f(x) = x^T H x$.

$$C(f) = C(H)$$

Where H is hessian matrix of function f. We consider linear approximation case, and because MSBE is a quadratic function, then it has a condition number as well denoted C.

Theorem: *a) For any Markov decision process and with any policy, the following takes place:*

$$C \geq \frac{(1-\gamma h)^2}{4} min(\frac{l^2}{\gamma^2}, \frac{1}{(1-\gamma)^2})$$

b) For any ≥ 1 *, there exists a policy and* n *state Markov decision process such as:*

$$C \geq \frac{\gamma^4 n^2}{(1-\gamma)^2}$$

Proof: Part b is proved in [Zhang, et al., 2020, P. 1611-1619], so we will prove only part a. Let's note that fixed policy gets to Markov process with termination point. We consider having a Markov chain with n non-terminal states, let P be associated transition matrix. Let

$$A = (I - \gamma P)^T (I - \gamma P)$$

If we take tabular approximation and uniform state distribution D, we have:

$$MSBE^V(w) = \frac{w^T A w}{n}$$

We denote largest and smallest eigenvalues of A as λ_{max} and λ_{min}. It follows that $C = \frac{\lambda}{\lambda_{min}}$

We estimate from above λ_{max} and from below λ_{min}. Let's denote l_i the expected number of steps until termination for state i. In that case it is obvious that

$$l_i = 1 + \sum_{j=1}^{n} P_{ij} l_j$$

Let's make a vector from these expected numbers and denote as $l = [l_1, \dots, l_n]^T$, then we can rewrite our expectation formula:

$$l = 1 + Pl$$

Where $1 = [1, \dots, 1]^T$. From above, we get:

$$(1 - \gamma P)l = l - \gamma P l = l - \gamma(l - 1) = (1 - \gamma)l + \gamma * 1$$

Let $l = \frac{l_1 + \cdots + l_n}{n}$ as mean of $\{l_i\}_{i=1}^n$. From Cauchy-Schwarz inequality we get:

$$\frac{||l^2||}{n} = \frac{1}{n}\sum_{i=1}^{n} l_i^2 \geq \left(\frac{1}{n}\sum_{i=1}^{n} l_i\right)^2 = l^2$$

Let's estimate largest eigenvalue firstly:

$$\lambda_{max} \geq \frac{1}{n} trace(A) = \frac{1}{n}\sum_{i}^{n} A_{ii}$$

$$= \frac{1}{n}\sum_{i=1,j=1}^{i=n,j=n} \left(I_{ji} - \gamma P_{ji}\right)^2 = \frac{1}{n}\sum_{i=1}^{n}\left((1-\gamma P_{ii})^2 + \sum_{j\neq i}\gamma^2 P_{ji}^2\right)$$

$$\geq \frac{1}{n}\sum_{i=1}^{n}(1-\gamma P_{ii})^2 \geq \left(\frac{1}{n}\sum_{i=1}^{n} 1 = \gamma P_{ii}\right)^2 = \left(1 - \frac{\gamma}{n}\sum_{i=q}^{n} P_{ii}\right)^2$$

$$= (1-\gamma h)^2$$

For the smallest one we get:

$$\lambda_{min} \leq \frac{l^T A l}{\left||l|\right|^2} = \frac{\left||(I-\gamma P)l|\right|^2}{\left||l|\right|^2} = \frac{\left||(1-gamma\,)l + \gamma * 1|\right|^2}{||l|^2}$$

$$= \frac{(I-\gamma)^2||l||^2 + 2\gamma(1-\gamma)1^T l + \gamma^2 n}{\left||l|\right|^2}$$

$$= (I-\gamma)^2 + \frac{2\gamma(1-\gamma)nl + \gamma^2 n}{\left||l|\right|^2} \leq (I-\gamma)^2 + \frac{2\gamma(1-\gamma)l + \gamma^2}{l^2}$$

$$= \left(I - \gamma + \frac{\gamma}{l}\right)^2$$

So, connecting these 2 estimations together we can write down:

$$C = \frac{\lambda_{max}}{\lambda_{min}} \geq \frac{(1-\gamma h)^2}{(1-\gamma+\gamma/l)^2} \geq \frac{(1-\gamma h)^2}{2(1-\gamma)^2 + 2\gamma^2/l^2} \geq \frac{(1-\gamma h)^2}{4}\min\left(\frac{l^2}{\gamma^2}, \frac{1}{(1-\gamma)^2}\right)$$

Which completes the proof of point a.

This theorem implies slow convergence of MSE gradient optimization methods. For example, if we set the following parameters for our MDP $\gamma = 0.99, l_{min} = 100, p = 0.1$, then from point a, we get that $C > 2000$.

Double Sampling Freedom: In RAN algorithm, we need double sampling, but such a requirement is possible only in theoretically created environments, because 2 sequential states are very likely dependent [Dabney, et al., 2014, 3-6]. To solve this issue, we use parametrization for 2 sequential samples, so the only difference compared RAN is one more additional parameter added and a separate update of that parameter.

Outlier Sampling: RAN also has a problem with rare samples with big gradients and it can't be clipped [Zhang, et al., 2019, 3-9] because of the information contained in them. Let's consider the idea of how we can do that. Let's note a task of minimization of $f_1 + \cdots + f_n$ for smooth functions $\{f_i\}_i^n$ and f_j -s gradient is k times larger than the gradient of norms of other functions for some $k > 1$. Instead of optimizing sum of

functions we optimize $\frac{f_1}{k} + \cdots + \frac{f_1}{k} + f_2 + \cdots + f_n$ random based. The first updates are getting rid of outliers, while latter ones are equivalent to updating initial sum. Let's set outlier sampling probability as σ (will be used later as a hyperparameter).

RANS: Final algorithm is a combination of RAN, double sampling freedom, and outlier splitting. To update Gauss-Newton directions more effectively, we insert adaptive step-size β using the algorithm from [Kochenderfer, et al., 2019, 95-99]. Let's denote a trace vector v_t of $(\nabla\delta_t)^2$. Here is the update rule:

$$v_t = \lambda' v_{t-1} + (1-\lambda')(\nabla\delta_t)^2$$

We set $\eta \in (0,1)$ and

$$\epsilon_t = < \frac{1}{\sqrt{v_t}} * \nabla\delta_t, \nabla\delta_t >$$

Where $*$ is entrywise product, $<>$ - inner product. After we compute trace ϕ and k the following way: $\phi_{t+1} = \lambda'\phi_t + (1-\lambda')\epsilon_t$ and $k = \lfloor \epsilon_t / \rho\phi_t \rfloor + 1$. Step size is set:

$$\beta_t = \frac{\eta}{\rho\phi_t}\frac{1}{\sqrt{v_t}}$$

Let's show that RANS prevents problems that RAN has. Let actions space consist of one element $A = \{a\}$. When we approximate functions, 2 successive states $(\{S_t, S_{t+1}\})$ often doesn't differ a lot from the representation standpoint, consequently their gradients of Q function are close to each other, which implies

$$\Delta\delta_t = \gamma\Delta q_w(S_{t+1}, a) - \Delta q_w(S_t, a) \sim 0$$

The problem here is not in the fact that $\Delta\delta_t$ is small. If it was small for all the consecutive states, then we could easily solve the problem by using a step-size scheduler and constantly increasing it (that action should happen slowly as a smooth function). The problem appears when the next state is terminal and in that case that state will be far from its previous state. Despite the fact that mostly such scenarios happen with a low probability, we risk to lose too much information. The updating rule in RAN has a momentum and correction terms (corrects direction to Gauss-Newton). In an outlier case, correction term gets too large, which means that direction change to Gauss-Newton happens much faster than it should have been. As a result, tracking that direction becomes challenging. As long as, we have defined updating β_t, we have

$$\frac{1}{k} < \beta_t * \Delta\delta_t, \Delta\delta_t > = \frac{1}{k}\frac{\eta}{\rho\phi_t} < \frac{1}{\sqrt{v_t}} * \Delta\delta_t, \Delta\delta_t > \leq \frac{\rho\phi_t}{\epsilon_t}\frac{\eta}{\rho\phi_t} < \frac{1}{\sqrt{v_t}} * \Delta\delta_t, \Delta\delta_t > = \eta$$

From there we get that

$$\left| \frac{1}{k} < \beta_t * (\Delta\delta_t^T m)\Delta\delta_t, \Delta\delta_t > \right| \leq \eta |\Delta\delta_t^T m|$$

Consequently, outlier sampling problem doesn't occur in RANS.

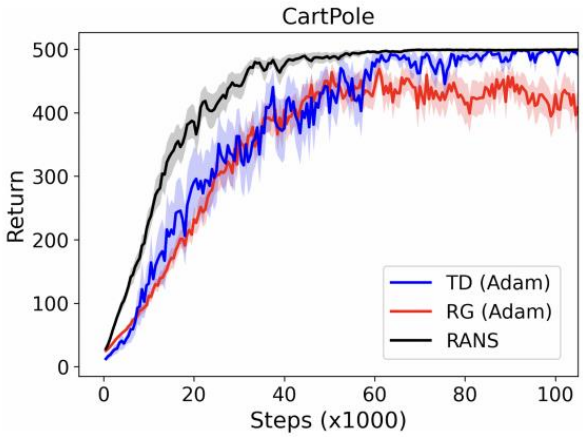

Figure 1. Performance of models on economical decision-making task CartPole, where Q-values are learnt

Literature review MSBE illness and the challenges that appeared with it were a complex challenge to solve. In the work [Wang, et al., 2021, 3-6] poor conditions related to MSBE were examined in detail. Their research was concentrated on Markov chains with a fixed length. In their work, it was found out that condition-number of chains increases quadratically to the length of that chain. Second important finding was that there is one more dependence and it is reverse quadratic related to γ. These findings provide a clear understanding of current problems with the corner cases.

Gradient-based value estimation methods are powerful, but they lack computational efficiency. For details, one can refer to Baird's article, where it is revealed that each update of RG method is an update of 2 components. First one is called TD component and is responsible for keeping a right direction during the optimization and wrong direction component. Here the main idea was to reduce second components' influence. The experiments have shown that the strategy clearly works on early epochs of training but after gaining a certain momentum, it is not effective at all.

The open question on how to get an adequate gradient value estimation had other alternatives proposed. For example, Gauss-Newton method was in [Gottwald et al., 2022, 1-5]. This development wouldn't have been done if Newton's method wasn't studied in [Sun, et al., 2015, 3-7], where authors discussed minimization problem of MSBE and solving it through Newton method.

Natural gradient-based methods for value estimations were presented in [Kakade, 2001, 1-3], where the author proposed a method to solve basic problems without complex data. Along with them a similar architecture to RAN was proposed. The model was similar from the algorithmic perspective to RAN but was 2 times larger than the original

RAN. In both articles the outlier sampling problem wasn't considered as a serious one and as an implication – wasn't solved.

To solve the problem with outliers, there were numerous tries. The most popular of them are [Karampatziakis, et al., 2010, 3-6] and [Tian, et al., 2019, 64-76], where step scheduling was proposed to decrease the effect of outliers. With outliers, there is a higher chance that we got a bigger direction change, so fixing of it will take longer rather than without outliers (which means that next state is not terminal and the gradient values' difference is not too big).

Scientific novelty Compared to previous works related to gradient-based value estimations, mostly all the challenges have unpleasant corner cases, which can't be handled through provided methods in real cases. Benchmark solutions like RAN effectively give value estimation in theoretical cases, when the data is not noisy and is consistent, which in production tasks never happens. That is the main reason why TD is still commonly used as an easy alternative to complex gradient-estimation approaches, because it behaves well on noisy data. This research shows that not all the complex methods have problems with corner cases, it theoretically proves how double and outlier sampling can be included in the common value-estimation solution, without making the method more complex. The newly provided gradient-based value estimation method – RANS gives an alternative to TD, which was one and only baseline for noisy and inconsistent data. It works faster than TD and convergence happens smoother.

Not only as a new method but also as a new way of considering both gradient-value and value estimations, RANS provides a way to improve already existing algorithms that work on unbiased, less noisy data. Overall, RANS is not only a new gradient-value estimation algorithm, but a new way of generalization of solutions with outlier sampling cases.

Analysis After analyzing previously developed methods and showing how RANS is better compared to its competitors, we will experimentally show the results that we have proven above. As baseline comparison methods we are going to take TD and RG. RG is not able to handle outlier sampling problem but provides good results otherwise. TD is faster, with worse quality but handles outlier sampling.

RANS has the following tuple of hyperparameters $< \alpha, \eta, \rho, \lambda, \lambda', \sigma >$. We set for experiment the following values as default without effecting performance: $\eta = 0.2$, $\rho = 1.2$, $\lambda = 0.999$,

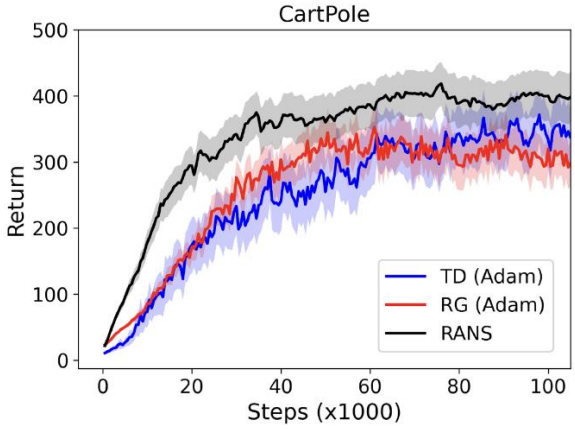

Figure 2. Performance of models on economical decision-making task CartPole, where average of expected Q-values are learnt

$\lambda' = 0.9999$, $\sigma = 0.02$. So, the only hyperparameter to optimize is α like TD and RG algorithms. Computational complexity in one iteration in the worst case is 2 times more than TD and RG.

Next step is formally defining the environment. Here, we are going to use a finite economic game "CartPole", which has the same naming as the balance game. The game itself can be considered as a benchmark to test the quality of RL-based models, especially in cases where the algorithm is not complex and doesn't need a lot of data to feed. In finite economy case, we have 2 types of states – stable and unstable. There are 2 types of instabilities, called negative and positive. The distinction between these two from task's goal perspective doesn't change, but for the understanding, we need to mention that there is a big difference on how economics can become unstable and based on type scores are different.

The player has a finite set of actions. There are three choices that in each state can be taken. First action pushes economy to the negative side of instability second action pushes the economy to positive side of it. Third action is more passive than previous 2 and it is designed to be more inactive and mostly causes not a dramatic move of economy stability score to neither one nor other direction. Fortunately, if the next state is terminal, then dramatic move may happen even in case of third type of action. It is logical because sometimes doing nothing to your economy can make situations worse or better.

The objective of this environment is not just about reacting to the current policy. It is created as a new RL task, where the model should find an optimal policy – sequence of actions, which gives the economy stability for some amount of time. If there are state changes with a low probability that may cause outlier sampling, this environment fully

matches the case to use RANS and make sure that theoretical results have experimental confirmation too.

First experiment is taken on a basic economics task with discrete environment [Charpentier, et al., 2020, 29-34]. We remind that the goal is to keep the economy stable between negative and positive instability during k consecutive steps. The final model is a neural network with 128 hidden units and Leaky-ReLU for actions distribution and Sigmoid for Q-function distribution. Results can be viewed in figure 1. where we compare our algorithm with TD and RG using Adam optimizer.

For the second experiment we used a multi-layer network with 256 hidden Leaky-ReLU activations, so we can learn action-values (AV). Actions are being chosen using sigmoid distribution on AV. The network for Q function is being trained by three algorithms, as the first one: TD, RG and RANS. Basic RANS has an advantage over its basic competitors because of adaptive step size updating, and because of that we are using TD and RG with Adam optimizer.

For each of the experiments we performed 200 randomly generated data samples with random seeds. We are estimating expected values of Q function, so we took an average of 200 environment simulations each 400 steps. The results can be viewed in Figure 2, where an average of expected returns on random samples is plotted.

There is a need to mention separately that once the algorithm achieves a score of 400 and stabilizes, the following happens. Once the algorithm reaches a certain equilibrium it starts to forget actions that were making summary reward higher. The absence of failures during some period causes the model to have catastrophic forgetting problem.

To solve of this problem, during the experiment the following strategy was used. Recognizing the fact that with specific scenarios that causes random samples, the environment won't be able to pass enough information to the model, which will cause it to have abovementioned problem. For that reason, 60 worst average return scenarios are dropped off. This helps the algorithm to concentrate on a certain set of challenges, preventing the rest from affecting the performance of the model.

To eliminate catastrophic forgetting at least partly, we used a replay buffer. It serves as a memory reserve, where we store previous replay experiences which allows us to revisit them later. It is a way to force the model to learn from previous experience which allows to overcome catastrophic forgetting. Anyway, to overcome this problem fully, we need to use updates through batches, which allows us to replay the algorithm with multiple sessions at the same time.

Ideal way of excluding catastrophic forgetting in case of big size of configuration space we need to increase replay buffer size significantly, because it will ensure more extensive range of experiences stored.

For both experiments there is a specific list of parameters that were used to ensure that the model is consistent and generalizable for any randomly generated finite environments. The choice of parameters is done through Grid Search on a set of parameters with size 2000, running them for small number of randomly generated environments, and getting the best results from that set. For each of below 3 algorithms the process is being repeated and as a result here are the parameters with their values that each algorithm uses as an optimal:

- For TD, sigmoid coefficient 0.01 with Adam optimizer with step-size 0.3 was used.
- For RG, sigmoid coefficient 0.005 with Adam optimizer with step-size 0.3 was used.
- For RANS, sigmoid coefficient 2, $\alpha = 0.001$, and the rest of the parameters were set to default.

Above experiments with set parameters show that RANS overperforms from the quality perspective both TD and RG algorithms, and from the speed perspective it is better than RG. On the other hand, it is slower than TD because each iteration RANS has adaptive step-size updating rule, which isn't included in TD but on the other hand, RANS handles outlier cases with higher accuracy, and the model doesn't lose its consistence if probability of outlier samplings increases.

As a further analysis for future works, we haven't covered off-policy cases, showing how RANS work experimentally only on-policy way. Of course, it can be easily transferred from on-policy to off-policy applying any importance sampling method. Also, there is a direction to test this method on an environment, which configuretion set's power is continuous and compare RANS to other baseline algorithms as well as applying unbiased gradient estimate instead of biased one. On continuous environments it would be also interesting to prove alike theoretical results as we did here to apply the same methods here and exclude corner cases and make the models for any types of environments (consequently, continuous economics problems) stable.

Conclusion In this article we explained the most common challenges that MSBE's gradient-based value estimations have. The main issue that was identified was the slow convergence. We theoretically explained why gradient-based value estimations for MSBE currently are slowly converging: double sampling and outlier sampling. Both problems cause inconsistency during the estimation process and add noise to it. Because of that overall efficiency of method becomes not competitive.

To fix that, we considered RAN algorithm, which provides robustness in many common cases. After that, we considered solutions for both double and outlier samplings and combined them with RAN getting more advanced algorithm called RANS. It includes RAN and corner case solutions lowering the noise and inconsistence for both problematic samplings. Theoretically we proved that RANS is improving overall convergence and solved problems of double sampling and outlier sampling.

Further taken experiments with RANS, particularly on an economical problem with a finite number of states and 3 decisions' environment has shown that it improved previous baseline algorithms like RG and TD. Compared to TD, RANS has shown competitive results, showing a potential to be used in certain scenarios, where the generated samples include a lot of noise.

This research provides a new way of looking at challenges in gradient-based estimations, where a smart combination of corner cases and ordinary solutions can give a significant enhancements and RANS as a perfect example, provides promising results for the future research and applications in finite decision-making environments.

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Efficient gradient-based estimation in finite economics' problems

Key words: reinforcement learning, finite economics problems, Q-learning, gradient descent, gradient-based value estimation, Bellman equation, loss function, temporal difference, outlier-splitting method, Gauss-Newton method

Gradient-based methods (GBMs) for estimating values have stability properties, but the temporal difference (TD) and its modifications' learning methods are much faster in reinforcement learning (RL). We prove a theorem stating the cause of GBMs being slow and show that the mean square of Bellman error (MSBE) is a not appropriate loss function if its second derivative matrix has a significant determinant. To resolve the problem with MSBE on GBMs we propose residual approximate Gauss-Newton with an outlier-splitting method (RANS). This method adds outlier-spitting on gradient methods and learning adapter ideas to residual gradient methods making them more stable from the estimation perspective. We show that it is faster than its residual competitors having the same computation time and competing with TD on the baseline problem of economics (CartPole) in RL that we tested. Further analysis and future contributions are considered to make the result of these methods better on any types of economics, which can be built as a finite set of state-action pairs. After proving that claim, GBMs can be used as a baseline in any types of RL-based problems including finite economics problems.

ISSUES OF INCREASING THE RESPONSIBILITY OF PARLIAMENTARY GOVERNANCE OF THE REPUBLIC OF ARMENIA: TRIPARTISM

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Key words. tripartism, democratic transition, consolidation, marginalization, political economy, social responsibility, social dialogue, coalition government

Introduction From the study of the activities of the coalition government of the Republic of Armenia, it is obvious that the low level of parliamentary control and socio-political response delayed the process from democratic transition to consolidation, deepening the inherent uncertainty, marginality, alienation and the possibility of revolutions. To study this multidimensional phenomenon on the basis of a scientific and analytical paradigm, we consider it necessary to carry out a value evolution of the activities of the Coalition Government of the Republic of Armenia, emphasizing the importance of institutional transformations aimed at democratic transition to consolidation. This will enable a reduction of uncertainty in the process of socio-political transformation, prevent marginality and alienation, and increase social responsibility.

Methodology Taking into account the multilevel nature of the topic we study, we consider it appropriate to apply a synergetic and functional-structuralist methodology within the framework of the principles of the scientific and analytical paradigm**.** In this section, from the point of view of expanding the responsibility of the coalition government, we consider the conclusion of a political agreement or pact possible in the context of the institutional implementation of the policy of tripartism. Since the formation of the first Coalition Government in 2003 up to this day, the pact as an institutional tool for consolidating public interests has almost always been ignored in both the legislative and executive branches, which led to the formation of "minimum-winning" coalitions. And "minimum winning" coalitions have shifted political accountability of their activities to the field of latently concluded informal political and economic relations. That is, each winning force "feeds" its electorate: neglecting public coexistence, it implements policies of monopoly and superprofits. Hence, the situational manifestation of the culture of exercising power not only causes a constant threat of revolutionization of an already marginalized society but also ignores the need for a pact of social coexistence.

Literature review Taking such values of political reality as a starting point, this article is based on such thinkers as K. Arrow, J. Gortney, J. Linz and A. Stepan, [K.

Arrow 2004, J. Gwartney and R. Stroup 1999, J. Linz and A. Stepan 1996] who attach great importance to social responsibility within the framework of the paradoxes of public choice. The analysis of this complex process from the standpoint of political economy is primarily important for determining the level of political freedom and the capacity of a deputy who has entered parliament. At the same time, it also assumes the value of communication-based on feedback from the electorate, the content of socio-political relations, as well as balancing party and public interests. In this respect, the efficiency of the legislative activity of newly elected members of parliament who entered the parliament is primarily due to the value content of socio-political communication with the electorate. Thus, for the correct use of organizational capabilities in the process of democratic transition, ensuring the proportionate use of resources and opportunities, and the introduction of more efficient mechanisms in the field of social partnership, the preferred form of cooperation is tripartite social dialogue - tripartism. The development of the traditions of socio-political partnership forming a tripartite format of cooperation dates back to the 1950s-60s of the 20th century, when in order to increase the responsibility of the authorities in European countries, a tripartite cooperation of governing (legislative, executive), business elites and trade unions began to form. The International Labor Organization, through the policy of tripartism, tried to develop social dialogue, process ways of natural modernization, take advantage of the opportunities of globalization, and prevent uncertainties arising in the floating spaces of the "global village", "global city", "outskirts", "center". According to the International Labour Organization (ILO), the promotion of tripartism will help to overcome such challenges as reducing income inequality, creating a legislative framework of institutional order aimed at increasing the efficiency of opportunities for workers of vulnerable groups, as well as increasing the responsibility of both governing (legislative, executive) and business elites and trade union organizations. It must be noted that accountability is also specified in the minimum definition of democracy, which, in addition to a secret ballot and universal suffrage, also includes the responsibility of the Government. However, since we are considering the tripartism functioning in the process of democratic transition to consolidation, it is impossible to talk about a coalition government without social dialogue and socio–ethnocultural aspects of exercising power.

New waves of innovation and digitisation of information and communication technologies have fundamentally transformed and will still transform the institutional foundations of management and the value system of managing the work environment [Report, 2018]. Governing (legislative, executive), business elites and trade union organizations are facing new challenges, which require new institutional changes [Hayter, 2015]. Evidently, the new technological progress and flexible socio-political interactions have created new challenges for regular modernization. The circulating concept of the "welfare state" is based on the creation of an accessible education and health system, the

implementation of social insurance programs, minimum wages and other programs aimed at reforming the sector [International Enciclopedia]. Hence, tripartism is implemented in all those countries where the states declare their social-oriented policies and pursue the solution of issues requiring social responsibility through tripartism. In fact, the determining factor of tripartism is to increase the responsibility of the governing (legislative, executive), business elites and trade union organizations through a multi-level discourse aimed at regular modernization of public interests. According to Ju Habermas, to popularize the discourse, it is necessary to form a platform for discussing issues of public interest and to ensure a real consensus:

- Provide all interested participants with the opportunity to engage in the discourse,
- All participants of the discourse should have a real opportunity to present their viewpoints, substantiate them, and conduct a dialogue with another person,
- The honesty factor is of paramount importance in the discourse, that is, all participants are faithful in their "inner world", in their feelings, relationships, and intentions,
- The viewpoints of the participants should not be influenced by the "external constraints" of reality, social status, or ratings of various groups and citizens [Linde, 2016, 55-56].

Analysis The key importance of socio-political multidimensional discourse is indisputable in all kinds of relationships, and tripartism can play a decisive role here for democratic consolidation. Consequently, tripartism, including the transition to relations of socio-political responsibility, is based on the principles of political democracy and market economy, which are based on the political and civil freedom of the participants.

One of the main stakeholders of tripartism are trade unions, and the intended goals of trilateral cooperation are realized provided the state shows political will and representatives of the business elite are ready to exercise social responsibility, denying super profit and monopoly. The efficiency of tripartism is determined by the capabilities of the partnership participants and the motivations and objectives of their cooperation. We believe that to implement tripartism, it is essential to accurately define certain rights, form corporate governance models, and, as a result, have *transparency* within companies, grant access to financial information, form internal mechanisms for monitoring the activities of employers, and provide *access* to the approval procedure for *strategic projects*. Corporatism is a structure of a social organization in which key economic, social and political decisions are made by joint efforts of corporate groups and the state [Abercrombie, 1997]. With the collapse of the USSR, the Soviet model of social cooperation was transformed, which made the authoritarian model of state-controlled tripartism noncompetitive. According to Russian researcher N. G. Khoroshkevich, to

overcome the deep institutional crisis in the Russian Federation and post-Soviet countries, it is necessary to enhance managerial qualities in the business environment, form a system governed by predictable decisions, start fighting against crime and corruption, establish the rule of law and found institutions that enjoy the trust of the population [Khoroshkevich, 2021]. In this context, we consider it necessary from the perspective of the formation of tripartism in Armenia to emphasize the imperative of its development in cyberspace. This approach is based on the fact that it will not only reduce the populist nature of cyber parties but also clarify their ideological basis, as well as the mechanisms for fulfilling responsibilities in the "struggle for power". In the event of network cooperation, young parties purposefully interact with interest groups to give a more democratic character to the "struggle for power". Experts studying the party activities of countries in the process of democratic transition are of the opinion that as a result of this cooperation, parties turn into new structural units - the so-called extended party networks. The network analysis of collaboration between parties and interest groups is based on two main circumstances: 1) characteristics of the formation of network cooperation between parties and interest groups and 2) network transformations of political parties in conditions of intensive cooperation with interest groups. Currently, the following main factors are identified that affect cooperation between parties and interest groups, as well as the forms and intensity of this cooperation. The first is the process of differentiation and segmentation of interest groups. Second, the role and significance of various types of social splits are diminished. These splits used to make Social Democrats unite with trade unions, large landowners with agricultural unions, and Christian parties with religious organizations. The essence of the third factor is that the growing importance of the role of mass media (especially social networks) contributes to the emergence of new ways of exchanging information and information resources that do not entail a coordinated relationship between parties and interest groups. And the fourth assumes that the chances of political influence of interest groups have increased, as a result of which the latter may not cooperate with parties, struggling with populism "for democracy". The last factor suggests that the cartel model of modern parties and the desire to coordinate intra-party cooperation, as well as the importance of ties between the party and the state, contributed to the division of political society into segments formed by various associations of a relatively independent party and civil society. And the fact that the parties, as agents of state influence, came to the center of criticism, contributed to the weakening of the classical ties between political parties and civil associations.

Hence, the theory of "Extended Party Networks" considers party building and party activity in the context of ties formed around intra-party and extra-party formal structures. In fact, the party today is a network of diverse ties that are used to achieve success in elections and conduct their own policies (both opposition and loyal). The following main participants of network cooperation are distinguished: formal organizational units

of the party, financial donors, supporting activists, campaign organizers, interest groups cooperating with the party, and friendly media. The main issue of these networks is the status of the formal structural units of the party. On the one hand, in such extended party networks, they cannot function outside the interdependence conditions. Based on the analysis of party networks and their coalition nature, M. Grossmann and K. Dominguez note that "party figures... are just representatives of a coalition of strong minorities, performing it in such a way that official committees cannot be the bearers of power without taking into account their interests" [Grossmann, et al., 2009, 771]. On the other hand, in such networks, it is also essential that formal organizations include renowned authoritative leaders who are empowered to enhance cooperation and coordination. Outside the hierarchy, the most important entities can only act informally and indirectly [Koger, et al., 2009, 637]. The obvious proof of the aforementioned is that the network restructuring of parties in Europe has proceeded and is proceeding under conditions of developed tripartism. Network relations in the leading EU countries enable parties in the struggle for power to emphasize public interests and the alternatives that exist in the social network for a mosaic representation of politics. When developing a political agenda, currently European parties first submit it to social networks. In fact, the struggle for power embraced the concept of networking, impacting political campaigns and the political organization of parties. The concept of network political parties becomes more suitable for the analysis of the "rejuvenating" party system in Europe. According to R. Karlsen, the cornerstone of the online strategy of the Norwegian Labour Party was the formation of a thematic network structure aimed at lowering the threshold of participation of party members in party life, as well as the recruitment of new members, which enables to talk about the transition to a network model of the organization [Karlsen, 2013].

Political experience shows that parties, constantly striving for priority status after passing several rounds of elections, complicate the parliamentary work, and such a situation does not contribute to the implementation of one of the most important principles of the democratic order - the evolutionary change of power: For civil society, the most efficient is the performance of those party systems that ensure the comparison of rational parliamentarism (i.e. a sufficient number of parties participating in legislative elections) with the dominant party. Those systems based on a coalition of minority organizations require a flexible and effective allied policy, since with a low assessment of the activities of one of them, the emerging public opinion causes instability of governments.

Consequently, it is also necessary for Armenia to develop solutions to the arisen challenges and to form a new framework of trilateral cooperation, which derives from the performance of the self-proclaimed social state [Constitution of RA, 2005]. Let's consider the realities existing in the social partnership in Armenia. As we have stated, this is also due to the radical transformation of post-Soviet social relations. Linear

liberalization and mechanical Westernization of the Armenian society (in the format of reaching/running modernization) formally formed institutions under which cooperative relations could proceed in line with the logic of tripartism. However, the process of political modernization presupposes not a mechanical reform of public policy, but a targeted modernization of the relationship between the leaders of the traditional ruling elite, the business elite and the trade union (tripartism) that is consistent with the new principles of public administration [Margaryan, 2014, 261]. The efficiency of tripartism is the result of the political will for the state to defend its constitutional obligations and become a guarantor of social relations. The efficiency of tripartism depends on the extent to which the country's business environment is ready to expand the boundaries of social responsibility policies, denying super-profits and monopolies. The formal nature of the trade unions and the lack of stimulating tools both pose significant barriers to the development of tripartism in the Republic of Armenia. Nevertheless, the RA Law "On Trade Unions", adopted by the RA National Assembly on December 5, 2000, was significant in terms of legal regulations. In addition, in 2004, the new Labor Code of the Republic of Armenia regulated collective and individual employment relations, as well as the rights and obligations of the parties. Moreover, on September 24, 2003, Armenia also ratified the "Convention of the International Labour Organization", which regulates the principles of collective bargaining. Article 4 states that to regulate working conditions through concluding collective agreements between employers and employers' organizations, measures should be taken to encourage the process of voluntary negotiations [Hamk.am]. As we can see, there is a sufficient legal-contractual framework both adopted by the RA and commitments assumed under international treaties, so based on this, tripartism can be practically developed in the RA. We think that in order for tripartism to develop in Armenia, both political will on the part of the government and a mandatory interest on the part of the parties concerned in the issue of social responsibility and cooperation is necessary. In the context of the real functioning of tripartism in the Republic of Armenia, firstly, it becomes possible to legitimize the election programs presented by the parties through elections, and citizens can also exercise public control over the activities of the formed coalition government, using the *"citizens' perspective"* approach [Open Government – A Citizen's Perspective, 2018].

It is noteworthy that political scientists M. Lanny and G. Vanberg emphasized the importance of the participation and responsibility degree of the society, based on considerations of managing the result in the process of implementing public policy, in parallel with the activities of coalition governments and party elites [Lanny, 2019, 339]. To solve this task, they developed a mechanism that, in addition to the value of the behavior of the parties that formed the coalition government, emphasized the need to develop and measure the efficiency of the implementation of sectoral policies in parallel with the strengthening of parliamentary institutions and relevant legislative mechanisms. Natural-

ly, the sectoral policy in terms of assessing the efficiency of the coalition government cannot be the only unit of assessment. In this regard, the evaluation criteria primarily take into account the procedures for the adoption of the law on the state budget, discussion on the implementation of the state budget in Parliament, compliance with the principles of security and tripartism with an expanded agenda, written and oral requests to government agencies regarding sectoral issues, etc. In our perspective, in terms of evaluating the efficiency of the coalition government, consistent implementation of public policy is of great importance, especially with the application of the principles of "good governance and social responsibility". According to this perspective, successful democracies have different dimensions of interaction between the legislative and executive branches of government, reflecting modern mechanisms and procedures of parliamentary and public control. Their study and analysis in combination with the institutions and mechanisms operating in the Republic of Armenia can be useful when discussing the possibilities of borrowing them. As key indicators, we propose to consider the procedures for the adoption of the law on the state budget.

In the Republic of Armenia, the procedures for discussing and adopting the draft state budget are established by Articles 110-111 [Constitution of RA, 2015] of Chapter 4 of the Constitution, as well as Articles 87-91 of Chapter 20 of the Rules of Procedure of the National Assembly, Constitutional Law [«Rules of procedure of the National Assembly» the Constitutional Law, 2016]. The latter, within the framework of the discussion of the draft law on the state budget, establishes such important provisions as 1) "Preliminary debates of the draft take place at sittings and joint sittings of the standing committees, by the established procedure of which, members of the Government and persons authorized by the Prime Minister as well as other persons indicated in the schedule also participate in it", 2) "The right to take the floor with a co-report during the debate of the draft in the National Assembly, except for the head committee, belongs to the representatives of other standing committees if the draft was previously debated in those committees and there is the conclusion of the committee about it", 3) "The right to submit written proposals by a result of preliminary debates of the draft state budget belongs to the Deputies and factions". These provisions are decisive in terms of organizing the procedures for discussing and adopting the draft law on the State budget. However, a systematic analysis shows that in the context of the deterrence and counterbalance of the legislative and executive branches of government, we are actually dealing with the dominant position of the executive branch over the parliament. This phenomenon, firstly, contradicts the principles of parliamentary government, in addition, it is unacceptable from the point of view of separation of branches of government and independence. Thus, the provision established by Paragraph 2 of Article 89 of the RA Constitutional Law, "Rules of Procedure of the National Assembly" actually guarantees the arbitrary attitude of the government regarding the acceptance of objections or proposals

submitted by factions or deputies. "The Government, after the expiry of the deadline for the submission of written proposals, may submit the draft for a debate to the National Assembly without change, either by elaborating it on its own initiative, or on the basis of written proposals."

Moreover, both the Constitution and the Rules of Procedure of the National Assembly, Constitutional Law, do not provide for the cases and consequences of the Parliament's failure to adopt the draft law on the state budget. As for the study and analysis of the procedures for discussing and adopting the draft law on the state budget, we can conclude that the existing legislative and constitutional regulations are incomplete and do not establish efficient mechanisms of restraint and counterbalance of the executive power.

Based on the principles of the parliamentary system of governance, the factions should participate in the decision-making process on the necessary information related to security and defense issues and coordinate work with the public to avoid various risks (the formation of dividing lines between the RA and AR societies). The above-mentioned is important both for the consolidation of work and elimination of the "super-prime minister" system of administration, as well as in the process of transition to parliamentary democracy.

In almost all parliamentary countries, the parliament has real levers to counterbalance the executive power and control its activities. In the Federal Republic of Germany, the Government cannot spend a single cent of the state budget without the knowledge and approval of the Bundestag deputies. Although parliamentary commissions play a crucial role from this perspective, deputies should also be able to request and receive complete information on matters that are important to them, fully exercising their constitutional rights.

The rights of the members of the parliament are restricted in terms of being fully informed about Armenia's foreign policy priorities, security, and military spending. It is significant that in this case the rights of deputies to vote should also be restricted since a deputy must not participate in voting on such important bills about which he does not have complete information. Therefore, it is important to ensure that deputies are informed according to the extent of state and official secrets in order to improve the institutions of the deputy and parliament, rather than restricting the ability to vote.

Conclusion Based on the aforementioned, we conclude that parliamentary control is of paramount importance in terms of the coalition government's responsibility. The quality of government activity, as well as the axiology of the Concept of Public Policy, is largely due to the actual use of models of restraint of the legislative and executive branches of government. In this section of the work, the activities of tripartist actors in

the Republic of Armenia were considered, based on the level of formation of parliamentary institutions and the deputies' awareness of public interests. In this context, it should be noted that the legislative behavior of deputies is differentiated in accordance with political culture, the value of exercising power and the ability to conduct an authentical discourse. The joint manifestation of these phenomena, simultaneously forming two social (public) and political (parliamentary) realities, formalizes discourse and communication function, which periodically raises the desire to *dispose of sensory hunger* in a marginalized society. The reason is the lack of a security system with an expanded agenda, which not only leads to emphasized marginalization and alienation of the society but there is also an escape from a fake reality – emigration.

The problem is that so far the process of consolidation from the democratic transition in Armenia does not include evolutionary convergence of public interests. Meanwhile, the best theorists of the democratic transition Linz J. and Stepan A. claim that it is precisely such convergence that enables to make such a theoretical generalization: "If a functioning state exists, five other interconnected and mutually reinforcing conditions must also exist or be crafted for a democracy to be consolidated. First, the conditions must exist for the development of a free and lively civil society. Second, there must be a relatively autonomous and valued political society. Third, there must be a rule of law to ensure legal guarantees for citizens' freedom and independent associational life. Fourth, there must be a state bureaucracy that is usable by the new democratic government. Fifth, there must be an institutionalized economic society." [Linz & Stepan, 1996, 7] Based on the approaches of the best theorists on the democratic transition Linz J. and Stepan A., we want to add that only transitions containing linear liberalization in post-Soviet countries overlooked the factor of relations between political and civil societies. The following approach is noteworthy in this regard:

"The political elite, assigning a priority to the institutional formation of civil society and cooperation with it, with the help of the institutions of this society, implemented a democratic transition with the model of running modernization without consolidation exit, overlooking the problem of the functional formation of political society. Meanwhile, by political society we mean the sphere where society intentionally organizes itself to justify its right of exercising control over society and the state apparatus" [Margaryan, et al., 2021, 24]. From the point of view discussed, it is also noteworthy that, analyzing the process of democratization of Latin American countries, L Avritser presents democratization primarily as a means of socio-political self-organization [Avritser, 2002, 3-10]. As such, it guarantees the fundamental human rights and freedoms enshrined in the Constitution and includes the public demand for the accountability of the authorities in the agenda of public discourse. L. Avritser calls this method of socio-political self-organization a political and public space. At the same time, L.

Avritser is convinced that democratization is an organized political competition between public administration institutions and non-government organizations. According to the author, this model of democratization assumes a political society dominated by group interactions. Based on L. Arvitser's observation, in the event of a violation of the balance between these two levels, democracy loses its viability. Furthermore, democratization may not succeed if participatory politics are not consistently used throughout the multi-level process. Rejecting public participation only in electoral processes, L. Avritzer uses the term "democratic elitism", convinced that the reduction of electoral fraud is a relative success if the political elite conducts an isolated and manipulative policy towards citizens in the interim between elections. All this more than deepens the alienation of society from reality and manipulates its consciousness hindering the process of natural modernization of public space and the formation of a political society. To prevent and manage these negative manifestations, we suggest using the Facebook social network, and digital and traditional media to develop a discourse between citizens and responsible actors of tripartist politics. This will reduce the manipulation of PR (public relations) and GR (government relations) technologies, as well as expand communication with the public based on feedback through the parallel application of PR and GR technologies. However, the recent socio-political developments in Armenia following the 44-day war indicate that politicians use PR-GR technologies not to conduct a real discourse with society, but to present their rating in a new light. Electronic media platforms and the Facebook social network play a decisive role in this matter.

The process of recent political developments in Armenia is characterized by:

1) Alienation of political figures and political parties from reality, that is, the content of the information broadcast by mass media under their control, having the nature of serving personal or group interest, manipulates public consciousness. Meanwhile, in the conditions of parliamentary governance, the discourse between the deputy and the electorate ought to be of utmost importance, through which the politician simultaneously enhances his knowledge of political communication, socializing and legitimizing his personality.

2) On Facebook and other social networks, false agendas are formed by fake users. In Armenia, the use of "rumorology" from latent tools of political marketing, which spreads information and communication through rumors or gossip, has been particularly developed and is developing [Zheltukhina, et al., 2016, 10587]. In this situation, politicians can construct values that they can use to manipulate and marginalize people's consciousness while evading responsibility by exploiting media resources in social networks. Meanwhile, the latter, being the bearer of the historical experience of the individual, society, and nation, is considered one of the most essential components of the system of social conditions of political development. Consequently, we can come to the following conclusions:

1. Armenia, which is experiencing a crisis of political development, can execute the process of natural modernization, cleansing the political system of marginality and alienation only through competitive cadres ("smart power") bearing an internal (indogenic) system of values. And in this instance, the coalition government will be able to implement a democratic transition to consolidation. This is the only way to ensure the stability of the political system and security with an expanded agenda.

2. The parliamentary elite, in line with responding to challenges, is obliged to make its activities and knowledge competitive. This will enable the parliamentary forces to develop a discourse based on the principles of cooperation culture based on a compromise policy of national solidarity and mutual security.

3. All parliamentary forces ought to conduct civic education addressed to all age groups of the society. Due to the development of manipulative technologies for exercising power, modern Armenian society is not released from the image of homo-sovietikus [Homo sovieticus, 2005, 186]. Moreover, the marginal and alienated masses formally participate in the processes of political development. And the political elite, in collaboration with the business elite, not only did not assume responsibility for the struggle against the monopoly on superprofits, having survived the crises of political development but also built a mutually coordinated oligarchy.

4. The formation of tripartism in the Republic of Armenia through multidimensional discourse is a decisive factor in the development of the responsibility of the ruling (legislative, executive), business elites and trade unions for the natural modernization of public interest.

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Issues of Increasing the Responsibility of Parliamentary Governance of the Republic of Armenia: Tripartism

Key words. Tripartism, democratic transition, consolidation, marginalization, political economy, social responsibility, social dialogue, coalition government

The article discusses the necessity to increase the management of the outcome of the process from democratic transition to consolidation. To this end, with the help of a synergetic and functional-structuralist methodology, the mechanisms of parliamentary control and increasing socio-political responsibility in the countries of democratic transition have been identified. According to the authors, to overcome the marginality derived in the process of the democratic transition, it is necessary to increase the culture of exercising power, emphasizing the priority component of managing the outcome of social responsibility. In this context, the political and economic foundations of tripartism are introduced, which enabled the authors to reveal the cooperation of the ruling elite, the business elite and the trade unions. There is a justified opinion that the process from democratic transition to consolidation has a formal nature if the policy of tripartism is not applied, and the coalition government does not disclose socio-ethno-cultural features of the exercise of power. Through this approach, it has been proved that the new waves of innovation and digitization of information and communication technologies have radically changed and will still change the institutional foundations of management and the value system of managing the working environment. According to the authors, new technological progress and transforming socio-political relations have created new challenges for regular modernization. The latter can be resisted if the socio-political discourse from the democratic transition to consolidation is made public. To this end, it is proposed to create a special platform in Armenia for discussing issues of public interest. Provide all interested participants with the opportunity to participate in the discourse to present and support their viewpoints on this platform.

THE EFFECTIVENESS OF CURRENCY MARKET REGULATION IN ARMENIA IN THE CONTEXT OF EXTERNAL CHALLENGES

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Key words: inflation, currency invasion, refinancing rate, international reserves, debt, foreign trade turnover

Introduction Today, almost all the countries of the world are struggling to restore the normal functioning of the currency markets, because the disruption of their functioning has a chain effect on the economy. The article analyzes the necessity and effectiveness of the instruments selected for the purpose of regulating the currency market implemented by the Central Bank of Armenia under external influences.

The importance of the currency policy of RA is justified on the one hand by the existence of the transmission mechanisms through which exchange rate changes affect macroeconomic indicators, economic activity and inflation, goods and capital flows, state budget revenues, money market, expectations of business entities, household incomes, purchasing power, therefore, on their standard of living and social condition. On the other hand, the exchange rate of the Armenian dram has become one of the main mechanisms for the transmission of external developments and shocks, because the economy of the Republic of Armenia, not having a comprehensively developed financial market that fully absorbs internal and external shocks, reacts to them with fluctuations in the exchange rate of the Armenian dram.

Methodology Considering that monetary policy is a complex and multifactorial category, the study would not be possible without the application of the scientific abstraction method to remove insignificant or secondary factors. Through the use of the deduction method, we have distinguished the analysis of the most primary factors, and after analyzing the information collected using the induction method, we have made generalizations specific to the given phenomenon, as a result of which we have reached certain conclusions. It is known that any phenomenon is a set of different components. During cognition, they are studied separately, the role and functions of each of them in social life are revealed, applying the method of analysis. Then, through the combination (synthesis) method, the studied phenomenon is observed in the internal relationship or unity of its various components, the properties already known to us.

In order to compare the close interdependence of the currency policy of RA with a number of macroeconomic indicators, as well as to highlight the current developments and problems, a statistical quantitative analysis was carried out, then qualitative assess-

ments and conclusions characterizing the situation were given, using comparative and graphical methods.

Literature review Having become familiar with the definition, participants, regulation and control of the currency market, analyzes of a number of advanced international structures, Armenian and foreign economists, forms of currency policy implemented for the purpose of currency market regulation were carried out [Andrianov, 2013, 57], articles on the evolution, types and classification, as well as the features of its implementation in different countries, the interaction of the exchange rate and economic indicators [Mkhitaryan, et al., 2016, 96], in-depth analysis of works and studies, laws and legislative acts.

We come across the point of view that the currency exchange rate can undergo changes under the influence of both fundamental and technical factors [Tholoor Thomas, 2013, 8]. The fundamental group includes economic, political and market factors, the technical group includes the many existing technical instruments, through which the trend of the exchange rate change is predicted.

Academic approaches of J. Madura [Jeff Madura, 2021, 112], A. Kireev [Kireev, 2001, 120], V. Artamonova [Artamonova, Ivanova, 282-283], A. Evdokimov [Evdokimov, 2003, 302-305], M. Tholoor [Tholoor, 2013, 8], H. Menkiw and M. Taylor [Mankiw & Taylor, 2013, 321], O. Blanchard [Blanchard, 2003, 403-404], P. Krugman, M. Obstfeld and M. Melitz [Krugman, et al., 2012, 320-324], N. Patel and P. Cavallino [Patel & Cavallino, 2019, 26-29], G. Nazaryan, [Nazaryan, et al., 2012, 293-299], T. Sargsyan [Sargsyan, 2008, 9], H. Avetisyan [Avetisyan, 2010, 31] were studied and analyzed. Among the forms of monetary policy, discount and foreign exchange monetary policies are distinguished. The discount (calculation or discount) monetary policy is the change of the refinancing rate of the Central Bank, it is aimed at the regulation of the exchange rate and the balance of payments, on the one hand, the international movement of capital, and on the other hand, the dynamics of domestic lending, money supply, price level, as well as affecting aggregate supply. Foreign exchange policy is a unique method of influencing the exchange rate of the national currency, the varieties of which are: currency invasions (interventions), diversification of currency reserves, application of currency restrictions, regulation of the degree of currency convertibility, regulation of the exchange rate regime, revaluation and devaluation.

Thus, it is important to note that the regulated operation of the currency market of any country is closely related to the development and implementation of an effective currency policy. In this context, the choice of the types of currency policy implemented by the Central Bank of Armenia and the systematic and timely application of tools are emphasized.

Analysis Studying the currency policy experience of a number of countries, we notice that for the purpose of ensuring currency stability, interventions are always carried out in the currency market. Experience shows that many countries that have adopted a free-floating currency policy (Armenia, Israel, New Zealand, Brazil, Chile, Colombia, Peru, etc.) at a certain stage have implemented, for example, interventions to mitigate exchange rate shocks. In most of the countries, there are noticeable trends of a sharp decrease in reserves, which is mainly due to the implementation of interventions. However, studying the effectiveness of the interventions, we notice that they mostly had a short-term impact on the exchange rate.

Studying the practice of interventions in Armenia, we came to the conclusion that the Central Bank of Armenia has from time to time resorted to the use of this instrument of monetary policy in order to mitigate sharp fluctuations in the exchange rate. Studying the operations carried out by the Central Bank of Armenia in the currency market in 2008-2022, we notice that the largest volume of sales was recorded in 2009, and the largest volume of purchases was recorded in 2022[1]. In 2019 and 2022, the Central Bank of Armenia regulated the overvaluation of the dram, which greatly harmed especially local producers and exporters.

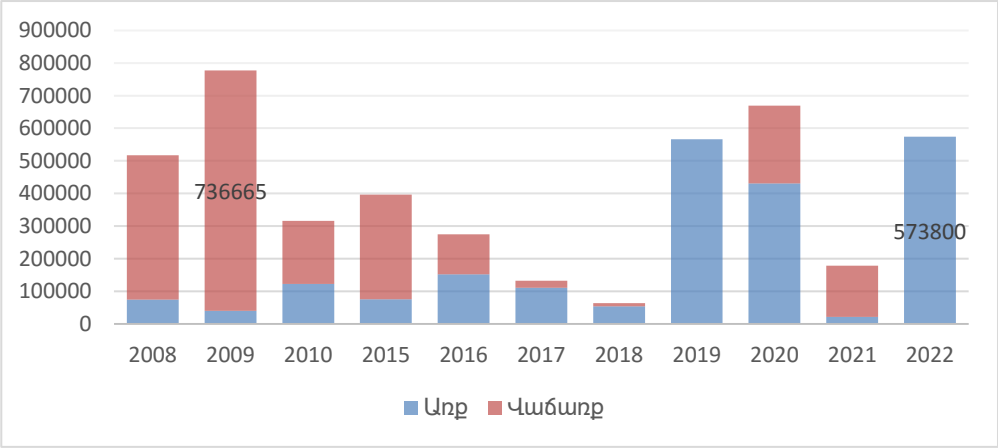

Figure 1. Operations carried out by the Central Bank of Armenia in the currency market in 2008-2022 (thousands of US dollars)[2]

As it is known, in recent years in most countries of the world, a high level of inflation has been observed, which has a negative chain effect in terms of ensuring many

[1] HH KB pashtonakan kayq «Vitwakagrowt'yown» bajhni, «Artaqin hatvac'i vitwakagrowt'yown» ent'abajhin: https://www.cba.am/am/SitePages/statexternalsector.aspx

[2] Hergnyan S. Hayastani mijazgayin pahowstnery' 11 amsowm 8.9%-ov atwel en https://hetq.am/hy/article/151021

macroeconomic indicators. From 2021 to June 2023 the rate of inflation in RA continued to accelerate. There are many reasons for this, starting with the Russian-Ukrainian conflict and ending with the global changes taking place in the world, when inflation has become a global phenomenon.

In order to regulate the currency market and curb inflation, central banks use long-term instruments, for example, raising the refinancing rate, which, of course, curbs economic growth to some extent. However, this tool used in time is a serious tool for long-term regulation. It was due to the efforts of the Central Bank of Armenia, that the right and quick decision was made to choose the form of monetary policy, since the beginning of 2022, it has raised the refinancing rate 6 times, setting it at 10.75%, with inflation at the target rate (+/-4.0% in order to reach 1.5 percentage points in the permissible range of fluctuations). In fact, in the last one - two years, the inflow of visi-tors' capital (in 2022, the transfers received by individuals from abroad through the RA banking system is the highest indicator recorded since 2004), the inflow of labor force, and the increase in wages created pressure on the consumer market, significantly increased the demand, did not allow to achieve the target rate of inflation, however, the continuous increase of the refinancing rate significantly curbed inflation, unlike many other countries that started applying this policy prematurely, recorded a decrease in economic activity, not achieving enough inflation control in their countries.

In order to stimulate economic activity, in 2023, for the second time, the Central Bank lowered the refinancing rate by 0.25% percentage point, setting it at 10.25%. This was made possible by the decrease in the prices of some types of food (bakery, cereals, meat, fish and fish products, oils and fats, sugar, eggs, dairy products and cheese, fruits and vegetables) in the summer months, although tobacco, water and mineral water, non-food products, excessive growth of aggregate demand for alcoholic beverages, some services has led to their price increase.

Compared to July of the previous year, among EAEU countries, only Armenia achieved a 0.5% drop in consumer prices. The CPI increased by 3.3 percent in Russia, 2.9 percent in Belarus, 10.5 percent in Kyrgyzstan, and 14.6 percent in Kazakhstan.

At this stage, inflationary pressures on Armenia from international commodity exchanges are not observed, while global financial centers such as American and European central banks continue to raise refinancing rates due to inflationary pressures.

Among the current external challenges, the sharp decrease in the level of reserves in the countries, which aims to ensure stability in the currency market, is also highlighted. Is there a similar situation in Armenia as well? We studied the structure and dynamics of the gross international reserves of RA in 2005-2022.

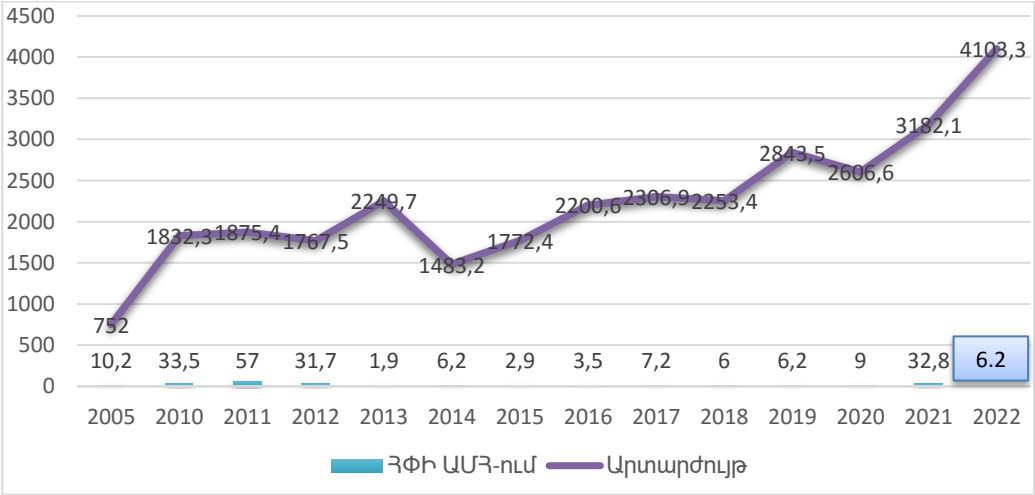

Figure 2. The structure of RA's gross international reserves in 2005-2022 (million USD) [18]

As can be noticed, while many developed countries implement their regulatory monetary policy at the expense of reserves, the gross international reserves of RA have increased dramatically over the last two years. During the year 2022 international reserves of RA increased by 288 million dollars or 8.9%, with the highest level recorded in September, after which it started to decrease[1]. Since the raising of public debt and debt servicing directly affect the change in international reserves, we also studied the dynamics of public debt.

As of February 2023, the RA state debt was 10 billion 751 million dollars, and in May it exceeded 11 billion dollars. The debt structure has also changed significantly. In February 2022, the weight of foreign debt in the total debt of the Government was 69.8%, now it has decreased to 57%, instead, the weight of domestic debt has reached 43% from February 30, 2022 to the same month of this year[2]. Although this leads to a decrease in foreign currency risks, the burden of interest payments in the budget will exceed 270 billion drams in 2023 instead of 200 billion drams, which is due to the more expensive domestic debt. The positive thing is that a larger part of that money will remain in the republic, increasing the average income indicator and the standard of living.

Certain risks have increased in terms of debt manageability: as a result of the rating increase, the interest rate of the external debt has increased, and the maturity has been shortened. Compared to the previous year, the cost of servicing the debt increased

[1] HH VK, Hraparakowmner, Hayastani Hanrapetowt'yan social-tntesakan vitwaky' 2022t'. hownvar-dektemberin, https://armstat.am/file/article/sv_12_22a_411.pdf
[2] http://surl.li/jxuzz

by about 2% (about 180-200 million dollars), and this burden would be much more tangible if the dram did not appreciate. Expressed in dollars in February, 2023 compared to February of the previous year, the debt increased by 15.3%, and due to the sharp devaluation of the dram, the debt expressed in dram decreased by 7%.

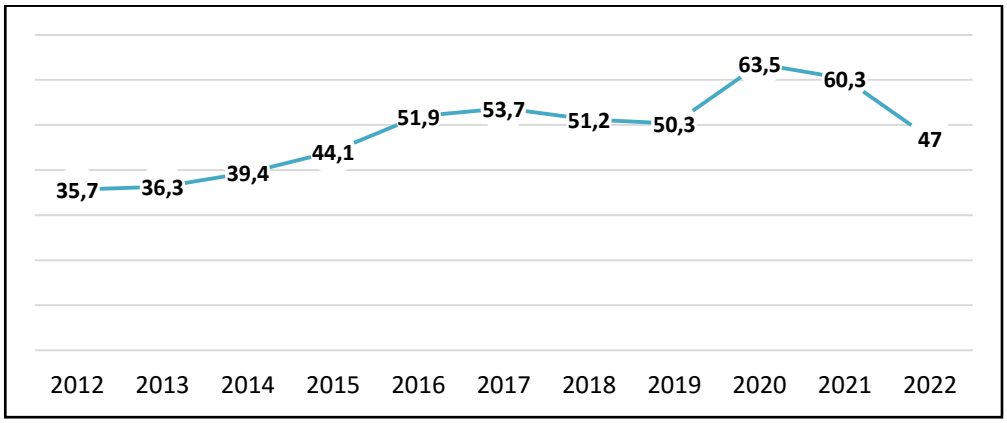

Figure 3. Debt/GDP ratio dynamics 2012-2022, in percentages

In 2021, the government planned to bring the debt/GDP ratio below 60% by 2022. As a result, it was about 47%. The reason was also the sharp increase of the GDP index. In 2022 it had reached 8,496,777.9 million drams. Although this number decreases when it neutralize the effect of the price increase in one year, 7,865,923.1 million drams, calculated by the average annual prices of the previous year, still, the volume of GDP in 2022 was 112.6% compared to 2021, 119.1% in 2020.

Regarding the amount of foreign currency in the domestic market and the continuous inflow due to various external reasons, the analysis makes it clear that they largely determine the appreciation of the national currency (the dram appreciated by more than 18% at the end of the year compared to the beginning of 2022), in connection with this the increase in the price of national products and the decrease in competitiveness in the world market, and as a result, the reduction of export volumes, when we separate the volume of re-exports in exports by individual products.

This does not exclude the observed increase in the volume of foreign trade turnover of RA in 2022 compared to 2021. in comparison, exports and imports increased by almost four and a half percent[1]. If there was no tangible increase in the volume of industrial products in the economy, moreover, rates of decline are noticeable (in January 2023, compared to January 2022, the entire industry recorded a 1.4% increase, that is, it

[1] https://armstat.am/file/article/sv_01_23a_121.pdf

showed decreasing trends[1], therefore, the increase in foreign trade turnover is conditional and affected by external factors. As a result of the study of the geographical structure of foreign trade turnover (in January-December 2022, compared to the same period of the previous year, exports to the Russian Federation increased by 45%, exceeding the previous year's indicator almost twice, and to the European Union, it increased by 14.4% registering a decrease of almost 1.5 times compared to the previous year, it became clear that such an unprecedented increase in export volumes is due to re-export transactions.

Conclusion As a result of the analysis, we come to the conclusion that although the rates of economic growth recorded in 2022 could not remain the same and already in May 2023 they showed a downward trend, the Central Bank of Armenia continues to fulfill its main function in the direction of ensuring the target level of inflation and financial stability in the environment of such serious external influences and the instability of the world economy. We also positively evaluate the steps to reduce the refinancing rate, but we believe that reducing it by 0.5% will not have enough impact in terms of stimulating economic growth and it will be necessary to contribute to the revitalization of local production and the real sector by using additional stimulating tools.

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https://armstat.am/file/article/sv_12_22a_411.pdf

Karmen GRIGORYAN, Tatevik ULIKHANYAN

The effectiveness of currency market regulation in Armenia in the context of external challenges

Key words: inflation, intervention, refinancing rate, international reserves, debt, foreign trade

In the contemporary context of globalization, the intricate execution of monetary policy is significantly influenced by the ongoing developments within the global economy. In the current wave of developments, the global economic market has undergone structural changes due to the negative consequences of COVID-19, the Russian-Ukrainian conflict, disruptions caused by regional instabilities, and shifts that have impacted the natural progression of global economies. These changes have significantly influenced the fundamental trajectory of economic growth across countries. Despite its own domestic challenges, the Republic of Armenia, is unable to remain immune to these multifaceted alterations. Moreover, internal issues further exacerbate the situation. Consequently, the imperative for astute economic governance has grown even more pronounced. Through a comprehensive analysis of international experience in the implementation of monetary policy, shocks in the global foreign exchange market, the authors sought to fully understand and endorse the current problems facing the Republic of Armenia economy in the context of the development of the Republic of Armenia foreign exchange market. The objective was to explore various forms of applied monetary policy, external influences, economic indicators of Armenia, the structure and dynamics of debt and foreign exchange reserves, inflation levels, reasons for the appreciation of the dram currency against foreign currencies, foreign trade turnover, and substantiate the effectiveness of the ongoing currency policy in our country.

ANALYSIS OF THE INTERACTION OF REAL ESTATE AND FINANCIAL MARKETS OF THE REPUBLIC OF ARMENIA OVER THE PAST FIVE YEARS

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Key words: real estate market, financial market, income tax refund, mortgage, transfers, commercial banks

Introduction The real estate market plays an extremely important role for the economy. Through the ownership of real estate, financial organizations carry out lending, through which they create capital, thereby materializing the economic energy available in the economy. Thus, you just need to try to imagine how much investment in the real sector of the economy can provide real estate in the country, if, of course, it is sufficiently liquid and financial intermediaries are willing to accept it as collateral. It is this property that connects the market prices of real estate with the state of the financial system and the activity of the markets.

Methodology Modern economics uses a variety of analytical methods. Some of them are considered common and can be used in any branch of the economy, while others have special features and can only be used in a separate industry: The theoretical and informational basis for the analysis were scientific publications of Armenian and foreign theorists in the field of real estate analysis and financial markets, assessment approaches used in international practice of developing and analyzing financial strategy. Methods of financial and economic analysis, statistics, measurement and comparison were widely used during our analysis. In the first part of the analysis, a comparison method was applied, which concerns the comparison of the income tax received by the State Budget of the Republic of Armenia and the income tax returned for 2018-22. In the second part of the analysis, is applied the method of financial and economic analysis, when were the total mortgage loans provided to residents by commercial banks of the Republic of Armenia analyzed by spheres. In the third part of the analysis, a comparison method was applied concerning the dynamics of inflows and outflows of transfers by country.

Literature review In our study, we analyzed the current situation in the real estate market of the Republic of Armenia, laws and government decisions aimed at development. In particular, we have studied the tax law of the Republic of Armenia regarding the compensation of interest amounts paid for servicing a mortgage loan received by an employee for the purpose of purchasing an apartment or building an individual residential building [Legal information System of Armenia, Article 160]. In addition, we analyzed the data published by the Central Bank on the provision of loans in the follo-

wing areas: And finally, we have studied the volume of transfers by year and country [Central Bank of Armenia]. Within the framework of this study, The approach proposed by A.N. Asaul is noteworthy in the sense that one should try to imagine how much investment in the real sector of the economy can be provided by the country's real estate, if, of course, it is sufficiently liquid and financial intermediaries are ready to accept it as collateral. It is this property that puts the market prices of real estate in connection with the state of the financial system and the activity of the markets [Asaul, 2013, 26-29].

In the context of this study, the principles of the formation of market price factors and the market value of real estate are also particularly important. While evaluating an object, it is necessary to identify all factors related to pricing (technical, financial, economic, social and legal), on which the composition and size of income and expenses depend [Kolankov, 2019, 98-99].

Factors affecting the value of real estate were also taken into account, which can be divided into two types:

- macroeconomics related to general market conditions (taxes, duties, the dynamics of the dollar, inflation, unemployment, the level and conditions of wages, the need for real estate, etc.),
- microeconomic, characterizing the objective parameters of specific transactions (all terms of the contract: subject matter, validity period, rights and obligations of the parties, termination of the contract, etc.) [Hovhannisyan, et al., 2007, 55-57].

Scientific novelty As a result of analysis and research, it becomes clear that the vulnerability of financial stability from fluctuations in real estate prices is mainly considered from the point of view of lending to the construction industry and loans secured by real estate, the materialization of risks of changes in the value of collateral: Sharp fluctuations in supply/demand for real estate, and consequently prices, may adversely affect the security and quality of bank loans, creating risks in terms of financial stability.

Currently there is a number of problems in the real estate market in Armenia, the systematic solution of which will lead to the development of the real estate market. Analyzing and comparing the existing and possible trends in the development of the RA real estate market, we have justified that in the future the most optimal policy in the real estate market and financial markets should be based on a balanced, coordinated policy.

Analysis The real estate market is an extremely important economic player. Real estate, in addition to meeting one of the most important needs of society, is one of the main "reserves" of wealth in the economy. Thus, in developing countries, the market value of shared real estate is usually many times higher than the capitalization of financial markets and the volume of investments coming into the country. This is a unique source of economic "energy" [Asaul, 2013, 26-29]. At the same time, the real estate market is

influenced by the development of the real and financial sectors, since supply and demand in this market depend on the state of the economy and the financial system of the country. Usually, prices in this market determine the financial and business cycles, in a certain sense also becoming an economic barometer and giving very important information about future economic developments[Hilbers, et al., 2001, 3-8].

Changes in the value of any real estate depend on a number of factors that manifest themselves at different stages of the valuation process: All factors affecting the value of real estate can be divided into objective and subjective. Subjective factors are related to the behavior of a particular seller, buyer or intermediary at the stage of concluding a transaction (for example, awareness, sincerity, personal preferences, etc.), that is, these are mainly psychological factors [Kolankov, 2019, 98-99]. Objective factors are primarily economic factors that ultimately determine the average price level for specific transactions. Objective factors are divided into two groups: macroeconomic and microeconomic. Macroeconomic factors include taxes, duties, inflation, low demand for real estate, the exchange rate, the level and conditions of wages, unemployment, the development of export-import operations, etc. Microeconomic factors characterize the objective parameters of specific transactions and are related to the characteristics of real estate, which is the object of sale, and the legal nature of the transaction. For a short-term period, macroeconomic factors can be conditionally considered constant (they change quite slowly), and the overall structure of the market is fixed.

All these factors have an impact on the real estate market, however, we will look at how mortgage loans issued by Armenian banks have affected the real estate market [Hovhannisyan, et al., 2007, 55-57]. As of the end of December 2022, the total loan portfolio of Armenian banks increased up to AMD 4 trillion 168 billion. This amount includes mainly loans provided by banks to residents, which also include loans issued to financial and insurance companies. Over the year, compared to the end of December 2021, the total volume of loans increased by AMD 378 billion or 10%. Based on the data of the Central Bank of the Republic of Armenia, it becomes clear that not all types of loans recorded growth. Moreover, lending has declined in some areas of the economy.

The absolute leader in growth is the mortgage market. If as of the end of December 2021, the volume of mortgage loans in all banks of Armenia together reached AMD 655 billion, then a year later it is AMD 195 billion or 30% more – AMD 849 billion. This sharp increase in the mortgage market was predictable. Since the end of 2021, it has already been known that the income tax refund program in Yerevan is gradually being discontinued. Under the program, which has been in effect since 2015, borrowers are given the opportunity to return the income tax they have paid in order to pay mortgage interest. However, since the budget lost income tax amounts as a result of this, and construction in Yerevan became over-centralized, the authorities decided in 2021 to

gradually and phased refuse from this program, providing developers and those preparing to take out a new mortgage loan for a period of 1 year for the center of Yerevan, and then gradually, until 2025, for the whole of Yerevan. The program will continue to work in the regions [www.arlis.am]. From this point of view, let's consider how much income tax was paid to the state budget and how much income tax was refunded. In total, income tax in the amount of AMD 36,502.00 million was refunded in 2022, which is 60% more than in 2021, and AMD 22,743 million were refunded in 2021, which is 70% more than last year. And in 2022, AMD 475,038 million of income tax were collected, which increased by only 10% compared to last year. This is quite a large indicator, since according to the new law, income tax is reduced to 20%, and in 2022 it amounted to 21%, having decreased by 1% since last year. What should have had a negative impact on the income taxes collected. However, the exact opposite was true, and income tax was collected more. These trends are shown in Figure 1 [https://www.petekamutner.am].

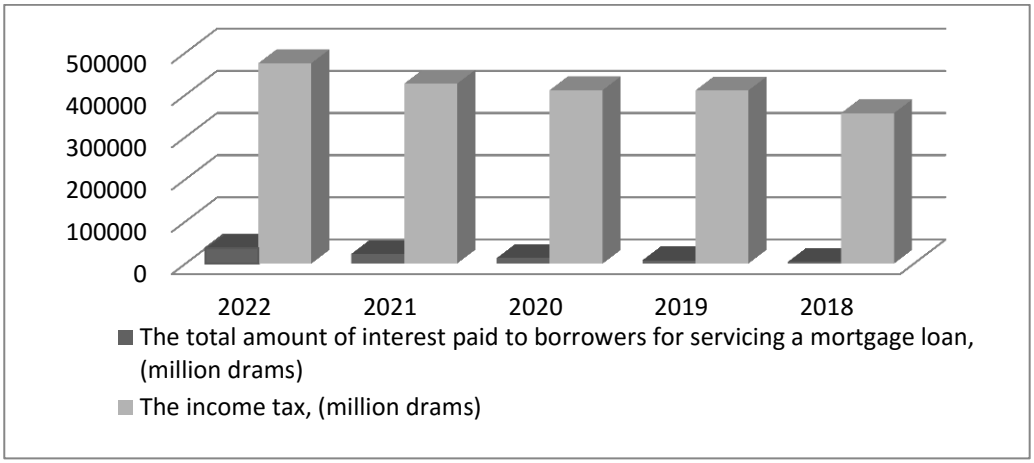

Figure 1. Comparison of income tax received by the RA State budget and returned income tax in 2018-2022. [www.arlis.am]

After the decision to discontinue this program in Yerevan, developers gave a new impetus to the construction, and those who were preparing to buy an apartment hurried to complete the transactions. As a result, both construction and the volume of mortgage loans increased. Another question is how long-term this growth is and whether it has stable grounds for contributing to the economy in the coming years. This growth in mortgage loans significantly contributed to the growth of the overall loan portfolio of banks. However, it should be noted that such a pace of mortgage loans growth poses a serious threat to the financial market. Since the vulnerability of financial stability from fluctuations in real estate prices is mainly considered from the point of view of lending to the construction industry and loans secured by real estate, the materialization of risks of changes in the value of collateral: Sharp variations in supply/demand for real estate, and consequently prices, may adversely affect the security and quality of bank loans,

creating risks in terms of financial stability. In the real estate market of the Republic of Armenia in 2021, during this period, an acceleration in the growth rate of the price index was recorded due to the recovery of economic activity, as well as the applied income tax refund mechanism and the factor of its phasing out. In 2022, this acceleration increased even more, because as a result of the Russian-Ukrainian war, many Russian and Ukrainian citizens came to Armenia and rented real estate, which in a short period of time very quickly increased the demand for real estate in Armenia. In 2021, compared with last year, there was an increase in activity in the real estate market, which resulted in an increase in total transactions by 27.0%, with the most significant growth in the part of multi-apartment residential buildings, the number of transactions for the purchase and sale of which increased by 21.4%: By the end of 2021, the prices of apartments in multi-family residential buildings as a whole remained unchanged: In particular, the decrease in prices for apartments in 10 apartment buildings in Yerevan in 2020 remained until 2021. June, then prices rose again. In December 2021, there was an increase of 9.7%.

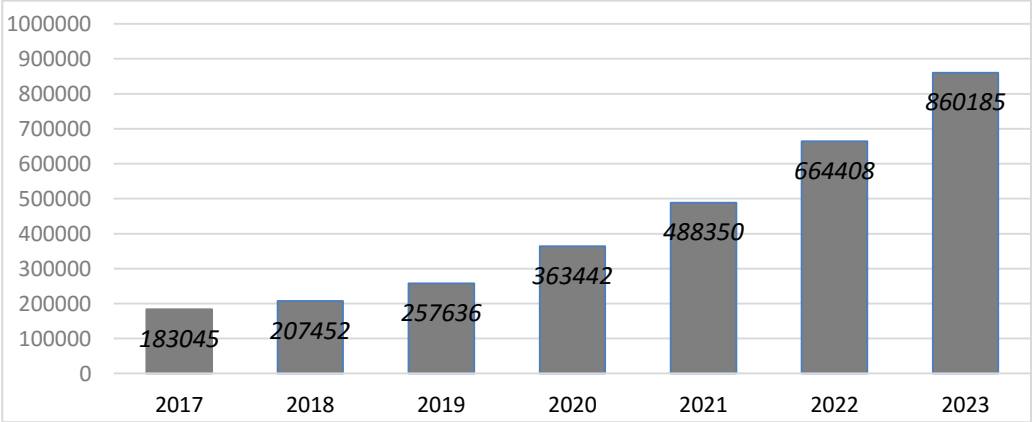

Figure 2. Total mortgage loans issued by commercial banks of the Republic of Armenia to residents by spheres as of January (million AMD) [www.cba.am]

Figure 2 shows that the amendments to the income tax Law had a very serious impact on the mortgage market. People began to acquire real estate at a rapid pace, which had a great impact on the financial market, increasing the volume of mortgage loans issued by banks. Thus, in 2021, banks provided AMD 488350 million loans, and in January 2023, a total amount of AMD 860185 million loans were provided, which increased by 56% in two years, which in general makes up the entire volume of mortgage loans provided by banks in January 2020.

One of the main incentives for the development and growth of the mortgage market was also the procedure for the refund of income tax amounts paid by employees,

individual entrepreneurs and notaries in the amount of interest paid for servicing a mortgage loan.

It should be noted that this program was introduced at one time in order to revitalize the field of capital construction. The program, in fact, has fulfilled the task set for itself, the best proof of which is the new apartment buildings in different parts of Yerevan. However, to continue this policy according to the same rules will mean to give an impetus to the development of the non-exported sector, which is not justified from three points of view. Firstly, the construction boom can turn the real estate market into a "air balloon", significantly reducing the resilience of the economy to shocks.

The best proof of this was the reaction of the RA economy to the 2008 - 2009 global financial crisis in the form of an economic downturn of 14.1%. Secondly, from a purely fiscal point of view, the construction sector has a short-term impact on state budget revenues. Thus, a construction company pays taxes only during construction work in the event that the "life expectancy" of the object under construction is significantly longer. Moreover, if the above-mentioned regulation of income tax refund is applied, the state incurs tax losses in the period after construction works. Thirdly, international experience shows that stimulating the export sector is most favorable for small open economies, since it opens the way to long-term stable economic growth. Thus, the application of this law makes it clear how the interaction between real estate and financial markets occurs, and how changes in one market have a direct impact on another market. Commenting on this influence, we are compelled to note that the influence between the two markets is mutual. That is, a small change in another market, as well as in this market, causes big shifts.

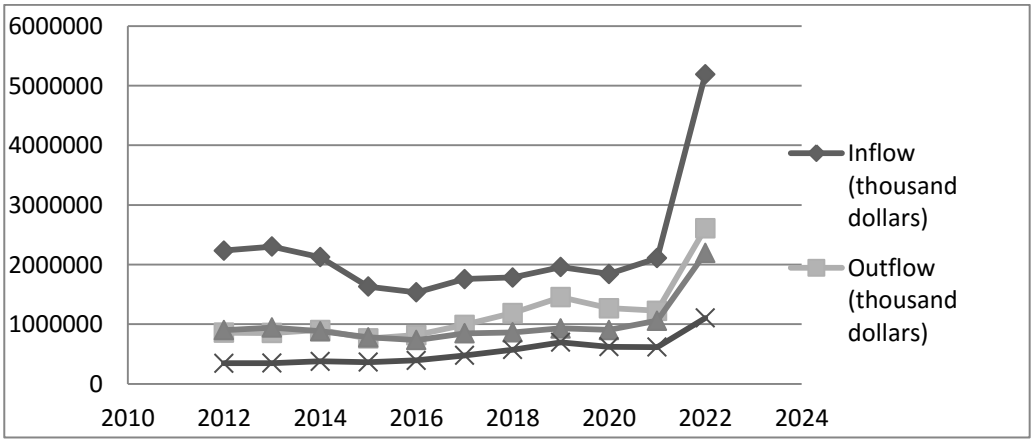

Figure 3. Transfer flows in 2012-2022 [6]

The financial market is also greatly influenced by transfers, through which the real estate market is also activated, since the flow of large transfers also has a positive impact

on the real estate market, activating the sphere. Now let's look at the dynamics of transfers in Armenia over the past 10 years.

Figure 3 shows that a very large increase in transfers was recorded in 2022, largely due to the Russian-Ukrainian war and EU and US sanctions against the Russian Federation. The impact of sanctions had a very negative impact on the Russian Federation, as a result of which most of the transactions were carried out through different countries, one of which is Armenia. However, it should be noted that with the transfer of these transactions to Armenia, the outflow of transfers should have increased to the same extent, but in reality the inflow of transfers increased more than the outflow. This indicates that the residents who migrated to Armenia due to the Russian-Ukrainian war moved their financial resources to Armenia and began to settle in Armenia, as a result, there was a big leak of transfers. In 2022, Armenia received USD 5,190,411 million, of which only USD 2,606,767 million came from the country, and the rest remained in the Armenian economy. Which, of course, could not but have their influence. For comparison, it should be noted that in 2021 Armenia received USD 2,108,936 thousand of transfers, of which only USD 1,225,622 thousand flowed away. In 2022, the net inflow increased by USD 1,700,330 thousand US dollars compared to 2021, approximately compared to last year, transfers increased by 2.5 times [www.cba.am].

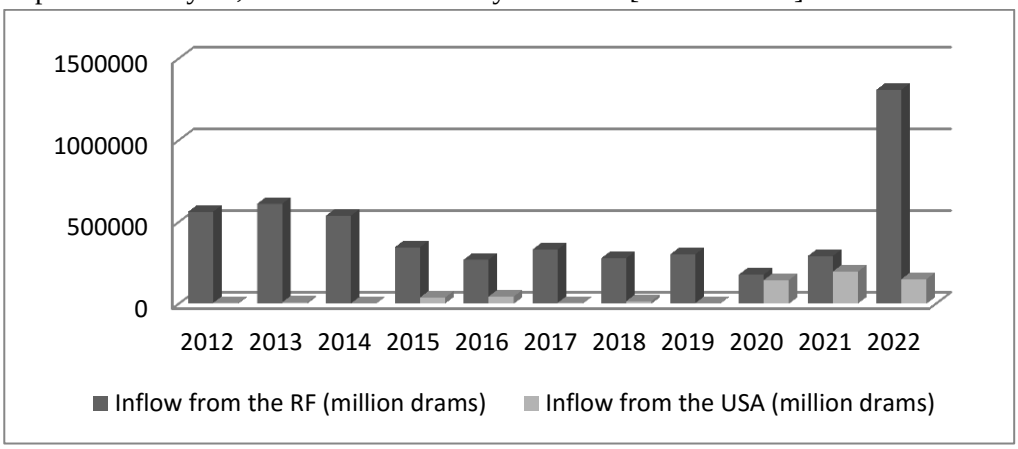

Figure 4. Transfers received to Armenia from Russia and the USA in 2012-2022

Conclusion As it can be seen from our analysis of obtained financial and economic indicators, the transfers increased mainly due to transfers sent from the Russian Federation. And the net inflow of transfers from the USA to Armenia in 2022 decreased from AMD 196 127 million to AMD 150 561 million compared to 2021. And the inflow of net transfers from Russia to Armenia increased by AMD 1,077,572 million. Of course, the net inflow of transfers of this volume could not but affect the financial market of the Republic of Armenia, and consequently, the real estate market of the Republic of Armenia.

Arine STEPANYAN

Analysis of the interaction of real estate and financial markets of the Republic of Armenia over the past five years

Key words: real estate market, financial market, income tax refund, mortgage, transfers, commercial banks

The real estate market is influenced by the development of the real and financial sectors, as supply and demand in this market depend on the state of the economy and the financial system of the country. The vulnerability of financial stability from fluctuations in real estate prices is mainly considered from the point of view of lending to the construction industry and loans secured by real estate, the materialization of risks of changes in the value of collateral. Sharp fluctuations in supply/demand for real estate, and consequently prices, may adversely affect the security and quality of bank loans, creating risks in terms of financial stability. The real estate market is an extremely important economic player. Real estate, in addition to meeting one of the most important needs of society, is one of the main "reserves" of wealth in the economy. Thus, in developing countries, the market value of shared real estate is usually many times higher than the capitalization of financial markets and the volume of investments coming into the country. This is a unique source of economic "energy". The evaluation and analysis of real estate in Armenia, the use of weak analysis methodology, are considered to be the causes of problems in the real estate market with incorrect versions and procedures, the lack of high-quality data on local markets, unreasonable market research and investment decisions based on them.

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THE PROSPECTS OF SOLVING THE ISSUESS OF THE STATE POLICY ON INCREASING THE COMPETITIVENESS OF AGRICULTURE IN THE REPUBLIC OF ARMENIA

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Keywords: agriculture, competitiveness, efficiency, productivity, indicators, factors, problems. gross output, agricultural commoditization, subsidy, loans, leasing, producer price

Introduction At the current stage of the development of agriculture in the Republic of Armenia, among the many problems faced by the sector, the increase of competitiveness merges with its importance. The solution of the mentioned problem is important, especially in terms of increasing the level of food security of the country, improving the balance of external trade of agricultural products, increasing the income of farmers in agriculture, increasing production efficiency. Increasing the competitiveness of agriculture in the Republic of Armenia requires the development and implementation of an effective state policy. The effective implementation of the mentioned policy, in turn, requires clarifying the main issues of that policy and providing proper solution to them. It is advisable to separate those problems based on certain approaches, in particular: improvement of the state of use of the main resources of the sector, provision of primary seed production and genealogical work ensuring the vitality of the main branches of agriculture, introduction of technical saturation and modern technologies in the sector, sale of agricultural raw materials and products, improvement of production and service infrastructures of the sector, from the point of view of ensuring the financial stability of economic operators in agriculture, improvement of state programs implemented in agriculture and launching of new, effective programs, etc. In this context, the presentation of ways to solve the problems of the state policy of increasing the competitiveness of the agriculture of the Republic of Armenia is gaining relevance. The purpose of this article is to identify the ways of solving the problems of the state policy of increasing the competitiveness of the agriculture of the Republic of Armenia. The main tasks of the article are to clarify the above-mentioned policy problems, to highlight the reasons for their occurrence.

Methodology The article uses dialectics, scientific abstraction, comparative analysis and logical methods. The application of the dialectic method is clearly seen in the interconnected study of the problems of the state policy of increasing the competitiveness of agriculture in the Republic of Armenia.

The application of the method of scientific abstraction is demonstrated in the fact that the ways of increasing the competitiveness of the agriculture of the Republic of Armenia were considered within the framework of state support.

The application of the comparative analysis method found its expression in the comparative analysis of a number of indicators characterizing the competitiveness of agriculture in individual countries, as well as in the comparisons of different types of drones and weather stations used in agriculture.

Logical methods are manifested in the subdivision of the problems of the state policy of increasing the competitiveness of agriculture of the Republic of Armenia with a certain logic.

Scientific novelty The ways of solving the problems of the state policy of increasing the competitiveness of the agriculture of the Republic of Armenia have been revealed.

Literature review The characteristics of the competitiveness of agriculture, the factors determining it, the problems of its increase have been recognized by a number of economists, including A. Borel [Borel, 2014, 4], T. Lenskaya [Lenskaya, 2013, 87], K. Saubanov [Saubanov, 2010, 38-53], V. Bespyatnykh [Bespyatnykh, 2000, 200], O Koryakina [Koryakina, 2017, 25], A. Voskanyan, A. Kartashyan [Oskanyan, et al., 2021, 73-87], S. Avetisyan [Avetisyan, 2002, 232-238] and others. However, certain problems related to the state policy of increasing the competitiveness of agriculture of the Republic of Armenia have not been studied in the necessary depth.

The problems of the state policy of increasing the competitiveness of the agriculture of the Republic of Armenia were also discussed in the corresponding programs of the state support of that branch, but the proposed ways of solving them are limited by general judgments and need additional study. Moreover, not all problems are addressed in the mentioned programs. It is especially related to policy problems of the best use of the biological possibilities of the main branches of agriculture: plant breeding and livestock breeding. The proposed approaches are aimed at solving the issues related to the state policy of increasing the competitiveness of the agriculture of the Republic of Armenia. The main problems of the policy of increasing the competitiveness of agriculture divided by a certain logic are considered the following:

• main problems of the policy of improving the state of use of the main resources of agriculture;

• policy problems of the best use of the biological possibilities of the main branches of agriculture: plant breeding and livestock breeding;

• policy problems of technical saturation and introduction of modern technologies in the agricultural sector of the Republic;

• problems of policy for the sale of agricultural raw materials and products, improvement of production and service infrastructures of the sector;

• problems of the policy of ensuring the financial stability of economic operators in the field of agriculture;

• policy issues of improving state programs implemented in agriculture and launching new, effective programs.

We tend to consider the solution of the above-mentioned problems of the state policy of increasing the competitiveness of agriculture from the point of view of the methods and approaches for improving the factors that condition them. First, the problem of improving the state of use of basic agricultural resources refers to the low efficiency of land use, the main resource of agriculture, and more specifically, to the insufficient condition of targeted use of arable land. Considering the importance of this problem, the RA government has adopted a number of resolutions, the implementation of which should contribute to the improvement of the use of land resources. In particular, the "concept of increasing the efficiency of the use of agricultural lands" stipulates the following: "There are many reasons for the non-cultivation of agricultural lands. Difficulty in conducting profitable activities on small and fragmented plots of land, unavailability or insufficient supply of irrigation water, unavailability of agricultural machinery, low level of soil fertility, lack of land user or land owner, as well as the lack of necessary working capital"[1]. In the said legal document, the main reasons for the non-cultivation of agricultural land are mentioned. In fact, the reasons are more diverse, and each of them has its own impact. According to the observations carried out by the former Ministry of Agriculture of the Republic of Armenia, 27 reasons for the non-use of agricultural land were identified, 8 of which were the most influential. Those causes and effect sizes are:

- low yield: 13.6%,
- lack of working capital: 12.0%,
- the inaccessibility of the use of agricultural machinery: 11.4%,
- unavailability or insufficient supply of irrigation water: 8.5%,
- low level of soil fertility: 7.4%,
- the unavailability and/or high price of quality seed and planting material - 7.2%,
- the high price of fertilizer: 6.4%,
- absence of the owner of the land user from the Republic of Armenia: 4.6%.

The total percentage of the mentioned reasons was 71.1%. 28.9% accounted for the remaining 19 reasons. In other words, according to the studies, the last reasons did not have a significant impact. It is logical that the policy of improving the condition of agricultural land use should be aimed at alleviating the reasons listed above as much as

[1] Resolution of the RA Government on Jan. 23, 2020 "On approving the concept of increasing the efficiency of the use of agricultural lands and the plan of measures" N68-L

possible, as a result, increasing the competitiveness of agriculture. Therefore, according to the presented reasons, significant improvement of the state policy may require additional steps. One of the main steps to eliminate the cause of low yield is to reduce the specific cost of cultivation of agricultural crops, in particular, the fulfillment of agro-technical requirements, as well as the use of resource-saving technologies.

It is particularly important to fulfill the agrotechnical requirements starting from the preparation of the land for the cultivation of agricultural crops, observing the norms of time and required resources, starting from sowing, then fertilizing, plant protection, irrigation, timely and proper harvesting, etc. Taking steps to increase the mentioned profitability requires both knowledge and provision of necessary resources and execution of works. Arranging consultation and public-private cooperation measures to increase the availability of resources used in plant breeding should play a major role here.

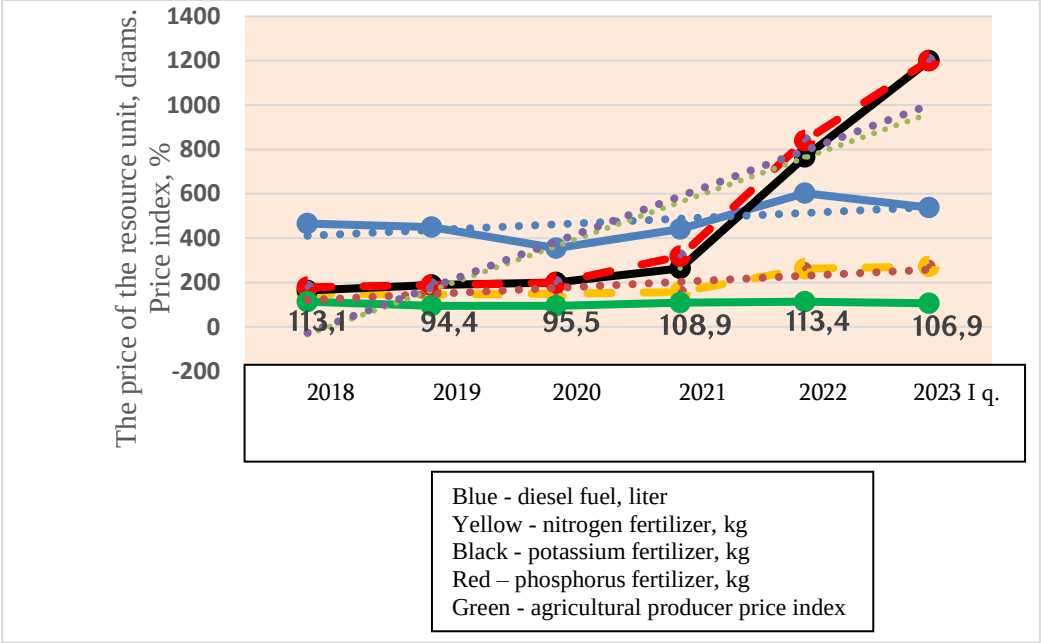

Figure 1. Changes in the prices of basic resources used in agriculture and the price index of agricultural producers in 2018-2022. and in 2023 in the first quarter. The following source was used as a basis for the construction of the chart: RA Ministry of Agriculture, Food Security and Poverty in 2023. January-March. 2023, 23; 27; 30.

It is justified that the subsidy of resource prices should be implemented in the amount of the difference between the price change of basic resources used in agriculture and the price index of agricultural producers. Among the steps to mitigate the so-called cause of the unavailability of agricultural machinery for the next reason can be the following:

- the introduction of affordable mechanisms for leasing agricultural equipment, in particular, it refers to the reduction of the advance payment of leasing, bringing it up to 10%, as well as the extension of the repayment period, up to 10 years for combines, up to 8 years for tractors, and up to 4 years for agricultural machines;
- promoting the formation of cooperatives providing production and technical services and supplies in agriculture, applying justified tariffs for production and technical services;
- the formation of structures to carry out production and technical services and supplies in rural communities with public-private cooperation, the definition and application of reasonable tariffs within the framework of the latter. Establishing contractual relations with agricultural producers is important.

Possible steps to mitigate the problem of unavailability or insufficient supply of irrigation water are:

- supplying irrigation water to water users and collecting rents based on accurate data from water meters;
- taking measures to implement modern irrigation technologies in the agricultural economy: support mechanisms with public-private partnership, in this process special-scientific advice to water users, reduction of losses in inter-economic and intra-economic networks, paying more attention to the repair and improvement of water pipes and junctions before the start of the irrigation season, are particularly important;
- it is necessary to pay attention to the possibilities of using polymer and other materials that retain moisture in the soil.

Among the important measures for improving soil fertility are:

- increasing the availability of the most important resources determining fertility, in which the expansion of the use of biological fertilizers is especially important;
- the organization of fertilization based on the results of agrochemical soil research and relevant advice;
- the possible application of crop rotation, the implementation of which can be effective under the conditions of providing professional advice.

We see the solution to the problem of unavailability and (or) high price of quality seed and planting material by applying the following steps:

- the primary seed breeding of agricultural crops should be a matter of state coordination and care, increasing the role and support of the state, expanding the capacities of the scientific research system in this field, using available mechanisms of state-private partnership;

- strengthening the system of subsidies and control in the reproduction of high reproduction seeds by state and private structures, the expansion of the scope of the programs implemented in this field;

- in addition to the primary seed production of grain crops, state coordination and care should also be directed to the seed production and seed production of other crops, in particular, fodder crops, applying existing public-private partnership tools here as well;

- introduction of a clear system of certification of seeds and planting material. The most important prerequisite for the latter is the adoption of the RA Law "On Seeds and Planting Material" [Law, 2022], the RA Law (HO-345-H) "On Seeds and Planting Material" will enter into force one year after its adoption.]. The adoption of legal acts ensuring the implementation of the given law is also emphasized.

One of the main obstacles in this field is high level of prices of fertilizers. The absence of a land user from the Republic of Armenia, the owner, is one of the current highlighted problems, we consider possible steps to alleviate it:

- by making additions and amendments to the land legislation and other legal acts, to legally reserve the right to the local self-government bodies to take measures to organize the use of the land in the event of the absence of the owner of the agricultural plot for more than two years and the purposeful non-use of the land;

- in case of non-cultivation of the land by the owner for more than two years, the local self-government bodies shall be empowered to obtain consent for the use of the land on lease through negotiations;

- in the absence of an agreement with the owner, in case of non-establishment of contact, to manage it with the use of communally owned land,

- in order to increase the attractiveness of renting such lands, to set the rent payment as land tax (in the amount of property tax).

The most important way to increase the level of targeted use of agricultural land can be the application of targeted state policy to promote the use of arable land. The latter can be implemented through state programs, applying a targeted subsidy policy according to zones. The application of the mechanism of providing subsidies for the purposeful use of agricultural land, particularly arable land, along with increasing the level of use of land resources, also aims to ensure the following results:

- promotion of local production of agricultural products, resulting in import substitution,

- promotion of local production and export of agricultural products with absolute advantages,

- improvement of the economic conditions of economic entities carrying out agricultural activities in border and high mountain settlements,

- implementation of the policy of preferred agricultural specialization,

- increasing the competitiveness of small farms.

According to our assessments, we propose to set the amount of subsidy for grain and leguminous crops and fodder crops at AMD 60-70 thousand per hectare of cultivated land. The latter will enable full reimbursement of diesel fuel costs and some reimbursement of agricultural investment costs.

One of the most significant measures to increase the efficiency of the use of labor resources in agriculture, should be the implementation of a state policy aimed at ensuring the following conditions:

- creating opportunities for expansion of non-agricultural activities in rural areas, in particular, processing of agricultural products, production technical services and supplies, etc.;
- creating opportunities to mitigate seasonality in agriculture, in particular, expanding animal husbandry branches (poultry farming, fish farming, beekeeping, animal husbandry), development of greenhouse economy;
- creating opportunities for processing agricultural products in farms, in particular organization of production of dried fruits, packaging, aging, etc.

Taking the mentioned steps will contribute to the growth of employment in other sectors, which will absorb part of the underworked labor force in agriculture and as a result, the efficiency of the use of labor force will increase.

Another policy issue for increasing the competitiveness of agriculture is the greater use of the biological possibilities of its main branches: plant breeding and livestock breeding. The most important issue of the policy of making the most of the biological possibilities of the plant breeding branch of agriculture is the provision of high-quality and conditioned seeds. The solution of the problem to provide seeds may consider the following directions:

- organization of production and reproduction of high reproduction seeds, super elite and elite seeds in the scientific organizations engaged in seed breeding in the country, including the latter in the process also specialized organizations and agricultural farms;
- increasing the specific weight of conditioned seeds in the medium term for planting agricultural crops, increasing it to 70-75% of the used seeds. For the latter, first of all, it is necessary to provide the necessary volumes of seeds of high reproduction. It mainly refers to wheat, spring, legumes, various types of vegetable and vegetable crops, potatoes. According to our assessment, the demand for different types of seeds in our country for wheat is 19-22 thousand. tons, for barley 12-13 thousand. tons, for potatoes - 81-85 thousand. tons, for vegetables 0.9-1.0 thousand tons, etc.;

- along with the production and reproduction of locally produced seeds, importing varieties and quantities of seeds that meet the demand is important. The latter is important for varietal renewal.

The scientific center of "Agriculture" and the breeding station of "Gyumri" are engaged in seed breeding of grain and leguminous crops in the republic. Some production units, such as the Seed Breeders' Association operating in the Sisian region deal with seed reproduction. Some specialized farms operating in Shirak marz are also engaged in seed reproduction. The scientific center of "Vegetable and Technical Crops" deals with the selection and seed breeding of vegetable and vegetable crops. The center currently supplies around 10-15% of the country's demand for vegetable seeds and has opportunities to expand it. The center is equipped with modern seed preparation and packaging equipment. There are no specialized structures dealing with the selection and seed breeding of potatoes. Specialized farms only reproduce imported seeds. In this regard, we see certain perspectives in the branch of the "Agrobiotechnology" Scientific Center of the National Agrarian University of Armenia in obtaining virus-free potato planting material and implementing their further stages of reproduction. For the latter, it is necessary to build a new greenhouse and expand the land areas for propagation and reproduction of potato seedlings.

Considering the fact that obtaining high reproduction seeds is a relatively complicated process and requires relatively high costs, therefore, the use of high reproduction seeds in this case requires the application of a certain support element for either the producer or the consumer. Such state programs for the seeds of cereal crops have been implemented in the republic, but increasing the amount of support can provide a greater result. Such an approach was used in the "2022 state support program for the promotion of winter wheat production in the Republic of Armenia" adopted on August 11, 2022 by the RA government. It is possible to revise the program, apply mechanisms for subsidizing the price of high-reproduction seed, setting a subsidy of 50% of the seed price. The latter will justify the investment of additional costs as a result of the increase in yield and the increase in the sown area with a certain increase in the budget burden.

Ensuring seed certification and control is an important issue in this field. One of the most important prerequisites for the latter is the application of the RA Law "On Seeds and Planting Material", which regulates relations related to the registration of plant varieties and hybrids with permission for use, the production, reproduction, certification, transportation, storage, sale and use of seeds and planting material. The policy of making the most of the biological possibilities of the livestock breeding branch of agriculture should be directed mainly to:

- improving the foraging and pedigree characteristics of agricultural animals, herd structure,

- improving animal behavior and feeding conditions.

In this direction, certain works were carried out within the framework of the "2019-2024 beef breeding development program in the Republic of Armenia". In 2022, 334 heads of animals were purchased at a cost of 328.0 million drams, the subsidy amount was around 143.8 million drams. 2019. The animals acquired in 2020 and 2021 are 319, respectively; Chapters 391 and 750. The mentioned program has a certain positive effect on animal husbandry, but this effect is not significant. In general, the most important index for the characterization of animal husbandry, the milk yield of cows increased by barely 3% during the considered period, 2019-2021. Of course, the increase in milk yield is also the result of other factors, not only the above-mentioned program. The actual increase in grain yield, which is 1.4-1.5% per year, is too small and it will not have a significant impact on the development of animal husbandry. It proves that the implementation of the project with such volumes cannot provide tangible results for the entire republic. While comparing, for example, the number of heads included in the program in 2022 with the number of cattle in the republic, it is obvious that it cannot give tangible results. In 2022, the number of animals included in the state support program is almost 0.06% of the number of animals mentioned at the beginning of the same year. The latter testifies that the implementation of the project with such volumes cannot provide tangible results for the entire republic.

In the direction of improving pedigree and foraging characteristics of small cattle, it is important in the Republic of Armenia in 2019-2023. the implementation of the sheep breeding and goat breeding development support program. The purpose of this program is "to create favorable conditions for the development of sheep breeding and goat breeding branches in the republic through the use of state support mechanisms, in particular, affordable lending conditions and cost compensation, encouraging the acquisition (import) of high-value pedigree sheep and goats and the formation of high-yielding herds, the improvement of breeding breeds, the development of pedigree work, the increase in the number of purebred animals with valuable production and economic characteristics obtained through crossbreeding, as well as the increase in the production and export volumes of sheep and goat products" [Ministry of Economy, 2022]. The goal of the project is quite comprehensive, but the results of the implementation of the project are not very promising. With the support of the project, 331 head of animals were purchased in 2022, the amount of the compensation loan was AMD 76.8 million. In 2020 and 2021, the number of small cattle obtained with the support of the program was 203, respectively; 668 and 125 chapters [Ministry of Economy, 2022].

The replenishment of tribal population with such volumes cannot provide tangible results either. For example, the number of animals added in 2022 is 0.05% of the number of animals at the beginning of the given year. In other words, the implementation of

programs at such rates cannot significantly increase the competitiveness of livestock farming. Of course, agricultural commercial organizations carry out some steps to replenish the pedigree herd, but their specific weight is extremely small. Thus, the latter account for 0.8% of the number of large cattle, and 2.4% of the small cattle [HK VK, Statistical Yearbook of Armenia 2022, 364]. Currently, the most effective use of the biological possibilities of animal husbandry requires the use of radical approaches. In particular, it is necessary to:

- to increase the volume of pedigree livestock acquisition in beef and small cattle breeding with state programs, as well as to establish a certain stable part of support, at least in the amount of 40-45% of the value of pedigree animals, in addition to affordable credit. Here, the introduction of project control mechanisms, the control of the targeted use of resources is extremely important. Under these conditions, the budget burden will increase, but real opportunities will be created for improving the structure of the herd of agricultural animals and increasing competitiveness;

- organize the process of artificial insemination. Currently, according to observations, about 30 thousand head of cattle are included in the process of artificial insemination in the republic. The latter is much smaller than the justified demand. The minimum amount of insemination, according to experts, should be at least ½ of the number of cows, that is, the current volumes should be increased 4-4.5 times. Here, the quality of the semen used is of particular importance, it must be obtained from animals with high pedigree characteristics and must meet the specified storage conditions. AMD 1.25 billion will be required for artificial insemination of such a population. In the case of a maximum subsidy of 50% per head, a real opportunity will be created to ensure the recommended volumes of artificial insemination;

- apply the method of embryo transplantation, which is considered progressive for the republic (in particular, it is necessary to apply it at the initial stage in cattle breeding). At present, this method is not used in the republic (it had some use in the past). Its implementation requires both well-founded and consistent training and education of specialists, as well as provision of necessary equipment. Their implementation will also be one of the important measures for expanding the biological capabilities of agricultural animals and increasing their competitiveness;

- the implementation of the mentioned program steps requires a lot of organizational work and consistent observations, taking timely mitigation approaches to the faced problems. It is not possible to organize the implementation of the mentioned by the current body of the state administration of the sector, the policy-making units. Therefore, it is necessary to create a separate animal husbandry program coordination unit in the structure of the state administration body, the main function of which will be the organization of the process of implementation of state programs in the area of animal husbandry, provision of advice and organization of process control.

There are various directions for solving the political problems of technical saturation and introduction of modern technologies in the agricultural sector of Armenia. First of all, it is necessary to review the terms of leasing agricultural equipment. We suggest to using a different approach for the advance payment of leasing of agricultural equipment, particularly, to reduce the advance payment of leasing, to apply it to 10% instead of 20% or to apply a subsidy of a certain part of the advance payment. In this case, of course, the budgetary costs will increase, but it will have a positive effect on technical saturation, the pace of technical re-equipment will increase. This is one of the measures that require an increase in the financial burden, but it can be an effective measure from the point of view of technical saturation. One of the important ways of technical saturation in agriculture can be the implementation of technical saturation programs with community components of previously implemented credit programs, which can become a prerequisite for the creation of machine-tractor stations. Such programs are currently suspended, but it is necessary to take measures by the state agricultural management bodies for their implementation.

One of the preferred directions for the technical saturation of agriculture can also be the implementation of the program for the formation of agricultural production and technical service cooperatives with public-private cooperation, for which the element of support and provision of advice should be a guarantee.

Digitalization of agriculture and the use of digital technologies in production processes are among the most important directions of the technical saturation of agriculture. Consulting firm Spherical Insights & Consulting has estimated the digital agriculture market at $12.18 billion in 2021, which will grow to $34.13 billion by 2030, with an annual growth rate of 12.8%. The digital agriculture market should grow due to technological advances, waste reduction and efficient use of resources, strategic government policies, awareness raising and implementation of digital agriculture. Thus, the development of the digital agriculture market in the world is predicted to be quite fast. In order to have its share in such a market, it is necessary to take certain steps, which can be one of the important components of increasing the competitiveness of agriculture. According to our observations, the steps for the transition to digital agriculture should be as follows:

- training of personnel in the direction of digital agriculture. In the direction of the latter, a separate specialty - *digital agriculture* - was established at the National Agrarian University of Armenia, and a separate material and technical base - *laboratory capabilities* - was formed. Here there is still a problem in the direction of increasing the attractiveness of the profession;

- taking steps to increase the level of awareness of businessmen about digital agriculture, especially developing knowledge about the results of its application;

- implementation of state programs for the import of equipment for the development of digital agriculture to the republic, including relevant grants;
- taking into account the complexities of implementation and application of digital agriculture equipment by economic operators in individual agriculture, both in terms of financial support and professional application, it is necessary to form a separate organizational unit for the provision of digital agriculture services, which will provide services on a regional, regional or national scale.

Digital agriculture is the use of advanced technologies in an integrated system enabling farmers and other stakeholders in the agricultural value chain to increase food production. Global digital agriculture is segmented into crop monitoring, weather tracking, field mapping, crop tracking, and others. One of the main obstacles to the development of digital agriculture is the high price of precision agriculture equipment. Precision agriculture uses advanced technologies and high value equipment such as drones, smart sensors, navigation satellite system, guidance equipment and receivers.

Drones (unmanned aerial vehicles) are considered realistic for investment in the digital agriculture equipment in Armenia, with the main activities of plant protection measures, high-quality and efficient use of working fluid, field research and other activities. We consider the use of weather stations in the areas of agricultural crops to be important, which, along with the recording and reporting of temperature, its changes, is important in terms of providing information about soil moisture, the amount of water given to the plant. Various models of drones are used in agriculture in the world, including: JT10L-404QC, JT16L-404QC, JT30L-606, AGRAS T-40. The mentioned models have different sizes of reservoirs, namely: 10; 16; 30 and 40 liters, flight duration (10-15 minutes), flight radius (0-1000 m), flight height (0-30 m), flight speed (0-12 m/s), injection coverage, productivity and other indicators , which characterize the features of their work. The use of agricultural drones certainly affects the competitiveness of agricultural products, but currently more advanced drones are used in agricultural work.

For use, we recommend the DJI AGRAS T-50 drone, which is a new generation device and has the following characteristics. DJI Agras T50 is one of the leading, most productive agricultural drone models, which differ from other T series drones in high productivity and efficiency. The equipment is oriented to work on large areas, it is capable of lifting up for spraying a 40-liter tank for spraying plants or 50 liters of bulk, granulated material for adding soil from above (from the air), processing a layer of 11 meters in one pass [Dji-agras-t50]. A photo of the DJI Agras T50 drone is shown below. As we can see, compared to other drones, this drone has a large mass of used material and a large coverage of the processed layer. This equipment also has other advantages related to the efficiency of the measurement system, increased productivity and safety.

Photo 1. The DJI Agras T50 drone in action

In order to increase the competitiveness of agriculture, particularly horticulture, as is known, it is important to increase the productivity of production processes, specifically spraying, fertilizing, in particular, this new generation drone has high productivity, which is one of its important advantages. The one presented above is one of the improved equipment of the last generation, with the description of which we aimed to emphasize the importance of the given system from the point of view of increasing competitiveness. According to our observations, the price of drones of this brand is 13999 USD, shipping costs are 540 USD. Taking into account VAT and other unforeseen costs, the purchase price of this equipment for an agricultural producer can be 18,000 USD.

Our observations show that such equipment in the republic can be used by large farms that have the ability to invest and include specialists. However, the number of such farms in the republic is extremely small, according to estimates, they can make up 0.15% of the total number of farms. Taking into account the fact that the use of these digital equipment is difficult to access for the agricultural farms, both in terms of technological complexity and finance, therefore, an effective mechanism for using such equipment can be the creation of separate service centers on the basis of public-private cooperation, which will provide services on a contractual basis. farmers in agriculture.

The weather station for measuring temperature is also one of the most important equipment of digital agriculture. Let's talk specifically about the iMETOS 3.3 weather station, because it has certain advantages. The weather station serves the complex solution of environmental monitoring, modeling of diseases, water resources and other issues.

The iMETOS 3.3 weather station is a reliable and flexible data logger for any climate, powered by pre-charged batteries or solar panels. It is universal, with configuration possibilities and many connected sensors, 600 sensors are given for selection. iMETOS 3.3 is used to solve a wide range of problems:

- accurate weather forecast taking into account local weather conditions,
- SMS alerts about expected frosts, heavy rains, high temperature,
- modeling of the possible development of diseases of agricultural crops,
- continuous meteorological monitoring,
- monitoring the operation of irrigation systems and soil moisture,
- analysis of the growth of crops and their condition,
- monitoring of hydrological factors and timely warning of possible floods [www.geomir.ru/catalog/monitoring-pogody/imetos-3-3/].

Photo 2. IMETOS 3.3 weather station

iMETOS 3.3 has a number of advantages, the main ones being:

- own built-in memory,
- Internet connection function and direct connection via Wi-Fi channel,
- compact size and low weight,
- LED notification of the working status of the device,
- possibility to choose the interval of data registration,

- built-in battery, rechargeable from a solar panel, which works in a wide temperature range,

- support for up to 600 types of sensors with their automatic detection,

ease of installation of the device and sensors [Geomir, 2022, 3].The price of the device is 3,600 Euros, with shipping costs and VAT, it will be around 4,800 Euros.

The use of digital agriculture equipment can significantly contribute to increasing the competitiveness of agriculture, but the large investments required for the acquisition of such equipment and the professional complexity of their use require the creation of a certain organizational unit in terms of regions or enlarged communities that can ensure the use of such equipment. That organizational unit should include the structure that manages the digital agriculture equipment, which should work in public-private partnership, local self-government and regional government bodies, structures that train and provide advice in the field of digital agriculture, economic operators in agriculture, companies that supply digital agriculture equipment, etc. The organization scheme of the structure using digital agricultural equipment is presented in figure 2.

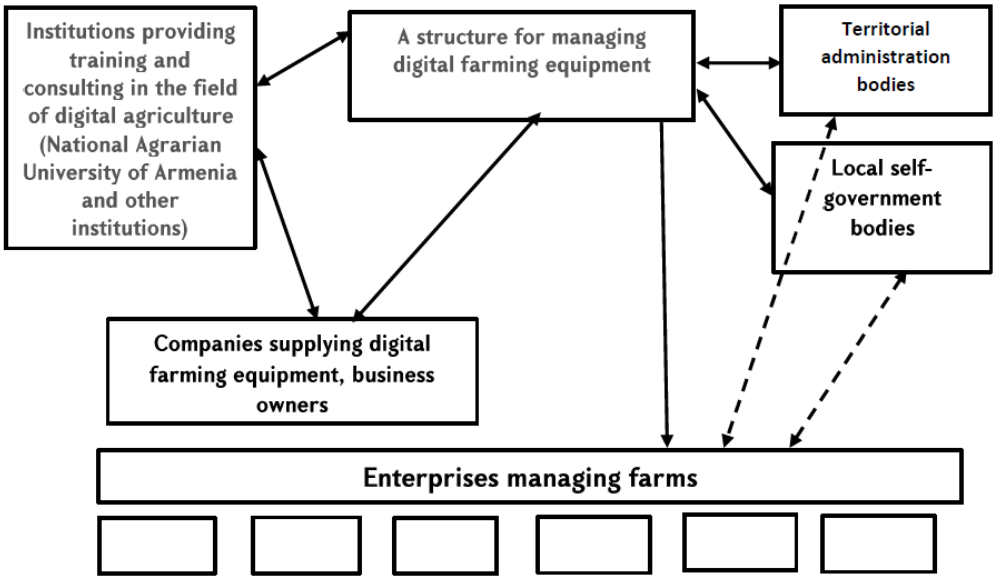

Figure 2. Organizational chart of a structure using digital agriculture equipment in RA

When considering the main directions of solving the problems of the policy of the sale of agricultural raw materials and products, the improvement of the production and service infrastructures of the sector, we will first stop at the organization of the mentioned sale process.

An important role belongs to the organization of the realization process in the links of the chain of agricultural raw materials and food from the producer to consumption.

The process of sale of agricultural products in the republic is mostly unregulated. A significant part of the sale of agricultural products is done through unregulated middlemen who dictate their prices to producers and the contractual relationship is not clear, which is especially important between producers and processors of agricultural products. The regulated organization of the process of sale of agricultural products requires the formation of certain infrastructures, the main function of which should be the reception of agricultural products, their sorting, as necessary, packaging, aging and delivery according to purpose, which can be carried out when selling these products directly to consumers in agricultural markets, supermarkets and stores. through the network, when providing to exporting structures and when selling to processing companies. We need to consider the assortment, quantities and directions of further sale of the products to be stored. It is proposed to jointly form collection points in rural settlements or for several settlements or communities, which should operate in the system of contractual relations with the economic operators in agriculture. Those collection points must have storage areas, including refrigeration, containers and packaging materials and equipment, appropriate means of transport, and certain staff. Such structures can be created based on cooperation or economic operators are united by a contract of joint activity.

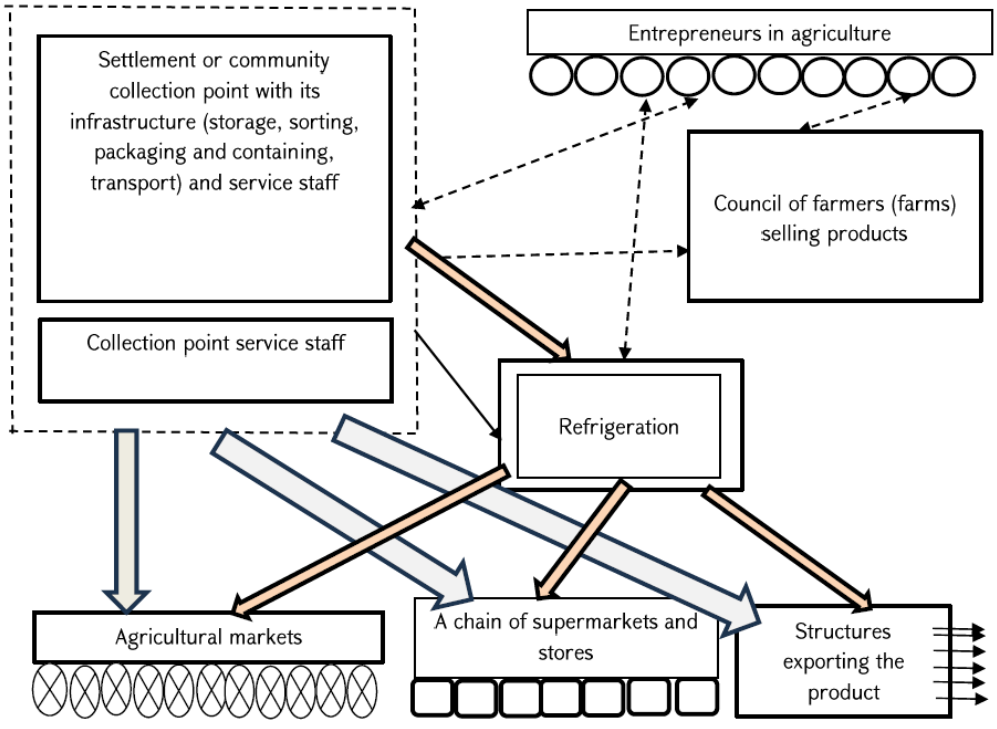

Figure 3. Organizational scheme of the agricultural product and raw material sales department

The costs of the process of collection and delivery of agricultural products must be compensated through certain deductions from the proceeds from the sale of products, the share of which must be determined based on the calculations of specific costs. It is important to establish contractual relations with processors of agricultural products, as well as exporting structures, supermarkets and chain stores. It is advisable to form the refrigerator economy on the principle of share-ownership or cooperation, the activity of which will serve the needs of the shareholders, or a service will be provided by the owner of the refrigerator for a certain fee.

Our observations show that one of the important directions for improving production and service infrastructures in the agricultural sector should be the creation of production-technical service and supply structures in rural areas. The formation of these structures is considered realistic on the basis of a certain support program with public-private partnership. The state should have its share with a share close to 50%. The possibility of repurchase by other owners of the state share should be created. The service center should work with farmers in agriculture on the basis of contractual relations, applying justified, realistic tariffs. In order to encourage the formation of such structures, we propose to apply agricultural equipment leasing program privilege options, both for the down payment, the leasing interest rate, and the leasing period. One of the preferred options used in the past is the creation of car-tractor assembly stations next to the municipal halls within the framework of community projects. In the last two cases, it is considered important to provide advice to these structures in the field of production and technical services and to carry out periodic monitoring of the production process by relevant competent authorities (structures of state administration bodies coordinating the sector, territorial administration and local self-government bodies).

The main directions of solving the problems of the policy of ensuring the financial stability of economic operators in the field of agriculture are:

- one of the instruments for ensuring the financial stability of economic operators in the agriculture of the republic was the agricultural loan interest rate subsidy program, but as we mentioned, the program was stopped starting from 2023 and no other equivalent program was started to replace it. Therefore, it is proposed to resume the interest rate subsidy program for agricultural loans, it is possible to revise the principal amount and repayment terms depending on the sub-sectors to be loaned;
- increasing the level of purposefulness of the loan interest rate subsidy program through the use of other mechanisms for proper monitoring and control;
- providing advice to borrowers in the direction of targeted use of financial resources.

The main directions of solving the policy problems of improving the state programs implemented in agriculture and launching new effective programs are:

- restoration of loan interest rate subsidy program;

- in case of problems in the implementation of almost all state agricultural support programs with the planned volumes, the implementation of the programs with the specified volumes can be facilitated by the expansion of the support element of the state support programs, by increasing the shares of subsidy and support components provided by the programs by about 25-30%;

- a new program is proposed, according to which, for a number of agricultural crops, according to the zones, it is appropriate to establish a payment for ensuring the sowing area of a unit area and for its proper cultivation;

- it is not necessary to implement programs aimed at the production and reproduction of high-yielding seeds of grain and leguminous crops, fodder crops;

- the implementation of state programs for the development of thoroughbred livestock breeding and improvement of the pedigree and food-producing characteristics of agricultural animals by increasing their volumes and the support component.

The proposed revision and expansion of state support programs requires a significant increase in budget investments, but our observations show that they will be compensated many times over due to increased production volumes and increased competitiveness of the sector.

Conclusions As a result of the research, the following conclusions were made:

The policy of improving the state of agricultural land use should be aimed at alleviating the causes of its inefficient use as much as possible, as a result, increasing the competitiveness of agriculture. The most important way to increase the level of targeted use of agricultural land can be the application of targeted state policy to promote the use of arable land. The latter can be implemented through state programs, applying a targeted subsidy policy according to zones. Increasing the efficiency of the use of labor resources, the other most important resource in agriculture, requires the implementation of a state policy aimed at expanding non-agricultural activities in rural areas, mitigating seasonality in agriculture, and creating opportunities for processing agricultural products in farms. The policy of making the most of the biological opportunities of the plant breeding branch of agriculture should be aimed at providing high-quality and conditioned seeds, and the policy of making the most of the biological opportunities of animal husbandry should be aimed mainly at improving the nutritional and pedigree characteristics of agricultural animals, herd structure, animal behavior and feeding conditions. The regulated organization of the process of sale of agricultural products requires the formation of certain infrastructures, the main function of which should be the reception of agricultural products, their sorting, as necessary, packaging, aging and delivery according to purpose, which can be carried out when selling these products directly to consu-

mers in agricultural markets, supermarkets and through a network of stores, when providing to exporting structures and when selling to processing companies.

One of the important directions of improving the production and service infrastructures of the agriculture sector should be the creation of production and technical service and supply structures in rural areas. The formation of these structures is considered realistic on the basis of a certain support program with public-private partnership. Taking into account the complexities of implementation and application of digital agriculture equipment by economic operators in individual agriculture, both in terms of financial support and professional application, it is necessary to form a separate organizational unit for the provision of digital agriculture services, which will provide services on a regional, regional or national scale. In the event of problems in the implementation of almost all state support programs for agriculture in the planned volumes, the implementation of the programs in the specified volumes can be facilitated by the expansion of the support element of the state support programs, by increasing the shares of the subsidy and support components provided by the programs by about 25-30%. Although the proposed revision and expansion of state support programs requires a significant increase in budgetary investments, they will be compensated in multiple volumes as a result of increasing production volumes and increasing the competitiveness of the sector.

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Lusine TSPNETSYAN

The prospects of solving the issuess of the state policy on increasing the competitiveness of agriculture in the Republic of Armenia

Key words: agriculture, competitiveness, efficiency, productivity, indicators, factors, problems. gross output, agricultural commoditization, subsidy, loans, leasing, producer price

The implementation of an effective state policy of increasing the competitiveness of agriculture of the Republic of Armenia requires clarifying the main problems of this policy and providing a solution to them. It is advisable to separate the problems based on certain approaches, in particular: improvement of the state of use of the main resources of the sector, provision of primary seed production and genealogical work ensuring the vitality of the main branches of agriculture, introduction of technical saturation and modern technologies in the sector, sale of agricultural raw materials and products, improvement of production and service infrastructures of the sector, from the point of view of ensuring the financial stability of farmers in agriculture, improving the state programs implemented in agriculture and launching new, effective programs. In this case, a nember of problems is presented in the article and the ways of their solution were identified.

• Main problems of the policy of improving the state of use of the main resources of agriculture.
• Policy problems of the best use of the biological possibilities of the main branches of agriculture: plant breeding and livestock breeding.
• Policy issues of technical saturation and introduction of modern technologies in the agricultural sector of the Republic.
• Problems of policy for the sale of agricultural raw materials and products, improvement of production and service infrastructures of the sector.
• Problems of the policy of ensuring the financial stability of economic operators in the field of agriculture.
• Policy issues of improving state programs implemented in agriculture and launching new, effective programs.

COMPARATIVE ANALYSIS OF ARMENIAN COMMERCIAL BANKS' PERFORMANCE

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Key words: Pythagorean fuzzy set, fuzzification, defuzzification, triangular and trapezoidal functions

Introduction The efficiency of the banking system is significant for ensuring the country's economic development and stability, both in developed and developing countries. It is well known fact that financial crises usually are the result of the instability and inefficiency of the banking system. Studying the factors for the assessment of the instability of the banking system allows to determine characteristic trends of the stability of the banking system. Therefore, the problem of studying the effective functioning of the banking system is emphasized and methods and approaches are proposed, which give an opportunity to evaluate factors with negative financial and economic effects, as well their manifestations and behavior.

Literature review Among the researches in this direction it is worth to mention the study of Zha, N. Liang, M. Wu, and Y. Bian [Zha, et al., 2016, 60–72] . The authors studied the problems arising in the conditions of economic globalization and identified the factors influencing the efficient operation of banks, as well as the phenomena determining the financial instability cha-racteristic of the competitive environment. In line with the studies of the mentioned authors there is another one by Y. Wooluru, D. R. Swamy, and P. Nagesh [Wooluru, et al.,, 2014, 399-416]. The researches revealed the features of the efficient operation of banks contributing to economic development. The assessment of the bank's activity is characterized by the fact that the effectiveness of the management process of cooperation with both internal and external clients is considered. The research implemented by European Journal of Operational Research [EJOR, 2016, 280-295]. The authors evaluated the performance of Chines banks through the study and comparative analysis of banks indicators and proposed a modeling approach, applying the method of fuzzy sets created by L. A. Zadeh [Zadeh, 1975, 199–249]. The next study [Zimmermann, 2001] is devoted to the study of the banking pro-cess under conditions of uncertainty by modulating fuzzy sets [Klir & Folger, 1988]. The authors proposed a model of the bank's activities under uncertainty using fuzzy set methods.

Scientific novelty Bank performance measurement is one of hot debated issues in financial sector. Based on the requirements and features of financial systems and in

particular banking, we note that banks generally differ from one another. The study of banking orientation shows that the activities of banks are associated with uncertainty, risks, and therefore banks are actively looking for effective methods and opportunities for organizing activities. The method of using fuzzy sets especially Pythagorean fuzzy sets has not been used by researchers for evaluating Armenian commercial banks performance. The research concludes that using fuzzy sets can be one of the tools for comparing banks efficiency and evaluating banks performance.

Methodology: *The Pythagorean approach to fuzzy sets* The studies [Parvathi, 2016, 1211-1227] and [Radhika, 2016, 19-26.] are significant contribution in the theory of fuzzy sets. The authors proposed an approach based on a new definition of fuzzification and defuzzification through the presentation of Pythagorean fuzzification and defuzzification functions [Jayapriya & Sophia, 2021, 286-290] are given.

Definition 1: Let X is a given universal set. Let's define $A=\{(x,\mu_A(x),\nu_A(x):x\in X\}$, where $\mu_A(x),\nu_A(x)$ represent the set on the segment [0,1], and express the degree of belonging or non-belonging from any $x\in X$ and $0\le\mu_A(x)+\nu_A(x)\le 1$.

Definition 2: Let's suppose M is a given fixed set. The fuzzy Pythagorean set in M can be represented as follows $P=\{(m,\lambda_P(m),\eta_P(m)):m\in M\}$,

where $\lambda_P(m),\eta_P(m)$ represents the set M on the segment [0,1], $0\le\lambda_P(m)\le 1,0\le\eta_P(m)$ and $\lambda_P^2(m)+\eta_P^2(m)\le 1,\ m\in M$ express the degree of belonging or not belonging to the P for he element $m\in M$, respectively.

Definition 3: Let $\pi_P(m)=\sqrt{1-\lambda_P^2(m)-\eta_P^2(m)},$ and it will be called as fuzzy index of P and represents the degree of uncertainty of $m\in M$ in terms of P; $0\le\pi_P(m)\le 1, m\in M$.

According to V. Jayapriya and R. Sophia Porchelvi <Pythagorean fuzzification and defuzzification functions>, Malaya Journal of Matematik, Vol. 9, No. 1, 286-290, the vague triangular Pythagorean function is defined as follows.

Definition 4:

$$\lambda_{APF}(x)=\begin{cases}0 & : x\le a_1\\ \sqrt{\dfrac{x-a_1}{a_2-a_1}-\varepsilon^2} & : a_1\le x\le a_2\\ \sqrt{\dfrac{a_3-x}{a_3-a_2}-\varepsilon^2} & : a_2\le x\le a_3\\ 0 & : x\ge a_3\end{cases} \qquad (1)$$

where $a_1 \le a_2 \le a_3$. A triangle is defines by determining the parameters a_1, a_2, a_3 where a_1, a_3 corresponds to the base of the triangle and a_2 corresponds to the vertex of the triangle.

Definition 5: The fuzzy Pythagorean tabular function is determined as follows.

$$\lambda_{APF}(x) = \begin{cases} 0 \ : \ x \le a_1 \\ \sqrt{\dfrac{x-a_1}{a_2-a_1} - \varepsilon^2} \ : \ a_1 \prec x \le a_2 \\ \sqrt{1-\varepsilon^2} \ : \ a_2 \le x \le a_3 \\ \sqrt{\dfrac{a_4-x}{a_4-a_3}} - \varepsilon^2 \ : \ a_3 \le x \prec a_4 \\ 0 \ : \ x \ge a_4 \end{cases} \qquad (2)$$

Lets suppose that X time series is given and a_1, a_2, a_3 are determined as follows: a_1 is a minimal value, a_3 the maximum value and a_2 is the median of value of the time series X . It follows that the expression under the root of equation $\sqrt{\dfrac{x-a_1}{a_2-a_1} - \varepsilon^2}$ (1) will get negative values in case $x = a_1$.

The same remark applies to the expression $\sqrt{\dfrac{a_3-x}{a_3-a_2} - \varepsilon^2}$.

Consequently definitions of fuzzy function (1) and (2) should be improved as follows by eliminating the negativity of the radical expression.

$$\mu_A(x) = \begin{cases} 0 \ : \ x \le a_1 \\ \sqrt{\dfrac{x-a_1}{a_2-a_1} - \varepsilon^2} \ : \ a_1 \prec x \le a_2 \\ \sqrt{\dfrac{a_3-x}{a_3-a_2} - \varepsilon^2} \ : \ a_2 \prec x \prec a_3 \\ 0 \ : \ x \ge a_3 \end{cases} \qquad (3)$$

Let us assume that X time series is sorted in ascending order. Define $A = \{(x, \mu_A(x) : x \in X\}$, where $\mu_A(x)$ is fuzzy function (3) defined on the set X and $0 \le \mu_A(x) \le 1$.

The defuzzification function

Suppose that $a_1 = \min x : x \in X$, a_2 is the median of the sat X , $a_3 = \max x : x \in X$: Let us denote

$\overline{X}_1 = \{x \in X : x \le a_1\}, \overline{X}_2 = \{x \in X : a_1 < x \le a_2\}, \overline{X}_3 = \{x \in X : a_2 < x < a_3\}$,

$\overline{X}_4 = \{x \in X : a_3 \le x\}$:

$X_1 = \overline{X}_1 \bigcup \overline{X}_2$, $X_2 = \overline{X}_3 \bigcup \overline{X}_4$, $X_3 = X_1 \bigcup X_2$.

Thus, denote

1. $\mu_i(x) = \mu_A(x), x \in X_i, i = 1,2,3$,
2. $\delta_i(x) = x * \mu_i(x), x \in X_i, i = 1,2,3,$
3. $M_i(X_i) = \sum_{x \in X_i} \mu_i(x), i = 1,2,3$ (4)
4. $D_i(X_i) = \sum_{x \in X_i} \delta_i(x), i = 1,2,3$
5. $\alpha_i = D_i(X_i) / M_i(X_i), i = 1,2,3.$

Thus, we will define the Pythagorean defuzification index as follows.

1. Let us define the set of banks as $N = \{1,2,...i,...,n\}$,
2. Let us denote a set of quarters as $E = \{1,2,..., j,...,m\}$,
3. Let us denote denote the value the of the activity indicator of the i-th bank for the j-th quarter as $x_{ij}, i = 1,2,...,n, j = 1,2,...,m$:
4. Let us denote the fuzzy function assessing the efficiency of the bank's activity as $\mu_i(x) = \mu_A(x), x \in X_i, i = 1,2,3,4$:

Let us denote defuzzy indices of the assessment of the efficiency of the bank's activity as $\alpha_i = D_i(X_i) / M_i(X_i), i = 1,2,3.$

Bank performance evaluation indicators The condition of uncertainty is the feature of bank's activity as noted in [N. Y. Sec¸me, A. Bayrakdaro˘glu, and C. Kahraman, pp. 11699–11709, 2009.] and [A. T. Gumus, pp. 4067–4074, 2009]. Authors of this research considered the method of fuzzy set for the assessment of bank performance. Following of this research and based on the trigono-metric representation of fuzzy set given in [D. Tadi´c, M. Stefanovi´c, and A. Aleksi´c, pp. 2091–2101, 2014] we implemented the method of Pythagoren fuzzy set for the comparative analysis of Armenian banks. Thus, we consider fuzzy function and defuzzufication given in definition (4).

Problem setting For the comparative analysis of the performance of the banks, the time series of the ROA indicator of the banks are considered, presenting them in ascending order, obtaining a vague trigonometric image according to formula (4) and the boundaries, where the vertex of the triangle corresponds to the vague estimate corresponding to the median of the time series (if the series has odd terms/ or the numerical average of the average of two values /if the series has an even term).

Lets denote the set of banks as $N = \{1,2,...i,...,17\}$, and the set of quarters of factors as $E = \{1,2,..., j,...,m\}$: Lets make a non-specification by applying formula (4).

Table 1. Banks defuzification indicators assessment

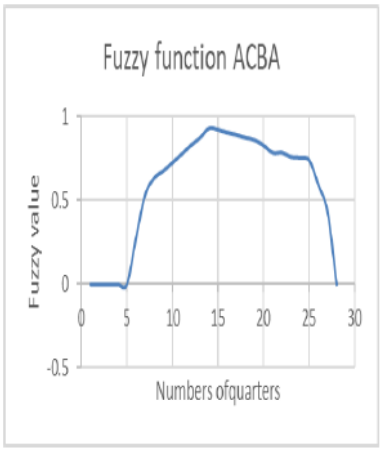
Bank's name	α_1	α_2	α_3
ACBA	0.84	1.89	1.49
ASHIB	0.95	1.98	1.47
America	1.86	1.84	1.48
ID	0.1	0.95	0.88
Ararat	0.92	2.21	1.6
ABB	0.51	0.7	0.64
AEB	0.13	0.31	0.25
ArmSwBank	3.26	4.2	3.68
Artsakhbank	1.21	2.7	2.4
VTB	(N/A)*	N/A	N/A
Byblosbank	N/A	N/A	N/A
Conversebank	2.79	2.11	4.38
Evocabank	1.91	2.31	1.82
HSBC	1.49	3.19	2.44
Inecobank	2.89	4.13	3.34
Unibank	0.29	1.02	0.71
MellatBank	1.65	3.2	2.41

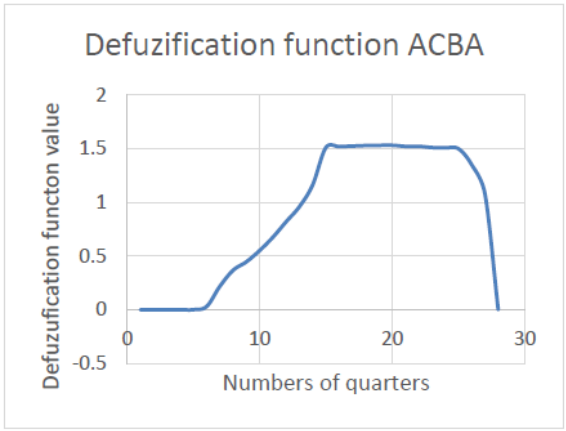
* Not adjustable

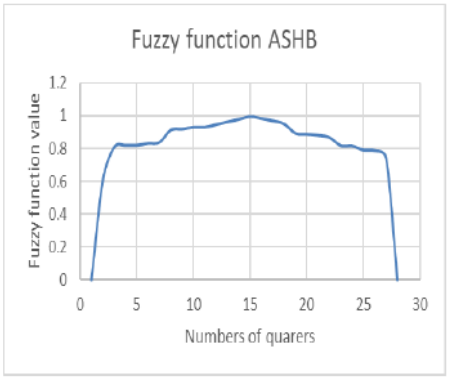
Conclusion Defuzzification indicators allows to implement comparative analysis of Armenian commercial banks using values of the indicator α_3. Banks ordering according to the value of α_3 is given in the table 2.

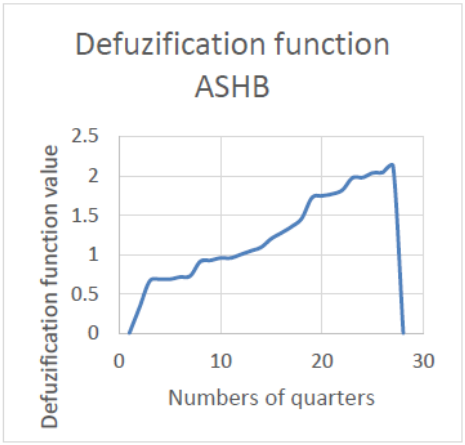
Table 2. Banks ordering according to the value of α_3

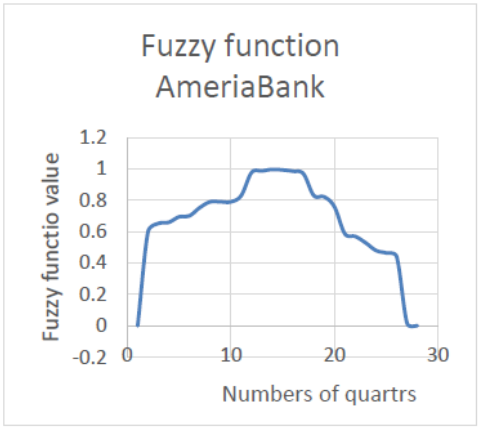
Bank's name	α_3
AEB	0,25
ABB	0,64
Unibank	0,71
ID	0,88
ASHIB	1,47
Ameria	1,48
ACBA	1,49
Ararat	1,6
Evocabank	1,82
Artsakhbank	2,4
MellatBank	2,41
HSBC	2,44
Inecobank	3,34
ArmSwBank	3,68
Conversebank	4,38
VTB	N/A
Byblosbank	N/A

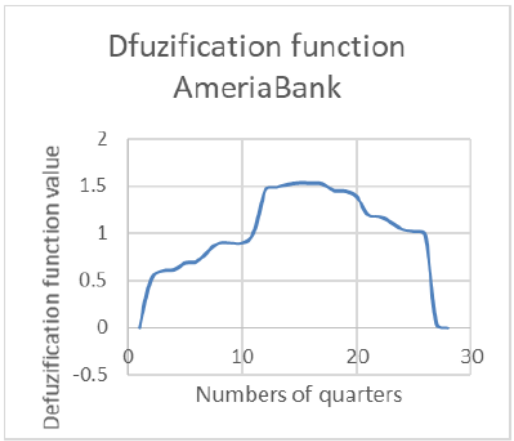

Fuzzy function ACBA
Fuzzy value
1
0.5
0
-0.5
0
5
10
15
20
25
30
Numbers ofquarters

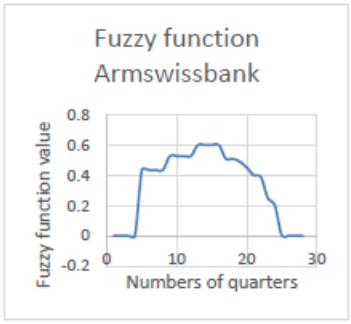

Defuzification function ACBA
Defuzufication functon value
2
1.5
1
0.5
0
-0.5
0
10
20
30
Numbers of quarters

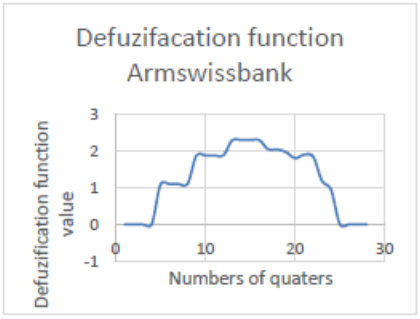

Fuzzy function ASHB
Fuzzy function value
1.2
1
0.8
0.6
0.4
0.2
0
0
5
10
15
20
25
30
Numbers of quarers

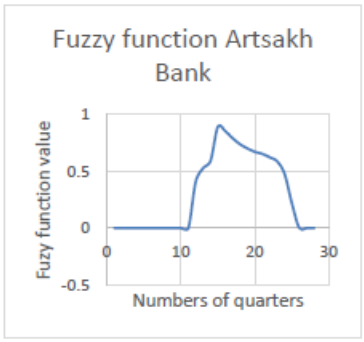

Defuzification function ASHB
Defuzification function value
2.5
2
1.5
1
0.5
0
0
10
20
30
Numbers of quarters

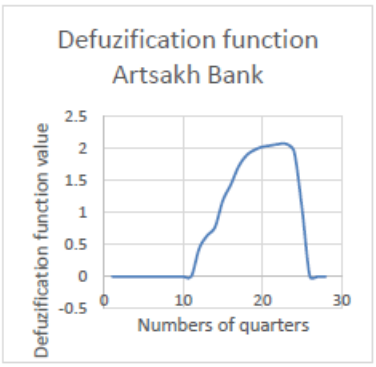

Fuzzy function AmeriaBank
Fuzzy functio value
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
0
10
20
30
Numbers of quartrs

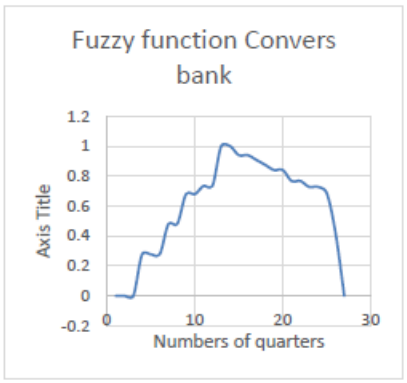

Dfuzification function AmeriaBank
Defuzification function value
2
1.5
1
0.5
0
-0.5
0
10
20
30
Numbers of quarters

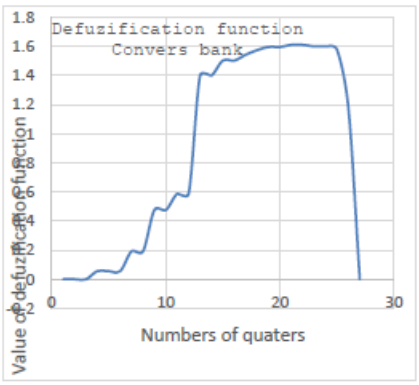

Fuzzy function Armswissbank
Fuzzy function value
0.8
0.6
0.4
0.2
0
-0.2
0
10
20
30
Numbers of quarters

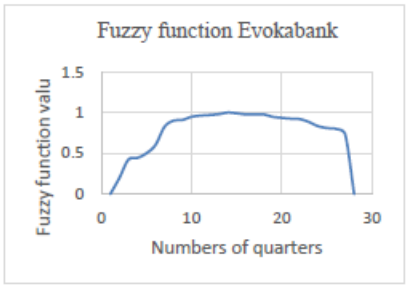

Defuzifacation function Armswissbank
Defuzification function value
3
2
1
0
-1
0
10
20
30
Numbers of quaters

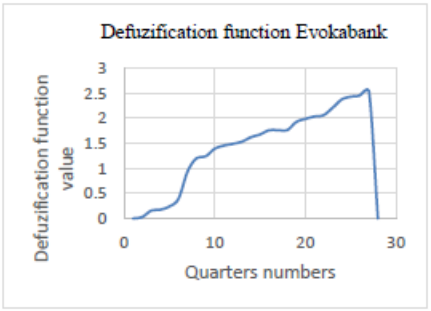

Fuzzy function Artsakh Bank
Fuzy function value
1
0.5
0
-0.5
0
10
20
30
Numbers of quarters

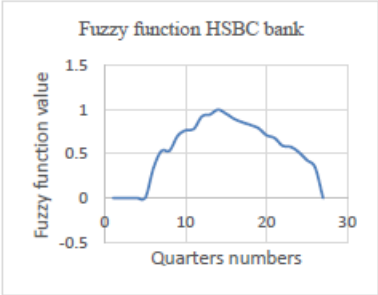

Defuzification function Artsakh Bank
Defuzification function value
2.5
2
1.5
1
0.5
0
-0.5
0
10
20
30
Numbers of quarters

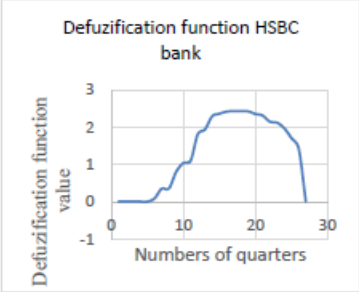

Fuzzy function Convers bank
Axis Title
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
0
10
20
30
Numbers of quarters

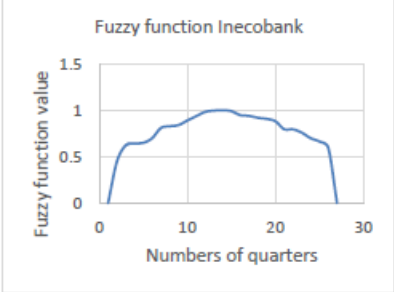

Defuzification function Convers bank
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
0
10
20
30
Numbers of quaters

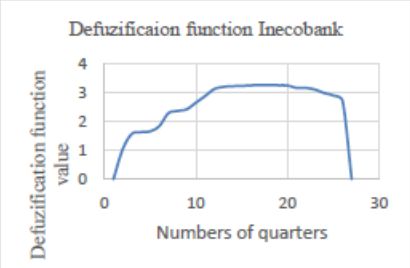

Fuzzy function Evokabank
Fuzzy function valu
1.5
1
0.5
0
0
10
20
30
Numbers of quarters

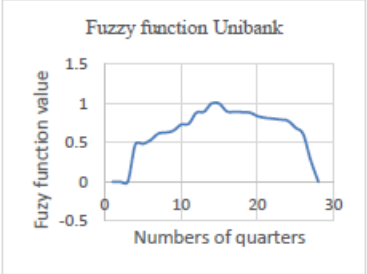

Defuzification function Evokabank
Defuzification function value
3
2.5
2
1.5
1
0.5
0
0
10
20
30
Quarters numbers

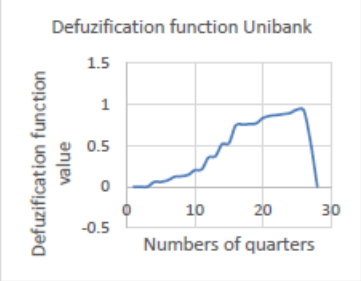


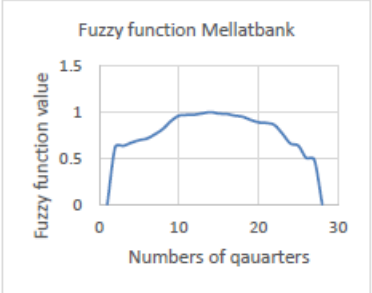


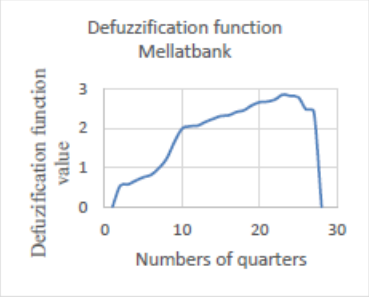












Summarizing above mentioned this paper proposes the modified Pythagorean fuzzifica-tion and defuzification method. Proposed approach of fuzification and defuzification is applied to the problem of comparative analyses of Armenian commercial banks as the application. The assessment of the degree of performance banks allows to get list of ranking of Armenian commercial banks.

We suggest that given schema of bank's activity performance assessment could be used for real economic or financial time series.

Conclusion This paper proposes the modified Pythagorean fuzzification and defuzification method. Proposed approach of fuzification and defuzification is applied to the problem of comparative analyses of Armenian commercial banks as the application. The assessment of the degree of performance banks allows to getlist of ranking of Armenian commercial banks.

We suggest that given schema of bank's activity performance assessment could be used for real economic or financial time series. Summarizing, the Pythagorean method refers to direct methods for constructing a membership function and, as a rule, allows measurements to be made on a quantitative scale. In particular, when using the method under study, it is enough to fix the most characteristic values and type of the membership function. We argue that the process of constructing or specifying a fuzzy set based on the Pythagorean membership function makes it possible to perform fuzification and bring the values of a measurable attribute to fuzziness in advance.

We also argue that the proposed approach applied to solving the problem of fuzification of variables characterizing the features of the bank's functioning expands the scope and capabilities of direct methods for constructing membership functions and fuzification of measurable features.

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Comparative analysis of Armenian commercial banks' performance

Key words: Pythagorean fuzzy set, fuzzification, defuzzification, triangular and trapezoidal functions

In order to get a tool for comparing banks efficiency, especially most efficient quarters the researchers suggest using fuzzy sets. For comparing various banks performances the time series of the ROA indicator of the banks are taken, presenting them in ascending order. A vague trigonometric image is obtained. Time series of seventeen Armenian banks quarterly ROA values has been analyzed. The concept of fuzzification and defuzzification is discussed in this paper. Crisp quantity is converted into a Pythagorean fuzzy set and respectively Pythagorean fuzzy set is converted into crisp quantity. After getting appropriate coefficients quarters have been classified into four groups from the more efficient to the less efficient. As a result it was possible to conclude when the banks were more efficient and when less. The method shows that is possible to use non regression new models for comparing and classifying banks performance determinants. It is a new approach in efficiency analyses.

CONTEMPORARY TRENDS IN TAX ADMINISTRATION AIMED AT REDUCING THE SHADOW ECONOMY

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Ph.D. in Law

Key words: shadow economy, taxation middle term projects, electronic service, taxpayers

Introduction Since 1992, a number of programs have been implemented in the direction of modernization of the tax system: legislative changes, development and implementation of three-year strategic plans, application of the latest technologies. Moreover, within the framework of the above-mentioned programs, a number of mea-sures have been implemented over the years, the most important of which are the sub-mission of tax reports to the tax authority in electronic form, new programs for training and requalification of employees, the introduction of the mechanism of selection of inspections based on the taxpayer's risk, etc.

Methodology The theoretical and analytical provisions of the tax administration, as well as the results of the researches of foreign and domestic economic scientists and relevant organizations were the theoretical basis for the formulation and solution of the problems presented in the article. Systematic, comparative and statistical analysis methods were used during the research.

The informative basis of the dissertation was the tax legislation of the Republic of Armenia, the publications of the National Statistical Committee of the Republic of Armenia, as well as the statistical publications of the Organization for Economic Cooperation and Development, the World Bank, the International Finance Corporation and other international structures.

Literature review We may state that the complexity of the shadow economy phenomenon, expressed in a variety of forms of manifestation, the subjects involved, stages of economic activity, allows us to consider various aspects of this phenomenon based on the following economic theories:

- neoclassical theory;
- institutional theory;
- neo-institutional theory;
- theory of economic systems.

Significant increase in interest in the shadow economy as noted higher appeared only from the late 60s - early 70s of the last century [Gutmann,1977, 20]. A kind of “discovery” of the shadow economy began in developing countries. One of the first was the

English sociologist K. Hart, who discovered that Third World citizens were in the majority have no relation to the official economic system [Hart, 1973, 61-90]. He was the first to introduce into scientific circulation the term “informal sector". Difference between formal and informal opportunities earning income is based on the difference between working for a salary [wage-earning] and self-employment, points out an English researcher Hernando de Soto in his work “The Other Way” (1989) defined: “The shadow economy is a spontaneous and creative reaction of the people to the inability of a corrupt state to satisfy basic the needs of the impoverished masses” [De Soto, 1989]. He also proposed a classification of transaction costs into based on the criterion “legality – extralegality” [De Soto, 2006, 97].

Analysis It is noteworthy that initially the tax reforms were aimed at increasing the state budget revenues through the tax system, and later a number of legal acts were adopted to regulate the tax burden in Armenia since the country gained independence..

In 2022 tax revenues amounted to AMD 1 trillion 926 billion, which increased by 21% compared to 2021. In December of last year, a record number of jobs was registered in RA: 704 thousand, the average salary was also a record – AMD 230 thousand. During the previous year, AMD 36 billion of income tax was returned to beneficiaries in terms of mortgage loans, the number of beneficiaries was 29 thousand. According to the official statistics, the number of beneficiaries using the income tax refund has increased dramatically in recent years, for example, in 2017, only 2,400 beneficiaries used the privilege. In this context, it was reported about the implementation of the electronic platform for the return of the interest paid for the servicing of the mortgage loan, the reduction of the time period for entering the refundable amounts (VAT) into the unified account. In 2022 according to the SRC of RA CA the main problem was ensuring the programmed indicators of the state budget. The indicators planned by the state budget have been achieved[1]. In terms of the structure of tax revenues, it is noteworthy that the share of direct taxes continued to grow in 2022, accounting for almost half of tax revenues. Emphasizing this fact, the SRC strives that the growth of direct taxes is directly related to the effective management of the administrative tools of the tax authority[2].

The reforms planned by the tax strategic plans were one of the priority issues of 2022. 2022 the reforms implemented in previous years were continued. As a result, it was possible to carry out large-scale works in the directions of modernization of existing mechanisms of tax control, improvement of the quality of tax payers' services, as well as improvement of the efficiency of SRC management. It is also noteworthy that the current program of tax reforms is mainly aimed at ensuring revenues controlled by the

[1] https://www.petekamutner.am/mdNews.aspx?sid=cs&nid=9552
[2] http://taxservice.am/

RA state budget and tax authorities. Moreover, this determines the priority of solving the goals and problems faced by the tax authorities: to continue the adopted path of reforms, combining it with the growth of revenues.

Judging by the tax administration in 2022-24 from the goals set by the strategy and the speeches of the Chairman of the SRC published on the website www.taxservice.am, it can be concluded that the primary directions of reforms in the coming years will be the rapid increase in the volume of services provided to taxpayers and the continuous improvement of their quality, the effective management of human resources, the implementation of the electronic management system full implementation, as well as the implementation of modern mechanisms of tax control, and strengthening of taxpayers' self-declaration[1]:

In many countries, tax revenues lost as a result of the "shadow economy" represent a very important component of the tax gap, where the tax gap is the difference between actual and potential tax revenues. Although the shadow economy has been recognized by many superpowers as a risk to their revenues, the extent of the shadow economy by its nature is difficult to determine. Nevertheless, as a result of the huge budget deficit caused by the fall of the GDP in RA in some years, the active measures taken by the Government to increase the degree of transparency of businessmen's income led to the fact that the volume of the shadow economy [Schneider, et al., 2020] significantly decreased and, as the Armenian office of the World Bank defined, made up about 35-40% of the GDP in the republic[2]. For comparison, we consider the volumes of the shadow economy of Armenia's immediate neighbors, Georgia and Azerbaijan, which make up 72.5% and 69.6% of the GDP, respectively. At first glance, from the comparison, it can be concluded that the situation in the Republic of Armenia was not so bad, because it was in a more favorable position than its two immediate neighbors in terms of the volume of the shadow economy by about 30%, however, 50% and even 35-40% [Schnider. Et al., 2020] the shadow economy that we have now is considered an extremely negative phenomenon, and the economic policy of any country should be aimed at reducing its volume. It is noteworthy that the USA, Switzerland and Austria have the smallest volumes of the shadow economy, which are 9%, 9.1% and 10.1%, respectively[3].

Tax planning, audits, improvement of information systems, increasing the degree of attitude of taxpayers towards their responsibilities to pay taxes, increasing the degree of qualification of tax authorities employees and, of course, improving the quality of

[1] http://taxservice.am/
[2] http://news.am/eng/news/22759.html
[3] Ibid

services provided to taxpayers are among the tools known to tax professionals that increase the efficiency of tax administration.

Improving the quality of service provided to taxpayers has been recognized by the tax authorities of many countries as an important factor contributing to the voluntary fulfillment of their tax obligations by taxpayers and, therefore, also to the reduction of the volume of the shadow economy.

It is appropriate to mention that the mission of the RA Tax Authority is to ensure the revenues of the RA state budget controlled by the tax authority through the full and equal application of tax legislation and the effective use of existing resources, and the vision of the tax authority is a policy strategy for the improvement of tax administration in the long term. aiming to have a radically new system. From this point of view, the focus of the tax administration system on providing high-quality services to taxpayers, which will lead to the rooting of the voluntary tax payment/self-assessment/ system, is very important[1]. It is noteworthy that the adopted tax administration 2022-2024. in the strategy, "increasing the quality of tax payers' service" was a defined primary goal, within the framework of which the tax authority carried out significant work during that period in the direction of introducing the principle of voluntary tax payment/self-assessment. In order to achieve the result set by the above strategy, the works were carried out in the following directions:

- submission of reports electronically through automated notification system,
- expansion of taxpayer service centers,
- improvement of clarification mechanisms.

As a result of the works carried out in the above-mentioned directions, the tax authority achieved significant successes, in particular:

- the concept of the implementation of the electronic management system was approved, based on which the basic operation of the electronic system for submitting tax reports is implemented as a result of the works carried out;
- the electronic reporting service center started to operate;
- taxpayer service centers were created;
- a new procedure for providing clarifications on the provisions of legal acts regulating relations with taxes, duties and other mandatory payments began to operate.

The results described above were certainly important steps towards the introduction of the institution of self-declaration. It is significant that along with achieving the mentioned results, certain problems aimed at ensuring the full application of the self-assessment system were also highlighted, the main ones being:

[1] http://taxservice.am/

- rather high expectations of taxpayers from the service sector; the tax authority is still unable to provide complete, quality and timely service to taxpayers;

- expanding the system of receiving reports electronically for taxpayers who are not considered VAT payers as defined by Article 3 of the RA Law "On Value Added Tax";

- existence of problems in providing up-to-date information to taxpayers through media, website, service centers and other means.

"Increasing the quality of taxpayer service" as a strategic goal was also fixed for 2022-2024. in the tax administration strategy, from which it can be concluded that the tax authority in 2022-2024. within the framework of tax administration reforms, priority will be given to increasing the quality of service to taxpayers, which will lead to the rooting of the principle of voluntary tax payment, taking into account the fact that the introduction of the voluntary tax payment system is the most important basis for having a tax authority that applies effective administration. This will create an opportunity for the tax authority to minimally intervene in the process of tax calculation and payment, and will help to avoid the need to calculate the taxpayer's tax obligations by other methods as much as possible[1]. Taking into account the problems aimed at ensuring the full application of the self-assessment system, in order to solve the issues described above, the tax authority has defined the following three sub-goals aimed at achieving the stated strategic goal[2]:

1. defining new ways of providing services to taxpayers, which will ensure low reporting costs and high efficiency,
2. provision of an effective system of taxpayer awareness,
3. ensuring effective cooperation with the public.

At the same time, the 2022-2024 tax administration in order to have a summary assessment of the performance of the stated strategic goal, the expected results of the tasks aimed at achieving its sub-goals and the performance indicators were also defined, which would enable to determine whether the tax authority was able to achieve its goals and whether the actual actions it carried out were in line with its mission and goals :

It is essential that the performance indicators for the mentioned sub-goals are: in line with the first sub-goal, the increase in the number of electronically provided services by the tax authority, taxpayers who use electronic services among general taxpayers and the number of users of the electronic reporting system on a voluntary basis, in the second sub-goal, the number of taxpayers applying to service centers and telephone call service centers, users of the official website of the tax authority and the increase in the number

[1] Tax administration strategy for 2022-2024
[2] Tax administration strategy for 2022-2024

of taxpayers included in the training events organized by the tax authority, the increase in the number of events related to tax legislation and administration with the participation of public and professional organizations in line with the third sub-goal.

Nevertheless, it is necessary to note that with the performance indicators described above, tax administration in 2022-2024. In our opinion, the evaluation of the performance of the goal of increasing the quality of taxpayers' services set in the framework of the strategy will not be so unsatisfactory, because only quantitative growth cannot give an assessment of the improvement of the quality of services provided to taxpayers, for example, the increase in the number of electronically provided services and the number of taxpayers applying to service centers. in itself does not speak of an increase in the quality of service, because there is a possibility when the number of electronically provided services increases, but their users are not so satisfied, or the number of taxpayers who turn to service centers increases, but they do it out of necessity.

Conclusion Thus, in order to get an accurate idea of the performance evaluation of the mentioned strategic goal, it is recommended to apply, along with the mentioned performance indicators, an evaluation of the service quality of taxpayers through an independent professional body, which will conduct surveys among representatives of tax associations and public unions, in order to find out the opinion of taxpayers about the services provided. Of course, the questionnaires should be comprehensive and targeted, so that it is possible to find out the reasons for taxpayers' dissatisfaction.

It is recommended to carry out the above-described assessment of the quality of tax services by independent research centers on an annual basis. This will create an opportunity to follow the dynamics of the work of the tax authority - public assessment over time and to put forward specific goals related to the quality of service, for example, such a goal could be to increase the quality of services provided by the tax authority to at least 90% by 2025.

On the other hand, so that the tax authorities do not receive information only once a year, we consider it necessary to organize regular inquiries about the quality of services provided to taxpayers by the tax authority itself, and to do this mainly within the framework of that strategic goal in the policies, procedures and approach necessary to achieve the desired results. in order to make changes. In our opinion, these surveys can be conducted in several ways.

- during seminars,
- during inspections,
- through the official website of the State Tax Service of the Republic of Armenia .

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Contemporary trends in tax administration aimed at reducing the shadow economy

Key words: shadow economy, taxation middle term projects, electronic service, taxpayers

It is obvious that the shadow economy is being fought in almost all countries, because the shadow economy causes negative consequences at many levels, the most important of which are:

- the government suffers huge revenue losses, which directly affect the level of public debt and threaten its ability to provide services and finance programs that meet the demands of society;
- some people have to pay for others. Law-abiding people shoulder a "heavier" tax burden than they should because they pay for those in the shadow economy;
- those businessmen who fulfill their tax obligations find themselves in unfavorable competitive conditions.

Realizing the above, state authorities have been fighting against the shadow economy in Armenia for a long time. The need to improve the tax administration was constantly emphasized, which should be aimed at significantly reducing the volume of the shadow economy. Management of financial processes (correct calculation of taxes, disclosure of integrity) can be implemented not only through state coercion, but also through other legal and institutional tools.

ASSESSMENT OF THE IMPACT OF VENTURE CAPITAL AND PATENTS ON HIGH-TECH EXPORTS

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Key words: venture capital, high-tech exports, patents, econometric models

Introduction On March 10, 2023, the world learned that one of the largest banks in Silicon Valley (SVB), went bankrupt. This bank serves a significant part of American startups, venture capital companies working in the field of IT and healthcare. Undoubtedly, for many years the bank has been a reliable partner and has significantly contributed to the development of venture capital in the United States, which, in turn, has provided great assistance in the development of innovative processes. However, the bank's bankruptcy in no way overshadows the role and importance of venture capital in the development of modern innovation processes. It is impossible to imagine a modern developed economy without innovation and, based on it, the creation of goods and services that are technologically competitive and contain a large share of added value. It is due to these factors that the high level of labor productivity in the economy and the income of the population, and therefore the proper standard of living and high quality of life, are ensured. Naturally, in order to achieve all this, it is necessary to make appropriate investments in the fields of scientific research, education and training systems, technological development and experimentation, infrastructures, and also in appropriate institutional support systems. Especially the former administratively centralized economic systems, which in the last few decades have been making more or less consistent efforts to transform into competitive market and free competition-based economies, are facing serious complications in the above-mentioned arena. It is clearly seen that especially the countries of the former USSR, including the newly independent Republic of Armenia, although they have focused certain resources and efforts on the modernization of the economy and the new technological base in the direction of having competitive economies by international standards, nevertheless, with the features of the general structure of the economy, innovative activity and productivity, with the level of labor productivity, the share of competitive products and services in the total output and export by international standards, they have very modest indicators.

Ensuring a certain level of high-tech export is one of the most important components of forming an innovative system. This problem, depending on the level of development of innovation systems of the countries, is solved by different policies. In this regard, the development of venture capital and the financing of innovative risky projects at

the expense of this source are essential. At the initial stage of formation of venture funds, the precise and coordinated work of all mechanisms of the country's financial system is important. Therefore, in the first part of the research, the dynamics of the availability of venture capital in Armenia were observed, and comparisons were made with the countries in the main foreign economic directions of Armenia. In addition to venture financing, the process of patenting in the country plays a major role in the promotion of high-tech exports. In order to visualize the processes taking place in the latter, the number of patents issued per 1 million population was studied in Armenia and other countries. Based on the study of the dynamics of the above indicators and the combinations carried out for different countries, an econometric model with panel variables was developed for 49 countries and 13 years. With the help of the received econometric model of sufficient quality, it was possible to understand the direction and extent of the influence of the ratio of the availability of venture capital on the one hand, and the number of patents issued per 1 million people on the other hand, on the share of high-tech exports.

Methodology 3 main indicators were considered within the framework of the research: the number of patents issued per 1 million people, the share of high-tech ex-ports in the volume of industrial goods exports, and the index of the availability of venture capital. The number of patents per 1 million people was obtained with the help of own calculations. The index of the availability of venture capital ranges from 1 to 7 points. The closer the actual indicator is to 1, the worse is the situation regarding the availability of venture capital, and the opposite is also true. Statistical data of 2007-2019 were used to study the dynamics of these indicators in Armenia. Next, comparisons were made in three main directions: the South Caucasus and its neighbors, Eastern Europe and the CIS, which includes the EEA member states. The comparisons between the countries included in the above three groups according to the described indicators were carried out as of 2019. This is due to the fact that the statistical data of the availability of venture capital ends in 2019. As a result, it was proposed to study the effect of the ratio of granted patents and the presence of venture capital on the share of high-tech exports with the help of an elonometric model with panel variables. Data of 49 countries in the period 2007-2019 were considered in the model. The initial data for more than 100 countries, but based on the fact that there were missing data for various indicators, as a result of statistical data cleaning, 49 countries remained, for which the statistic indicators are available for 2007-2019. Different specifications of models with panel variables were considered, and the one with better statistical properties was selected.

Literature review The possibilities of venture capital are wider than it can be imagined at first glance. They are gaining an increasingly greater role in the world, especially from the point of view of providing financing for innovative high-risk projects. Unfortunately, the process of formation of venture capital does not take place evenly,

significantly limiting the potential for formation of an innovative economy. Many studies have been done on the significance of venture capital, its role and development prospects. In particular, it is noted that venture capital contributes to economic growth in two main ways: firstly by introducing new products and processes to the market, and secondly by developing the absorption capabilities of knowledge generated by private and public research institutes [Pottelsberghe&Astrid, 2004]. It turns out that as a result of the investment of venture capital, the Israeli economy has achieved much higher growth, contributing to securing the leading positions of the country [Zhang et al., 2013].

Many analyzes conducted confirm a positive relationship between venture capital and the coefficient describing innovation development. However, these connections, as shown by the results of the econometric analysis, are quite small, especially for the countries of Central and Southern Europe. Probably, this is due to the fact that the banking system plays a significant role in economies, which strives to reduce the impact of external financing [Leogrande et al., 2021]. Growing economies can benefit from a close relationship between banks and businesses. However, in the case of developed countries, the prospects of financing high-risk productions are not clear. Everyone agrees that Japan has a financial system based on credit, which was acceptable in the immediate post-war economic situation, but the credit financing system is ineffective under current conditions, because a developed economy needs large amounts of venture capital [Pascha& Mocek, 2002]. From this point of view, more plausible are the claims that venture funds, by providing funds to risky research and development projects, contribute to the advancement of innovations, either to effective patenting or to the creation of high-tech products based on it [Greenwood et al., 43].

Many analysts believed that the COVID-19 pandemic would completely destroy the venture capital markets, but these predictions did not materialize globally. The pandemic has only introduced regulation and a shift in venture investment risk to areas where new opportunities are opening up [Ezangina&Malovichko, 2021]. The work has an important role in revealing the connections between the granted patents and the share of high-tech exports in the volume of industrial products exports. In this context, there are works in which a positive relationship between patents and high-tech exports is revealed, but they are conditioned by a number of institutional factors [Malik et al., 2020]. Some others now emphasize that venture financing, patenting of new technologies and product developments are of decisive importance for the competitiveness and market positioning of companies [Webb et al., 1-2]. A number of theoreticians consider the involvement of foreign venture investments in high-tech start-up companies and the export of competitive products created on this basis as one of the main ways of developing small open economies. In particular, this model was successfully launched in Israel [Razin, 2018, 23-24]. The results of a number of studies indicate that investments

in research and development have a greater impact on high-tech exports and success in foreign markets than on productivity in the domestic market [Maican et al., 2020, 25-26].According to a group of researchers, the volume and intensity of financing of innovative projects are largely determined by the type of innovation they are aimed at. Research shows that risk financing funds and institutions are more likely to finance product and procedural innovations than organizational innovations [Mina et al., 2013, 894]. Studies show that success in innovation is achieved by those countries that build their development strategies by stimulating research and development aimed at creating and securing patents [Pradan et al., 2018, 32]. On the other hand, according to some observations, the macroeconomic effects of venture capital are not very large, in particular, these effects are very modest for economic growth. [Mirna et al., 2022, 13].

Scientific novelty One of the most important tasks of this study is to understand the importance of venture capital in the development of innovative processes. In this context, in Armenia, a number of EAEU, CIS and Eastern European countries, not only the links between venture capital and key innovation indicators have been identified. Also the results of econometric analysis indicate that the development of venture capital contributes to the growth of high-tech exports and patents per 1 million people.

Analysis The following main goals were formulated in the research:

1. Are there any correlations between high-tech exports and granted patents on the one hand, and high-tech exports and the availability of venture capital on the other hand?
2. What direction and size relationships are between the quantities given above?

As part of the first question, the dynamics of the number of patents granted per 1 million people, the share of high-tech exports in industrial exports and the index of venture capital availability for Armenia were considered. Then, in 2019, the behavior of the above indicators in the main external directions of the economy of the Republic of Armenia-the South Caucasus and its closest neighbors, the EAEU, the CIS and Eastern Europe was considered, which allowed certain comparisons to be made. Number of patents issued in Armenia per 1 million people shows the dynamics of high-tech exports share and the index of venture capital availability in the industrial exports (Figure 1). It should be noted that the share of high-tech exports in Armenia in the period under review showed an upward trend. In particular, back in 2007, the share of high-tech exports was 1.1% of industrial exports, and already in 2019, this share reached the level of 9.8%. The interest lies in the fact that for quite a few years in 2009-2014, the share of high-tech exports fluctuated around 1% -3%. This interval actually lasted about 6 years. Then, starting in 2015, there is an immediate transition to the level of 5.7, after that, the share of high-tech exports begins to grow. In 2019, the share of high-tech exports increased by about 2.7 percentage points compared to 2018. In fact, we are seeing an acceleration in the growth of the share of high-tech exports. If in 2007 the number of patents was 55 units, then in 2019 we have a level of about 34 units.

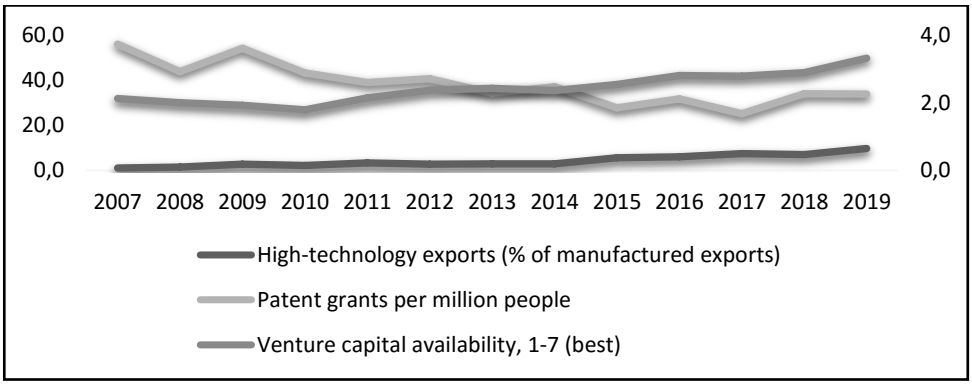

Figure 1. The dynamics of the number of patents granted per 1 million people, the share of high-technology exports in the volumes of industrial exports and the availability of venture capital in RA in the quarters of 2007-2019

(Source: own calculations, WIPO IP Statistics Data Center, High-technology exports (% of manufactured exports) Data (worldbank.org) , WEF_TheGlobalCompetitivenessReport2019.pdf (weforum.org))

The lowest figure was recorded in 2017, when the number of patents issued was about 25 units. The maximum level of patents granted during the period under review was recorded in 2007, amounting to about 56 units. And finally, the index of the availability of venture capital in 2019 was 3.3 points, which is the highest indicator for 2007-2019. The minimum level was observed in 2010 -1.8 points. In the period 2007-2010, there was a decrease in the index of the availability of venture capital, after which, since 2011, there has been an oscillatory increase in the indicator. Since gaining independence, Armenia has established various economic ties in different directions, which are important for the current economy of Armenia. Of these areas, we have identified the most significant - the South Caucasus and its neighbors, Eastern Europe, the EAEU and the CIS. As a result of regional and multilateral cooperation, the main directions important for the economy of Armenia have been formed. Therefore, in terms of the above indicators, combinations of countries included in different directions are important, which will allow us to have certain guidelines for policy implementation. The first region is the South Caucasus and adjacent neighbors. From Figure 2, it can be seen that in terms of the number of patents issued per 1 million people, Russia has an absolute advantage, where the number of patents issued in 2019 amounted to 236 units. Interestingly, in terms of the number of patents, Armenia is in second place -34 units, and Iran is in third place -33 units. In terms of the number of patents granted, the minimum level is fixed in Azerbaijan - 10 points. In terms of high-tech exports in 2019, Russia, Armenia, Turkey and Azerbaijan are leading in the region by 13%, 10%, respectively, 5% and 5%. According to the index of availability of venture capital, Azerbaijan is in the lead-4 points. Armenia, Russia, Georgia and Turkey recorded a 3-point level of the venture capital index. In Iran, the index is fixed at 2 points.

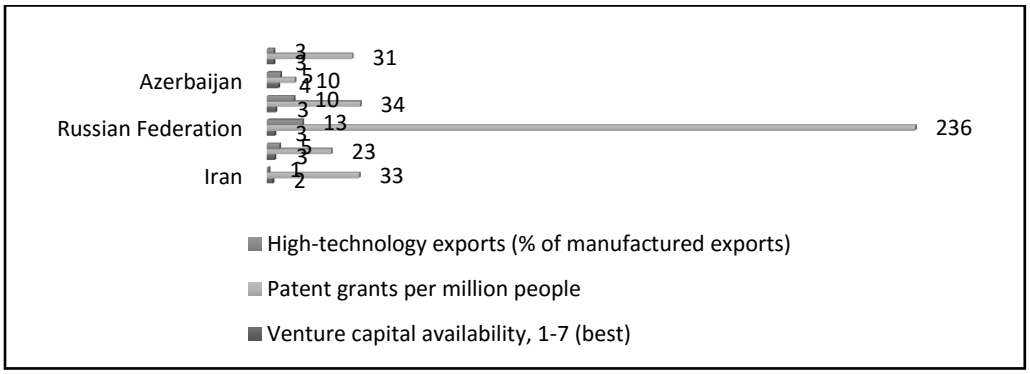

Figure 2. The dynamics of the number of patents granted per 1 million people, the share of high-technology exports in industrial exports and the availability of venture capital in the South Caucasus and neighboring countries in 2019

(Source: own calculations, WIPO IP Statistics Data Center, High-technology exports (% of manufactured exports) Data (worldbank.org) , WEF_TheGlobalCompetitivenessReport2019.pdf (weforum.org))

The next region we are interested in is Eastern Europe.

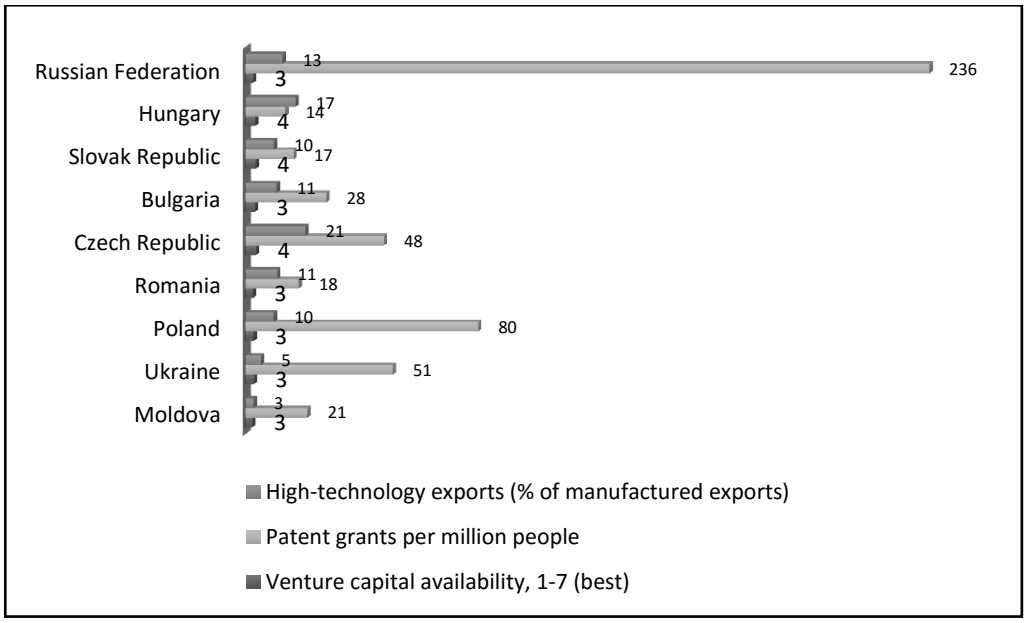

Figure 3. The dynamics of the number of patents granted per 1 million people, the share of high-technology exports in industrial exports and the availability of venture capital in the South Caucasus and neighboring countries in 2019

(Source: own calculations, WIPO IP Statistics Data Center, High-technology exports (% of manufactured exports) Data (worldbank.org) , WEF_TheGlobalCompetitivenessReport2019.pdf (weforum.org))

In terms of the number of patents issued per 1 million people in Eastern Europe, Russia is again the leader. Poland is in second place, where the number of patents

granted reaches 80 units. The next place is occupied by Ukraine with an indicator of 51 points. Ukraine is followed by the Czech Republic, where, as of 2019, the number of patents per 1 million people amounted to 48 units. The minimum level in Hungary is 14 points. The Czech Republic and Hungary are the leaders in terms of the share of high-tech exports, where the share of exports was 21% and 17%, respectively. Russia ranks third in terms of exports, while Moldova has a minimum share of 3%. The Czech Republic, Slovakia and Hungary are the first in the index of availability of venture capital (4 points). The lowest level of venture capital in Eastern Europe is 3 points.

And finally, let's consider the situation in the CIS, which also includes EAEU members Russia, Armenia, Belarus, Kazakhstan and Kyrgyzstan.

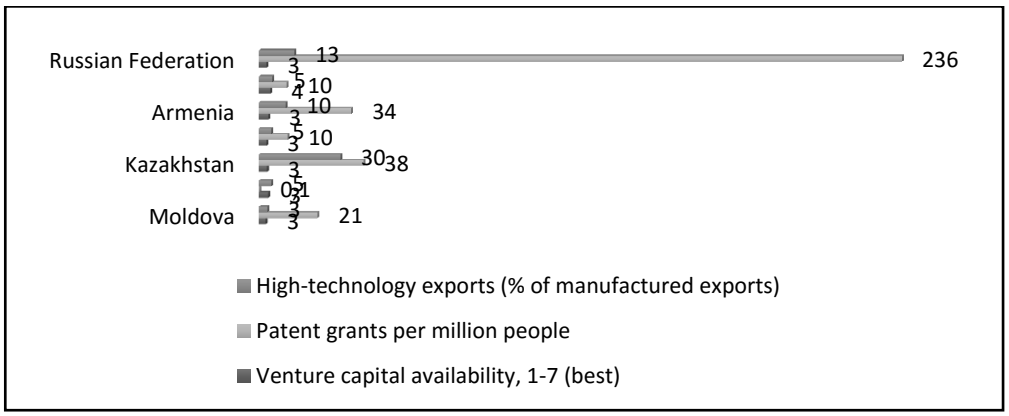

Figure 4. Dynamics of the number of patents per 1 million people, the share of high-tech exports in the volume of industrial exports and the index of the availability of venture capital in the CIS in 2019

(Source: own calculations, WIPO IP Statistics Data Center , High-technology exports (% of manufactured exports) | Data (worldbank.org) , WEF_TheGlobalCompetitivenessReport2019.pdf (weforum.org))

According to the number of patents issued in the CIS for 1 million people, the Russian Federation is the leader. Azerbaijan has the highest rating on the index of availability of venture capital. In the volume of exports of industrial products, Kazakhstan occupies the absolute maximum share of exports of high-tech products-30%. In the CIS, according to the index of the availability of venture capital is at least 3 points. The number of patents issued in Tajikistan for 1 million people is almost close to zero. Kazakhstan and Armenia are in second and third place in terms of the number of patents granted. Armenia ranks third in terms of high-tech exports 10%.

Modeling The above analysis showed that there are certain links between the share of high-tech exports and patents granted on the one hand, as well as the index of high-tech exports and the availability of venture capital on the other. To assess these relation-

ships and, consequently, to answer the second question posed above, an econometric model with the following panel variables was studied [Eliseev, 2021].

$EXP_{it} = \alpha_0 + \alpha_1 \cdot VCA_{it} + \alpha_2 \cdot PAT_{it} + \varepsilon_{it}$ *(1)*

where

EXP_{it} −is the share of high-tech exports of the i-th country in the volume of exports of industrial products in the t-th year ,

VCA_{it} − is the coefficient of venture capital availability of country i in year t,

PAT_{it} −is the number of patents granted per 1 million people in country i in year t,

$\alpha_0, \alpha_1, \alpha_2$ − are the unknown parameters of the model,

ε_{it} −is the random error of the model,

i − is the country index. Moreover,$i = \overline{1,49}$

t −is the index of the year. Moreover $t = \overline{2007,2019}$.

In the model, the coefficients α_1 and α_2 are of interest, indicating the direction and magnitude of the impact, respectively, the index of availability of venture capital and patents for the share of high-tech exports per 1 million people. To select the optimal model, they were evaluated according to various specifications. The output gave satisfactory results using an econometric model of separated variables, which was evaluated using the least squares method. As a result, the following results were obtained.

Table 1. Estimated econometric model results in terms of key variables

Dependent variable: log(EXP)		
Variable:	coefficient:	level of significance:
log(VCA)	1.1:	***
log(PAT)	0.2:	***
R-squared	0.62	

The evaluation results show that:

1. a 1% increase in venture capital, ceteris paribus, leads to an average 1.1% increase in the share of high-tech exports;

2. a 1% increase in patents granted per 1 million people, ceteris paribus, leads to an increase in the share of high-tech exports by 0.2% on average.

Conclusion One of the main conclusions of the conducted research is that in modern conditions, qualitative and development resources, particularly venture capital and issued patents, play the main role in the movement of economic growth and high-tech export factors. During the analysis, in order to reveal the connections between the indicators described above, an econometric model with panel variables was put forward, after its evaluation, the following conclusions were made:

1. a 1% increase in venture capital, ceteris paribus, leads to an average 1.1% increase in the share of high-tech exports;

2. A 1% increase in patents granted per 1 million people, other things being equal, leads to an increase in the share of high-tech exports by 0.2% on average.

Venture financing is a unique mechanism through which it is possible to provide the "road map" of business promotion and its expansion from knowledge and development to the market. In our opinion, the development of the venture system is more effecttive if it is institutionalized in a proper way, that is, it is provided with a proper legal basis, unique mechanisms for the protection and regulation of intellectual property, general and selective economic policy tools and levers.

The results of the study indicate that high-tech exports with a large share of added value have a significant impact on venture investments, access to venture capital, R&D expenses/GDP ratio, as well as volume indicators of patents. In this context, RA's economic policy toolkit should be aimed at improving the above-mentioned indicators. In particular, it refers to the reservation and proper protection of intellectual property rights.

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Assessment of the impact of Venture Capital and Patents on High-tech exports[1]

Key words: venture capital, high-tech exports, patents, econometric models

Ensuring appropriate financial flows is of key importance in the development of innovation processes. This study describes the importance of venture capital, one of the sources of financing innovative processes and the basics of its formation, based on the analysis conducted by many authors. Particular attention was paid to the dynamics of high-tech exports, patents granted and the index of venture capital availability in Armenia and neighboring countries, Eastern Europe. Using econometric models, the following hypotheses underlying the study were tested: Are there dependencies between high-tech exports and patents granted, on the one hand, and the index of availability of venture capital and high-tech exports, on the other? What is the direction and amplitude of above-mentioned relations? As a result of the study, it was shown that an increase in venture capital, other things being equal, leads to an increase in the share of high-tech, while an increase in patents granted also positively affects the dynamics of the share of h*igh-tech exports.*

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