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COMPETITIVENESS, NATIONAL BRAND AND CULTURAL DIPLOMACY

Tatoul MANASSERIAN
Ph.D., Doctor of Science, Professor

Key words: cultural diplomacy, national brand, competitiveness, peace, security

Introduction. Cultural diplomacy is an important component of not only political but also economic diplomacy. Scholarly studies of the significance of cultural diplomacy in the past century have occasionally focused on the United States and the Cold War, with the premise that cultural diplomacy could act as a key foreign policy tool to include the Soviet Union in relevant programs in terms of peace and security. As a result of all this, the term "cultural diplomacy" had turned into a one-way concept, which was also somewhat associated with political manipulation and subordination, and was "placed" in the framework of political diplomatic interactions. At the beginning of the third millennium, new approaches appeared, new studies were carried out, the purpose of which is to consider the importance of cultural diplomacy not only and not so much in the United States or the "Western" system, but also in different countries, that is, in those regions that until then were neglected by scholars and by experts: Eastern and Central Europe, Asia, the Middle East, even Australia, South America and Africa. As evidenced by our observations, studying cultural diplomacy in these areas varies significantly from one area to another in terms of information and development programs implemented and their functions, depending on historical circumstances and, more importantly, the cultural mindset of the individuals involved.

Methodology. The methods used in the analysis of cultural diplomacy are different from those used in the ordinary research. They are as unique as the various forms of communications in different fields of arts and culture themselves. It will be true to state that the lack of foreign languages is not an obstacle to understand art works, music, and other expressions of cultural. Therefore, the talent is the only way to success and progress in cultural diplomacy despite the political regimes and conditions where people create their masterpieces. It was mentioned on one occasion that Parajanov proved that it is possible to be an absolutely free person even in Soviet conditions. This phrase alone is enough for free-minded people to look for Armenia on the world map, and for those who know it, to be interested in today's Armenia. Ukraine and Armenia, which have historically quite rich friendly relations, but which are politically somewhat sensitive at present, are closely connected not only by the adoption of Christianity and the image of Princess Anna, who became a symbol of Armenian-Ukrainian friendship throughout her life, but also in the twentieth century by Armenians, Ukrainians and their Sergey Parajanov, who bridges the cultures of many peoples and is close to those cultures.

Compared to the methods and tools of traditional diplomacy, cultural diplomacy is more accessible. Different forms of art are more perceptible, and the intelligence conveyed through art is as easily received as drinking water or a favorite beverage. Those who have gained experience in cultural diplomacy, as a rule, demonstrate versatile knowledge of the topics under discussion, and as a result, negotiations or discussions on the given topic take place in a more professional manner.

Literature review. A study of the history of the development of modern European countries suggests that the first fundamental publications on cultural diplomacy over the years are the works of Gienov-Hecht and Donfried, which are highly valuable not only for reasons of impartiality and scientific validity. In terms of academic debate and relentless criticism, their work clearly required scientific courage in the presence of experts with diametrically opposed opinions and in an environment not so favorable from the point of view of practical application. Along with this, together they have undertaken extensive and in-depth studies that are equally useful in understanding and applying cultural diplomacy in countries with different public administration systems.

In general, the various reviews of this issue in the professional literature suggest the importance of considering cultural diplomacy and especially the need to establish and develop it on an institutional basis that includes not only those countries that seek to conduct foreign policy, but also foreign societies through culture, but also with the involvement of various non-governmental organizations, sometimes also with the involvement of regional unions. In such a process, one can often see popular actors, artists, singers representing various styles of classical or modern music, composers, poets or writers pursuing such goals.

According to some experts, cultural diplomacy can be different, depending on what goals are set, who are its representatives, as well as the interests of which states it is aimed at. For example, J. Guieno-Hecht and M. According to Donfried, it is important to consider the mentioned factors when developing a concrete model of cultural diplomacy. Accordingly, it is important to take into account the potential of the given country, the physical distance between the negotiating countries, historical and cultural characteristics, traditional and modern problems of civil society, etc.[Gienow-Hecht, et al.,2013, 17.

It should be noted that in the last two or three decades, very important studies have been published, particularly on the role of Catholics in Ostpolitik or on separate issues of electronic, network, non-state diplomacy in the context of the Bensberger Polen-Memorandum, especially in 1966-1970. events, as well as international competition and culture in the Middle East, Syria and Lebanon under the French mandate, as well as the limits of US cultural diplomacy in the Arab Middle East, Japan and elsewhere, which reinterpret cultural diplomacy in its many folds. However, the post-Soviet space retains its attrac-

tiveness and interest not only in terms of political and economic developments, but also in the sense of cultural diplomacy itself.

National brand management can be considered as a phenomenon that a nation uses to establish its image, reputation, using the tools of cultural diplomacy. It also aims to help raise the country's international profile through imaginative policies to promote diplomatic, economic, entertainment and sports capacity building. Those goals can be described as follows.

- creating a reliable and positive image of the country;
- achieving greater respect and influence on the international scale, as well as the level of positive perception in political terms;
- increasing export potential;
- creation of a favorable environment for investment attraction;
- increasing the income of tourism and related industries.

Analysis. Interesting stereotypes have been formed about Soviet culture, interpreting it as a collection of old and new cultural values that were selective and served the political and economic interests of the empire. On the other hand, it is known that many states during that historical period had the opportunity to form not only "socialist in form, national in content" trends, but also fertile ground was created for the manifestation of representatives of culture that does not fit within the accepted framework, the art of dissidents, which also formed a unique cultural diplomatic network. around the world. As a rule, they were recognized and appreciated only after their earthly life and the collapse of the Soviet empire. In our opinion, a new direction of alternative cultural diplomacy was formed, one of the bright representatives of which was S. Parajanov, A. Tarkovsky, M. Bulgakov and others. Thanks to such figures, their homeland became more recognizable and beloved by the peoples of the world. Therefore, issues of Soviet cultural relations and foreign policy, selling Soviet socialism to the West, cultural diplomacy in Eastern Europe, and responses to Western cultural activities in communist countries retain their relevance and utility even today.

In some cases, cultural diplomacy makes recognizable not only the culture of the given nation, country, but it also becomes an instructive example for politicians and statesmen.

This is how the art figures of world greatness expressed themselves about Sergey Parajanov.

Andrei Tarkovsky: "There are few geniuses in the history of cinema, among them are Bresson, Midzoguti, Dovzhenko, Parajanov, Buñuel...."

Catherine Deneuve: "the most brilliant director of all times and nations".

Bella Akhmadulina: "The evil atmosphere of the day was not to his nature. Despite this, he became the most persecuted artist. It was the providence of those times. He was guilty because he was free."

Tonino Guerra: "Parajanov has one match tied to me. One, not in a numerical sense. Any meeting with him was another new acquaintance for me. I felt his magical presence everywhere: at home, in Italy, in Moscow and Tbilisi. I breathed in the magic of his tales."

Vladimir Gabbe: "Sergey Parajanov belonged to a rare human type - a playing person. Films, collages, scripts and letters of the master are an endless game about objects, images, paints, puppets, masks, myths, death... A poet once said: "For me, all material things are magical." Perhaps this intuition was growing in the brilliant Armenian boy. For those around him, Parajanov was something like a philosopher's stone, a substance that transforms everything it touches into perfection."

It is noteworthy that even today the relics of S. Parajanov's priceless heritage are stored in Yerevan and Kyiv (Parajanov-ART AOKS-Ukraine), causing admiration for representatives of various peoples.

And if in S. Parajanov's house-museum in Yerevan it is the result of a certain care of the state, including the dedicated work of Z. Sargsyan, then in Kyiv for a quarter of a century, all this has been done without any state financial and organizational support, exclusively thanks to the representatives of the local Armenian community. With the efforts of prominent Ukrainian Armenians Roman Balayan, Elena Hovhannisyan and others, information about the genius was collected, a traveling museum was created, the exhibits and books of which are presented in the country's most prestigious exhibition halls: Taras Shevchenko, Sholom-Aleichem, Sophia Cathedral in Kiev, Menorah - Dnipro, Khmelnytskyi, In Mariupol, Alchevsk and folk art houses and art museums in villages and regional centers, almost everywhere where S. Parajanov's films were shot. The three zones where he spent considerable creative energy and time were also not bypassed. Gubnik and Strizhka - Vinnytsia region, Perevalsky zone and Luhansk region. For a long time, an attempt has been made to create a Cultural Center, tentatively planned as Parajanov-Art-Experimentarium - as a creative laboratory with its lecture hall, library, popularization and interpretation, film club carrying out educational activities, etc.

All this also emphasizes the role of the Diaspora in the effective implementation of cultural diplomacy. It is no secret that a large number of immigrants from any nation can also influence the formation of their own image and reputation in the host country through their crafts, skills and culture, which add significant value to the host country over those from that country and reflect positively on the art and culture of their country of origin. Traditionally, the Italians, Irish, Scots, Chinese, Indians, Armenians, Greeks

and others have been most effective in establishing their own culture abroad thanks to the Diaspora. There is also the opposite point of view that the image of diaspora residents may be unfavorable due to the behavior of some immigrants, their unique "culture". Such stereotypes can be based on the behavior of North African immigrants in France, particularly in the suburbs of Paris and other cities, the behavior of Turkish immigrants in Germany, as well as the behavior of Mexican immigrants, particularly in the southern states of the USA. All this, of course, from the point of view of cultural diplomacy, can legitimately be characterized as part of the "national brand". This is a tool through which a prejudiced opinion towards representatives of other nations and peoples is unintentionally formed, which is otherwise called the "origin effect". The idea of branding a nation derives from the commercial concept of a brand used in economics, which is a combination of rational and emotional factors that play a decisive role in the formation of the competitiveness of a given product or service and their proper delivery in foreign markets. Another way of describing a trademark is a name, term, sign, or combination thereof, which is intended to identify the goods and services offered and to enable a business or organization to be more advantageously distinguished from its competitors. The mentioned factors are currently widely used in cultural diplomacy and nation branding processes. According to experts, nation branding is most likely to be successful when the brand is perceived by citizens. On the other hand, the so-called branding of a country can be considered accomplished when not only government officials and paid agents, but the public of one country speaks to the public of another country; when a significant part of the population, ordinary people consider the state strategy in these matters acceptable and implement it in their daily affairs with the outside world.

Conclusions. Effective branding of the state is important and influential especially where investments are most in demand, where foreign companies are looking for favorable conditions to present their products or are planning to expand their own production. It can also be useful for negotiating prestigious international cultural festivals, economic and business forums, scientific and technological conferences, global or regional sporting events. However, it is impossible to simply "brand" a given country or people in the sense of a purely commercial product. It can be perceived perhaps in the context of globalization processes, which is also inevitable today. On the other hand, it is not really possible to artificially build a country's reputation or brand, it has to be earned.

Thus, cultural diplomacy is, at first glance, invisible and therefore difficult to measure and account for. Meanwhile, its purposeful use can lead to quite tangible material results. In other words, cultural diplomacy can help materialize many spiritual values. On the other hand, due to this, both political dividends and universal values and goals such as the prevention of armed conflicts, ensuring security, etc. can be obtained. Cultural diplomacy can play an important role in raising the profile of a given country and highlighting

its niche as an important pillar of foreign policy. It can also have an increasing influence in international economic relations, to stimulate exports and imports between countries, and to attract certain flows of foreign investment.

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Tatoul MANASSERIAN

Competitiveness, national brand and cultural diplomacy

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It is enough to get acquainted with the expressions of recognized authorities to understand that universal absolute values are born over time, which are only national in origin. They turn into a cultural language that everyone can understand, with which any thought and mood can be expressed, and which, of course, does not need a translator. It is in this sense that cultural diplomacy becomes easier, which does not require additional explanations and interpretations. With its universal perception, it can only serve universal values: peace, friendship, cooperation, etc. It is important to note that the factor of cultural diplomacy directly addresses the interconnected problems of mutual understanding, stability and development, and as such provides a reliable starting point for a fruitful work. Finally, cultural diplomacy contributes to the national brand, the process of improving the overall environment to establish peace, increase the level of competetitiveness of nations in the global economy.

THE MAIN PROBLEM OF POPULATION AGING IN THE REPUBLIC OF ARTSAKH DURING THE YEARS OF INDEPENDENCE

Manush MINASYAN
PhD, associate professor
Senior researcher, Institute of Economics, RA NAS

Key words: life expectancy, population aging, total birth rate, demographic dependency ratio

Introduction. Throughout the establishment and development of Artsakh, the improvement of the demographic situation has been emphasized. Many state and charity programs, concepts have been developed and implemented. The dominant perception was that the warring country should ensure population growth, that the improvement of the demographic situation is closely related to the stability of the economic system, that the improvement of the sex-age structure of the population will have a positive effect on the pace of development of all spheres of public life. It should be noted that the state policy contributed to the improvement of the demographic situation in the republic in all years have brought to the natural growth, a fairly high index of population vitality, the lowest indices of maternal mortality and infant mortality in the region. However, the population was growing slowly and the benchmark index of almost all authorities - 300 thousand people had not been achieved. Ever since the last century, the aging of the world's population has been a serious challenge. It is undeniable that the qualification of an aging country is a danger, however, we should never forget that the elderly are the wealth of the state, the intellectual and spiritual potential, which should nurture and educate the generation, transfer its rich experience to it. The process of demographic aging has naturally accelerated due to long-term demographic changes, changes in birth rates, mortality and their ratio, labor migration. According to the forecasts of the United Nations Population Fund, in case of incomplete implementation or lack of appropriate measures aimed at aging, this figure will be 22-23% in 2050. The purpose of the article is to evaluate and analyze the population aging process in the Republic of Artsakh in 2010-2022. In order to achieve that goal, we studied the trend of demographic indicators, especially those related to aging, in the United States, to identify the factors affecting it, to make a comparison with the relevant indicators of other countries.

***Methodology*.** We consider two indicators based on the concept of chronological age for the assessment of demographic aging [Barsukov, 2014, 1404]. The first group of indicators includes the weight of the elderly in the total number of the population or in a separate age group. The EU and the OECD use 65 as the cut-off age, and the UN uses both 65 and 60. According to the Gornier-Rosset scale, demographic aging begins when the proportion of the population aged 60 and over exceeds 12% of the total population, while according to the UN demographic aging scale, 7% [UN, 1956, 7]. In the article, the rate

of demographic aging, birth rate, death rate and population growth rate in the USA were studied mainly for 2010-2022. In some cases, parallels were also made with indicators of earlier stages, as well as statistical analytical methods were used.

***Literature Review*.** According to the UN Development in an Aging World World Economic and Social Survey - 2007 publication, the process of demographic aging has been divided into three stages [World economic and social survey 2007]. In the first phase, the population was getting younger at the expense of high rates of decline in child and infant mortality, even though life expectancy was increasing. Basically, due to the decline in the birth rate, the age structure of the population shifts up, leading to a decrease in the weight of children in the population and an increase in the weight of the elderly already in the second stage. The weights of children and the working-age population decrease, and the elderly increase in the third stage, and the increase in life expectancy becomes an important factor in the aging of the population.

In his article "Demographic shocks" S. Blum observed the change in the demographic situation at the global level, identified its impact on security, economic growth, stability of state revenues and the standard of living of the population [Blum, 2016, 6-11]. C. Maroisan, S. Belanger and V. Lutz in the work "Population Aging, Migration and Productivity" looked at the population aging indicators of 28 EU countries. The conclusion made was that the impact of the negative consequences of population aging on the economy can be mitigated by changing the volume of migration and labor participation [Marois, et al., 2020 , 7539–7541]. J. Darek proposes to determine the "aging" of the population by the following indicators.

a/ by the number of old people per 100 working-age population,
b/ by the number of adults per 1 elderly person,
c/ by the number of old people per 100 minors,
d/ the number of children per 1 old man [Rosset, 1968, 25].

According to the classification of the World Health Organization, 60 to 74 years old are elderly, 75 to 89 years old are old, and those 90 and older are long-lived. V. Khojabekyan in his article "Demographic Processes in Armenia" [Xojabekyan, et al., 2002, 117] has thoroughly analyzed the views of various authors regarding the concepts of "old" and "aging" population in accordance with the "Regional Imple-mentation Strategy of the Madrid International Action Plan on Aging Issues" adopted by the RA Government in 2012 [RA Government, 2002].

Two documents were adopted during the Second World Assembly on Aging: the Political Declaration and the Madrid International Plan of Action on Aging. The Republic of Artsakh, being an internationally unrecognized state, naturally had no international obligations. Perhaps that is why it did not adopt any strategy related to solving the consequences of population aging.

Scientific novelty. By studying the domestic and foreign literature related to demographic aging, using international indicators, the characteristics of the manifestation of the phenomenon, the cause-and-effect relationships of demographic aging in Artsakh were identified and presented, the available data were used to calculate new indicators.

Analysis. Population longevity, an indicator of life expectancy, has a significant impact on the demographic aging process. In Artsakh, the mentioned indicator is calculated starting from 2010. We have observed the trend of the indicator over 13 years. The rate of demographic aging in the Artsakh (the weight of people aged 65 and older in the total population) in 2022 compared to2010, on average, decreased annually by 0.04% and in 2022 was 11.9%, and according to the Rosette scale by 0.01% point and was 16.3%. For comparison, we should note that according to the UN scale, the population of Armenia has been considered aging since 1993, and according to Rosset, since 1996, because the share of the population aged 65 and over 60 in the population structure was 7.4% and 12.1%, respectively. [Statistical Yearbook, 2002, 24-25], and in 1990 the life expectancy index of 71.8 years increased to 75.1 years in 2022.

Japan, Italy and Germany are in leading positions in the world by the indicator of demographic aging, where at least 20% of the population has already reached the age of 65. Today, playgrounds are opened for the elderly in Japan, dance classes are organized in Italy and in Germany, the number of pensioners is more relevant than the number of unemployed. Expert forecast suggests that in 2030 the number of "super aging" countries will reach 34. In Georgia in 2002-2023 the share of women aged 65 and older in the total number increased from 15.3% to 18.7%, among men - from 10.9% to 12.1%. Life expectancy for women was 78.4 years, for men - 69.4 years.

Table 1. Life expectancy at the time of birth, years [Demography in Artsakh, 2023, 48-49]

Years	Total	Man	Woman	City			Village		
				Total	Man	Woman	Total	Man	Woman
2010	73.9	71.2	76.5	73.1	69.7	76.3	74.7	72.6	76.7
2015	74.1	71.5	76.6	73.6	70.8	76.3	74.5	72.1	77.0
2016	74.4	71.3	77.4	74.4	71.2	77.2	74.4	71.4	77.6
2017	75.2	72.6	77.5	75.0	72.7	76.9	75.3	72.4	78.4
2018	75.8	72.5	79.0	75.2	71.6	78.5	76.6	73.7	79.6
2019	75.6	73.2	77.8	75.2	72.6	77.4	76.2	74.0	78.5
2020	68.9	61.2	78.2	68.4	60.2	77.7	69.7	62.7	78.8
2021	72.4	67.2	78.0	71.7	66.0	77.5	73.5	69.1	78.7
2022	77.7	74.5	80.8	75.6	71.5	79.4	81.0	79.1	82.9

Life expectancy in Artsakh has generally been higher than the world average and in 2022 exceeded Ukraine – the country with the lowest rate in the world by 9.7 years (2021), including 14.8 years for women, and the country with the highest rate – Japan, by 7.3 years, including 7.2 years for women (2021) [Statistic yearbook, Armenia, 2023, 627-

628]. The high degree of aging among women in Artsakh is due to their low mortality rate in individual age groups and a large proportion of older age groups (60 and over). It should be noted that the life expectancy of women is 5-6 years higher than the same indicator of men in all considered years, and due to the consequences of the war in 2020 and 2021 it is correspondingly 17 and 11 years higher [Artsakh demography yearbook, 2023, 48-49].

It is well known that during the demographic transition, the decline in birth rate and death rate were mainly factors that led to the aging of the population in different ways. The following types of demographic aging are present: "aging from below" related to the decline in birth rate and "aging from above" due to the increase in the share of the elderly in the population and longevity [Piroshkov, 1994, 112]. One of the main reasons for demographic aging in Artsakh is the sharp decline in the birth rate. The figures in the table indicate that the birth rate has decreased since the middle of the last century (from 40.5 per thousand to 15.1 per thousand). Death rates compared to births were relatively stable and ranged from 6.6 to 9.4 per thousand.

Table 2. Birth, death and natural growth of the population of Artsakh (NKR) in 1951-2022 (per 1000 people) [Khojabekyan, 2002, 285]

Year	Number of births	Number of deaths	Natural increase
1951	31,4	9,4	22,0
1960	38,0	7,2	30,8
1961	40,5	7,2	33,3
1965	34,6	6,6	28,0
1970	27,6	6,9	20,7
1980	25,1	7,0	18,1
1987	25,2	7,4	17,8
1997	15.1	9.4	5.7
2007	15.4	8.8	6.6
2017	15.9	8.4	7.5
2022	15.9	8.1	7.8

History suggests that the number of births increases after disasters and wars, which is called compensatory birth rate. For example, in 1988, after the devastating earthquake, the number of officially registered births in RA in 1990 was 84,000. The disaster touched all age groups of the population, families were divided, a large number of children were killed. And solving both of these problems led to an increase in the birth rate, the losses had to be restored. However, the situation was different in 2020. After the war, the majority of the victims were conscripts who had yet to marry and have children, and their mothers were mostly beyond reproductive age. The number of births registered in Artsakh in 2020 was 1659, in 2021 - 1549 and in 2022 - 1789, in the Republic of Armenia - 36.4 thousand, 36.6 thousand, 36.4 thousand, respectively. In other words, the pre-war 2016-2019 annual average birth rate in 2020-2022 decreased by 650 births or 28.1%

in Artsakh and by 2.0 thousand births or 5.3% in Armenia. And this trend will become more pronounced after some time. It is noteworthy that the age-specific birth rates have changed in Artsakh.

Table 3. Age coefficients of birth[1]

Years	Live births per 1,000 women of appropriate age, per year							
	Below 20	20-24	25-29	30-34	35-39	40-44	45-49	15-49
2016	9.4	116.1	150.5	96.1	56.9	11.5	1.1	69.9
2017	20.9	135.6	133.9	84.3	39.0	6.7	-	65.6
2018	15.3	116.5	135.7	95.8	44.7	12.3	-	65.1
2019	10.0	114.2	126.2	84.8	40.5	10.7	0.5	59.0
2020	4.6	76.1	104.2	70.5	39.0	9.7	1.0	45.7
2021	5.4	73.5	96.5	64.0	37.0	7.8	1.0	42.4
2022	4.0	92.8	119.1	65.4	38.4	11.0	1.4	27.9

The observation of the birth rates by age of the settlement speaks of its deterioration, especially in rural settlements.

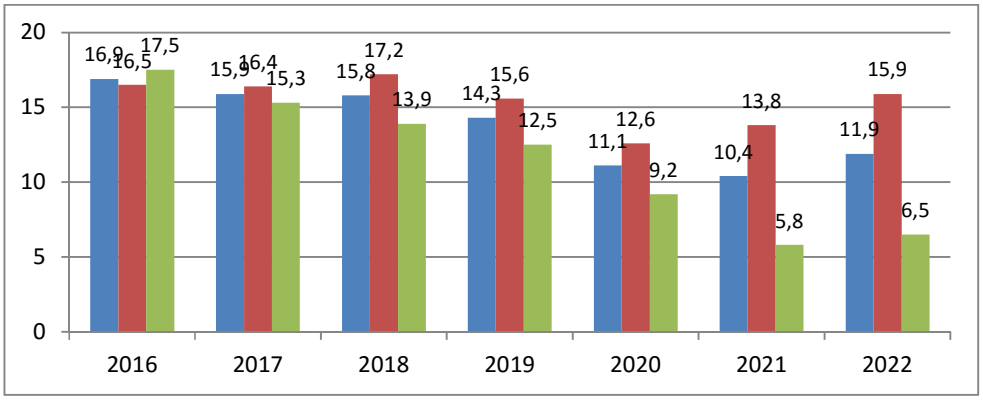

Figure 1. Total birth ratios in towns and villages (number of births per 1000 inhabitants)[2]

2022 the total birth rate in Artsakh was 1.66 children, compared to the 2.15 children needed for simple reproduction of the population. Moreover, the total birth rate of the urban population was 2.113 children, and the rural population was 0.974 children. In the post-war period, this index significantly worsened at the expense of the index of rural settlements. In 2010 the total birth rate was 2.4 children, including 2.1 children for the urban population and 2.9 children for the rural population. During the period of independence – 1997-2022, the overall mortality rate decreased by 1.3 per thousand points and was mainly due to an increase in deaths of people aged 75 and over, and deaths of people in the 0-59 (according to Rosset) and 0-64 (according to the United Nations) age groups.

[1] Artsakh statistic yearbooks for 2016-2022.
[2] Ibid

decreased or remained unchanged [1]: Thus, the results of the study of age-specific mortality rates also prove that one of the main reasons for the aging of the population in Artsakh is the decline in the birth rate. As a result of Azerbaijan's policy, population emigration from Nagorno-Karabakh reached large proportions even in the Soviet years, 9 out of 10 young people left their homeland hoping to study or get a good job [NKAO 50 years, 126]. During the 30 years of independence, also due to migration (in some years it had a negative balance), there was no significant increase in the population of the Republic of Azerbaijan. Citizens of reproductive working age (age group 20-49) made up the main part of emigrants, which significantly affected not only demographic aging, but also changes in the sex-age structure of the population and a decrease in the birth rate. Migration had the most severe consequences in Armenia. In 1992, 70 thousand children were born in Armenia, 10 years later, in 2002, there were 32.4 thousand children, there was a decrease of about 54%.

Table 4. The average age of the population in 2010-2100: facts and forecast[2]

	2010	2015	2020	2025	2030	2050	2100
World	28,5	29,6	31,0	32,2	33,2	36,1	41,2
China	34,6	36,0	37,7	39,6	42,1	46,3	46,9
Japan	44,9	46,5	48,3	50,2	51,6	53,4	51,8
India	25,5	26,9	28,4	29,9	31,3	36,7	44,3
Indonesia	26,9	28,4	29,7	31,0	32,5	38,4	45,3
Russia	38,0	38,5	39,4	40,8	42,4	41,6	42,4
Italy	43,3	45,0	46,7	48,3	49,4	49,9	49,6
France	40,0	41,0	41,3	41,8	42,3	43,4	46,7
Germany	44,3	46,3	47,6	48,4	49,1	51,5	51,1
Mexico	25,9	27,7	29,5	31,5	33,6	41,9	50,5
Brazil	29,0	31,2	33,3	35,3	37,1	44,4	49,8
USA	37,1	37,7	38,2	38,9	39,5	40,6	44,4
Armenia	31,6	33,4	35,5	37,9	40,4	45,6	47,1
Artsakh	32.4	33.4	34.2	38.3	*	*	*

According to UN data, the median age of the world's population has increased over the last decades (increased by about 1 year every 5 years). If in 1970 half of the world's population was under 22 years old, then in 2020 the median age had reached 31. According to UN forecasts, this trend will continue in the next 50 years, and already in the second half of the 21st century, 50% of the world's population will be over 40 years old (see the UN population's median age database). The median age of the population in Artsakh in 2023 was 34.9 years at the beginning of the year, including 36.4 years for women, 33.3 years for men [Demography of Artsakh yearbook, 2023, 6].

[1] Calculations are made by the author based on Statistic yearbook data, Republic of Artsakh.
[2] UNESA. http://esa.un.org/unpd/wpp/unpp/penal-indicatg rs.htm

It should be noted that the process of demographic aging is related to various aspects of social life. The increase in life expectancy leads to an increase in the share of the elderly in the population, which results in an increase in the burden on the (economic) working-age population, health and social protection systems. Tax rates levied on the working-age population are rising, inevitably intensifying social tensions. Thus, as of 01.01.2023 in Artsakh, there were 639 children and pensioners per 1,000 able-bodied residents, or the demographic dependency ratio was 63.9, including 64.1 in cities and 63.6 in villages [Demography of Artsakh yearbook, 2023, 6]. It is interesting that the consumption behavior of households is also changing, which leads to a decrease in aggregate demand and a slowdown in economic growth. The mentioned circumstances influence the increase in the number of children in the family and the average age of the parents. In the end, the burden on the state budget is increasing, the policy towards the elderly is changing. As a rule, the elderly do not work, so as their workload increases, there is a predominance of consumption over accumulation. Social security has never been radically reduced in any country, so the non-productive costs of the working population will increase in a country with more pensioners on social care, reducing labor productivity. This suggests that demographic aging is one of the significant factors behind the global savings gap. As a justification of what has been said, the indicators of poverty for the elderly can be presented, which do not deviate significantly from the average, moreover, in two of the three years we observed, they were lower than the average indicators. Based on World Bank methodology, the aggregate consumption index is used to assess the level of well-being in Artsakh, because international experience proves that consumption presents more accurate information and is less sensitive to short-term fluctuations than the income index, especially in countries with a transitional economy like Artsakh.

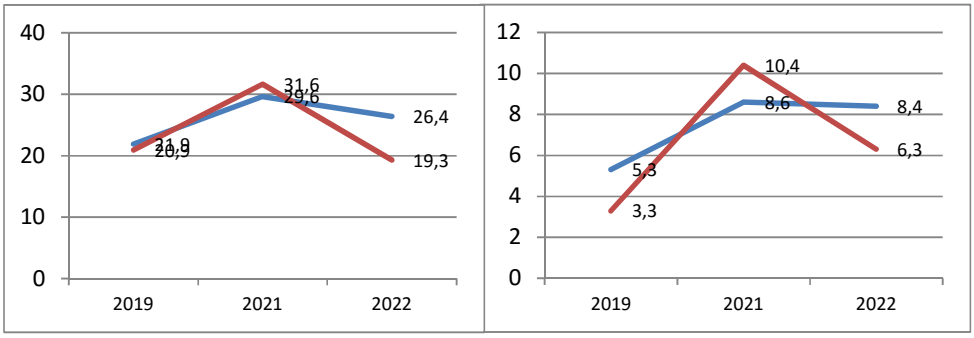

Figure 2. Elderly poverty rates in the United States 2019-2022
Source: Poverty and social conditions in Artsakh, Statistic-analitical report.

Thus, the consequences of population aging can be represented by the three main groups given in diagram 3: economic, demographic, social.

Economic	Demographic	Social
- generation of tension caused by reduction of resources in the labor market, - increase in the average age of the employed, - as a result of the increase in the weight of the elderly, an increase in the falling load of an employee, - predominance of consumption over accumulation, reduction of savings.	- decrease in the number of the population, worsening of the sex-age composition, - narrowing of the population's birth rate and widening of the mortality rate, -modification of population reproduction.	- increase in budget expenses, social orientation, - increase in the burden of the healthcare system, -increase in the burden of other social sub-structures.

Figure 3. Effects of demographic aging

Perhaps, for now, the demographic policy is perceived as a tool of social support, it is necessary to conduct a complex policy. Although the state had taken certain steps aimed at improving the demographic picture (housing provision program, increasing the amount of one-time cash benefit for first and second children, providing benefits to non-working parents, a big wedding, etc.), there is a need for a comprehensive solution to the problem. In recent years, the birth rate in the regions of Azerbaijan is lower than the Stepanakert index, which is incomprehensible even for European countries. The reason is aging villages that are not attractive to young people, including infrastructure, quality of education and health services, income levels, entertainment opportunities, etc. If we also add labor migration, the picture will be complete. It is clear from Figure 1 that the decrease of the rural population also contributed to the decline of the fertility rates in rural areas compared to urban areas.

Throughout the period of independence, the government of Artsakh never considered repatriation as a priority of state policy, as a result several opportunities were missed, it did not follow, say, the example of Canada, which through the "Syrian Refugees" operation in 2015-2016. resettled 25 thousand Syrian refugees in his country. Israel also has a successful experience. 1970 by adopting the "Return" law, 3.3 million people from the diaspora were repatriated. For the sake of truth, it should be admitted that some work was done in Kashatagh region in this direction, but after the review of social and tax benefits, the population decreased noticeably. As for the other resettled regions of Shushi and Shahumyan, the resettlement was carried out mainly from the nearby regions of Artsakh, the potential of the Armenian diaspora was not used.

Conclusion. As a generalization, the characteristics of demographic aging are:

1. population aging is characteristic of the whole world,
2. the increase in life expectancy and the decline in fertility in all countries leads to an aging population,

3. Demographic aging is a systemic phenomenon that affects all spheres of life at the level of the individual, the household and the entire society.

Naturally, while accepting the realities, steps should be taken to counter its negative effects and reduce them in the future, namely:

- Put the demographic, economic and social components in the basis of programs aimed at mitigating the consequences of demographic aging, as a result, the elderly should become active participants and implementers of the economic and social development process.

- To maintain the health of the elderly and ensure well-being. as the number of elderly people tends to increase, there is a need to expand social services and infrastructure,

- To create an encouraging and favorable environment for the elderly. housing conditions, implement health, environmental and other programs.

- It is necessary to encourage multigenerational families, to emphasize intergenerational solidarity. Take steps to actively involve people aged 50+ in voluntary aged care groups.

- In order to overcome the negative attitude related to the employment of the elderly, it is worthy to provide tax benefits incentives to employers. The social insurance system should be regularly adapted to the problems of aging.

- Since the aging of the population is inevitable in the coming years, it is necessary to develop programs aimed at turning the experience and knowledge of the elderly into an economic result.

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Manush MINASYAN

The main problem of population aging in the Republic of Artsakh during the years of independence

Key words: life expectancy, population aging, total birth rate, demographic dependency ratio

Population aging is visible worldwide. It is a systemic phenomenon that touches all spheres of life at the level of the individual, the household and the entire society. Observations show that the process of demographic aging is a consequence of long-term demographic changes, changes in birth rates, deaths and their ratios, acceleration of labor migration. The purpose of the article is to evaluate and analyze the population aging process in the Republic of Artsakh in 2010-2022. In order to achieve that goal, we have asked to study the trend of demographic indicators, especially those related to aging, to identify the factors affecting it, to make a comparison with the relevant indicators of other countries. Statistical analytical methods were used. The rate of demographic aging in the USA (the weight of people aged 65 and older in the total population) in 2022. 2010 compared to, on average, it decreased annually by 0.04-% point and in 2022 made 11.9%, and according to the Rosette scale by 0.01% point, making 16.3%. During the 30 years of independence, due to the insufficient birth rate and migration (in some years it had a negative balance), there was no significant increase in the population of the Republic of Azerbaijan. Citizens of reproductive working age (age group 20-49) made up the main part of emigrants, which significantly affected not only demographic aging, but also changes in the sex-age structure of the population and a decrease in the birth rate.

CHARACTERISTICS OF PROFESSIONAL ORIENTATION AND CAREER PROCESS MANAGEMENT IN RA IN THE CONTEXT OF THE NEW FORM OF UNIVERSITY-LABOR MARKET COOPERATION.

Syuzanna YEGHIAZARYAN
Ph.D. applicant, researcher, Chair of sociology at YSU, Lecturer at ASPU

Key words: student, model, labor market, education, professional orientation, employer, career, employment, unemployment, research

Introduction . Providing a prospective guarantee of the employment of young people, especially students, in ensuring the effective connection of the labor market and educational systems is still one of the most important issues facing the Republic of Armenia. The educational system, aimed at providing a professional education and training system in line with the needs of the economy and the labor market, is still in the stage of structural reforms.

The issue of student employment and job security requires an urgent solution, especially nowadays. In the last decade, the youth unemployment rate is higher than the general unemployment rate, because not all specialists with a high level of professional qualification are able to find a job corresponding to their profession.

Employment is one of the important indicators of meeting social and personal needs of a person. in that sense, student employment has a great impact on both the education and economic spheres, as well as the entire structure of society. Further employment of specialists with higher education in RA is becoming more difficult year by year due to the mismatch between the offer of the educational system and the demand of the labor market, low pay and other factors.

Methodology. The survey and research were conducted using a combination of qualitative and quantitative methods. Methods of content analysis of documents, expert interviews and questionnaire interviews were chosen as a source of information collection. The students of bachelor and masters degree at GSU, as well as teachers from the same university were surveyed. The sample population was calculated with a sampling accuracy of 95% and a margin of error of 5%. We have conducted 40 structured interviews with lecturers and heads of departments, 200 structured interviews with students from different faculties of GSU, 20 structured interviews with representatives of employying companies, selected by field of activity and number of employees.

Literature Review. In the framework of the research are studied the works of such authors as Feng, R. Z., Sharpe R.T., Ashikhmina L.P., Wang, H. M., Saakyan A., Yeghiazaryan S., Barabanova V.V., Zelenova M.E. etc. In this article are also included conclusions of this published issues: Yeghiazaryan S. (2023), Applicability of possible mo-

dels to ensure easy access to employment for RA, students. Yeghiazaryan S. (2020), Opportunities for introducing international experience to increase the level of student employment in Armenia, Yeghiazaryan S. (2023) A New Model of Employment and Job Security for Students of RA Herald of Social Sciences 1(667) Yerevan.

Scientific novelty. Taking into account the studies done on students, as well as some works of theoretico-methodological and scientific practical significance, it should be said that the present research is the first attempt to generalize and present in a systematic way the social problems of students, related to both the past decades and current employment and unemployment. As a result, it is proposed to create a new, more effective model of university-labor market cooperation, which, if used correctly, will create a professional staff base that meets the requirements of the modern labor market. The scientific novelty of the research lies in the absorption and proposal of six new directions of university-employer cooperation**.**

The first direction can be the active involvement of employers in the processes of drawing up, adjusting, and evaluating the quality of education and training of graduates. "Employers' Council" should be created for the purpose of effective interaction and timely adjustment of training programs, training of specialists, examination of candidates for this or that job. The competences of that council may include the functions of organizing internships in production organizations, companies, conducting external consultations in educational institutions, and organizing targeted training in the fields of professions in demand in the field of industrial production. In addition, we believe that it is possible to create a "Council of Experts" that monitors professional education and training of students, and for the purpose of its effectiveness, it can be endowed with wide state functions, even making it a body attached to the government.

College counselors should provide employment guidance to students as soon as possible, establish diversified employment guidance models, and strengthen the cultivation of employability. Before the start of employment guidance work, college counselors systematically sort out and analyze the professional characteristics of the school, the scale of graduates, the proportion of graduates choosing employment, and the regional employment orientation, and formulate the employment guidance model and Guidance plan, establish diversified employment guidance strategies, such as: service mode, consulting mode, practice mode, etc., make full use of diversified employment guidance modes to help graduates choose jobs. At the same time, it is necessary to organize graduates to participate in corporate talent recruitment fairs, employment guidance seminars, job application practices, etc., and use diversified forms to improve the effect and quality of employment guidance [Wang, et al., 2020, 93-96].

The second direction can be the organization of production and pre-degree internships in companies. Moreover, contracts can be signed between universities and companies, which will make it possible to make production internships remunerative for students and

create temporary jobs for them. The use of high-tech equipment in this process can achieve unprecedented results.

The third direction, we believe, can be considered the formation of basic skills, which implies the rooting of a number of abilities among students and graduates. At the same time, the process of formation of specific abilities and capacities should be carried out through joint consultations and surveys of representatives of universities and employers. In particular, it refers to the acquisition of professional-managerial skills by graduates of higher educational institutions, which can be achieved through professional preparation of students in relevant jobs in companies and organizations.

The fourth direction is the mutual training of heads of trade-industrial companies, organizations and educational institutions, as well as staffs. in other words, pedagogical and theoretical knowledge training classes can be organized in universities for employers, and internships in manufacturing enterprises and companies for professors.

The fifth direction is the task of universities taking into account the needs and requests of enterprises and societies. In this case, it is possible to apply the sample version of acquiring necessary professions by students.

The sixth direction can be practical support for university students and graduates with a view to their employment. In order to successfully implement this process, it is necessary to demonstrate a step-by-step approach: the study of the vacant position by the university staff and the analysis of the job content before handing over to the employers the characteristics of students, graduates, resumes, letters of recommendation or the meeting organized by the employers for the purpose of conducting interviews with young people. its establishment.

Analysis. As a result of the research carried out in RA universities, we came to the conclusion that the students of regional universities have more pronounced work and professional orientation problems due to local and economic characteristics. Since the students of marzes are more vulnerable due to the lack of jobs and certain conditions of education, a decision was made to choose a regional university during the study.

According to the example of Gavar State University, the survey conducted among students, professors, management staff and employers is an attempt to identify the problems of professional orientation, organize the orientation work, as well as highlight and present the ways to solve the problems. As a result of the studies, we came to the creation of a modern, efficient working model of integration of student-professionals into the labor market, which certainly will not only express local needs. Moreover, on the example of the university in question, the issues that are organically connected with the phenomena of republican significance will be raised. The choice of this regional educational institution was made taking into account a number of circumstances. First of all, it should be noted that the over-concentration of socio-economic, socio-political, as well as

cultural life in the capital Yerevan seems to have left the problems of the marze population, including the youth, on the sidelines. As a result of such a reality, a feeling of abandonment or, at least, neglect arises among the population of the mentioned regions, which is fraught with very negative consequences: psychological depression, despair, which eventually leads to emigration. No less important is the fact that regional universities, not having the same informational and material resources that most universities in the capital city have (internet and high-quality mobile communication, transportation, as well as modern technological means with high software capacity, various printers, copiers , three-dimensional modeling equipment, etc.), are not able to give a public voice to their own problems, emphasize the peculiarities that exist in places, etc. [Hanrapetutyun, 2022]

Although among the regional universities, the selection of GSU was made on a random basis, we believe that the majority of the results of the survey conducted there are also applicable to the entire university network of the republic. In other words, although the work was of a local nature, the results have universal theoretical and applied significance. Moreover, some local characteristics, such as some features of the traditional way of thinking and lifestyle of the population, can be taken into account when formulating and solving some private problems. The results of the surveys conducted among students highlight a very problematic situation. it's about the huge difference between university, student and employer perceptions of a "professional". That very circumstance is at the basis of the inconsistency of the requirements of both GSU and the entire university network of the republic and the demands of employers. The students' answers proved once again that the nature of university knowledge is mostly theoretical. Moreover, in such a state of things, it was notable that students and employers saw this problem as a limitation of the possibilities of consuming knowledge, and many of the professors attributed this circumstance to the obvious limitations of the Armenian labor market [A Phenomenological Study, 2019]. According to the students, the insufficient effectiveness of the quality of education was due to the theoretical nature and, so to speak, wear and tear of the taught knowledge, as well as the quantitative and qualitative insufficiency of university practices [Sharpe, 1932]. The study of professional orientation and the reasons for choosing professions allows us to say that it was important for young students to achieve a certain level of education first, and then to think only about the profession.

The education at GSU can be considered high-quality in comparison with the education provided in a number of other universities of the country, and when it comes to the assessment of employers, it should be noted that it is not of high quality (the situation is almost the same in other universities) in the case of many), because it does not meet their requirements. It is noteworthy that the employers had their own ideas and assessments regarding the concept of "quality employee". First of all, they considered the commitment of employees to the organization, communication skills, constant professional

growth, analytical thinking, etc. as primary. Most employers, in addition to the requirements for a "qualified employee", emphasized the fact that young people who have graduated from university or are in their last year should pay special attention to the development of such characteristics as analytical skills, the ability to apply theoretical knowledge in practice, and the ability to solve work problems. creative approaches, etc. According to employers, it is the ability to apply theoretical knowledge in practice and the analytical mind that are not at a sufficient level. Therefore, we believe that in order to change such a situation, it is urgently necessary to use interactive methods in the teaching process, to assign analytical materials and to create the necessary environment for the purpose of promoting student initiative (establishing of laboratories, reorganization of electronic and real libraries, remote organization of trainings, retraining, internships, etc.).

According to the vast majority of employers, it is necessary to adapt educational programs and subjects to the requirements of the labor market. As a result of the survey with the employers, it became clear that they prioritize knowledge and creative thinking, followed by the presence of a diploma. Confidence in the education system of the country remains at a rather low level among the employers of Armenia. Therefore, today more than ever, state intervention in these issues is important, particularly in the management of the number of applicants, the planning of necessary specializations, the regulation of the number of applicants according to specializations. It is necessary to take into account the modern requirements of the Armenian labor market, which should be included in the educational standards, during the development of both higher and general education programs. Of course, vocational guidance groups are already operating in Armenian schools today, whose attempt to break some taboos can be considered successful. Therefore, we suggest to organize the work of these groups together with the bodies dealing with vocational guidance issues (state employment agency, NGO's, methodological centers of vocational guidance, etc.) [Barabanova, et al., 1998, 52-58].

Through investigations, it is found that many colleagues in colleges and universities are based on their parents' views or the name of the school, and do not have their own opinions. The most of the students said: "after arriving at the university, I realized that I was not interested in the major I chose, and then I was not interested in planning my university life and future development direction". Career choices are not clear enough, which makes students' values fuzzy and has no reasonable plan for their careers. [Feng, 2016, 128-129]. In this case it is possible to organize professional orientation courses in schools with the direct participation of specialists-experts invited from the above-mentioned structures, as well as employers [Balabanov, et al., 1975, 22-47]. As a result, the school graduate and the future applicant will already be objectively oriented regarding the choice of profession and university [Ashikhmina, 1990, 118]. It becomes clear that *it is necessary to train specialists with the required number, adequate stock of professional*

knowledge and appropriate level of abilities, who will flexibly find their place in the labor market. The results will be visible almost immediately if the number of hours of practical classes and practices in universities is increased, taking into account the applied features of the subjects. In addition, the employer's provision of a certificate to intern students can be considered as work experience. In relation to the issue, we should mention that, as shown by a number of studies, the lack of work experience is an extremely big obstacle among students' employment problems. Therefore, in the settlement of this issue, the purposeful participation of not only the management of the internship place, but also the Ministry of Labor and Social Affairs is important.

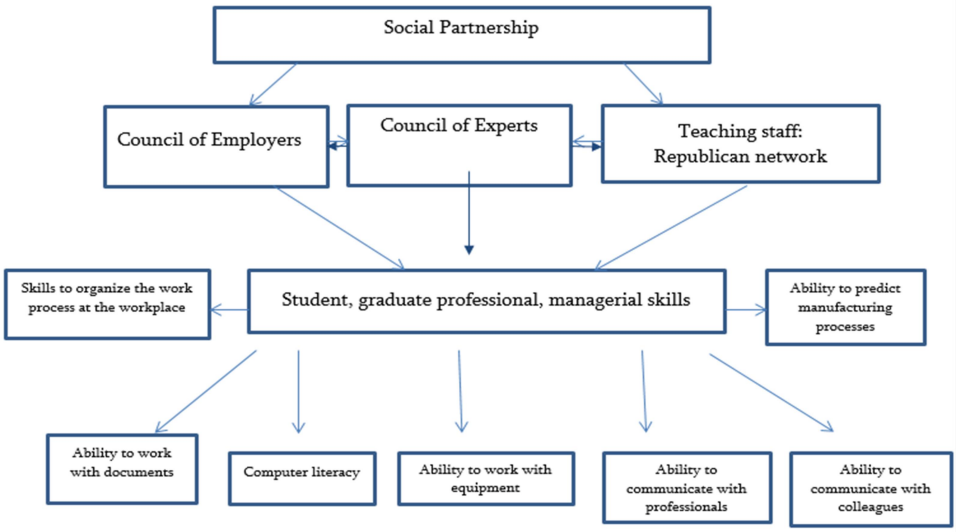

Diagram 1. The diagram, of university-employer cooperation

Today, examining the transitions made in the labor market of Armenia from a distance of years, it should be noted that in particular, the state funds allocated for the training and training of specialists were used in an irrational manner, the demand for labor resources was maintained in the economy, especially in the scientific and high-tech branches. , the disparities between the demand and the supply of the labor force deepened, there were no effective mechanisms coordinating the tasks of training workers and professional self-determination of young people. Studying the occupations with the highest and lowest demand among young people and the dynamics of the number of specialists who graduated from RA higher educational institutions during the past decades, we come to the conclusion that there was almost always a quantitative and qualitative imbalance between supply and demand in the labor market of Armenia. At the same time, it should be noted that the field of professional education not only did not adjust the above-mentioned imbalance, but also deepened it, because the university applicants were mainly guided by the desire to acquire prestigious and attractive professions among the public, due to

which the labor market is almost constantly many other jobs have remained vacant. We propose to create a new, systematic, model for ensuring the work and employment of students. The presented directions will guarantee the stable social and labor interaction of the RA labor market and educational system. This idea is illustrated with the growing influx of young people to economic, managerial and legal professions, the demand from the employers grows for training in engineering and engineering areas. The education system is oriented to cultivate the initial personal preferences, "nurture" and give young people the opportunity to realise their interests [Saakyan, et al., 2019, 120-127]. Any phenomenon and the fact of social life is subject to systematic analysis as an ideal start, of notional example, to which practice of social activity should correspond. In order to complete the description of the model, we also suggest the points that present in more detail the functional role and significance of the links included in the model.

Conclusion. Thus, the socio-labor interaction of key market entities and universities will gain special importance especially in the way of their integration with the government, state and local (self-government) bodies, as well as public and cultural organizations, the ultimate goal of which will be to provide the labor market with high-quality specialists. the need. The socio-labor interaction of universities and employer organizations is actually a mutual integration of production and education, which will definitely contribute to the training of high-quality specialists, social support of students of universities and secondary professional educational institutions. It is important to emphasize that this model we offer not only provides an opportunity to start the process of professional orientation from schools, but also solves the problem of employment of already professionally oriented students, involving in the process both state and non-state structures that are responsible for employment regulation. There is no doubt that these issues are of strategic importance for the state and society. The fact that it is also due to the wrong choice of profession that Armenia's socio-political and economic relations, to put it mildly, are not healthy and normal, is simply undeniable. Therefore, failure to solve this issue before a day is fraught with serious, even catastrophic, irreversible consequences. We would like to point out that with the present work we have tried to identify and examine as comprehensively as possible one of the most important problems of the educational and economic spheres of Armenia, which, it can be said, is of decisive importance for the stability and development of both the educational system and the economy of the country. It should be definitely noted here that the future belongs to the young, intellectual society. Knowledge endowed and creative thinking students will occupy the high positions of the society and create their future and the country. Those young people who are more flexible and able to overcome challenges will stand out of all. Ideological struggle in society is reduced to the establishment and subversion of social ideals. Society should be interested in forming ideal models of social development and people‟s behaviour which would be in the interests of social development, state

preservation and personal establishment. If a social ideal is formulated wrongly, it can ruin society [Bystriantsev, 2021]. Although the university-labor market connection has a history of decades, in general, it was of an extremely formal, administrative and formal nature, as a result of which many issues remained in the shadows, never receiving a deep and comprehensive study. And that as a result of such studies, it was possible to solve such cornerstone issues as, for example, the choice of the right profession commensurate with individual abilities, the acquisition and improvement of professional experience, the appreciation and remuneration of the workforce as it deserves, is beyond doubt.

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Syuzanna YEGHIAZARYAN

Characteristics of professional orientation and career process management in RA in the context of the new form of university – labor market cooperation

Key words: student, model, labor market, education, professional orientation, employer, career

This article examines the technology created in Armenia for professional orientation and career process management, the core of which is the individual in education and work environments, which have an influence on the formation and development of skills and abilities. The methodology of professional orientation of young people was newly presented, highlighting the process of choosing a workplace and role, ensuring professional diversity and growth. As a result, an attempt was made to create a new, more effective model of university-labor market cooperation, which, if used correctly, will create a professional personnel base that meets the requirements of the modern labor market. Taking into account the studies done on students, especially young people, as well as some works of theoretical-methodological and scientific practical significance, a research was carried out within the framework of the article, as a result of which an attempt was made to generalize and systematically present the social problems of students, related to both the past decades and current employment. and unemployment problems.

INFORMED CONSENT: THE COMPLIANCE OF THE ARMENIAN LEGISLATION TO THE OVIEDO CONVENTION

Mikayel KHACHATRYAN
PhD in Public Property Law

Key words: informed consent, medical care, medical services, patient rights, right to information

Introduction. The patient's consent is an important ethical and legal principle and presumption for any intervention on his body as a whole. For a person to decide on medical intervention, he must be informed about the problem and its possible solutions, risks, and conditions.

Informed consent is a fundamental ethical principle in the field of biomedicine which implies the prior consent of the patient for any permissible medical or other intervention on the patient's body. It is based on the constitutional value, the principle of respect for human dignity. No purpose, especially scientific research, can justify medical intervenetion on a person without his consent. In biomedical activity, it is a general rule, from which deviation should be applied only in exceptional cases, and then only for the benefit of the patient. Informed consent is not a burden for the doctor, but a way to make the patient responsible for his health, insuring the doctor from further risks. It pursues three main goals. The requirement to obtain the patient's consent before medical intervention, in addition to respecting the patient's dignity, physical integrity, and autonomy, aims to create a relationship of trust between the doctor and the patient with the prospect of increasing the effectiveness of the medical intervention, as well as to avoid causing consequences for the patient that he is not ready to accept and bear. That is why the doctor can deviate from the performance of these duties towards the patient only in exceptional cases, acting in the best interest of the patient. In addition, the autonomy of the patient's will and self-determination in a certain matter prevails over the medical intervention by the doctor for any purpose, including saving the patient's life. Medical intervention without patient intervention, among others, violates the right to the physical integrity of a person. The person giving the consent, that is, the holder of the right, is the patient. In all other cases, when the patient does not express his consent, or rather, third parties make that decision instead of him, is an exception to the general rule. These are the cases when the patient's rights are exercised by third parties, for example, representatives based on the law, civil law transaction, or court act, or the cases where the medical worker acts based on the need to provide emergency care. In all mentioned cases, the universal condition "best interest of the patient" is an important guarantee for ensuring the patient's rights. For example, in the case of a child or incapacitated persons, the rights of representatives are exercised on behalf of the right holder and for the benefit of the right holder. That is why it is important to ensure that there is no conflict between the interests

of the patient and his representative. Expressing the simple word "yes" is not enough for consent. For the patient's consent to be valid, the following elements must be present at the same time: A necessary condition for expressing consent is the patient's ability to give consent. To decide for medical intervention, the patient must be informed about the problem and its possible solutions, risks, and conditions. When making that decision, one should not be under the influence of deception, violence, or threats. The European Charter of Patient Rights, defining the right to information, took into account not only the patient's information about his health, the necessary medical care, and methods but also the medical care and service providers, and the available medical services.

Methodology. The title of the study expresses the preference for method selection. The literature was studied from a comparative perspective, to highlight the current state of informed consent from the perspective of the legal and health systems. However, other methods of study, which are familiar in social science, have been used. It is important to use the comparative method, the main purpose of which is to understand the patterns and features of informed consent in the given legal system. The systemic method allows us to understand, interpret, and describe the system in which a certain level of development of informed consent was possible and due to which informed consent took a certain form. In addition to the ones listed, abstraction, generalization, induction deduction, and other scientific methods were also used.

Literature review. For the work, a study of theoretical and practical literature, materials, and publications available in Armenian, Russian, and English was carried out. Considerable monographs, articles, empirical studies, judicial precedents (case law), and publications were referenced. To increase the research value, it was also important to study the existing positions, views, and opinions in related sciences and their comparison.

Scientific novelty. Informed consent is the minimum ethical and legal standard to ensure respect for human dignity, autonomy, and integrity in the field of biomedicine. The rule provides legal framework securing both patients and doctors. Namely, it stipulates the duty of health and medical professionals. The article is the first in it kind analyzing the legislation of the Republic of Armenia from the point of view of its compliance with European human rights standards. The main sources of such standards are the European Convention on Human Rights, the case law of the European Court of Human Rights, the Oviedo Convention, etc. Based on the conclusions made as a result of the research, concrete recommendations are made to improve the national legislation to approximate it with the European standards.

Analysis. An overview of the legislative framework allows to considering the following. The Armenian Constitution amended in 2015 guarantees the fundamental right of every individual to personal (physical and mental) integrity (Art. 25). Yet, the content of this article has not found any interpretation in the case law of the national judiciary it

shall be interpreted according to the practice of bodies operating based on ratified international treaties on human rights, as required by the Constitution [Article 81, Constitution, 2015]. The Constitution specifies the rule of integrity about informed consent only in the case of scientific, medical, or other experimentation, highlighting the requirement that the subject understands the consequences of such experiments. Accordingly, explicit voluntary consent must be obtained before any such experiments. The Law on Medical Aid and Services to the Population serves as a framework law (*lex generalis*) in healthcare intended to regulate the organization of medical care and services and to safeguard the exercise of constitutional rights to the protection of human health. The last considerable amendments to the Law were made in May 2020.

Rigth to information

Content of the information

The Armenian Law on Medical Care and Services to the Population (hereinafter Law on Medical Care) enumerates and provides a list of patient rights, including the right to information. The patient's right to information is ensured by Articles 14, 15, and 16 of the Armenian Law on Medical Care. Those articles stipulate the scope and the content of information related to health status and contend with the management of health-related information by the patient. Article 15(1) of the Law envisages that every person (patient) shall have the right to receive (…) information on his/her health condition, disease diagnosis, medical care and services provided (in the past or currently), including the choice of treatment methods, the implementation progress and outcomes, and the related risks.

Several parts of Article 14 and Article 15 entirely are dedicated to information rights including the right to information about diagnosis, health status, treatment recommendations and alternatives, and details about medical care and services provided currently or in the past. Other details that are covered include provisions addressing information rights regarding the progress of a treatment plan, outcomes, related risks, and payment amounts and details. According to the European standard, the scope of information covered by "informed consent" is extended to the information related to the concrete medical intervention, its purpose, nature, consequences, risks, and other information necessary to freely decide on the intervention [R. Andorno, 2005; V.L. Raposo, E. Osuna, 2013].

Except in emergencies, impossibility, or refusal of the patient to be informed, a doctor is required to give the patient fair information, clear and appropriate on the serious risks associated with the proposed investigations and care. Moreover, this obligation is not waived by the mere fact that these risks occur only exceptionally. The French courts, for example, pay increasing attention to the duty of informing the patient of exceptional risks [Garay Al. 2002]. The decision for intervention largely depends on the gravity of the risks and consequently therapeutic alternatives to the proposed treatment. The Law serves as a guideline for its general stakeholders and in that sense, there is, arguably, an impor-

tant omission regarding the importance of providing patients with appropriate information on the gravity of risks and alternatives to proposed treatments. Informed consent is the process of allowing to a person receiving health services to make a choice more suitable for him. In this regard, the appropriateness of information possesses both material and formal aspects. Consent is not valid without prior information. However, there is no provision envisaging negative consequences or sanctions for the failure to provide appropriate information and obtain consent for treatment.

Limitations. The will of the patient to disclose relevant information. In local legal traditions coming from the Continental legal system, the right of an individual to exercise his or her rights includes the possibility that the right-holder might willingly refuse to exercise the right in question. In line with this concept, Article 14 of the Law on Medical Care sets out that every patient has the right "to refuse information related to his health conditions, including on medical care and services" (Art. 14, para 1, part 11). Comparative legal research of European countries reveals that the legitimate aim of the forgoing right is to ensure the interest of the patient by omitting from harming the patient by information on a serious diagnosis or prognosis (except for cases of risks of contamination for third parties. Accordingly, only the patient, but not the proxy or representative, is entitled to this right. The Armenian Law is not clear in this sense and this right as a general matter could be entrusted to the patient's proxy or representatives [CoE report, 2022, 13-18].

Impossibility and emergency. The Armenian health-related legislation does not envisage any grounds allowing doctors to make an exception for providing information directly to the patient or delaying the provision of such information. This raises several ethical issues because, practically speaking, many doctors have been accustomed to sharing information first with relatives and family - especially in the case of serious diseases such as cancer. Legislative standards do not prohibit or sanction placebo information. In the Armenian health-related legislation there is no mention of exceptions to the doctors' duty to provide information. Such exceptions are set out only for the doctor's duty to obtain patient consent before any medical intervention, but there is no clarity concerning prior or subsequent information. No exception is set out from the doctor's duty to inform the patient of prior consent which is in line with European jurisprudence [ECtHR case, Mayboroda v, Ukraine]. However, this is not appropriate when it comes to the exercise of the same duty towards representatives or proxies. For example, in the case of a serious genetic disorder, the information should be disclosed to the patient and their family member. The absence of the provision reflects the ethical perspective that the conventional patient waiver could jeopardize the essence of that right especially when the doctor-patient relationship is influenced by traditions and an orientation based on human rights.

Modalities. The Armenian health legislation remains silent concerning the details around the modalities of informing the patient. Only Article 15 of the Law requires that

information be provided in an accessible manner, but does not clarify criteria for accessibility. Information within the "informed consent" concept means information not only dully provided but adequately perceived. For giving consent to an intervention, the patient must receive clear information adapted to the patient's degree of understanding. The practitioner should provide the information in respect of the patient intellectual abilities and the socio-cultural level. Those abilities vary with age, mental situation (for stress, choc, etc.), nature of the situation (cancer, stroke, heart attack), and other situations. This requirement derives from the general principles of the law of equality and non-discrimination and the idea of ensuring equal access to healthcare.

Right to consent. Characteristics of consent. Armenian health-related legislation does not specify characteristics that must be fulfilled for consent to be valid. Those guarantees are established in the Civil Code because patient-doctor relationships are qualified as private-law relationships. Indeed, it is worth noting explicitly that important aspects of doctor-patient relationships are considered to be subsidized by the civil-law regulations because they are classified as private-law relations, similar to capacity, competencies, transactions (contracts, agreements), and forms of transactions. In the condition of weak case law on the matter, the forgoing relations never receive an appropriate judicial description and hence qualifications. Besides, Article 1 of the Civil Code provides that relations pertaining to the exercise and protection of inalienable human rights and freedoms and other intangible assets shall be regulated by civil legislation and other legal acts unless otherwise derived from the essence of these relations [Civil Code of Armenia, 1999].

The relationship between medical care and service is based on the patient's trust in the doctor and full disclosure. In the context of Continental (Civil law) traditions, it means that any agreement between parties could be abrogated if one party loses trust in the other parties. In the case of an entity delivering healthcare services, this prerogative is strictly limited to the patient and is subject to legal regulation. The same is related to the form of consent as a unilateral transaction in the sense of civil law [Graziadei, M., 2014].

Prior consent: general rule. The Armenian Law does not however provide any other requirement to the consent such as free of coercion, or prior information to the consent as the Oviedo Convention does. According to European standards, the information should be prior to consent and hence to an intervention in the health field. The prior element requires that the information for medical decision-making should be provided sufficiently in advance by providing the person concerned with adequate time for accepting or rejecting the medical intervention or other activity.

Free and informed consent. Article 16(1) of the Armenian Law on Medical Care defines that a person's written consent to a medical intervention is a necessary condition. Article 14 of the Law provides that the patient has the right to refuse to receive medical care and services. Exceptions to the mentioned rules serve the cases prescribed by Article

24 of this Law (a threat to the person's life and diseases posing a danger to the surroundings). The consent is free, given voluntarily, and without coercion, intimidation, or manipulation. Hence, the consent should be free from coercion or undue influence. It aims to respect individual autonomy and to ensure that people have freely chosen a course of action. The practitioner should respect the patient's will and autonomy after having been informed about the consequences of his/her choice.

The Armenian constitution requires informed consent only when a person is to be subjected to scientific, medical, or other experiments without his or her freely and clearly expressed consent (Article 25(4)). Health-related legislation does not elaborate on the elements of the freely expressed consent which means civil-law regulations are applicable by analogy. The Armenian civil law would consider the consent to medical intervention as a transaction whereas consent in health law is more than a civil-law transacttion aimed at the "establishment, amendment or termination of civil rights and obligetions" (Article 289 of the Civil code). Besides, the requirements extended to the transacttions are usually not applicable to the consent and the Civil code does not provide special rules adapted to the bioethical requirements and principles of the consent. For example, civil law provisions on types of transactions (bilateral, multilateral, or unilateral), forms of transactions, invalidity of transactions, etc. Namely, if the consent is a unilateral transaction that means it creates obligations only for the person who has entered into the transaction – for the patient. If the consent is a bilateral transaction that means creating obligations for both sides, neither case is applicable here as free, informed, and prior consent of the patient serves as a pre-condition for any medical intervention. However, it is important to notice that in the existing regulation, the Civil Code reserves the right to regulate the protection of subjective rights exercised in healthcare and biomedicine, including issues related to legal capacity.

In sense of the Article 5 of the Oviedo Convention, informed consent is the duty of the medical service provider to collect the given patient's agreement before any intervention to body integrity. It creates no obligation for the patient who is free to withdraw their consent at any time unless the doctor believes that at the time of withdrawal, the patient lacked capacity.

The interference with the patient's physical integrity could be justified by the consideration laid down in Article 25(2) of the Constitution such as state security, preventing or disclosing crimes, protecting public order, health and morals, or the basic rights and freedoms of others. For example, in the case of the COVID-19 virus, the interference could be justified by public health considerations and the necessity to control the spreading of infectious diseases.

The Armenian legislation imposes limited grounds for the intervention without respecting the informed consent rule. Moreover, this provision prescribes only the reasons

for intervention but does not provide additional conditions for making exceptions such as intervention should be proportionate to his situation.

The general purpose of the international standards pertaining to rights to information is to provide the patient with the information necessary and appropriate for medical decision-making [Sox, et al., 2024]. Contrary, in the Armenian legal system no clear link exists between the general right to medical information, the right to consent prior to any medical intervention, and the provision of full information as a necessary precondition to obtaining consent. Hence, the articles of the Armenian legislation cover the information that is protected by Article 5 and Article 10 of the Oviedo Convention without making a clear distinction between them.

Forms of consent. Article 16() of the Law states "A person's written consent to a medical intervention shall be a necessary condition, except for cases stipulated by Article 24 of this Law". The Armenian law (Article 16) envisages that the consent is of written form without making any exceptions from the rule as the exceptions stipulated in Article 16 concern intervention without consent.

Consent could be express or implied. The Armenian Law does not differ amongst varieties and types of explicit and implicit consent. Express written consent is normally considered the most undisputable form of consent and so the safest course of action is to ask the applicant to sign a consent. Taking into account the invasive and irreversible character of the expected intervention and the substantive consequences of it, the implied consent legally could not be sufficient in the particular case (for example, in the case of heart surgery or organ transplantation).

The written form requirement for all types of medical investigation is not itself in contradiction with the Oviedo convention. Nevertheless, limitation to only a written form of consent could cause several problems and lead to violations of patient rights. It does not provide responsiveness to all existing cases when the nature of the intervention does not require major formalities. This requirement can cause problems when it does not take into consideration the nature of the intervention. The form of informed consent should be proportionate to the nature of the intervention.

This might also create risks in the case when the practitioner would avoids anytime the informed consent rules when he does not have sufficient time and means to collect it in writing. Hence, the patient will be deprived of the right to physical integrity at any time when there would be a possibility to consent but not enough time for forming it in writing. Besides, while evaluating consent, the judge cannot limit himself only to the formal aspect of express consent but also can assess the totality of the facts on the records. The written form of the consent is supplementary to what is agreed between the doctor and patient for disclosing the expressed will based on the provided information.

The principle of medical intervention either with written consent or without consent set out in the Armenian health legislation is not adaptable for a variety of cases faced by the doctors in practice. It does not also envisage the possibility of taking into account the patient's previously expressed wishes, which is one of the novelties of the Oviedo Convention [Koch, et al., 2016, 79-81]. It is in the patient's best interests that the decision-maker must determine and consider there the patient's past and present wishes and feelings. However, no answer is provided when previously expressed wishes conflict with best interests [Smith, et al., 2013].

Limits to the rule. Armenian Law on Medical Care set out the principle of informed consent as a general rule (Article 16) except for the cases when consent for medical intervenetion is not required by Article 24, such as a threat to the person's life (1), and conditions posing a danger to the surroundings (2).

In emergencies, when a decision must be made urgently for the sake of the patient's health or life, or in case of impossibility, when the patient is not able to participate in decision-making, and the patient's representative is not available, physicians may initiate treatment without prior informed consent. In such situations, the physician should inform the patient or the representative at the earliest opportunity and obtain consent for ongoing treatment in keeping with these guidelines.

Protection of persons not able to consent. Article 15(2) of the Law on Medical Care provides a general rule for providing information in case of children and incapacitated persons. According to the Law, as a rule, the right to information should be provided to the lawful representative of these individuals, rather than to a child regardless of age. The same holds for persons legally declared as incapable.

On an exceptional basis, the information could be provided to the child holding the underlying information rights if the following circumstances are met simultaneously: the child, in the doctor's opinion, is capable of evaluating his or her health condition; such information will not harm the child; such information will facilitate the provision of medical care and services; and the lawful representatives do not object to the provision of information (except for a person declared as incapable under the procedure defined by law or a child who has reached the age of 16).

Article 16 of the Law provides that the opinion of a person who has not reached the age of 16 or has been declared incapable according to procedures defined by law shall be taken into consideration nevertheless.

The wording of the current regulations presupposes that even in the cases when the child's consent could be collected, it is subject to the will of the lawful representative. That simply means the lawful representative can oppose without any justification the provision of information to the child notwithstanding grounds that recognized by law to do

so. Here, it is worth noting that the Armenian health-related legislation does not provide a mechanism for balancing the conflict of interest between the right-holder and the lawful representative. This concern is equally relevant in the case of a person deemed to be incapable: persons with mental health issues receiving treatment and care in psychiatric and social care institutions are usually neglected by their guardians. Moreover, the guardians are granted the prerogative of managing the property and the income of the incapable persons, including their pension, and in general to manage them in contrary or not in the interest of the ward.

The wording of Article 14 (3) of the Law on Medical Care supports the general rule that the provision of information on health status should be provided not to the child but rather to its lawful representative or, in the absence thereof, a contact person authorized by the lawful representative. In the exceptional case, in particular, when the conditions stipulated by Paragraph 2 of Article 14 have been met, information could be provided to both the children and the lawful representatives. Meanwhile, it should be noted that the wording of Article 14, especially its third paragraph lacks clarity.

In this regard, certain regulations related to the issue have been fixed in the Law on Psychiatric Care and Service of Armenia. Specifically, according to Article 17(1), psychiatric care and service are provided when a person with mental health issues or that person's legal representative provides written informed consent except for the cases provided for by this Law.

According to the second part of the same Article, a child who has reached the age of 16 or a person declared incapable under the law can give his/her written informed consent to receive or reject psychiatric intervention, except in cases provided for by law, if:

(i) In the opinion of the doctor or psychiatrist, the child who has reached the age of 16, or the person declared incapable by the law can understand the consequences of the psychiatric intervention or its lack thereof;

(ii) that information will not cause harm to the child who has reached the age of 16, or the person declared incapable under the law;

(iii) will facilitate the provision of psychiatric care and service.

Regarding the legislative provision, it should be noted that it does not support the requirement to obtain the informed consent of the incapable person and the minor as patients. According to the assessment of the Constitutional Court, based on the application of the Human Rights Defender, the involvement of the legal representative is justified only based on subsidiarity that is if the bearer of the mental health right does not have the legal capacity to execute his fundamental right to mental integrity. This also applies to cases when it appears that the person can execute this right, but by doing so, may cause harm to his mental health. The Constitutional Court stressed that it is necessary to conduct a professional assessment of a person's ability to independently exercise his/her

mental health and fundamental rights. The Constitutional Court also stressed that the principle of subsidiarity should also apply in the case of minors.

It is important to take into account the principle that is provided for by international treaties, which state that the ability of any patient - not only those with mental health issues - to give informed consent for medical intervention should be assessed by the healthcare provider on a case-by-case basis. The necessary precondition of such consent is the appropriate fulfillment by the healthcare provider of his duty to inform, taking into account the abilities of the patient, and the specifics of the given case. Therefore, from the point of view of the assessment of the legal capacity to of patients to express their will, its proper implementation is extremely important from both a medical and a legal context. This proves once again that such legislative solutions should not be raised only as formalities, but also in terms of ensuring their effective application. This is especially important in as much as, in considering the vulnerability of persons recognized to be incapable, in certain cases, in the event, the guardians do not pursue the best interests of their wards, conflicts of interests may develop between the persons recognized as incapable and their guardians.

Studies and the recorded systemic and continuous problems prove that the institution of guardianship does not always reliably serve its purpose. Thus, there is a need for new institutions and new mechanisms to assist persons with mental health issues in their decision-making process.

Limitations to consent: Article 16(5) Law on Medical Aid provides that the doctor can act without patient consent, relying on medical experts or even on his medical opinion alone, based on best interests of the patient, so long as the following conditions are met:

- the doctor believes that the medical intervention cannot be delayed (thereby establishing the basis for declaring an "emergency" situation;
- the patient's condition does not enable the patient to express his/her will;
- no lawful representative or contact person can be found.

According to European standards, the doctor can act without prior patient consent in cases when the circumstances require prompt medical intervention to serve the benefit of the health of the patient regardless of the fact whether or not the patient can express his/her will [Derse, 1999, 307-325]. The Armenian Law combines impossibility and emergency as grounds for providing medical care and services without prior consent.

In the case of Article 8 of the Oviedo Convention, the impossibility of receiving the patient's consent concerns the timeframe for obtaining consent rather than the capacity of the patient to express his will. Hence, the current regulation existing in Armenian law does not provide for a possibility for medical intervention without the patient's consent in case of a grave situation that requires prompt reaction.

The foregoing conditions do not concern the cases set out in Article 24, in particular, in case of a threat to the person's life, by the procedure defined by the Government (1); and in case of diseases posing a danger to the surroundings, in the procedure defined by law (2). It might be that in the absence of ethics-based medical practice of informed consent, this exception to the rule on consent, even in cases when it is possible to obtain consent in a timely matter, represents a regulation that reflects the direct interest of the patient to remain alive, even though it also represents a violation of the right to personal integrity from the European standards perspective.

Free, informed consent is one of the fundamental and key principles of bioethics, medical ethics, and medical law alongside patient autonomy, which is defined as respect for the right of patients to determine, among other things, what is to be done to them, including which treatments will or will not be accepted. The principle requiring free, informed consent is based on the constitutional value of the principle of respect for human dignity. Thus, prior, informed consent of the patient is necessary for any medical intervention on the patient's body except under emergency circumstances that require prompt intervention for the sake of the patient.

As a general rule, informed consent before any intervention is required whenever it is possible. Hence the mere intent to save the life of the patient does not serve as sufficient grounds to create an exception to the general rule.

Protection of public health: Restriction of human rights is permitted within individual cases and for reasons reflecting public interests. Human Rights limitation clauses might similarly serve as grounds for restricting human rights both in regular times and during emergencies. The Oviedo convention allows restriction of informed consent (Articles 5 and 6) in case of interest of public safety, for the prevention of crime, for the protection of public health, or the protection of the rights and freedoms of others (Article 26 of the Oviedo Convention). Article 25(2) of the Armenian Constitution provides more extensive grounds for restricting the right to physical and mental integrity, and hence to the right to informed consent. The reasons reflecting public interests are state security, preventing or disclosing crimes, protecting public order, health and morals, or the basic rights and freedoms of others. At the level of legislative acts, the Law on Medical Care provides exceptions from the general rule of informed consent but no indication is made about the grounds and conditions of their restrictions.

The Armenian health legislation does not provide any regulations allowing the appliers of the law to implement necessary measures for ensuring human rights in medical practice. For restriction of human rights in line with European standards, a state should respect several requirements, namely, to implement the restrictive measure: by the law; in the interest of a legitimate objective of general interest; necessary in a democratic socie-

ty; in the absence of less intrusive and restrictive measures available to reach the same objective; based on evidence and rather than arbitrary or discriminatory.

Conclusion. To conclude, it should be noted that there are various contradictions between national law and European standards in the field of biomedicine. Those contradictions are not in compliance with the human rights requirement as they do not secure the granting of an effective remedy before a national authority. Despite in case of conflict between the norms of international treaties ratified by the Republic of Armenia and those of laws, the norms of international treaties shall apply, the Armenian legislation does not provide an institutional and pecuniary remedy for violations. When the Oviedo Convention is adopted, the legislature should bring national laws and bylaws in compliance with standards enshrined in the Convention, and medical, healthcare professionals should apply them into their practice as legal and ethical rules.

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Mikayel KHACHATRYAN

Informed consent: the compliance of the Armenian legislation to the Oviedo convention

Key words: informed consent, medical care, medical services, patient rights, right to information

The article is dedicated to the issues of informed consent, the provisions of regulation by legislation, their specificities related to children, and persons with disabilities, in times of emergencies, and cases when consent cannot be obtained due to the inability of the patient, the impossibility of the circumstances and the urgency of the situation.

The informed consent rule invokes the duty of health and medical professionals, especially of professionals responsible for healthcare management and governance.

The purpose of the article is to analyze the legislation of the Republic of Armenia from the point of view of its compliance with European human rights standards. The main sources of such standards are the European Convention on Human Rights, the case law of the European Court of Human Rights, the Oviedo Convention, etc. Based on the conclusions made as a result of the research, concrete recommendations are made to improve the national legislation to approximate it with the European standards.

ARMENIA'S LAND RESOURCES AND FOOD PROBLEM

Nairi SARGSYAN
Ph.D. in Law, President of the Chamber of Auditors of Armenia

Key words: agriculture, food security, land resources, cultivation, taxation, climate change

Introduction. When addressing the issues of agricultural development and food security, it is important to take into account the multifaceted challenges of the farming sector. According to the testimony of experts, our country is affected by both global and regional risks and threats in this regard, therefore it is important to realistically assess their effects first, and then take systematic steps to increase the level of food security[1]. The Commission on World Food Security of the Food and Agriculture Organization of the United Nations (FAO) defines food security as: "All people are always provided with physical, social and economic access to sufficient, safe and nutritious food that meets their dietary preferences and dietary needs for an active and healthy life" [Fanzo, 2023].

Methodology. In our study, comparative analysis, statistical series, economic generalizations, comparison of economic indicators and other methods were used. As a rule, self-sufficiency in terms of the most demanded food products is one of the important indicators for assessing the country's food security level. According to the Ministry of Economy of the Republic of Armenia, the level of self-sufficiency in "essential food products" (products that consumers are likely to buy regardless of income level) in Armenia is 52.5% [Ministry of Economy, 2023]. According to the Ministry of Economy, a higher level of self-sufficiency can be achieved by increasing the cultivated land, and also by improving the yield and quality of crops. Efforts aimed at improving the quality of agricultural products and increasing the yield of crops make the entire production process more profitable and attractive for farms [Sargsyan, 2023]. In fact, at no time in the past have agri-food systems faced so many disasters as in recent years. the entire food system is at risk. Disasters go beyond the economic realm and have devastating effects on food security and nutrition. It is noteworthy that no country, rich or poor, large or small, can avoid the irreversible consequences of climate change.

Literature review. Our analysis is based on the professional approaches of leading experts, reports of international organizations, the legislation regulating agriculture, in particular, the farming sector, as well as the instructive experience of different countries and the study of the challenges caused by climate change. International experts pay attention to the system of crop intensification for more productive, resource-conserving, climate-resilient, and sustainable agriculture [Adhikari, et al., 2017], as well as to social capital in post-crisis resilience [Aldrich, 2010]. While practical aspects are among more frequently

[1] The term "food security" was first used in 1974.

discussed topics, Ansah, I. G. K., Gardebroek, C., & Ihle, R. (2019) examine resilience and household food security from a methodological standpoint and bring new approaches and empirical evidence. Others discuss the role of natural disasters in the overall process of ensuring food security [Arouri et al., 2015, 59–77] with a carefull consideration of the development resilience literature: theory, methods and evidence [Barrett, et al., 2021], as well as the latest trends, including the impact of COVID – 19 [Béné, et al., 2021, 59-67]. Finally, we consider studies related to the role of resilience in food system studies in low and middle-income countries [Meyer, 2020, 56].

Analysis. The land fund of the Republic of Armenia is 2974.3 thousand. ha, of which 46.8 percent can be used for agricultural production. The following land zones are distinguished in RA:

- Semi-desert,
- Dry steppe,
- Steppe,
- Forestry,
- Mountain meadow.

The total land area of RA and agricultural lands types are presented in the table below.

Table 1. Armenia's land structure

	2018	2019	2020	2021	2022
Total land area, 1000 ha	2974,3	2974,3	2974,3	2974,3	2974,3
Of which, agricultural	2044,5	2044,2	2043,5	2042,5	2042,1
Including					
Arable land	445.6	444.8	444.0	443.4	442.7
Perennial planting	35.3	36.4	37.3	38.1	39.2
Lawn	121.0	121.1	121.1	121.1	121.2
Pasture	1 051.6	1 051.1	1 050.6	1 049.9	1 049.7
Other lands	391.0	390.8	390.5	389.9	389.3

Based on the RA Government's decision No. 1927 of 03.12.2020 "On approving the 2020 report on the availability and distribution of the land fund of the Republic of Armenia (Land balance)", we record that only 208.89 thousand ha are irrigated from the territory of the RA , the detailed description of which is given in table 1.

The studies of Annex 1 of the RA Government Decision No. 68-L of January 23, 2020 prove that in 2018, 242.8 thousand arable land or about 54.5 percent were used for the purpose.

There are many reasons for non-cultivation of RA agricultural land:

- The lack or difficulty of profitable activities on small or fragmented land,
- Inaccessibility of irrigation water,
- Absence or unavailability of agricultural machinery,
- Low level of soil fertility,

- Climatic conditions,
- Absence of land user or land owner,
- Unfavorable tax environment,
- Defective legal regulations,
- Imports of agricultural products at competitive prices,
- etc.

Table 2. Arable and other categories of land.

	Area (1000 ha)	**From which irrigated**
The territory of Armenia	2974,26	208,89
RA land fund according to purpose		
Lands of agricultural significance	2043,51	155,39
From which		
Arable land	444,00	117,45
Perennial plantings	37,34	36,44
Lawns	121,11	1,5
Pastures	1050,54	
Other lands	390,52	

Profitable activity on small plots of land is a rather difficult task, one of the solutions of which may be the implementation of new discoveries related to increasing the yield on a unit of land. A close cooperation between science - private sector - the state is necessary, under such conditions the registration of the result can last up to decades.

Armenia ranks among the extremely risky countries from the point of view of agriculture. Climate change in Armenia has led to biodiversity loss, ecosystem degradation and water scarcity. Food security cannot be imagined without developed irrigated agriculture. We are already facing this problem in Armenia. Farmers report that the flow of water from springs and the availability of water for irrigation have decreased dramatically in recent years. And the scarcity of water leads to a decrease in agricultural production, reduces the economic efficiency of farmers, which in turn causes a problem of food security. Compared to the 1960s, the frequency and intensity of dangerous hydro-meteorological phenomena such as droughts, depressions, hailstorms and early spring frosts have increased by about 20% in the context of climate change. In some years, about 123 thousand hectares of our cultivated lands were damaged, which is about 30% of the territory of the entire republic [Ecolur, 2021].

In Armenia until 2100 it is predicted that the shift of agro-climatic zones will be 200-400m, crop yields will decrease, soil degradation will increase and fertility will decrease, and the negative impact of hazardous hydrometeorological phenomena will increase. The frequency of disasters in different regions of the world in 1979-2019. has also grown

worldwide. "The frequency of disasters worldwide in 2010 increased more than three times compared to 1970 and 1980. It has an equally negative impact on agriculture. Economic losses due to disasters in the 2010s averaged 170 billion US dollars per year. Estimates show that about 25-26% of it goes to agriculture.

In order to improve the food security situation in our country, first of all, it is necessary that there are no uncultivated arable lands in the country, while today more than half of the arable lands in Armenia (more than 222 thousand ha) are not cultivated, degraded and out of order. For food security, specialists urge to consider modern technologies, machinery, material and technical means, correct agro-techniques, as well as efficient and targeted spending of financial resources allocated by the state and international organizations to be a necessary prerequisite in the agricultural sector. In addition, in order to regulate the country's food security situation, some believe that it is necessary to restore the Ministry of Agriculture and fill it with competent, intelligent and experienced specialists in the field [Ecolur, 2021].

Conclusions and recommendations. We propose the creation of agricultural cooperatives through the unification of small plots of land, which will create an opportunity for the settlement of the above-mentioned problems, will promote the direct involvement of cooperative members in the cooperative's work, and will benefit the cooperative members by receiving two types of stable income: as a hired employee of the cooperative, a salary, and as a member of the cooperative, a dividend. .

It is expected that the mentioned solution will be full use of agricultural lands, reduction of unemployment, reduction of poverty, increase of welfare, reduction of emigration, increase of aggregate consumption, reduction of import, increase of export.

In order to solve the problems of the absence, inaccessibility or otherwise of land users or land owners, we suggest that during the period of impossibility to find the land owner, the right of temporary management of the land should be reserved to the community or the state, until the owner or user appears, including the community as a user. agricultural cooperatives. In order to solve the problems of land use, we propose to increase the real estate tax rates of unused lands, thereby forcing them to use them for their intended purpose, sell them, or rent them out, or in some other way promote the joining of cooperatives. Currently, supermarkets or other large consumer organizations pay high taxes for the purchase of agricultural products. For example, acquisition costs of agricultural goods are often not deducted when calculating income tax because the seller's information is missing [RA Tax code, 150], which requires the payment of income tax in the amount of 20 percent of the acquisition value, then the prohibition of recognition of expenses for the purpose of income tax calculation, which means the payment of additional income tax in the amount of 18 percent [RA Tax code, 111], as well as value added tax in the amount of 20 percent of the sales price. If the high cost of acquisition is added to this

high tax burden, large reselling organizations prefer the import of agricultural products from other countries, from which income tax is not charged, in terms of profit tax calculation, it is considered a reduction, and the amount of tax paid at the customs border is deducted from the value added tax.

In order to solve this problem and promote local agricultural products, we propose to amend Articles 150, 111 and 63 of the RA Tax Code to exempt agricultural products from income tax, create an opportunity to recognize expenses for the purpose of calculating profit tax, and set a 5% value added tax rate. Or, set the field of taxation of agricultural products as the field of taxation of turnover tax, without threshold limitation, and set a rate of 5 percent of turnover tax.

Finally, it is necessary to carry out mapping, inventorying and digitalization of the RA land fund. Then make a yield map by sector, on the basis of which make business plans and present them to potential investors.

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Nairi SARGSYAN

Armenia's land resources and the food problem

Key words: agriculture, food security, land resources, cultivation, taxation, climate change

In the changing world, consumption is organized through online platforms of supermarkets, hypermarkets or large corporations of international dispersion working with digital technologies. Such global changes have led and continue to drive small and me-dium-sized stores out of the market. And for the entry of goods into such giant structures, uninterrupted supply of goods, speed, quality, competitive price, branding, etc. are re-quired. It is obvious that households or small agribusinesses cannot access such plat-forms, so there is a need to merge or otherwise scale up commercial organizations, which will create an opportunity and promote the increase in agricultural production, with the aim of developing local production to replace imports and why not. export promotion.

THE ROLE AND THE CURRENT TRENDS OF BUSINESS ENGLISH AND TEACHING FOREIGN LANGUAGES IN THE CONTEXT OF ECONOMIC GLOBALIZATION IN THE ERA OF DIGITALIZATION

Zarik YESAYAN
National Defense Research University of MoD of RA
Scientific analyst of the scientific and educational department

Key words: foreign language teaching, foreign language education, secondary linguistic personality, education standardization, early foreign language teaching, teaching technologies

"Language is the road map of culture.
He tells where he came from and where his people are going.
Who hasn't dreamed of mastering a foreign language perfectly?"
Rita Mae Brown, American writer, public speaker, screenwriter

Introduction. The article examines the effectiveness of using modern pedagogical technologies to increase motivation for learning foreign languages. The role of the language teacher as a coordinator directing students to independent activities is revealed. Many writers, columnists concludes that today a foreign language teacher has a lot of opportunities to make the learning process more varied, interesting and effective. To properly organize his educational process, a teacher needs to constantly develop himself, keep abreast of all innovations, analyze the reliability of information, and discuss with students possible ways of independent work.

Methodology. The article explains the best methods of language learning. Communicative language teaching (CLT), Task-based language teaching (TBLT), Content and language integrated learning (CLIL), Cooperative Language Learning (CLL), The Direct Method, Grammar-Translation, Audiolingualism, Total Physical Response and online learning. Continuous changes in the content of education in our country and other countries of the world are caused by global trends and the influence of powerful factors: intensive integration social processes, growth of professional and academic exchanges, international cooperation in the field of education, access to information resources of the World Wide Web and quality education in the country and abroad.

The role of foreign language in the context of economic progress. Knowing a foreign language is an important factor in solving the problems of the development of foreign economic relations by various specialists. Nowadays, English has become an integral part of our life. At the international level, in the conditions of rapid progress in the study of science, the latest technologies, economic and political relations, the knowledge of a foreign language becomes more important for communication between partners. Business English is becoming a vital tool for businessmen, professionals and to establish relations between employees of international companies. It is the ability to competently negotiate

and sign contracts in a foreign language that determines the image and professional level of business partners. Business English is an important component in large business. It allows you to easily conduct various presentations, negotiations and conduct business correspondence, which makes it possible to conclude important contracts and contributes to the growth of profits and the development of the company.

Literature review. The role of foreign languages, particularly, business English is significant in the changing and digitalizing world. Many experts pay attention teaching techniques [Galskova, 2019, 335], while others discuss the communicative foreign language education program-concept [Pasov, 2000, 170]. Serostanova N. pays attention on modern technologies of teaching foreign languages in the era of digitalization of education [Serostanova, 2020, 259], Gazilov M., Loginova N., look at the cultural aspects of tourism and language peculiarities [Gazilov, et al., 2021, 3-9], Loginova, N., Gruzdeva M. and Kostovarova V. examine the development of the creativity of students in a non-linguistic university in foreign language classes [Loginova, et al., 2020]. It is also worthy to look at Makarova's approach on the application of song content in the second foreign language classes [Makarova, 2021, 57] and Mushnikova's views on social networks as an interactive source of learning foreign languages [Mushnikova, 2017, 112]. Finally, we value Volkova's approach (2016) on creating a positive learning environment in foreign language lessons.

Scientific novelty. As the Chinese proverb says: "A thousand teachers, a thousand methods." Generalizing the innovation of foreign language learning presented in the article, the methods and technologies that are considered can be called scientific innovation and distinguished bilingual education (Bilingual advantage) in addition to the mother tongue in STEM subjects that allow to predict the key strategy adopted in the field of education.

Analysis. Today, when someone applies for a prestigious job with a high income, employers are interested in the level of knowledge of a foreign language, which is often an important factor when considering the candidacy. In that case, knowledge of the language at a basic level, which is quite sufficient for an ordinary tourist, will not be enough to have a business partner. Business English is not just about interviews and writing resumes. In the field of business, it is constantly necessary to make presentations, conduct negotiations, answer calls and carry out business correspondence, conclude deals, etc.

Based on the fact that the economy is constantly improving and globalizing, there is a need to develop business English, as new professional terms for narrowly oriented professions appear. Therefore, people who want to work successfully in any field of business - aviation, engineering - must regularly improve their language skills. During the period of globalization and the rapid development of commercial relations with representatives of foreign countries' commercial companies and business circles, the need to study bu-

siness English as a language of international business communication, focusing on its practical use, is increasing. The modern information age has reduced the time and distance to transmit a message. It is shifting the global economy from industrial production to the production of services and goods determined primarily by information systems.

Knowledge of banking English is no less important for professionals. The modern banking sector is developing at a tremendous pace, exceeding the growth rate of the general economy, causing an influx of new personnel. A huge number of foreign banks in the sector, foreign partners, foreign terminology - all this is a condition for successful work and promotion of employees, that is, knowledge of banking English. For example, for participants of the foreign exchange market, knowledge of English is one of the prerequisites for successful trading. Let's pay attention not only to ordinary English, but to the terminology used on the trading platform, in financial news, as well as when signing contracts for opening accounts with brokers.

Business English is an integral part of a skilled expert's professional knowledge. This is evidenced by the MBA (Master of Business Administration) business education course programs. Along with subjects such as quantitative methods of economics and management, management, trade, strategic management, legal regulation of business activities, marketing, etc., business English is no less important in the program as a link between all subjects[1]. In the modern theory and methodology of foreign language teaching and education, the emphasis is not so much on language learning as on language education and the development of the learner's personality through the subject of "foreign language". The need to learn a foreign language takes priority with the country's culture.

Foreign language teaching. Under these conditions, the foreign language has acquired the status of an effective tool for forming the intellectual potential of the society, as well as a resource for the development of the state. An example is the educational success of Singapore, whose education system is considered one of the best. An important advantage of the Singapore school is the adoption of bilingual education (Bilingual advantage) with English in addition to the mother tongue (Chinese, Malay or Tamil) and the focus on science, technology, engineering and mathematics (STEM - Science, technology, engineering, and mathematics), which allowed the country to be predicted by modern politicians and the key strategy adopted in the field of education [Pasov, 2000, 18]. In modern foreign language education, general trends can be distinguished, which also occur in regional practice. Update of early language learning, use of new teaching technologies, including information and communication, professional development of teachers. All these trends indicate a transition to a new quality of language education, i.e. qualitative. The result of any language education is the formed linguistic personality, and the result of edu-

[1] https://cbe.aua.am/mba/

cation in the field of foreign languages is the secondary linguistic personality as an indicator of a person's ability to fully participate in intercultural communication [Galskova, 2019, 81-138]. The formation of a new type of personality is associated with such qualities as independence, creativity, interaction with communication partners and the ability to build mutual understanding, self-development and improvement of human society.

Integrated language and content learning in languages other than English; effective transitions across educational stages (CLIL-Content and Language Integrated Learning has become an umbrella term to describe learning a content subject such as physics or geography through a foreign language), where academic subjects are taught in a foreign language, is becoming increasingly common throughout in the world: CLIL has two objectives, namely learning a subject in a foreign language and a foreign language through the subject being taught. In Finland, as in other European countries, CLIL is used in various educational contexts, from upper age group of kindergarten to higher education.[1]

New pedagogical technologies. The integrated teaching of the subject language is implemented in two Surgut gymnasiums and the science lyceum as part of the implementation of Language Strategy in a form of English for Specific Purposes specialized courses.*"Intex"* International Testing Center offers a TKT CLIL - Content and Language Integrated Learning (TKT CLIL - Content and Language Integrated Learning) refresher course for subject teachers and foreign language teachers, which includes teaching methodology, the subject, necessary skills and strategies: presentation of information, coordination of the educational process and support during training. Thus, the integration of foreign language and school curriculum subjects is a new approach to the formation of language knowledge of students in general education institutions.

A characteristic trend of our time is the spread of early learning of a foreign language, which is caused by changes in the economic, political, and social conditions of humanity, in particular, the increase in population migration, especially in European countries. Today, we are witnessing a third wave of growing interest in this field, following the first and second waves of the 1960s and 1980s. As the studies of Russian and foreign scientists show, a foreign language studied from early childhood allows to reveal linguistic abilities: two images of the worldview are formed - the child learns to compare two languages, as a result of which thinking becomes multi-level, because: the child learns to be tolerant, and other abilities develop [Serostanova, 2020, 1-10]. The assimilation of new pedagogical technologies for teaching a foreign language is impossible without the use of information technologies and digital educational resources (IT and TK). These global trends in foreign language education also find their practical embodiment in the activity of educational institutions of the Khanty-Mansiysk Autonomous Region. Foreign lan-

[1] https://cyberleninka.ru › article › sovremennye-tendents...

guage teachers actively use ICT (Information and Communication Technologies) in academic and extracurricular activities[1]. Currently, the methodological association in the city of Surgut is developing a network resource for teachers of foreign languages within the framework of the program "Remote support of foreign language education". Knowledge of a foreign language is an important criterion for the successful professional activity of future professionals, and their linguistic and professional training requires a new approach using modern teaching tools in the era of digitization of higher education.

Digital educational technologies. Digital educational technologies are used everywhere to activate the process of learning foreign languages, increase information content, interactivity and effectiveness of teaching. However, their integrated application requires an innovative approach to organize the educational process in accordance with the necessary pedagogical conditions. Until recently, the term "informatization of education" was widely used. Informatization of education is considered as a set of socio-pedagogical transformations aimed at equipping educational systems with information products and technologies. Contribution of information tools and pedagogical technologies based on the use of these tools in educational organizations [Galskova, 2019, 95].

Among the main advantages of ICT in the educational process are the updating of the entire educational system in accordance with the needs of society and the requirements of the latest generation federal state educational standards, rapid adaptation of students to social changes, faster process, transfer of knowledge and experience from one person to another; thus improving the quality and efficiency of the educational process as a whole [Pasov, 2000, 62]. Thus, digitalization in education (sometimes digitization) mainly focuses on maintaining such a modern trend in education as the continuity of learning (lifelong-learning - learning throughout life, "for life"), and also creates conditions for individualization, educational trajectory based on innovative technologies. Currently, there is no unified interpretation of this term.

Digitization is seen as a means of manipulating data using digital devices [Serostanova, 2020, 1-10], computerization of systems and various operations in order to improve them and ensure accessibility; widespread use of digital technologies, including the Internet, e-mail, video communications, etc.Thus, the key technologies of digitization can be considered the Internet and mobile communication, which provide an opportunity to organize an online dialogue between different parties in the educational process.

In language didactics, the term computer-assisted language instruction (CALI-Computer Assisted Language Instruction) and later computer-assisted language learning (CALL-Computer-Assisted Language Learning) ("computer learning of foreign languages", "computer linguistics") appeared in the process of teaching foreign languages as an active

[1] https://www.prodlenka.org/metodicheskie-razrabotki/

part of computers by investment. However, this concept does not fully include the entire arsenal of modern technologies. With the advent of interactive websites and mobile applications, such terms as Electronic Learning (e-learning), Mobile Learning (m-learning) began to be used in the field of education. Therefore, currently the term Technology-Assisted Foreign Language Learning (TAFLL) is considered more acceptable, which more accurately reflects the use of a wide range of ICTs in the practice of foreign language education[1]. Innovative ICTs provide access to foreign language information sources and different language options, as well as a variety of educational content, allow creating a virtual authentic language environment, enable both interpersonal interaction between students and communication with the teacher. Internet, create favorable conditions for self-education and increasing the level of knowledge of foreign languages.

Modern digital technologies greatly contribute to the activation of the process of learning a foreign language, thanks to various multimedia and interactive authentic resources that enhance the pace of students' work in the process of training various types of speech activities. As a result, cognitive activity and motivation increase, students' language and communication skills are formed. Of the interactive resources for teaching foreign languages, Learning Apps.org deserves special attention, which provides for the use of educational interactive modules in the educational process. Teachers are offered special templates to create exercises with their own language content (including audio and video files) and integrate them into the teaching scenario (language (Choose the right item, match the pictures with the words, Fill in the blanks, etc. - Choose the right item, Match the pictures with the words, Fill in the gaps, etc); conditional speech and speech (Make up a dialogue (or put the lines in the correct order),

Make up a dialogue (or Put the lines in the right order), Describe the picture/Compare two pictures, etc). This interactive application contains tasks of varying degrees of complexity for any level of foreign language proficiency. The My Lessons tab allows you to organize students' independent work in separate groups. However, despite the significant advantages of digital learning tools, they cannot completely replace the teacher, but only create conditions for creatively implementing some aspects of foreign language activities both in practical and extracurricular activities, as well as for personalizing the learning process. The most promising direction of foreign language teaching in the field of higher education is the "blended learning" technology. The concept of blended learning is the combination of traditional and online learning [Pasov, 2000, 32-33]; combination of various tools in the electronic (online) learning (e-learning) system; a teaching system that combines the most effective aspects of classroom learning and distance learning; integration of face-to-face learning and interactive educational technologies.

[1] https://revolution.allbest.ru/languages/

Blended learning. Blended learning includes a combination of regular foreign language learning and online learning, while communication between the teacher and students is a prerequisite. It should be noted that the role of the teacher changes, because he becomes the coordinator of the educational process, organizes and advises the students. This type of training allows you to optimize the learning process and effectively organize students' independent activities using modern digital technologies.

One of the areas of application of ICT (innovation computer technologies) in the practice of foreign language teaching is the teaching of computer educational programs, which are software tools with special subject content, which are aimed at pedagogical interaction with students. to solving specific problems. CSP includes software and methodological complexes, electronic training courses and electronic manuals, electronic dictionaries, educational program complexes, etc. This list is constantly being expanded and updated.

Computer programs of teaching languages. Computer programs can be widely used in the process of teaching vocabulary, applying articulatory and phonetic skills, teaching monologue and dialogic oral and written speech, studying and using basic grammatical phenomena. The analysis showed that the most popular programs are LinguaLeo, Duolingo, LingQ, FluentU, Rosetta Stone, etc.

Rosetta stone - The best way to learn a foreign language, combines proven teaching methods with the world's best speech technology.

LinguaLeo - English learning platform for Russian, Turkish and Brazilian Portuguese speakers. As of September 2020, 23 million users have registered.

Duolingo **-** Duolingo is a free program that allows users to learn a number of foreign languages. Works on multiple platforms. Android OS, IOS, as well as on PC. The program is free and allows you to pass licensed tests.

Available in Armenia. Founders: Luis von Ahn, Severin Hacker.

LingQ - An efficient way to learn languages:

FluentU - Language comprehension is the key to learning a foreign language. FluentU brings language learning to life with language immersion through real-world videos.

Semper - Semper takes care of memorization. Created by people who love learning but hate learning, Semper is the most effective way to learn words, phrases or facts.

Busuu - Try Busuu, the best and most effective mobile language learning app. Learn up to 13 languages: access free lesson content created by experts.

Lingvist is a smarter and faster way to learn new languages. Improve your vocabulary and learn the necessary words in just 10 minutes a day. Launch date in Armenia: 2014.

Available languages: English, Estonian, Russian

All of these involve learning foreign languages using the immersion method. At the initial stage, the level of knowledge of the language is determined, the course is developed taking into account this level. Furthermore, the advantages of many programs are language learning in a socio-cultural context based on authentic materials in audio and video format, as well as the opportunity to communicate online with native speakers from around the world.

Most computer programs now have mobile versions, which makes it possible to use the service from mobile devices. This approach to foreign language learning is called Mobile Assisted Language Learning (MALL) ("Learning foreign languages through mobile technologies"), it allows for personalization of learning by creating situations that have personal meaning for each student and self-regulation. due to the learning process, due to the ability to choose the intensity of language learning, provide immediate feedback, diagnose and correct errors.

Among the interactive mobile services, the following should be mentioned:

• universal (Duolingo, Lingualeo, Semper, Busuu, Lingvist, etc.);

• applications for formation and development of vocabulary skills (Easy ten, Upmind, Memrise, Quizlet, etc.);

• applications for improving grammar skills (English Phrasal Verbs, Filp and Learn, Color Verbs, etc.);

• applications that offer videos and tasks developed for them as a basis for learning a foreign language (FluentU, TED, YouTube, etc.);

news applications (BBC News, CNN News, etc.);

• Applications for the development of foreign language communication skills (Urban Dictionary, Genius, Smigin Travel, etc.);

• portable dictionaries (ABBYY Lingvo Dictionaries, SlovoEd, Multitran, etc.);

• automatic translators (Word Lens, Google Translate, iTranslate, etc.).

• The characteristic features of mobile applications are their multimedia and hypertext, which allow to speed up and improve the process of learning a foreign language, develop stable language patterns, communication skills and English grammar rules. Mobile dictionaries, in addition to transcription and grammar entries, are equipped with voice action and voice entry recognition of word units.

Thus, mobile technologies (or mobile applications) make it possible to best organize both autonomous and independent learning, as well as group learning through training

courses developed in mobile formats; contribute to the increase of students' motivation by using the technical means they are familiar with.

Currently, distance learning technologies of foreign languages, such as Skype and Zoom, deserve special attention. They are video communication tools and are attractive due to their accessibility and ease of use. Teachers have the opportunity to organize individual and combined classes, chat clubs, as well as webinars and video conferences, involving participants from other countries or native speakers. These technologies allow students to learn to speak and listen online; You can also improve your writing skills using text chat.

An obvious advantage of using Skype and Zoom in language education is that students gain experience in language communication. In the course of communication, a person gets to know not only the verbal, grammatical, phonetic language features that are characteristic only of the mother tongue, but also the entire culture, way of thinking, and lifestyle of another country. Therefore, a unique opportunity arises to create a real foreign language online environment.

Recently, the Skyeng online English language school, which offers an interactive educational platform based on Skype technology, has become more and more popular. Tutored sessions are available around the clock and are complemented by mobile apps, browser extensions and educational newsletters. After the introductory lesson, in which the level of knowledge of the English language is determined, the methodologist gives individual training recommendations, and appropriate teachers are selected, taking into account the interests of the students, the goals and objectives of the course.

Conclusions. Careful planning and development of auxiliary language materials, a systematic lesson plan and task monitoring contribute to effective and fun English learning. It should be noted that despite all the advantages of digital technologies in teaching a foreign language, their use should be of an auxiliary nature. Therefore, for a more effective process of developing higher education students' foreign language communicative abilities, it is necessary to identify a number of pedagogical conditions for the use of ICT in the context of the general digitalization of education. Pedagogical conditions are, in fact, circumstances (methods, techniques, organizational forms of teaching, etc.) that have a significant impact on the results of the pedagogical process. In this case, we examine a set of interrelated conditions, the implementation of which will contribute to the effective process of learning a foreign language based on the use of ICT, including the following:

1. Increasing the digital literacy of teachers, which implies not only the knowledge of the appropriate level of modern digital educational resources, but also the willingness to work in a digital educational environment, to develop new electronic materials depending on educational goals;

2. organization of training based on the individual-activity approach, involving students in joint production activities, taking into account individual psychological characteristics and the level of knowledge of a foreign language;

3. innovative orientation of foreign language teaching, which implies the teacher's awareness of the methodological possibilities of using modern digital tools and the selection of the most optimal ones that correspond to the goals and tasks of teaching;

4. Using ICT as a learning tool both in the classroom and for organizing students' independent activities.

5. technical and technological support for the foreign language learning process, including equipment with the necessary hardware and software, Internet access, etc.;

6. Formation of students' motivation, which implies the creation of conditions for learning a foreign language for the realization of internal needs for personal and professional purposes, their awareness and further development.

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Zarik YESAYAN

The role and the current trends of business English and teaching foreign languages in the context of economic globalization in the era of digitalization

Key words: foreign language teaching, foreign language education, secondary linguistic personality, education standardization, early foreign language teaching, teaching technologies

The article presents an analysis of some modern trends in foreign language education and regional experience in solving urgent problems of teaching foreign languages and using new teaching technologies.Thus, competent organization of the process of learning a foreign language, taking into account the psychological and pedagogical conditions listed above, will help increase the motivation and cognitive activity of students, develop their creative abilities and skills to navigate the modern foreign language information space and gain experience in intercultural communication. Modern digital technologies used in the practice of teaching a foreign language also personalize the learning process, create conditions for self-education and self-development, as well as the formation of foreign language communicative competence of future specialists. Modern computer technologies also contribute to the development of science, greatly simplifying the process of creating calculations and scientific projects. In a world where military operations can span multiple regions and cultures, it is more than necessary to ensure effective communication in foreign languages between the armed forces of different countries. As an ancient profession, translation has laid the foundation of civilizations and interpersonal relationships and has enabled the translation of a wide variety of works and books around the world. It maintains its presence in almost all sciences and fields.

QUANTITATIVE EVALUATION OF THE INFLUENCE OF INDIVIDUAL FACTORS ON THE RESULT INDICATORS CHARACTERIZING THE COMPETITIVENESS OF RA AGRICULTURE AND THE INTEGRAL INDICATOR OF THAT COMPETITIVENESS

Lusine TSPNETSYAN
Ph.D. applicant, Chair of AMAP,
National Agrarian University of Armenia

Key words: agriculture, competitiveness, indicators, integral index, factors, budget allocations, agricultural output index, productivity, gross output, agricultural commodity, agricultural services tariff index, producer price

Introduction. Competitiveness is one of the most important characteristics of a market economy and an important economic category. The level of competitiveness is influenced by many factors that can contribute or hinder its increase. State policy is of particular importance in increasing the competitiveness of agriculture, which is designed to provide the necessary conditions and a favorable environment for the realization of this goal. The favorable influence of the state policy on the competitiveness of agriculture finds its expression in the improvement of indicators characterizing competitiveness, in qualitative shifts, in the positive trends of changes in the characteristics of the level of competitiveness. However, it is not justified to attribute the mentioned positive changes only to the influence of the state policy, because other factors also affect the competitiveness of agriculture. In this case, a clearer picture of the impact of state policy on the competitiveness of agriculture can be made by quantifying that impact.

The level of competitiveness of agriculture is affected by other factors besides the above-mentioned policies. Certain factors have more or less influence on this or that characteristic of agricultural competitiveness. In this case, the quantitative assessment of the influence of various factors on individual characteristics of agricultural competitiveness is of particular interest. First of all, we are talking about productivity as a characteristic of the competitiveness of a branch, including agriculture, which most comprehensively reflects it, and in this sense, its study acquires particular importance. Therefore, we consider M. Porter's interpretation of competitiveness, according to which "Competitiveness is determined by productivity..." [National Competitiveness Report of Armenia, 2008, 14].

Productivity as a characteristic of the competitiveness of a branch, including agriculture, reflects it more comprehensively and in this sense its study acquires particular importance. The role of productivity is becoming more important as one of the main output indicators characterizing the competitiveness of agriculture. In the case of agriculture, productivity has its own manifestation and is reflected in the index of gross agricultural output per employed person in that branch. Many direct and indirect factors affect the size of the indicated indicator, in particular: the level and structure of agricultural mecha-

nization, population employment, the yield of agricultural crops and the yield of agricultural animals, the level of agricultural commoditization, the index of tariffs for agricultural services, the exchange rate of foreign currency (for example, the US dollar). The impact of many factors on agricultural productivity may or may not be favorable. The size of that effect may also vary. In this case, the assessment of the mentioned amount allows to identify the factors that have more or less influence on agricultural productivity in the given period. Along with the productivity of agriculture, it is of no less interest to evaluate the quantitative impact of various factors on indicators characterizing the competitiveness of its crop and livestock sub-sectors, such as yield (in particular, wheat) and food yield (for example, milk yield of cows) indicators. The gross yield of the given agricultural crop, producer price, agricultural services tariff index, foreign currency exchange rate can be considered as the factors influencing the yield, and the milk producer's price, the price index of livestock vaccinations can be considered as the factors affecting the grain yield. The influence of the mentioned factors on yield and grain yield may be more or less. Identifying the factors that have a greater or lesser impact on the competitiveness of agriculture and its sub-sectors allows to focusing on mitigating specific negative factors and making the most of the opportunities of positively influencing factors.

The identification of the factors influencing the above-mentioned indicators to a greater or lesser degree characterizing the competitiveness of agriculture and its individual sub-sectors is possible as a result of the quantitative assessment of the impact of these factors using regression models and econometric calculations. Although the role of such assessment is becoming more and more important in the economic literature, the evaluation of the quantitative relationship between not all result and factor indicators related to the branch, including the agriculture of our republic, has received the necessary attention. In this case, it refers to the above-mentioned indicators. If we take into account that there is a statistical relationship between not all the result and factor indicators related to the agriculture of our republic, then the discovery of such a relationship becomes more important. At the same time, the development of an integral indicator of the competitiveness of the branch, particularly agriculture, which has not received enough attention in the economic literature, is no less important, which will allow a more complete quantitative understanding of the level of competitiveness and the extent of its change under the influence of various factors. In this context, the quantitative assessment of the impact of individual factors determining the competitiveness of RA agriculture and the development of an integral indicator of the competitiveness of the sector, particularly agriculture, are becoming relevant.

The purpose of the article is to evaluate the quantitative impact of a number of factors with a statistical relationship with them on the individual result indicators characterizing the competitiveness of RA agriculture in the considered period, using a regression model,

and to isolate the factors that have a greater or lesser influence, as well as to propose a methodology for evaluating the integral indicator of the competitiveness of the branch, in particular, agriculture approach. The tasks of the article are to clarify the scope of the factors with which there is a statistical relationship with the individual characteristics of the competitiveness of RA agriculture, to perform a regression analysis characterizing the influence of the mentioned factors for the considered period, as well as to estimate the annual and average annual value of the integral indicator of the competitiveness of RA agriculture.

Methodology. The article uses dialectics, scientific abstraction, comparative analysis, logical, statistical and mathematical methods. The application of the dialectic method is clearly seen when observing the movement of individual indicators in the tables included in the research over a number of years and determining the degree of closeness of the relationship between them using appropriate formulas. The application of the scientific abstraction method applied to the entire research, because the scope of the latter is limited to individual characteristics of agricultural competitiveness and one factor affecting them or a limited number of individual factors, that is, others were not considered. The application of the method of comparative analysis found its expression in the comparative analysis of the impact of budget allocations to agriculture on the individual characteristics of agricultural competitiveness: agricultural production volume index, agricultural productivity, and the level of commercialization, the results of which are reflected in the conclusions of the article. The use of statistical methods was demonstrated in the calculations of correlation and determination coefficients. The application of mathematical methods (referring to the calculation of the mean square) found its expression in the calculations of the integral indicator of the competitiveness of the branch, in particular, of agriculture.

Literature review. A number of economists, including A. Borel, T. Lenskaya [Lenskaya, 2013, 87], K. Saubanov [Saubanov, 2010, 38-53], V. Klyukach [Klyukach, 1998, 208], Bespyatnykh [Bespyatnykh, 2000, 200], O. Koryakina and other authors have identified a more limited or comprehensive range of the mentioned factors. As a result, individual factors were left out of view. We discuss, in particular, the level of commercialization of agriculture, the index of tariffs for agricultural services, the exchange rate of foreign currency (for example, the US dollar), the gross yield of a given crop, the price of a milk producer, the price index of livestock vaccinations, which are not shared by all economists and are considered as factors determining the competitiveness of agriculture. It is also noteworthy that in the economic literature, these factors were mostly considered in the context of contributing to increasing the competitiveness of agriculture. As a result, the issues of quantitative evaluation of the influence of the mentioned factors on the competitiveness of that branch have not been studied in the necessary depth,

especially when it comes to the evaluation of their influence by regression analysis. In other words, the study of the above-mentioned issues is mostly limited by the theoretical judgments related to the regression analysis, and in the context of the competitiveness of RA agriculture, not the necessary attention was paid to the identification of the statistical relationship between all the result and factor indicators.

In the economic literature, not enough attention was paid to the nomination of the integral indicator of the competitiveness of the sector, particularly agriculture. Individual indicators of this competitiveness found in the literature characterize one or another of its aspects and do not provide a comprehensive quantitative picture of its level. Meanwhile, a more complete picture of that level can be made by proposing an integral index by calculating various indicators characterizing different aspects of competitiveness with a specific methodical approach.

Scientific novelty. The statistical relationship between a number of factors determining the competitiveness of RA agriculture in the studied period was revealed and quantitatively evaluated, as well as the factors that had more or less influence on the result indicators characterizing that competitiveness. At the same time, an integral index for assessing the competitiveness of the branch, particularly agriculture, was developed and its annual and average annual value was estimated in the case of RA agriculture. The results of the regression analysis are characterizing the influence of the state policy on the competitiveness of the agriculture of the Republic of Armenia.

Analysis. We used the following approach for the quantitative evaluation of the influence of state policy on a number of indicators determining the competitiveness of agriculture. As the bearer of the state policy, we observed the allocations from the RA state budget to the agricultural sector and, by calculating the correlation and determination coefficients, we assessed their quantitative impact on the value of the gross agricultural product, the agricultural product volume index, and the level of agricultural productivity and productivity. Baseline data for calculations were taken for a long period of time, 15 years (budget data are available since 2007). The baseline data are presented in Table 1.

First, we tried to assess the nature of the relationship between the state budget allocations to agriculture and the value of gross agricultural output. For the econometric analysis of the impact of agricultural budget allocations on the gross agricultural product, agricultural product volume index, agricultural productivity, agricultural commodity level, let's make the following desgnations:

x_t - budget allocations to agriculture, mln drams, in t year,

y_{1t} - gross value of the agricultural products, billion drams in t year,

y_{2t} - the index of the volume of agricultural products, %,

y_{3t} - Productivity of agriculture, thousand AMD/person in t year,

y_{4t} - Level of commercialization in agriculture, %, in t year.

Table 1. Allocations to agriculture from the RA state budget and the indicators determined by them: the value of the gross agricultural product, agricultural productivity, the volume index of agricultural products, the level of commercialization of agriculture.

Years	Budget allocations to the agriculture, million drams	Gross value of the agricultural products, billion drams	The index volume of agricultural product, %	Productivity of agriculture, thousand AMD/person	Level of comercializetion in agriculture, %
2007	6700.183	633.9	109.6	1261.5	57.3
2008	10961.888	628.1	101.3	1285.2	54.6
2009	13671.217	552.1	99.5	1123.1	56.2
2010	7171.655	636.7	86.4	1294.9	55.8
2011	5808.389	795.0	113.9	1738.1	56.0
2012	9105.868	841.5	109.5	1924.7	56.1
2013	9337.618	919.1	107.1	2177.4	56.4
2014	9651.395	983.0	106.3	2516.5	56.2
2015	20208.724	945.4	108.4	2641.7	58.6
2016	27087.158	878.5	96.2	2598.3	57.3
2017	10516.520	908.6	97.6	2865.3	56.7
2018	9575.971	892.9	92.8	2675.0	56.5
2019	6235.071	853.3	95.9	2478.4	56.3
2020	9858.199	833.3	103.2	2465.4	57.2
2021	20053.744	934.4	99.1	2702.1	57.0

The closeness of the relationship between the mentioned indicators was evaluated using the correlation coefficient. In the case of a linear relationship, its closeness is measured by pairwise correlation coefficient, which is determined by the following formula:

$$r_{xy} = \frac{\sum_i (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}} \quad (1)$$

If the sign of the deviation from the mean matches, then the relationship is direct ($r_{xy} > 0$), if the sign of the deviation does not match, the relationship is inverse ($r_{xy} < 0$): The pairwise correlation coefficient is measured from -1 (in the case of random complete inverse correlation) to 1 (in case of complete direct correlation). In absolute magnitude: $0 \le |r_{xy}| \le 1$. The closer the value of r_{xy} is to unity, the closer the relationship is, and the closer the value of r_{xy} is to 0, the weaker the relationship. When the connection from

$|r_{xy}|$<0.30 is considered weak, the connection of $|r_{xy}|$=0.3÷0.7 is considered strong, and when $|r_{xy}|$>0.7 the connection is considered very strong or close" [Yeliseeva, 2010].

The interdependence between the studied phenomena was presented using a two-dimensional linear regression model:

$$y_t = a_0 + a_1 x_t + e_t \quad (2),$$

$$\hat{y}_t = a_0 + a_1 x_t \quad (3),$$

where` x_t - is the actual level of the factor attribute, in t year

y_t և $\hat{y}_t$ - are the actual and theoretical levels of the output characteristic in t year,

e_t - is the effect of factor characteristics and random factors not included in the model,

$a_0; a_1$ - are the parameters of the regression model, which are estimated by the method of least squares [Yeliseeva, 2014, 23-25]. The coefficient of determination and the F criterion of significance of the regression analysis were also calculated among the studied indicators. The coefficient of determination shows how much of the variation in the outcome characteristic is due to the variation in the factor characteristic:

$$R^2 = \frac{\sum(y_i-\bar{y})^2}{\sum(\hat{y}_i-\bar{y})^2} = (r_{xy})^2, \quad 0 < R^2 < +1, \quad (4),$$

$$F = \frac{\sum(\hat{y}_i-\bar{y})^2}{df_1} \div \frac{\sum(y_i-\hat{y}_i)^2}{df_2} \quad (5), \text{ where}$$

$\sum(y_i-\bar{y})^2$ - is the total variance of the resulting trait,

$\sum(\hat{y}_i-\bar{y})^2$ - is the variance due to the regression of the outcome trait,

$\sum(y_i-\hat{y}_i)^2$ - is the variance due to the residuals of the outcome trait,

df_1 and df_2 – is the number of degrees of freedom.

The results of calculation of correlation and determination coefficients characterizing the relationship between budget allocations to agriculture and other outcome features are presented in table 2.

From the results of the analysis presented in Table 2, it can be seen that in 2007-2021 Between budget allocations to RA agriculture (X_t) and the volume of gross agricultural output (Y_{1t}), a direct relationship of medium strength was formed ($r_{xy_1} = 0.288$). According to the calculated coefficient of determination, about 8.32% of the fluctuations in the volume of gross agricultural products in the studied years are due to the fluctuations of budget allocations to agriculture ($R^2 = 0.0832$), and the remaining 91.68% are due to the influence of other and random factors. According to the regression coefficient in the constructed regression model, the gross agricultural output increased by 6.46 billion drams in parallel with the increase of one million drams in budget allocations for agriculture in 2007-2021 ($a_1 = 0.00646$). However, the results of the regression analysis showed that the budgetary allocations to agriculture in the studied years did not have a significant impact on the increase in the gross output of agriculture (**F=1.17,** sig.=0.29)). From the results of the analysis presented in Table 2, it can be seen that in 2007-2021 a

weak inverse relationship ($r_{xy_2} = -0.134$) was formed between budget allocations to RA agriculture (x_t) and the volume index of agricultural products (y_{2t}). According to the calculated coefficient of determination, about 1.81% of the fluctuations of the index of agricultural output volume in the studied years are due to the fluctuations of budget allocations to agriculture ($R^2 = 0.0181$), and the remaining 98.19% are due to the influence of other and random factors. According to the regression coefficient, in the built regression model, in 2007-2021, parallel to the increase of budget allocations to agriculture by one million drams, the volume index of agricultural products decreased by 0.16 percentage points (a_1 = **0.00016**). However, the results of the regression analysis showed that the budgetary allocations to agriculture in the studied years did not have a significant impact on the increase of the volume index of the agricultural products (**F=0.23**, sig.=0.63).

The analysis has shown that a direct relationship of average strength has been formed between the budget allocations for agriculture (x_t) and the level of agricultural productivity (y_{3t}) in 2007-2021. According to the calculated coefficient of determination, about 14.9% of fluctuations in the level of agricultural productivity in RA in the studied years are due to fluctuations in the budgetary allocations of agriculture (**R2 = 0.149**), and 85.1% are due to the influence of other and random factors. According to the constructed regression model, one million of agricultural budget allocations were made in the studied years. The increase in drams contributed to the increase of agricultural productivity by 0.039 thousand drams/person or 39 drams/person (a_1 = **0.039**). It should be noted that the relationship formed between budget allocations for agriculture and agricultural productivity is not significant (**F=2.28,** sig.=0.15).

According to the results of the analysis, in 2007-2021 a direct and strong connection has been formed between the budgetary allocations of RA agriculture (x_t) and the level of agricultural production (y_{4t}). According to the calculated coefficient of determination, 25.8% of the variations in the agricultural product level in the studied years are due to the variations in the budgetary allocations of agriculture (R^2=**0.258**), and the remaining 74.2% are due to random factors not included in the model. According to the constructed regression model, the increase of budget allocations by one million drams in the studied years contributed to the increase of the level of agricultural commercialization by 0.07 percentage points ((a_1 = **0.00007**). The analysis showed that the relationship formed between the budgetary allocations of agriculture and the level of commercialization in 2007-2021 was significant. (**F=4.58**, sign. = 0.047). In fact, the policy conducted in the field of agriculture had a positive effect on the competitiveness of the sector with the budgetary allocations shown, but this effect was weak.

As a result indicator characterizing competitiveness, we considered the productivity in agriculture and separately evaluated the impact of various factors on that indicator. In particular, we have considered the following factors: the level of agricultural commodification, the tariff index of agricultural services, average annual exchange rate of the US dollar. The following designations have been made:

y_t - is the agricultural productivity in the t year, thousand drams / person,

x_{1t} - is the level of commercialization of agriculture in the t year %,

x_{2t} - is the index of tariffs for agricultural services in the t year,

x_{3t} - is the average annual exchange rate of 1 US dollar in the t year, in drams.

Table 2. The results of the calculation of correlation and determination coefficients characterizing the relationship between budget allocations to agriculture and other outcome features

Indicators	Impact of budgetary allocations for agriculture (x_t)`			
	On the volume of gross agricultural output y_{1t}	On the index of the volume of agricultural output	On the level of productivity of agriculture	The level of commercialization of agriculture
Correlation coefficient	$r_{xy_1} = 0.288$	$r_{xy_2} = -0.134$	$r_{xy_3} = 0.386$	$r_{xy_4} = 0.508$
Coefficient of determination	$R^2 = 0.0832$	$R^2 = 0.0181$	$R^2 = 0.149$	$R^2 = 0.258$
Regression model	$\widehat{y_{1t}} = 739.9 + 0$	$\widehat{y_{2t}} = 103.7 - 0.00016x_t$	$\widehat{y_{3t}} = 1653.5$	$\widehat{y_{4t}} = 55.6 + 0.00007$
Significance of the regression model by F criterion	$F = 1.17$ *(sig.=0.29)*	$F = 0.23$ *(sig.=0.63)*	$F = 2.28$ *(sig.=0.15)*	$F = 4.58$ *(sig.=0.047)*

The results of the regression analysis characterizing the effect of individual factors determining labor productivity, wheat yield and milk yield of cows in RA agriculture.

In order to assess the specific impact of the mentioned factors on the level of productivity in RA agriculture in 2000-2021, the results of the analysis are presented separately. The analysis shows that in 2000-2021 a non-linear relationship was formed between the level of productivity and commercialization of RA agriculture, which was presented through a stepwise regression model:

$y_t = a \times x_{1t}^b \times e_t$ (6), where:

a, b are the parameters estimated by the method of least squares,

e_t - are the effects of random factors not included in the model.

The coefficient of elasticity is calculated, which shows by how much a one percent increase in the factor characteristic changes the resulting characteristic: (7) [Ekonometrika, 2007, 86-90].

From the results presented in Figure 1, it can be seen that in the studied years, a strong non-linear relationship was formed between the productivity and commercialization level of RA agriculture (**R = 0.606**). According to the coefficient of determination, around 36.8% of the fluctuations in the agricultural productivity level of RA in the studied years are due to the fluctuations in the level of agricultural commodity ($R^2 = 0.368$), and the remaining 63.2% are due to the influence of other factors not included in the model. As the elasticity coefficient shows, in 2000-2021 a one percent increase in the agricultural commodity level contributed to an increase in the agricultural productivity level by 5.527% (**E = 5.5271%**).

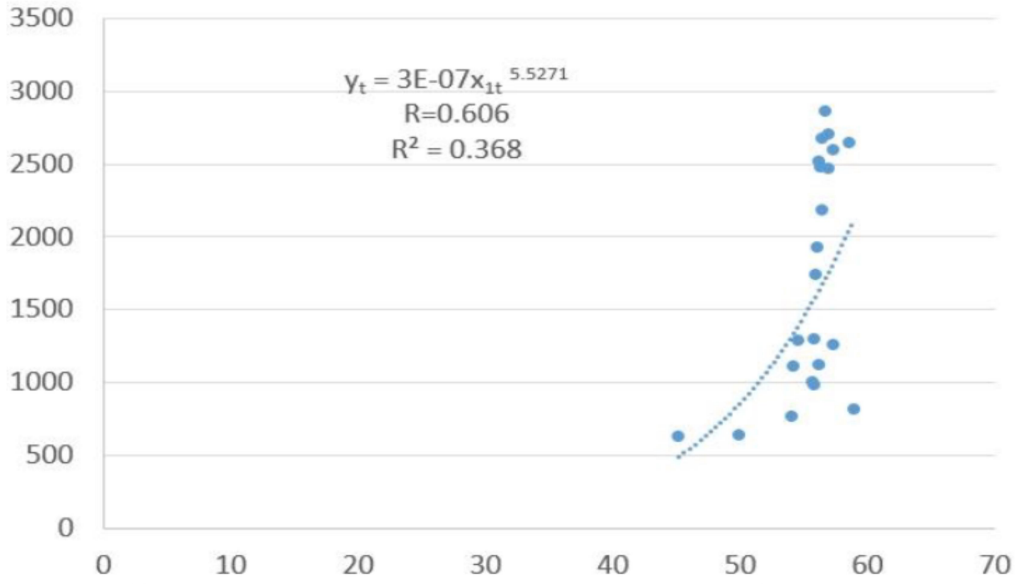

Figure 1. The interdependence of RA agricultural productivity (vertical) and level of commercialization (horizontal) in 2000-2021.

An inverse relationship was formed between the agricultural productivity of the Republic of Armenia and the agricultural services tariff index in 2000-2021, which was presented through a two-dimensional linear regression model:

$$y_t = a_0 + a_1 x_{2t} + e_t \quad (8)$$

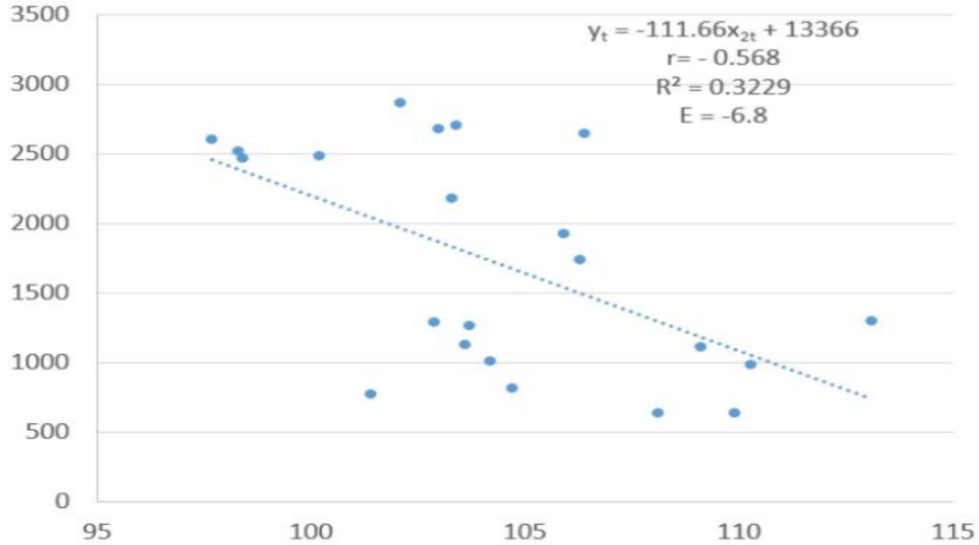

Figure 2. The interdependence of RA agricultural productivity (vertical axis) and agricultural services tariff index (horizontal axis) in 2000-2021

The results of the analysis presented in Figure 2 showed that in the studied years, a strong inverse relationship was formed between the agricultural productivity of the Republic of Armenia and the tariff index of agricultural services. (**r = -0.568**). According to the calculated coefficient of determination, around 32.29% of the fluctuations in the level of agricultural productivity in the studied years are caused by the fluctuations of the price index of agricultural services ($\boldsymbol{R^2 = 0.3229}$), and the remaining 67.71% are caused by other random factors not included in the model. According to the constructed regression model, 2000-2021. an increase in the price index of agricultural services by one percentage point leads to a decrease in agricultural productivity by 111.66 thousand drams/person ($\boldsymbol{a_1 = -111.66}$). In the same period, a one percent increase in the price index of agricultural services leads to a 6.8% drop in agricultural productivity.

The analyzes showed that in 2000-2021 A non-linear relationship was formed between the productivity of RA agriculture and the average annual exchange rate of 1 US dollar, which was presented through a parabolic regression model:

$\boldsymbol{y_{3t} = a + bx_t + cx_t^2 + e_t}$ (9) where: **a,b, c** are the parameters estimated by the least squares method,

e_t - are the effects of random factors not included in the model.

The coefficient of elasticity is calculated, which shows by how much a one percent increase in the factor characteristic changes the resulting characteristic:

$$\boldsymbol{E = \frac{(b+2\times c\times \bar{x})\times \bar{x}}{a+b\times \bar{x}+c\times \bar{x}^2}} \quad (10)$$ [Ekonomietrica, 2007, 90].

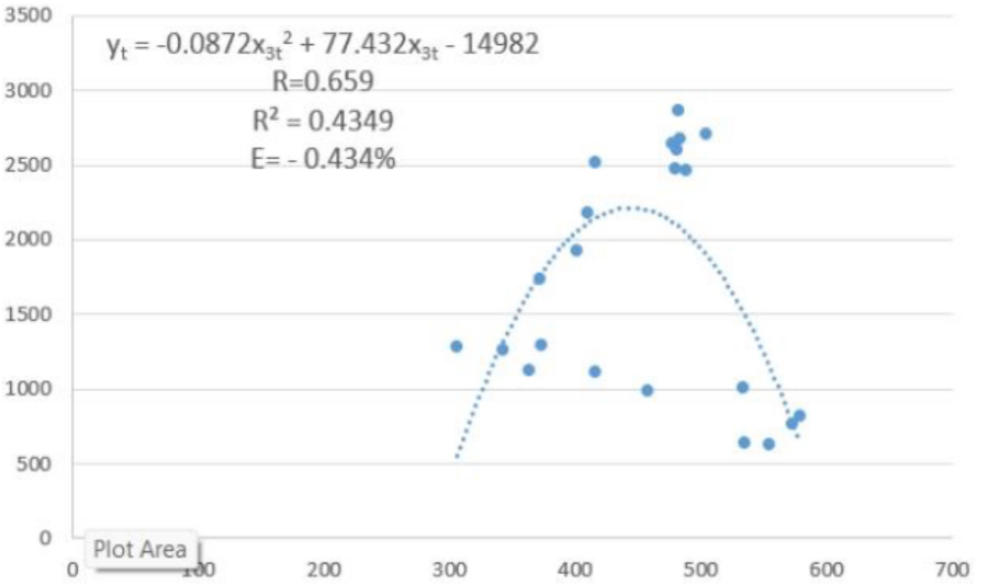

Figure 3. Interdependence of RA agricultural productivity (vertical axis) and the average annual exchange rate (horizontal axis) of one US dollar in 2000-2021

The results of the analysis presented in Figure 3 showed that in the studied years, a strong relationship was formed between the average annual exchange rate of 1 US dollar and the productivity of RA agriculture ($R = 0.659$). According to the coefficient of determination, 2000-2021 About 43.49% of the fluctuations in the level of agricultural productivity in the Republic of Armenia are due to the fluctuations of the average annual exchange rate of 1 US dollar, and the remaining 56.51% are due to the influence of random factors not included in the model. A one percent increase in the calculated elasticity coefficient, the average annual exchange rate of 1 US dollar in the years of study, led to a 0.434% decrease in the level of agricultural productivity in RA. We consider the impact of a number of factors on productivity, the most important indicator of competitiveness.

The application of the regression model provides an opportunity to assess the impact of various factors on agricultural productivity. In order to apply that model, we considered many factors that can logically affect the productivity of agriculture. Our econometric calculations show that not all factors and the productivity index have a statistical relationship. The calculations were made with data covering a long period of time (2000-2021). Calculation indicators of productivity in agriculture and the range of factors affecting them are presented in table 3.

Table 3. Agricultural productivity in RA and individual indicators (factors) affecting it in 2000-2021

Years	Gross agricultural output per employed person (productivity), thousand AMD	Sowing areas of agricult. crops, thousand ha	Gross production of crops, bln drams	Gross output, animal husbandry, bln drams	Tariff index of agricultural services comp. to previous year, %
2000	630.5	303.2	136.2	145.3	109.9
2001	634.0	317.1	208.0	143.0	108.1
2002	766.2	305.6	226.6	151.0	101.4
2003	814.5	314.6	228.7	181.4	104.7
2004	1005.0	322.8	283.9	220.2	104.2
2005	982.9	331.8	288.0	205.0	110.3
2006	1110.2	310.2	356.2	199.7	109.1
2007	1261.5	306.0	429.9	204.0	103.7
2008	1285.2	304.5	405.9	222.2	102.9
2009	1123.1	300.0	346.4	209.3	103.6
2010	1294.9	283.6	302.7	244.0	113.1
2011	1738.1	286.7	465.1	329.9	106.3
2012	1924.7	304.2	516.0	325.5	105.9
2013	2177.4	318.1	572.8	346.3	103.3
2014	2516.5	332.8	605.7	387.8	98.3
2015	2641.7	353.4	550.0	395.4	106.4
2016	2598.3	294.5	486.7	391.8	97.7
2017	2865.3	242.3	469.3	439.3	102.1
2018	2675.0	277.9	415.8	477.1	103.0
2019	2478.4	227.9	410.9	442.4	100.2
2020	2465.4	222.8	399.5	433.8	98.4
2021	2702.1	227.2	469.1	519,2	103,4

The following calculations have been made:

y_t - agricultural productivity in the t year, thousand drams/person,

x_{1t} - sowed areas of agricultural crops in the t year, thousand hectares,

x_{2t} - the gross product of plant breeding in the t year, bln. AMD,

x_{3t} - the gross product of animal husbandry in the t year, billion drams,

x_{4t} - is the index of tariffs for agricultural services in the t year, %.

The influence of the mentioned factors on the level of agricultural productivity of RA in 2000-2021 is presented using a multivariate linear regression model:

$y_t = a_0 + a_1x_{1t} + a_2x_{2t} + a_3x_{3t} + a_4x_{4t} + e_t$ (11) where

$y_t; x_{1t}; x_{2t}; x_{3t}; x_{4t}$ are the actual levels of outcome and factor attributes in t year

$\mathbf{a_0; a_1; a_2; a_3; a_4}$ - parameters estimated by the method of least squares,

e_t - is the effect of random factors not included in the model.

In multivariate analysis, partial elasticity coefficients are calculated, which show how much a one percent increase in a factor attribute changes the outcome attribute:

$E_k = a_k \times \frac{\overline{x_k}}{y}$ (12) [Ekonometrica, 2014, 39-53].

Below the results of the regression analysis between the studied phenomena are presented in the table.

Table 4. 2000-2021 The results of the regression analysis between the agricultural productivity of RA, agricultural crops, gross crop production, gross livestock production and agricultural services tariff index

Indicators	**Results**
Multiple correlation coefficient	$R = 0.987$
The coefficient of multiple determination	$R^2 = 0.973$
The regression model	$\hat{y}_t = 418.8 + 1.327x_{1t} + 1.103x_{2t} + 5.618x_{3t} - 11.$
Coefficient of partial elasticity	$E_1 = 0.228,$ $E_2 = 0.251,$ $E_3 = 0.985,$ $E_4 = -0.709$
Significance of regression coefficients	$a_1(p - value = 0.360),$ $a_2(p - value = 0.03),$ $a_3(p - value = 3.56E - 08),$ $a_4(p - value = 0.235)$
Significance of the model	$F = 155.2(signif. = 3.84E - 13)$

According to the results of the analysis presented in Table 4, a close relationship was formed between the indicators we are studying (**R = 0.987**). According to the calculated coefficient of determination, 2000-2021. About 97.3% of the fluctuations in the level of agricultural productivity of RA are due to the joint fluctuations of the factors included in the model (**R^2 = 0.973**), and the remaining 2.7% are the effects of other and random factors. The performed regression analysis can be considered significant
($F = 155.2 (signif. = 3.84E - 13)$).

According to the constructed multivariate regression model, 2000-2021. Along with the increase of agricultural crops by one thousand hectares, the level of agricultural productivity increased by 1.327 thousand. drams/person (**a_1 = 1.327**), the increase of the gross product of plant breeding by 1 billion drams contributed to the productivity of agriculture to the increase of 1.103 thousand dram/person (**a_2 = 1.103**), and in addition to the increase of the gross output of animal husbandry by 1 billion drams, the productivity level of agriculture increased by 5.618 thousand drams/person (**a_3 = 5.618**). In the studied years, the increase of agricultural services index by 1 percentage point led to the level of agricultural productivity of 11,651 thousand drams/person reduction (**a_4 = 11.651**.

Table 5. Wheat yield in RA and individual indicators (factors) affecting it in 2000-2021.

years	wheat yield, t/ha	wheat exporter's price per 1 kg for last year, drams	gross wheat yield, thousand ton	Agricultural services tariff index compared to the previous year, %	USD exchange rate, AMD
2000	16.6	95	177.8	109.9	555.08
2001	22.3	88	241.7	108.1	535.06
2002	23.9	92	284.7	101.4	573.35
2003	17.2	79	216.7	104.7	578.77
2004	23.4	107	291.6	104.2	533.45
2005	20.3	111	258.4	110.3	457.69
2006	14.6	82	146.5	109.1	416.04
2007	25.8	88	254.2	103.7	342.08
2008	24.3	104	225.7	102.9	305.97
2009	22.4	121	198.1	103.6	363.28
2010	21.2	96	183.5	113.1	373.66
2011	28.8	121	224.1	106.3	372.5
2012	26.5	139	243.1	105.9	401.76
2013	30.8	158	311.6	103.3	409.63
2014	31.8	162	338.2	98.3	415.92
2015	31.3	142	362.7	106.4	477.92
2016	30.7	118	350.4	97.7	480.49
2017	21.8	111	176.4	102.1	482.72
2018	28.2	114	187.5	103	482.99
2019	19.6	113	112.6	100.2	480.45
2020	22.5	126	132	98.4	489.01
2021	16.8	130	97.2	103.4	503.77

The calculated partial elasticity coefficients showed that in 2000-2021. Along with the one percent increase in the cultivated areas of agricultural crops, the level of agricultural productivity increased by 0.228% (**E_1 = 0.228**), the one percent increase in the gross output of crop production contributed to the increase in agricultural productivity by 0.251% (**E_2 = 0.251**), and the level of agricultural productivity paralleled with the one percent increase in the gross output of livestock breeding increased by 0.985% (**E_3 = 0.985**). In the studied years, a one percent increase in the tariff index of agricultural services led to a reduction in the level of agricultural productivity by 0.709% (**E_4 = -0.709**).

We also consider it necessary to address the quantitative impact of various factors on such indicators that characterize the competitiveness in the crop and animal husbandry branches of agriculture, such as yield and grain yield indicators. We consider the yield of wheat as the most important crop. Baseline data on wheat yield and factors influencing it are presented in Table 5.

The following designations were made for factors affecting wheat yield:

y_t - wheat yield level, c/ha, in t year,

x_{1t-1} - price of one kg of wheat offered by wheat producers, drams, in t-1 year,

x_{2t} - gross wheat production, thousand. tons, in t year,

x_{3t} - is the tariff index of agricultural services, %, in t year,

x_{4t} - The average annual exchange rate of 1 US dollar, AMD, in t year.

The influence of the mentioned factors on the level of wheat yield in the Republic of Armenia in 2000-2021 is presented using a multivariate linear regression model (table 6).

Table 6. 2000-2021 The results of the regression analysis between the level of wheat yield in RA, the price per kg of wheat by producers in previous year, the gross output of wheat, tariff index of agricultural services, the average annual exchange rate of 1 USD

Indicators	Results
Multiple correlation coefficient	$R = 0.903$
Coefficient of multiple determination	$R^2 = 0.816$
The regression model	$\hat{y}_t = 43.04 + 0.066x_{1t-1} + 0.04x_{2t} - 0.28x_{3t} - 0.015x_{4t}$
Coefficient of partial elasticity	$E_1 = 0.316,$ $E_2 = 0.4,$ $E_3 = -1.235,$ $E_4 = -0.301$
Significance of regression coefficients	$a_1(p - value = 0.02),$ $a_2(p - value = 3.84E - 05),$ $a_3(p - value = 0.07),$ $a_4(p - value = 0.04)$
Significance of the model	$F = 18.88(signif. = 4.41E - 06)$

According to the results of the analysis presented in Table 6, a close relationship was formed between the indicators we are studying ($R = 0.903$). According to the calculated coefficient of determination about 81.6% of the variations in the wheat yield level in RA 2000-2021 are due to the joint variations of the factors included in the model ($R^2 = 0.816$), and the remaining 18.4% are the effects of other and random factors. The performed regression analysis can be considered significant

$(F = 18.88(signif. = 4.41E - 06))$.

According to the constructed multivariate regression model the increase in the price of wheat in 2000-2021per kg offered by wheat producers in the previous year by one dram contributed to the increase of the wheat yield level by 0.066 t/ha in the given year

($a_1 = 0.066$), the gross wheat harvest was thousand. The increase in tons contributed to the increase of the wheat yield level by 0.04 c/ha ($a_2 = 0.04$), and the increase of one percentage point of the agricultural services tariff index led to the reduction of the wheat yield level by 0.28 c/ha ($a_3 = -0.28$).

In the studied years, the increase of the average annual exchange rate of 1 US dollar by one dram led to the reduction of the wheat yield level by 0.301 t/ha

($a_4 = -0.301$).

The calculated partial elasticity coefficients showed that in 2000-2021 in parallel with a one percent increase in the price of wheat per kg offered by wheat producers in the previous year, the level of wheat yield increased by 0.316% in the following year

($E_1 = 0.316$), a one percent increase in the total wheat harvest contributed to an increase in the level of wheat yield by 0.41% ($E_2 = 0.4$), and agricultural parallel to the one percent increase in the service price index, the level of wheat yield decreased by 1.235% ($E_3 = -1.235$). In the studied years, a one percent increase in the average annual exchange rate of the US dollar led to a 0.301 percent reduction in wheat yield ($E_4 = -0.301$).

Also, we have tried to quantitatively evaluate the influence of the most important index defining the competitiveness of livestock breeding, the factors affecting the average annual milk yield of cows. The econometric calculations show that there is a statistical relationship between not all the considered logical factors and the average annual milk yield of cows. The values of the average annual milk yield of cows and factors statistically related to it are presented in table 7. The agricultural services tariff index is also included in the mentioned factors (presented in table 5).

y_t - the average annual milk yield of one cow in the t year, kg,

x_{1t} - average annual sale price of one liter of milk producers in t year, drams,

x_{2t} - the index of livestock vaccination rates in the t year compared to the previous year,%,

x_{3t} - is the index of tariffs for agricultural services compared to the previous year, % in t year.

Table 7. Average milk yield of cows in RA and individual factors (indicators) affecting it in 2000-2021.

Dates	Average milk yield of cows, kg	Average annual selling price of 1 liter of milk producers	AMD Village: animal vaccination price index, %
2000	1668	103	71.7
2001	1685	102	126.8
2002	1708	98	123.7
2003	1728	101	95.5
2004	1772	100	85.8
2005	1877	101	98.9
2006	1890	107	116.2
2007	1957	112	102.2
2008	1992	115	105.6
2009	2027	105	129.3
2010	2035	114	97.1
2011	2035	163	130.5
2012	2036	143	87.7
2013	2054	145	209.2
2014	2102	162	140.1
2015	2144	146	98.8
2016	2192	137	92.1
2017	2260	145	98.5
2018	2310	152	96.2
2019	2365	144	93
2020	2398	148	90.9
2021	2435	155	94.8

The results of the regression analysis between the average annual milk yield of one cow in RA in 2000-2021, the average annual price of 1 liter of milk producers, the index of livestock vaccination rates, index of agricultural services rates are presented in table 8.

According to the results of the analysis presented in the table, a close connection has been formed between the indicators we study (**R = 0.858**). According to the calculated coefficient of determination, 2000-2021. About 73.7% of the variation in the average annual milk yield of one cow in RA is caused by the joint variation of the factors included in the model ($\mathbf{R^2 = 0.737}$), and the remaining 26.3% is the effect of other and random factors. The performed regression analysis can be considered significant

($\boldsymbol{F = 16.8(signif. = 1.87E - 05)}$).

According to the constructed multivariate regression model, in parallel with the increase in the average annual price of one liter of milk producers by one dram in 2000-2021, the average annual milk yield level of cows increased by 7.811 kg ($\mathbf{a_1 = 7.811}$), in parallel with the increase in the index of livestock vaccination rates by one percentage point, the average annual milk yield level of cows decreased by 1.598 kg ($\mathbf{a_2 = -1.598}$) . In the studied years, the average annual milk yield level of cows decreased by 11,182 kg in parallel with the increase of the tariff index of agricultural services by one percentage point in RA ($\mathbf{a_3 = -11.182}$).

Table 8. The results of regression analysis between the average annual milk yield of 1 cow in 2000-2021, the average annual selling price of 1 liter of milk producers, the tariff index of livestock vaccinations, the tariff index of agricultural services

Indicators	Results
Multiple correlation coefficient	$R = 0.858$
Coefficient of multiple determination	$R^2 = 0.737$
The regression model	$\hat{y}_t = 2387.5 + 7.811x_{1t} - 1.598x_{2t} - 11.182x_{3t}$
Coefficient of partial elasticity	$E_1 = 0.486,$ $E_2 = -0.085,$ $E_3 = -0.572$
Significance of regression coefficients	$a_1(p - value = 2.75E - 05),$ $a_2(p - value = 0.14),$ $a_3(p - value = 0.18),$
Significance of the model	$F = 16.8(signif. = 1.87E - 05)$

The calculated partial elasticity coefficients showed that in 2000-2021 a one percent increase in the average annual selling price of one liter of milk contributed to an increase in the average annual milk yield of cows by 0.486% ($E_1 = 0.486$), a one percent increase in the index of livestock vaccination rates led to a decrease in the average annual milk yield of cows by 0.085% ($E_2 = -0.085$), and a one percent increase in the agricultural services tariff index in RA led to a decrease in the average annual milk yield of cows by 0.572% ($E_3 = -0.572$).

Designation and calculation of the integral index of agricultural competitiveness

The above-mentioned indicators and methods for assessing the competitiveness of agriculture, despite their importance, do not provide a complete quantitative picture of the competitiveness of agriculture. In this case, we consider important to propose an integral index characterizing the competitiveness of agriculture. For the latter, we considered it necessary to propose a system of indicators related to various aspects of agricultural competitiveness, which should be a starting point for proposing and calculating an integral indicator of agricultural competitiveness.

Based on our studies, taking into account the availability of a specific indicator and the fact that it is a characteristic of different aspects of competitiveness, we propose the following system of indicators. The description of the mentioned indicators and the corresponding designations are presented below:

1. The agricultural production volume index (%), APVI.
2. The share of agriculture in gross domestic product (%), SAGDP.
3. The share of employees in agriculture (producers of marketable products) among the total number of people employed in the country (%), SGEA.
4. The share of agricultural crediting in the total volume of crediting of the country's economy (%), SACTVC.
5. The weighted average level of agricultural commercialization (%), WALAC.

6. The average level of self-sufficiency of priority necessary food products included in the national food balance of RA, estimated by energy value (%), ALSEEV.
7. The share of the value of exported agricultural products in the value of the gross agricultural product (%), SEAPGAP.
8. The share of agricultural commercial organizations among the total economic entities in agriculture (%), SACO.

Taking these indicators as a starting point, for calculating the integral index of agricultural competitiveness according to individual years, we offer their mean square formula (designation: IICAt integral index of agricultural competitiveness), which will look like this:

$$IICAt = \sqrt{\frac{APVI^2 + SAGDP^2 + SGEA^2 + SACTVC^2 + WALAC^2 + ALSEEV^2 + SEAPGAP^2 + SACO^2}{8}} \quad (13)$$

For the calculation of the integral indicator of competitiveness, we considered it appropriate to consider it based on the indicators of the last 10 years, in order to be able to more thoroughly assess the trends of the change in competitiveness. For the baseline data, some of which are calculated, the data of the website of the RA Statistics Committee (https://www.armstat.am/am/) and the website of the RA Central Bank (www.cba.am) were the source of information. The baseline data for calculating the integral indicators of agricultural competitiveness according to the considered years (2013-2022) and the calculated integral indicators of competitiveness are presented in Table 9.

Table 9. Baseline data for calculating the integral indicator of the competitiveness of RA agriculture and the integral indicators of agricultural competitiveness calculated on their basis for 2013-2022, (percentage)

INDEX DESIGNATION	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
APVI	107.1	106.3	108.4	96.2	97.2	92.8	95.9	103.2	99.1	100.4
SAGDP	18.4	18.1	17.2	15.9	14.9	13.9	11.5	11.3	11.3	10.4
SGEA	26.9	25.4	25.2	22.8	23.1	24.8	21.9	21.8	21.8	22.0
SACTVC	8.08	8.51	8.79	7.86	6.82	6.08	5.66	4.94	6.74	6.71
WALAC	56.4	56.2	58.6	57.3	56..7	56.5	56.3	57.2	57.0	57.3
ALSEEV	60.82	61.96	63.08	64.50	54.13	51.40	47.48	44.09	44.75	47.07
SEAPGAP	2.5	1.6	1.7	3.3	2.9	4.4	5.6	7.9	9.6	8.5
SACO	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143
The integral indicator of the competitiveness of agriculture IICAt	49.35	49.19	50.22	46.83	45.28	43.75	43.73	45.49	44.46	45.12

** The data on this baseline indicator is not available for the considered years. Therefore, we have taken as a basis the data of the period of observation of the data of the comprehensive registration of agriculture of the Republic of Armenia (2014).*

The results of the calculation of the proposed integral indicator of agricultural competitiveness show that the competitiveness had a fluctuating characteristic during the observed period – in 2013-2014. It had decreased somewhat, then had an increasing trend and in 2015 the highest index of the observed period was recorded (50.22%), then dec-

reased until 2019, and the lowest level was recorded in 2019. Then in the following year it had an upward trend and fluctuated somewhat in the following two years. Then we considered it appropriate to estimate the average level of the integrated indicator of agricultural competitiveness for the observed years $\overline{\text{IICA}\boldsymbol{t}}$: For the latter, we suggest using the following formula:

$$\overline{\text{IICA}\boldsymbol{t}} = \sqrt{\frac{\text{IICA}\boldsymbol{1}^2 + \text{IICA}2^2 + \text{IICA}3^2 + \text{IICA}4^2 + \cdots \ldots \ldots + \text{IICAn}^2}{n}} \quad (14)$$

Here n is the number of years observed (n=10).

Inserting the relevant data into the formula, we get the following: $\overline{\text{IICA}\boldsymbol{t}}$ = **46.60 %**

In fact, in the observed period in 2017 and after that, the integral indicators of agricultural competitiveness were lower than the average level of these indicators.

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

1. The policy conducted in the agricultural sector has had a positive impact on the competitiveness of the sector with the demonstrated budgetary allocations, but this impact is weak.

2. Characterizing the separate or joint effect of various factors on the results indicators of the competitiveness of RA agriculture in 2000-2021, the results of the regression analysis allow us to conclude that the unit volume increase of the parameters characterizing the magnitude of these factors had an impact on the indicated indicators in different directions and sizes, and the fluctuations of the latter magnitudes to a greater or lesser extent were due to the combined influence of individual factors.

3. In all the years of the observed period, the integral indicators of agricultural competitiveness were below the average and were characterized by variable dynamics, and in 2017 and after that, the integrated indicators of agricultural competitiveness were below the average level of these indicators.

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Lusine TSPNETSYAN

Quantitative evaluation of the influence of individual factors on the result indicators characterizing the competitiveness of RA agriculture and the integral indicator of that competitiveness

Key words: agriculture, competitiveness, indicators, factors, integral index, budget allocations, agricultural output index, productivity, gross output, agricultural commodity, agricultural services tariff index, producer price.

It is impossible to get a comprehensive understanding of the impact of the factors determining the competitiveness of agriculture without a regression model and a quantitative assessment of that impact using econometric calculations, which allows to izolate the factors that have a greater or lesser impact. However, the range of result and factor indicators that have a statistical relationship with the competitiveness of the Republic's agriculture is not comprehensive (taking into account that not all of them may have such a relationship), which limits the possibilities of quantitative assessment of the joint impact of all factors on the said competitiveness. In this case, it is necessary to limit to the quantitative assessment of the impact of specific factors on individual characteristics of agricultural competitiveness. Taking into account the special role of the state policy factor in increasing the competitiveness of agriculture in terms of creating the necessary conditions and a favorable environment, the article highlighted and revealed the individual characteristics of the competitiveness of RA agriculture in the studied period: the value of the gross production of agriculture, the index of the volume of agricultural products, the productivity and commodity of agriculture, the statistical relationship between the level and the factor of budgetary allocations to agriculture considered as the bearer of the above-mentioned policy as a result of regression analysis.

FINANCIAL STATEMENTS OF THE FOOD INDUSTRY IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

Nonna KHACHATRYAN
Ph.D., associate professor at YSU
Qnarik KHACHATRYAN
ASUE lecturer

Key words: food processing, financial reporting, sustainable development indicators, SASB standards

Introduction. In practice, it is not always possible to represent the results of the business process with the principles of sustainable development in the reports published by commercial organizations with financial indicators, and that is why the disclosures presented in the reports with non-financial indicators, which in turn require standardization, are currently being activated [Alekseeva, et al., 2022, 57]. Currently, the international accounting standards for the publication of sustainable development information have been put into use, in which the key objectives of the disclosure of information on the results of the business process with the principles of sustainable development are emphasized [IFRS S1, 2022]. Organizations in particular are challenged to inform reporting stakeholders what strategic sustainability risk management model is in place, how sustainability risks and opportunities are targeted, and most importantly, how the risk management process is implemented. Financial information disclosures related to cash flows, access to financing, and changes in the cost of capital are also highlighted. In particular, the organization should reveal quantitative and qualitative information about how the risks and opportunities related to sustainability have affected the financial condition of the economic activity, financial results and cash flows during the reporting period [FRS S1, 2022].

Methodology. The collection of information related to sustainable development in organizations is most effective in the accounting system, when special metrics related to environmental protection are used. Here, the methodological problem arises to present those metrics with value designations, which will then be used in the accounting information system. Accountability of sustainable development results also contains methodological problems. In particular, the question arises as to how to integrate financial and non-financial information in one report. In this regard, in the last decade, the International Accounting Federation has presented many methodological developments, even publishing international accounting standards related to sustainable development.

Literature review. The issues related to financial statements and accountability of the food industry in the context of sustainable development are widely discussed in economic literature. We have mainly considered the works of Alekseeva I. and Popova E., who

concentrate more on standardization of disclosing information in non-financial accountting of commercial organizations [Alekseeva, et al., 2022, 57-67], as well as Melnik M. [Melnik, 2019, 58-64], discusses the entire system of indicators designed for the integrated accounting. While examining financial sttatements and accountability we pay keen attention to IFRS S1 general requirements for disclosure of sustainability-related financial information and the sustainability accounting standard for the processed foods and sustainability accounting standards.

Analysis. It should also be emphasized that, in practice, solutions to the problem of measuring non-financial indicators reflecting the process of sustainable development of organizations are proposed. To this end, the Sustainability Accounting Standards Board (SASB) was established in 2011 as a non-profit, standards-setting organization whose mission is to create and develop industry-specific standards that help stakeholders in sustainable development to obtain reliable information in an organized manner. about the risks and opportunities in the organizations, to assess the environmental, social, and administrative risks on changes in the capital, cash flows, and financial results of the organizations in the short-term, medium-term, and long-term, using criteria developed based on the specifics of the industry. Currently, the SASB standards define subsets of environmental, social and environmental issues most relevant to financial performance and enterprise value for 77 industries, including the food industry. SASB standards present sustainability information that interprets how a business generates financial results and increases the value of its capital [IFRS S1, 2022]. In particular, the "Food Processing" SASB standard requires comments related to the value chain of the business model. Food companies use a significant amount of agricultural inputs, much of which is produced under the influence of drought or is otherwise subject to changing weather patterns [SASB, 2017, 132]. This effect may lead to inflation and may affect the company's financial results. Finally, climate change, water scarcity, and land use restrictions pose risks to the company's long-term operations. Furthermore, agricultural raw materials from suppliers whose production complies with social and environmental principles give food processing companies the assurance that their products are released in a way that reduces the risk of reputational damage.

Findings related to agricultural supplies to the food industry in terms of compliance with social and environmental requirements are particularly important. Moreover, they should make up at least 80% of the volume of agricultural raw materials supplies. Attention is paid to the evaluation of the results of the use of energy-saving technologies in the supply sector. Taking into account all this, SASB standards present indicators that make it possible to make non-financial information measurable, transfer it to the field of comparability and present it in published reports (see table 1).

Table 1. Non-financial indicators of sustainable development of food industry organizations [1]

Non-financial indicators	Measuring
Saving of used water resources	Technical
Improvement of quality properties of supplied raw materials	Technological
Waste processing	Technological
Implementation of energy-saving technologies	Technical
Maintaining the health of the workforce	Sociological
Increasing equity in business value chain	Economical
Ensuring the safety of food sold	Healthcare

It should be noted that the integrated reports of food industry results in the budgeting system are mostly related to financial information. Moreover, if to some extent the obvious losses related to the sustainable development of the organization are included in the management accounting system, then the corresponding "hidden" losses arising from economic transactions, as a rule, in business, they generally bypass the accounting system.

In this sense, in the professional literature, the definition and application of eco-carriers in food industry organizations is proposed as a solution to this problem. In this case, they comment on how much damage was done to the environment as a result of the economic operation, how this damage was compensated in the reporting period, and on what principle (separately or integrated) is presented the sustainable development of business. Disclosure information in the entity's published financial statements. Moreover, the structure of repeated registration of the results of activities aimed at sustainable development requires the use of special accounts from food processing organizations, due to which, according to the monetary scale, on the one hand, reporting the volumes of consumption of natural resources in the period, and on the other hand, the contribution of the organization in the field of their restoration [Melnik, 2019, 58].

Therefore, eco-drivers act as additions to the expenditure streams, which form ESG assets and sustainable development-supporting activities in the financial statement of organizations. And if these assets are recorded in the accounting period with double registration in the financial accounting system, then the liabilities formed against them can be paid off within several years. Therefore, every transaction related to ESG developments is recorded with eco-drivers, on the one hand reducing the profit of the organization, on the other hand creating liabilities. It is on this principle that specialized literature recommends publishing integrated reports of financial results by organizations.

[1] Sustainability accounting standard | processed foods |, SASB 2017, pages 3-5

The authors also express the opinion that reports published by organizations cannot give a complete picture of the formation of financial results if they do not integrate financial and non-financial information. Moreover, it is even encouraged by the organizations to publish reports within the framework of ecosystems, which specifically record what services the environment provides to the economic activity and instead, what resources the activity spends on restoring the damages caused to the ecosystem.

Based on all this, we recommend to be guided by financial and non-financial information during the budgeting of financial results, taking into account both the standards for the presentation of financial reports and the standards for the presentation of non-financial information (see Figure 1).

Figure 1. Formation of integrated accountability of financial results of food industry organizations

Conclusions. Thus, in the context of budgeting of financial results in food processing organizations, we highlight a number of approaches to the presentation of integrated reports.

First, during the budgeting of financial results, the component of non-financial results should also be taken into account, thereby creating informational opportunities to make managerial decisions in the range of business model values.

Second, to organize integrated reporting of financial results in such a way that the user of the reports can understand how manageable the revenues and expenses generated by organizations in the business ecosystem become.

Third, organizations should present the integrated information of financial results in a standardized format, based on the sectoral features of ESG standards, which will create an opportunity to conduct comparative analyzes in the competitive field.

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Nonna KHACHATRYAN, Qnarik KHACHATRYAN

Financial statements of the food industry in the context of sustainable development

Key words: food processing, financial reporting, sustainable development indicators, SASB standards

Currently, the activity of organizations is not evaluated only from the point of view of profitability. The evaluation of the activities of organizations contributing to sustainable development is also put in the foreground. Therefore, if the published financial reports in the recent past represented the economic side of the organization's activities and were mainly of interest to private stakeholders, now the public also demands the publication of non-financial reports. The article discusses the methodological issues of preparing reports integrated with non-financial and financial information in food processing organizations and suggests ways to solve them.

MANAGING MULTI-RESIDENTIAL BUILDINGS IN ARMENIA: ADDRESSING CHALLENGES AND SOLUTIONS

Mher OTARYAN
Ph.D. applicant, Faculty of Economics, Yerevan State University

Key words: condominium, housing fund, fiduciary manager, housing maintenance offices (HMO)

Introduction. The modern democratic society assumes the responsibility of public welfare, development of human potential, provision of equal starting conditions for economic activity of all citizens and protection of legal interests of all people. In order to solve these problems, each country creates an appropriate management system over time. Public management is one of the widespread systems of state administration in the modern world, a part of which is local self-government. Improving the living conditions of citizens has a great impact on public welfare. The latter depends on a number of circumstances, one of which is the maintenance and use of the housing stock of apartment buildings. The owners of multi-residential buildings run management structures supporting the building, the inter-floor coverings (ceilings, floors), basements, attics, technical floors, the roof, as well as the entrances serving more than one building and intended for the unified full service of the multi-residential building, stairwells, stairs, elevators, elevator and other wells, mechanical, electrical, sanitary and other equipment and areas that are not the property of other persons in accordance with the law [Law on the Management of Multi-residential Buildings, 2024]. The law also stipulates that all owners of the building are obliged to make appropriate payments for the maintenance of the given areas or fulfill the requirements of the mandatory norms with their own strength and means.

Methodology. The methods of document analysis, abstraction, induction and statistical data analysis and others are used. In the framework of this research, various public and scientific materials were studied. Also, by studying the historical development, their cause-and-effect relationship using the method of combining the historical and the logical were found.

Literature review. The first law on condominiums in Armenia was adopted more than a quarter of a century ago, in 1996. According to the law, the condominium management office had to manage, maintain, repair and maintain the common property of the building's residents, that is, the building's supporting structures, ceilings, floors, basements and attics, roofs and entrances, staircases, elevators and other areas. Prior to the adoption of the law, their maintenance and maintenance was carried out by local government bodies - housing operation sites (HOPs) or so-called "zhek" (Russian: ЖЕК: Жилищно-эксплуатационная контора). The issue of managing multi-residential buildings remains unresolved for all post-Soviet countries. Many researches have been carried out related to this topic. Some researchers believe that almost all condominium offices have some

receivables. The mechanisms of collecting these debts are still ambiguous and different approaches have been proposed to solve this problem. Some of the researchers believe that it is possible to improve the work of condominium offices through the courts [Asryan, 2019, 159], the other part believes that the buildings should be modernized and overhauled [Busyrev, 2012, 285]. Some of the researchers believe that it is necessary to use the facilities of the buildings to provide additional income for the condominium offices. It is the opportunity to increase the market value of apartments in an apartment building [United Nations, 2014, 10].

Scientific novelty. In the research, a number of results of theoretical, methodological and practical value were obtained, from which the following propositions were presented as scientific novelty: a new mechanism for increased accountability was proposed and proposed to be enshrined in legislation. The condominiums offices can also participate in the grants (subsidies) given by the government, as well as the implementation of the mandatory state training program for the managers of the offices.

Analysis. Condominium management offices are voluntary associations and had to be established by a decision of the founding meeting of owners. However, they were not created voluntarily. The former "zheks" were forcibly transformed into condominiums.

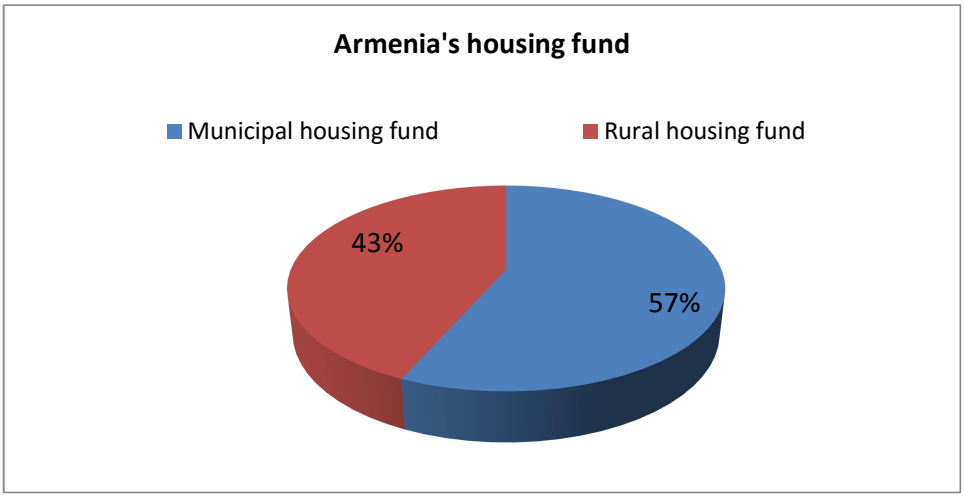

Figure 1. Armenia's housing fund[1]

Condominiums inherited the logic and characteristics of "zheks" in terms of lack of participation and accountability, type, quality, size and other aspects of services. Now some condominiums are so big that the general meeting of the owners would occupy the Republic Square in Yerevan. To this day, they continue to be perceived and act according to the old logic [Melkomyan, 2024]. According to the summary data of the reports re-

[1] The chart is made by the author. The data are taken from the RA Statistical Committee

ceived from the Cadastre Committee of RA communities, condominiums, fiduciary managers and other legal entities, the total area of the RA housing fund in late 2022 was 105.7 mln. m^2, including in cities: 59.8 million. m^2 (56.6%), in villages - 45.9 million. m^2 (43.4%), The statistical report and the 2022 plan of the RA housing fund and communal economy was taken into consideration. The housing fund in the city of Yerevan is 29,966,922 m^2, which is about 50.1% of the RA urban fund, and the smallest part is occupied by the Vayots Dzor region, 682,102 m^2, which is 1.14% of the total [Armstat, 2022]. These data show the distribution of the population and it is natural that the maintenance of these buildings in the city of Yerevan will be more difficult than in the regional regions. In this context, it is necessary to study the housing stock of multi- residential buildings. The total area of the housing stock of multi- residential buildings in late 2022 was 30,157.3 thousand. m^2 or 28.5% of the total area of the Armenia's housing stock. The number of multi- residential buildings was 19,339 units, the number of apartments was 460,803 units. The number of apartment buildings in the city of Yerevan is 5168, which is 26.7% of the total. The housing stock of multi- residential buildings is divided into 2 types according to the form of management: community driven, managed by condominium offices, trust and fiduciary managers. The housing stock of multi- residential buildings (without dormitory stock), in marzes and in Yerevan was a total of 19,157 buildings, of which 11,099 were managed by communities, and 8,058 were managed by condominium offices, trust and fiduciary managers. In general, the model of management by communities is more popular, except for the city of Yerevan.

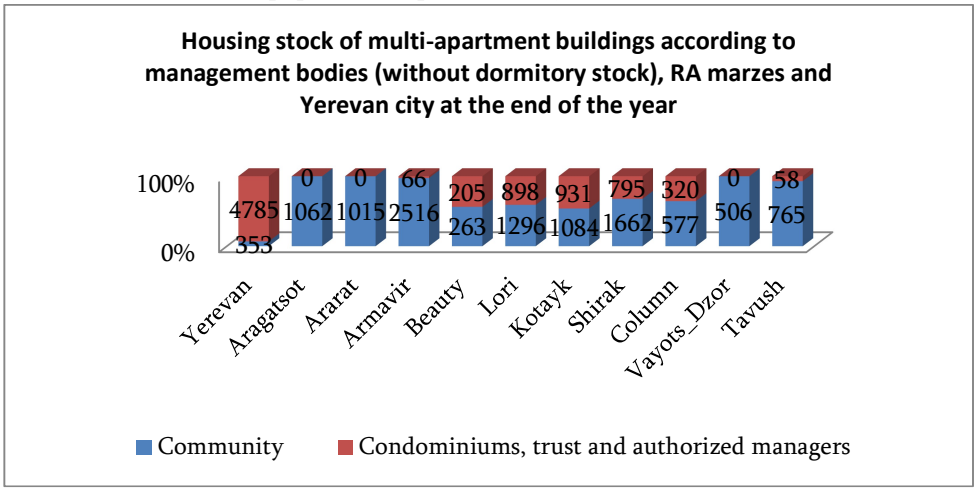

Figure 2. The housing stock of multi-residential buildings according to management bodies (without dormitory fund), end of year in Armenia's marzes and in Yerevan[1]

[1] The chart is made by the author. The data of the Statistical Committee were taken into account, www.armstat.am

This situation is very worrying from the point of view that in parallel with such multi-residential apartment buildings there is very little level of management by condominium, trust and fiduciary managers. Condominiums in Aragatsotn, Ararat, Vayots Dzor marzes can be said to be completely absent. This once again shows that the matter of trust in these structures is quite low, but in the city of Yerevan it is quite high. For a more illustrative presentation, one may consider this framework, which shows that the level of governance by condominiums offices is weaker than governance by communities. Most of the condominiums operate in the city of Yerevan. It makes up about 58.7% of RA condominiums. This is a very worrying number and the question arises as to why the gap between the capital and the marzes is so large. Condominiums have many problems, and first of all, the weak level of accountability, which leads to mistrust of the system, can be singled out. The problem here is at the two-levels: owners of residential buildings in multi-residential apartment buildings are not demanding, condominiums are not interested to be accountable. From this point of view, the lack of information mechanisms is a critical obstacle. Experience has shown that those condominiums offices that have clear accountability mechanisms are able to collect up to 90-95% of the condominium's sums. There are still condominiums offices that take the money and, due to the lack of accounttability, the citizen does not know where the money goes. This problem has a psychological aspect on the one hand, and a financial aspect on the other. Among the transparent and accountable condominiums offices, the example of Noravan and Malatia-Sebastia is more impressive. Noravan condominium is a new generation condominium office. It publishes its expenses and is accountable for the work done. The Malatia-Sebastia condominium office states that it is able to collect up to 90% of the condominium's funds. The main deviation of that 10% comes due to the insolvency of pensioners and families in difficult social status [Armeniasputnik, 2024]. This condominium office circulates among its members both a paper version and an electronic version, which is the key to success. An international study states that for the effective operation of condominiums, 81.2-87.7% revenue collection is necessary [United Nations, 2016, 209]. In our sample condominium office, there are almost no deviations from that range, and the transparency of the above-mentioned accountability contributes to revenue collection. Another important issue is the oldness of the buildings. Most of them have 40 or more years of wear and tear. It is necessary to make large investments for the repair and furnishing of those buildings. Condominiums offices that do not have that high level of trust will have problems in this regard and cannot organize capital repairs for apartment buildings. Thus, most of the buildings are in need of capital repair due to their many years of operation. This problem is combined with the difficult collection of funds from condominiums, which leads to a budget deficit. As a result, condominiums become unviable and at best manage to incur some administrative costs in terms of salaries. Taking into account the above, we propose to implement economic and legal changes and to strengthen the law

"On the management of multi-apartment buildings" by mentioning that for each year the condominium office must notify the members of the condominium electronically, both the initial version of the budget and the implementation. In other words, one unified system should be created. Training programs should be implemented for condominium managers. Regarding subsidies from the RA state budget aimed at the development of economic and social infrastructures of communities, we also suggest that the law be amended so that condominiums can also participate in subsidy programs, simply by paying the community's share from their budget. For example, in the field of renovation of shared ownership of multi-apartment buildings, including energy saving project, the condominiums can pay 35%, the difference will be paid by the government, and the local governments will be responsible for drawing up the documents. As a result of all this, the transparency of budget management will increase and the confidence of condominium members in the structure will increase.

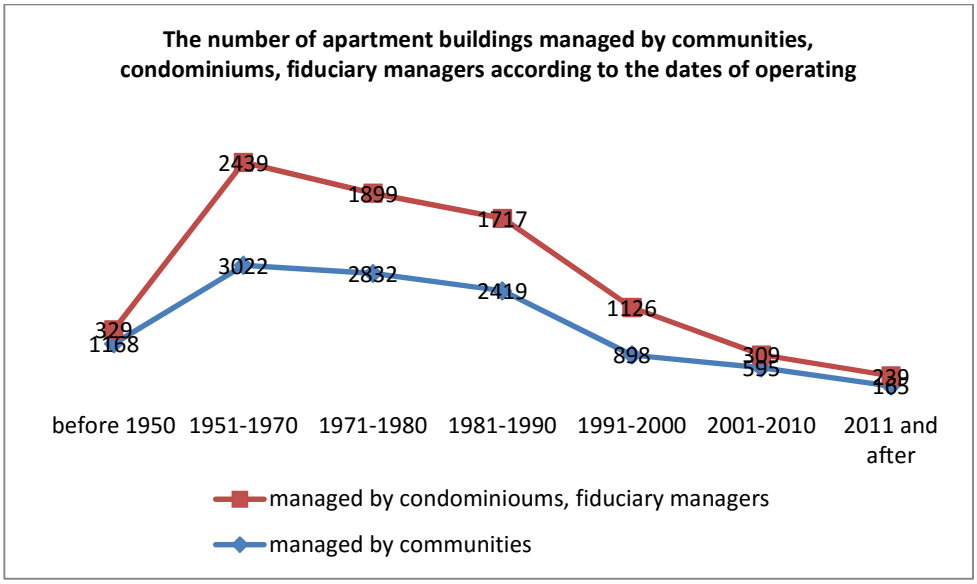

Figure 3. The number of apartment buildings managed by communities, condominiums offices, trust and fiduciary managers according to the dates of commissioning[1]

Conclusion. Thus, it can be seen from the reconstruction that most of the apartment buildings have a history of 40 years or more. There are many problems in those buildings, and most of the problems depend on lack of consistency. There are few accountability mechanisms in condominiums, and less trust from the population. We suggest that

[1] Figure is made by the author. The 2022 data of the RA Statistical Committee was used.

the accountability mechanisms should be clearly stated in the law. In order to make the work of condominiums more transparent, we suggest communities to introduce an electronic management system. It is necessary to organize trainings for other managers by managers of exemplary condominiums and to exchange experience. Most of the buildings are in need of capital repair due to their many years of operation, and this is possible through the provision of subsidies from the state budget. In our opinion, the level of public welfare will increase as a result of proper planning and management.

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Mher OTARYAN

Managing multi-residential buildings in Armenia: addressing challenges and solutions

Key words: condominium, housing fund, trust manager, fiduciary manager, housing development sites (HST)

Public management is one of the widespread systems of state administration in the modern world, a part of which is local self-government. Improving living conditions significantly affects public welfare, with one of the determining factors being the maintenance and utilization of apartment buildings' housing stock. This article highlights the importance of managing and maintaining residential properties to enhance the overall well-being of citizens. The first law on condominiums in Armenia was enacted in 1996. According to this law, condominiums were responsible for managing, maintaining, repairing, and servicing the common property of the building's residents, which includes various structural elements and shared areas such as support structures, ceilings, floors, basements, attics, roofs, entrances, staircases, elevators, and other communal spaces. Before the adoption of the law, the maintenance and upkeep of residential buildings were the responsibility of local government bodies, such as housing operation sites or housing and maintenance offices. In the article, the housing fund of the Republic of Armenia and its management methods are discussed. We discovered that as of 2022, the total area of the housing stock in apartment buildings amounted to 30,157.3 thousand square meters, accounting for 28.5% of the total area of the country's housing fund.

THE ANALYSIS OF FIRST PRICE SINGLE BID AUCTION WITH UNIFORMLY DISTRIBUTED TYPES WITHIN THE SCOPE OF MECHANISM DESIGN THEORY

Vilen KHACNARTYAN
Ph.D. student, Academy of Public Administration
Rafayel PETROSYAN
Ph.D. student, Academy of Public Administration

Key words: mechanism design theory, auction, first price sealed bid auction, dominant strategy, Bayesian Nash equilibrium state, incentive compatibility, social choice function.

Introduction. Mechanism design theory has widespread applications across various fields of economics. The exploration of mechanism design and its market implementations has attracted considerable attention from researchers. The primary aim of mechanism design theory is to develop mechanisms that achieve pre-defined objectives. Mechanism design operates within the constraints of informational asymmetry and individual rationality. In this context, agents act in their self-interest, striving to maximize their utility. Meanwhile, the mechanism designer aims to achieve desirable social and economic outcomes for all parties, guided by specific criteria of interest. Previous studies by the authors have offered the particular solution of the first price sealed bid auction consisting of two agents. The goal of this article is to extend this ana-lysis to the first price sealed bid auction consisting of N agents, employing mechanism design theory as the analytical framework. To achieve the defined goal the following objectives will be addressed:

- analyze the first price sealed bid auction consisting of N agent using the methodology and tools provided by mechanism design theory,
- analze the first price sealed bid auction consisting of N agents employing simulation tools to understand its dynamics,
- identify Bayesian dominant strategies for the agents and determine Bayesian Nash equilibrium of the auction,
- discover social choice function that is implemented by the mechanism of first price sealed bid auction,
- assess the probability of agents winning when they apply Bayesian dominant strategies, considering the type of agent,
- calculate expected utilities of agents and the expected revenue of the seller, providing insights into the auction's efficiency,
- evaluate the impact of increasing the number of agents on various auction performance metrics

The object of the article is the first price sealed bid auction consisting of N agents, and the subject of the article are the problems of design and implementation of the first price sealed bid auction.

Literature review. In recent decades, mechanism design theory has captivated the economic community, boasting both theoretical and practical applications. This theory finds wide-ranging applicability in various markets, organizational processes, and in the design of new auction formats, contracts, jurisdictions, among other areas [Royal Swedish Academy, 2007, 1-19; Jackson, 2014, 1-8]. Particularly notable is the theory's efficiency in auction theory. Mechanism design theory facilitates the analysis and comparison of different auction types, assessing the efficiency of their implementation and application. Leveraging this theory, new auction models have been developed, whose equilibrium states align with the mechanism designer's initial goal function [Milgrom, 2004, 1-62].

Methodology. The article conducts a detailed analysis of the first price sealed-bid auction. In such auctions, all participants submit their bids simultaneously without knowledge of the others' bids. The item is awarded to the participant who submits the highest bid, and this winning bidder pays the price they proposed [Lebrun, 1996, 421-443], [Despotakis, et al., 2021, 888-907]. This analysis specifically focuses on auctions where a single, indivisible item is sold. Within the domain of mechanism design theory, the term θ_i is utilized to represent the type of an agent. This framework facilitates agents in making collective decisions. Prior to engaging in the decision-making process, each agent privately observes a distinct parameter or message, which delineates his preferences and, consequently, influences his utility function. Mathematically, this concept is articulated by incorporating the parameterΘ_i, which is exclusively observed by agent.

In the utility function $u_i(a, \theta_i)$, the inclusion of the θ_i parameter signifies that an agent's type directly affects his preferences and utility function. Specifically, in the context of a first-price sealed-bid auction, the type θ_i indicates an agent's valuation or willingness to pay for the product, whereas Θ_i denotes the set of all possible types [Colell, et al., 1995, 857-897].

$f: \Theta_1 \times \Theta_2 \times \ldots \times \Theta_N \to X$ social choice function defines an alternative $f(\theta) = x \in X$ for each type vector $\theta = (\theta_1, \theta_2, \theta_3, \ldots, \theta_N)$. Social choice function is ex post efficient or Pareto efficient, if for any type vector $\theta = (\theta_1, \theta_2, \theta_3, \ldots, \theta_N)$ there is no alternative $x \in X$, where $u_i(x, \theta_i) \geq u_i(f(\theta), \theta_i)$ for each agent i, and $u_i(x, \theta_i) > u_i(f(\theta), \theta_i)$ for some agent. The social choice function of the first price sealed bid auction is Pareto efficient, if the product is sold to the agent with the highest valuation.

Mechanism $\Gamma = \left(S_1, S_2, \ldots, S_N, g(\cdot)\right)$ is a set of N strategy vectors and $g: S_1 \times S_2 \times \cdots \times S_N \to X$ result function. Each agent observes his θ_i type and based on some S_i strategy sends a message to the mechanism, which makes a collective decision based on $g(\cdot)$

result function and chooses an alternative x from the set of X alternatives. In first price sealed bid auction all the agents privately observe their types and place bids based on a strategy. According to the result function of the mechanism the product is sold to the agent, who placed the highest bid $(y_i(b) = 1\ if\ b_i = \max\{b_1, b_2, \cdots, b_N\}, 0\ otherwise)$, where b_i is the bid of the agent i and b is the vector of all bids. For the auction the alternative also consists of t_i payments, which align the result function of the mechanism with the highest bid $t_i = -b_i \times y_i(b)$. The description of the first price sealed bid auction as a mechanism is given bellow:

(1) $\Gamma = \left(S_1, S_2, \dots, S_N, g(\cdot)\right)$

(2) $s_i \in S_i \in R_+$

(3) $g(b) = x \in X = \begin{bmatrix} y_i(b) = 1\ \text{եթե}\ b_i = \max\{b_1, b_2, \cdots, b_N\} \\ y_i(b) = 0\ \text{եթե}\ b_i \neq \max\{b_1, b_2, \cdots, b_N\} \\ t_i = -b_i \times y_i(b) \end{bmatrix}$

$\Gamma = \left(S_1, S_2, \dots, S_N, g(\cdot)\right)$ mechanism implements the social choice function, if there exists a vector of strategies $(s_1^*, s_2^*, \dots, s_N^*)$, which results in an equilibrium state (Nash equilibrium, Bayesian Nash equilibrium, etc.) for the Γ mechanism [Maschler, et al.,, 2013, 75-313], where the result function and the social choice function are equal $(s_1^*(\theta_1), s_2^*(\theta_2), \dots, s_N^*(\theta_N)) = f(\theta_1, \theta_2, \theta_3, \dots, \theta_N)$.

Γ mechanism is called direct mechanism, when the sets of types and the strategy sets of the agents coincide, and the social choice function is consistent with the result function. Particularly $S_i = \Theta_i$ and $g(s(\theta)) = f(\theta)$. In direct mechanisms the agents directly reveal information regarding their types. While in indirect mechanisms the agents reveal information based on their θ types and S strategies, which is sufficiently different from the types. The first price sealed bid auction is considered as a direct mechanism, because the agents reveal information regarding their types or valuations. The social choice function which is implemented by the first price sealed bid auction is provided in the analysis part of the article. The social choice function f is truthfully implementable (incentive compatibility), [Nissan, et al., 2007, 76-93], if there exists $(s_1^*(\theta_1), s_2^*(\theta_2), \dots, s_N^*(\theta_N))$ strategy vector for the $\Gamma = \left(\Theta_1, \Theta_2, \dots, \Theta_N, f(\cdot)\right)$ direct mechanism, which results in an equilibrium state, where $s_i^*(\theta_i) = \theta_i$ for all $\theta_i \in \Theta_i$ and i. Therefore, the social choice function is truthfully implementable if the truthful revelation of the type by the agents results in an equilibrium state of the mechanism $\Gamma = \left(\Theta_1, \Theta_2, \dots, \Theta_N, f(\cdot)\right)$. The truthful implementation or incentive compatibility of the first price sealed bid auction is evaluated in the analysis part of the article. First price sealed bid auction is not considered to be implementable by dominant strategies, therefore it cannot be truthfully implementable by dominant strategies. Although the first price sealed bid auction does not have a dominant equilibrium strategy, the solution to the problem may be found among Bayesian Nash equilibrium strategies. The strategy of the agent in first price sealed bid auction is depen-

dent on the expectations of the strategies of the other agents, which in their turn depend on their types. The types of agents may be modeled by probability distribution. Based on the abovementioned a conclusion is made, that in first price sealed bid auction the strategies of agents are based on not actual utilities (which is the case under dominant strategies), but on expected utilities. In the framework of mechanism design, a strategy vector$(s_1^*(\theta_1), s_2^*(\theta_2), \dots, s_N^*(\theta_N))$ is recognized as a Bayesian Nash equilibrium strategy for a mechanism $\Gamma = \left(S_1, S_2, \dots, S_N, g(\cdot)\right)$, if for every agent i and for all types θ_i the expected utility from adopting the Bayesian Nash equilibrium strategy exceeds the expected utility from any other strategy [Börgers, et al., 2015, 76-93].

$$(1) \quad E_{\theta_{-i}}[u_i(g(s_i^*(\theta_i), s_{-i}^*), \theta_i)|\theta_i] \geq E_{\theta_{-i}}[u_i(g(s_i'(\theta_i), s_{-i}^*), \theta_i)|\theta_i]$$

$for\ \forall\ i, \theta_i, s', s_{-i}$

In the context of first-price sealed bid auction, rational agents aim to maximize their expected utility. Since the expected utility from the implementation of Bayesian Nash equilibrium strategy is the highest, this strategy is deemed to be the one implemented by rational agents. The mechanism $\Gamma = \left(S_1, S_2, \dots, S_N, g(\cdot)\right)$ implements the social choice function f with Bayesian Nash equilibrium strategy, if there exists Bayesian Nash equilibrium strategy vector $(s_1^*(\theta_1), s_2^*(\theta_2), \dots, s_N^*(\theta_N))$ for the mechanism Γ, which brings the mechanism to the equilibrium state, where the result function is equal to the social choice function $g\left(s^*(\theta)\right) = f(\theta)$ for all $\theta \in \Theta$. If there exists Bayesian Nash equilibrium strategy for the first price sealed bid auction, then the mechanism implements a social choice function [Kephard, et al., 2006, 296-334].

The social choice function is considered truthfully implementable by Bayesian Nash equilibrium strategy (incentive compatible) if the strategy $s^*(\theta) = \theta$ is considered Bayesian Nash equilibrium strategy for a mechanism $\Gamma = \left(\Theta_1, \Theta_2, \dots, \Theta_N, f(\cdot)\right)$. According to the revelation principle, if there exists a $\Gamma = \left(S_1, S_2, \dots, S_N, g(\cdot)\right)$ mechanism, which implements the social choice function f in Bayesian Nash equilibrium, then the social choice function f is truthfully implementable by Bayesian Nash equilibrium.

Scientific novelty. This article utilizes the methodology and tools of mechanism design theory to dissect the first price sealed-bid auction. It presents a general solution applicable to any number of participants and calculates key auction performance indicators. Additionally, it assesses the impact of increasing the number of agents on various auction metrics. These contributions underscore the scientific novelty of the article, showcasing its addition to the existing body of knowledge on auction theory and mechanism design.

Analysis. In the first price sealed bid auction the participants reveal their bids simultaneously. The product is sold to the participant, who revealed the highest bid, and the participant pays that bid. The first price sealed bid auction with one indivisible good is con-

sidered in the article. As mentioned above, the authors have already given the particular solution to the auction for two participants, the conclusions of which are given in the table below.

Table 1. Conclusions regarding first price sealed bid auction with 2 agents

First price sealed bid auction	
Number of participants	2
Bayesian Nash equilibrium strategy	$\frac{\theta_i}{2}$
Equilibrium state	$y_1(\theta) = 0$ եթե $\theta_1 < \theta_2$ $y_2(\theta) = 1$ եթե $\theta_2 > \theta_2$ $y_1(\theta) = 0$ եթե $\theta_2 \leq \theta_1$ $t_1(\theta) = -\frac{1}{2}\theta_1 y_1(\theta)$ $t_2(\theta) = -\frac{1}{2}\theta_2 y_2(\theta)$
Implemented social choice function	$y_1(\theta) = 0$ եթե $\theta_1 < \theta_2$ $y_2(\theta) = 1$ եթե $\theta_2 > \theta_2$ $y_1(\theta) = 0$ եթե $\theta_2 \leq \theta_1$ $t_1(\theta) = -\frac{1}{2}\theta_1 y_1(\theta)$ $t_2(\theta) = -\frac{1}{2}\theta_2 y_2(\theta)$
The mechanism which truthfully implements the social choice function	$t_i = \frac{b_i y_i}{2}$
Probability of winning	θ_i
Expected utility of an agent	1/6 = 0.1667
Expected revenue of the seller	1/3 = 0.3333

In this article the set of agents $I = \{1,2, \ldots, N\}$ is considered, which can be used to find the general solution to the auction not only for two agents, but for any number of agents. It is also viable to evaluate the impact of an increase in the number of participants on Bayesian Nash equilibrium strategies of the agents, equilibrium state, implemented social choice function, mechanism truthfully implementing the social choice function, probability of winning, expected utilities of the agents and expected revenue of the seller.

The X set of mutually exclusive alternatives are considered in the article: $x \in X$. In case of first price sealed bid auction the vector of alternative has the following formulation [Matsushima, 2007, 1-30].

(4) $X = \{(y_1, y_2, \ldots, y_N, t_1, t_2, \ldots, t_N): y_i = \{0,1\}$ *և* $t_i \in R$ *բոլոր i համար,* $\sum_i y_i = 1, \sum_i t_i \leq 0)\}$

The payments t_i made by an agent in an auction is determined by the formula:

(5) $t_i = b_i y_i$,

where b_i represents the bid submitted by an agent. The factor If the agent wins the auction y_i indicates the outcome of the auction for the agent: if the agent wins the auction ($y_i = 1$), they are required to pay their bid $t_i = b_i \times 1 = b_i$. Conversely, if the agent does not win the auction ($y_i = 0$), no payment is made $t_i = b_i \times 0 = 0$.

The utility function of an agent depends on θ_i type, while Θ_i denotes the set of all possible types. θ denotes the vector of types of all agents: $\theta = (\theta_1, \theta_2, \theta_3, \ldots, \theta_N)$. It is assumed that these types are random variables following a continuous uniform distribution) [Kuipers, et al., 2002, 1-85], [Forbes, et al., 2011, 176-182]. θ_i types are normalized over the interval [0,1]. The probability density function and cumulative distribution function of continuous uniform distribution are given bellow:

(6) $f(\theta_i) = \begin{cases} \frac{1}{b-a} = \frac{1}{1-0} = 0.04, \text{հավասար } 0 \leq \theta_i \leq 1 \\ 0, \text{հավասար } 1 \geq \theta_i \text{ կամ } 1 \leq \theta_i \end{cases}$

(7) $F(\theta_i) = \begin{cases} 0, \text{հավասար } 1 \geq \theta_i \\ \frac{\theta_i - 0}{1-\theta_i}, \text{հավասար } 0 \leq \theta_i \leq 1 \\ 1, \text{հավասար } 1 \leq \theta_i \end{cases}$

In the framework of a first-price sealed bid auction, the mechanism can be represented as follows, considering N number of agents, the set of strategies consists of N objects: $\Gamma = \big(b_1(\theta_1), b_2(\theta_2), \ldots, b_N(\theta_N), g(\cdot)\big)$. Each agent i observes their own type θ_i (it is a private information known only to them) and places a bid according to b_i function. The problem of an agent in first price sealed bid auction is to maximize their expected utility by choosing a strategy function b_i:

(8) $\max((\theta_i - b_i(\theta_i))F(b_i(\theta_i))$

(9) $F(b_i(\theta_i) = Prob(b_i \geq b_{-i})$

(10)
$\max((\theta_1 - b_1(\theta_1))F(b_1(\theta_1))$
$\max((\theta_2 - b_2(\theta_2))F(b_2(\theta_2))$
...
$\max((\theta_N - b_N(\theta_N))F(b_N(\theta_N))$

The agent i chooses a strategy b_i to maximize the multiple of utility and the probability of winning. The problem of an agent is an optimization problem, which is formulated bellow, and is solved by the first order differentiation:

(11) $\max((\theta_i - b_i(\theta_i))F(b_i(\theta_i)^{N-1}) = \max((\theta_i - b_i(\theta_i))(\frac{b_i(\theta_i)-0}{1-0})^{N-1})$

(12) $(\theta_i b_i(\theta_i)^{N-1} - b_i(\theta_i) b_i(\theta_i)^{N-1})' = (\theta_i b_i(\theta_i)^{N-1} - b_i(\theta_i)^N)'$

(13) $(N-1)\theta_i b_i(\theta_i)^{N-2} - N b_i(\theta_i)^{N-1} = 0$

(14) $b_i(\theta_i) = \frac{(N-1)\theta_i}{N}$

In the context of an auction with N agents the Bayesian Nash equilibrium strategy is given by $\frac{(N-1)\theta_i}{N}$. . Notably, an auction involving two agents represents a specific instance of this general formula. When $N = 2$ the strategy simplifies to $\frac{(N-1)\theta_i}{N}$ simplifies to $\frac{\theta_i}{2}$, aligning with the previously identified Bayesian Nash equilibrium strategy for two-agent auctions. This analysis underscores a viable insight: as the number of agents increases, the bids submitted tend to be higher. The rationale behind this trend is that with more participants, the probability of winning the auction diminishes, which in turn reduces the expected utility for each agent. To counteract this decrease in expected utility, agents are motivated to place higher bids.

The relationship between the number of agents and their bidding strategies, with types normalized within the interval [0,1], is illustrated in Figure 1. It is clear from the figure that the disparity in bids intensifies for higher types. Figure 1 displays the bids of agents in auctions comprising 2, 3, 4, 5, and 6 agents, demonstrating the progression of bidding behavior as the auction becomes more competitive.

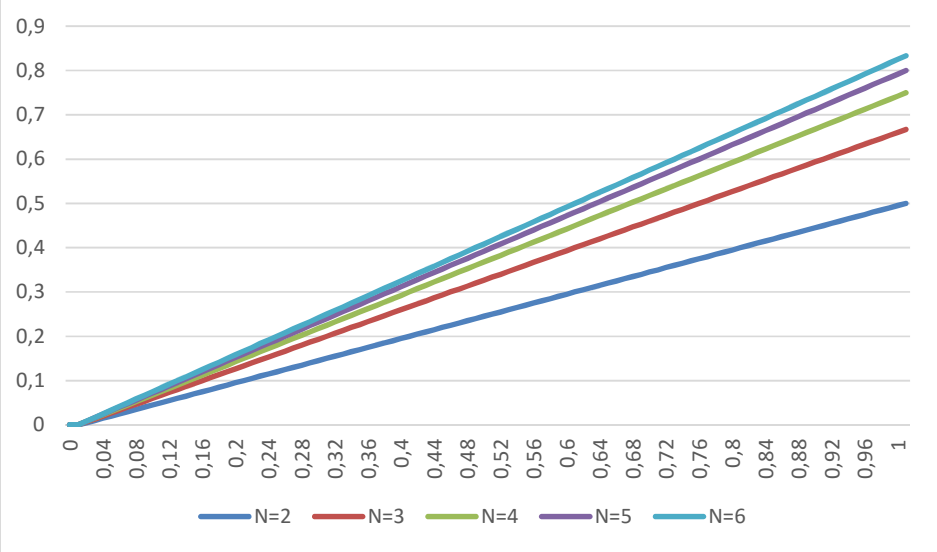

Figure 1. The placed bids in a first price sealed bid auction consisting of 2-6 participants

The bids placed in auctions featuring 10, 20, 30, 50, and 100 agents are illustrated in Figure 2. According to the analysis it can be stated that as the number of agents increases the Bayesian Nash equilibrium strategy increasingly aligns with incentive-compatible strategy. The implementation of the Bayesian Nash equilibrium strategy in the auction consisting of N agents results in an equilibrium state provided bellow:

(15) $y_i(\theta) = 1$ ако $\theta_i \geq \max(\theta_{-i})$

$y_i(\theta) = 0$ ако $\theta_i < \max(\theta_{-i})$

$t_i(\theta) = -\frac{(N-1)}{N}\theta_i y_i(\theta)$

Considering that the placed bids $-\frac{(N-1)}{N}\theta_i$ are higher in case of more participants, it can be stated that the increase in the number of agents will lead to increased payments. Therefore, the mechanism $\Gamma = (S_1, S_2, \dots, S_N, g(\cdot))$ implements the social choice function f, which is represented by the formula (16) with Bayesian Nash equilibrium strategy. It is also evident, that the first price sealed bid auction consisting of N agents is not incentive compatible. More particularly, the agent having the type θ_i prefers not to reveal his true type θ_i, but another $-\frac{(N-1)}{N}\theta_i$ type, which results in higher expected utility.

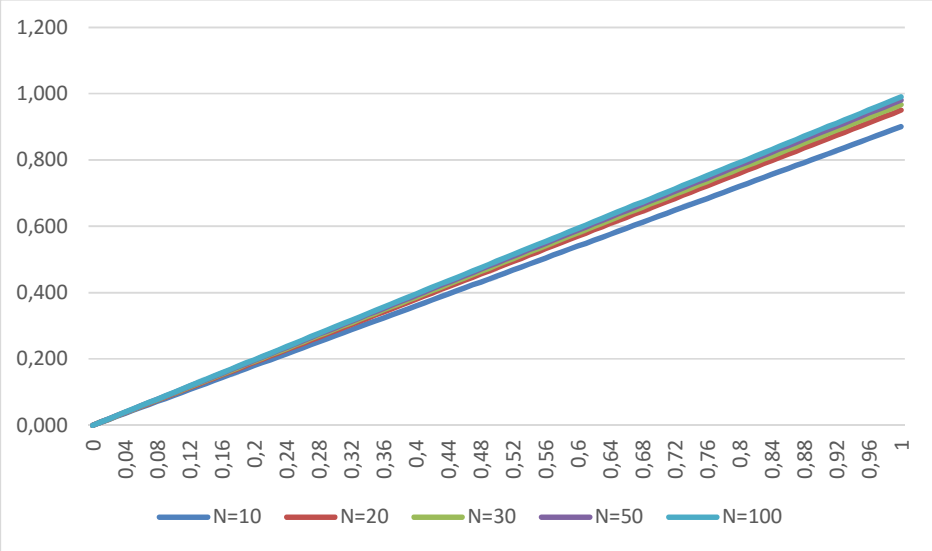

Figure 2. The placed bids in a first price sealed bid auction consisting of 10, 20, 30, 50, 100 participants

If the payment function of the auction, initially defined as $t_i = b_i y_i$, is modified to $t_i(\theta) = -\frac{(N-1)}{N} b_i y_i(\theta)$, then the mechanism $\Gamma = (S_1, S_2, \dots, S_N, g(\cdot))$ achieves truthful implementation. Particularly, the mechanism truthfully implements the social choice function represented in formula (16).

In the end it is also viable to evaluate the impact of an increase of the number of agents in the auction on the expected utilities of the agents and on the expected revenue of the seller from the auction. Having the type θ_i the agent i places a bid and in case of winning pays the price $-\frac{(N-1)\theta_i}{N}$. As the types are random variables with continuous uniform

distribution, the expected utility of an agent is calculated by integrating the utility function and the cumulative distribution function over the interval [0,1].

$$(16)\ \int_0^1 (\theta_i - \frac{(N-1)\theta_i}{N}) F(\theta_i)\, dx = \int_0^1 (\theta_i - \frac{(N-1)\theta_i}{N}) {\theta_i}^{N-1} = \int_0^1 \left({\theta_i}^N - \frac{(N-1){\theta_i}^N}{N} \right)$$

$$(17)\ \int_0^1 \left({\theta_i}^N - \frac{(N-1){\theta_i}^N}{N} \right) = \frac{1^{N+1}}{N+1} - \frac{(N-1)1^{N+1}}{(N+1)N} = \frac{1}{N^2+N}$$

As indicated by formula (18), an increase in the number of agents leads to a reduction in expected utilities. This outcome is directly attributable to the adjusted Bayesian Nash Equilibrium strategy. As the probability of winning decreases with more participants, agents are compelled to submit higher bids. Consequently, winners end up paying a higher price, which, while increasing the cost of winning, diminishes the overall expected utility for each participant.

The seller's expected revenue from the winning agent can be represented by the price $\frac{(N-1)\theta_i}{N}$. Accordingly, the total expected payment to the seller from all participating agents can be expressed as:

$$(18)\ s = -\sum_{i=1}^{N} t_i(\theta) = \sum_{i=1}^{N} \frac{(N-1)}{N} \theta_i y_i(\theta)$$

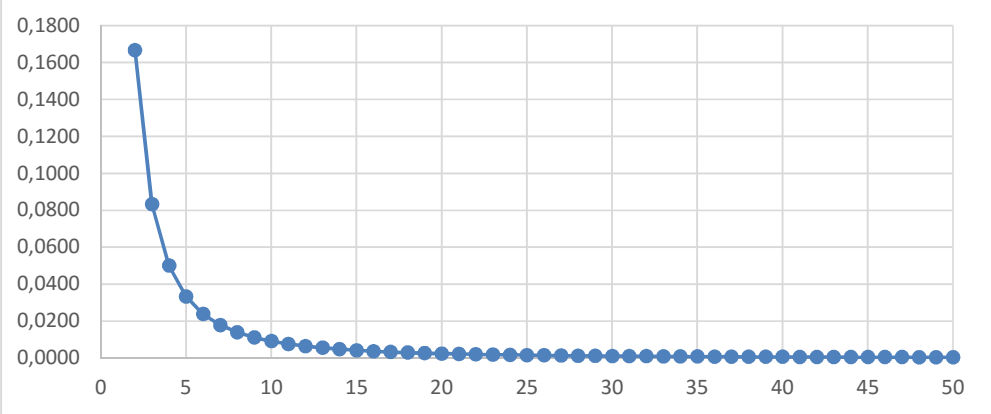

Figure 3. The expected utility of agents from first price sealed bid auction in case of 2-50 participants

As the types are random variables with a continuous uniform distribution, the expected revenue from the winning agent is derived by integrating the payment function $t_i(\theta)$ and the probability of winning in the interval [0,1]. The total expected revenue from the auction, therefore, is obtained by summing the revenues derived from each agent:

$$(19)\ s = \int_0^1 t_1(\theta_1) F(\theta_1) dx + \int_0^1 t_2(\theta_2) F(\theta_2) dx + \cdots + \int_0^1 t_i(\theta_i) F(\theta_i) dx$$

$$(20)\ s = \int_0^1 \frac{(N-1)}{N} \theta_1 F(\theta_1) + \int_0^1 \frac{(N-1)}{N} \theta_2 F(\theta_2)\, dx + \cdots += \int_0^1 \frac{(N-1)}{N} {\theta_1}^{N-1}\, dx + \int_0^1 \frac{(N-1)}{N} {\theta_2}^{N-1}\, dx + \cdots + \int_0^1 \frac{(N-1)}{N} {\theta_N}^{N-1}\, dx$$

$$(21)\ \int_0^1 \frac{(N-1)}{N}\theta_1{}^N = \frac{(N-1)}{N^2+N} \rightarrow s = \sum_{i=1}^{N} \frac{(N-1)}{N^2+N} = \frac{N(N-1)}{N^2+N}$$

As the number of participating agents increases, the expected revenue generating from each individual agent diminishes, but the total revenue from the auction exhibits an upward trend. Figure 3 presents the variation in expected utility for auctions with 2 to 50 agents, Figure 4 depicts the expected revenue of the seller for auctions with 2 to 50 agents. Finally, the table 2 compiles all the conclusions associated with the first price sealed bid auction involving N agents.

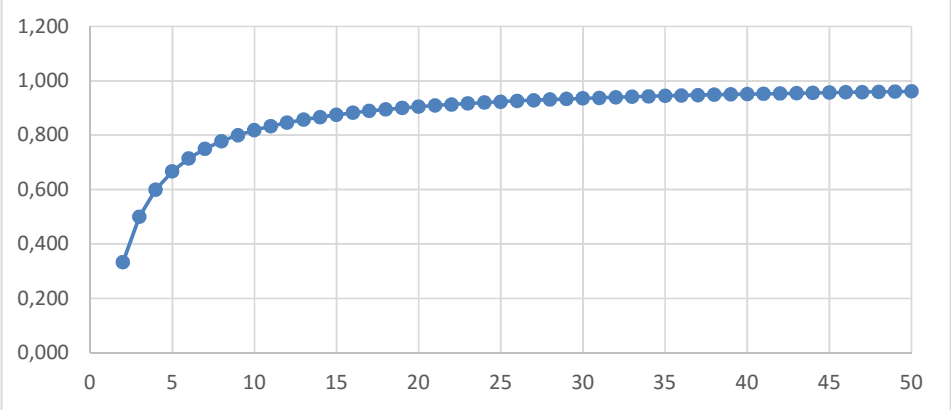

Figure 4. The expected revenue of the seller from the first price sealed bid auction in case of 2-50 agents.

Conclusions. Based on your detailed examination of the first-price sealed bid auction with varying numbers of agents, we can articulate several key conclusions.

- In an auction of N agents the Bayesian Nash equilibrium strategy is $\frac{(N-1)\theta_i}{N}$, and the increase in number of participants, results in increased bids placed by the agents according to the Bayesian Nash equilibrium strategy.
- In an auction of N agents the equilibrium state resulting from the implementation of Bayesian Nash equilibrium strategies is provided in the formula (16), additionally an increase of the number of agents results to an increase of the payments.
- In an auction of N agents to ensure the truthful implementation of the social choice function the transfer function $t_i = b_i y_i$ should be modified to $t_i = \frac{(N-1)b_i}{N} y_i$.
- In an auction of N agents the probability of winning of an agent is $\theta_i{}^{N-1}$.
- In an auction of N agents the expected utility of an agent is $\frac{1}{N^2+N}$
- In an auction of N agents the expected revenue of a seller is $\frac{N(N-1)}{N^2+N}$
- The increase in the number of agents results in:
  - increased bids,
  - reduced expected utilities of agents,

- increased expected revenue of the seller.

Table 2. Conclusion regarding first price sealed bid auction consisting of N agents

First price sealed bid auction	
Number of participants	N
Bayesian Nash equilibrium strategy	$\frac{(N-1)\theta_i}{N}$
Equilibrium state	$y_i(\theta) = 1$ *ако* $\theta_i \geq \max(\theta_{-i})$ $y_i(\theta) = 0$ *ако* $\theta_i < \max(\theta_{-i})$ $t_i(\theta) = -\frac{(N-1)}{N}\theta_i y_i(\theta)$
Implemented social choice function	$y_i(\theta) = 1$ *ако* $\theta_i \geq \max(\theta_{-i})$ $y_i(\theta) = 0$ *ако* $\theta_i < \max(\theta_{-i})$ $t_i(\theta) = -\frac{(N-1)}{N}\theta_i y_i(\theta)$
The Mechanism which truthfully implements the social choice function	$t_i = \frac{(N-1)b_i}{N} y_i$
Probability of winning	${\theta_i}^{N-1}$
Expected utility of agent	$\frac{1}{N^2+N}$
Expected revenue of seller	$\frac{N(N-1)}{N^2+N}$

Recommendations:

- The agent types considered in this study are modelled as random variables following a continuous uniform distribution. For a more comprehensive understanding of bidding behaviour and auction dynamics, it is recommended to explore the impact of alternative distribution types on the model's variables. Analysing how different distributions affect bidding strategies, expected utilities, and the seller's expected revenue could provide deeper insights into the mechanisms underlying auction markets.
- To corroborate the findings presented in this article, conducting empirical analysis through surveys or scientific experiments is advised. Such empirical studies could involve collecting real world data from actual auctions or simulating auction environments to observe and analyse bidding behaviour and auction outcomes in real-world settings.
- The analytical framework and conclusions derived from this study offer a basis for predicting the outcomes of first price sealed bid auctions across varying numbers of agents.

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Vilen KHACNARTYAN, Rafayel PETROSYAN

The analysis of first price single bid auction with uniformly distributed types within the scope of mechanism design theory

Key words: mechanism design theory, mechanism, auction, first price sealed bid auction, dominant strategy, Bayesian Nash equilibrium, incentive compatibility, social choice function.

In the article the first price sealed bid auction has been analysed within the scope of mechanism design theory. The sealed bid auction consisting of N number of agents has been observed finding the general solution to the auction. Bayesian Nash equilibrium strategies, the equilibrium state, and the implemented social choice function for the auction have been evaluated. The mechanism has been designed to truthfully implement the social choice function for the auction consisting of N agents. The variables such as the probability of an agent to win, the expected utility of an agent and the expected revenue of the seller have been evaluated. The effects of the increase of the number of agents on the variables of the model such as bids, Bayesian Nash equilibrium strategies, expected utility of an agent, expected revenue of the seller have been evaluated.

ENTERPRISE ZONE TAX EXEMPTION POLICY IMPACT EVALUATION IN RURAL REGIONS OF ARMENIA

Arsine SARIKYAN
Ph.D. in Economics, Mathematical Modeling of Economy, ASUE

Key words: tax exemptions evaluation, economic development, descriptive data analysis, extensive and intensive margins, survival analysis

Introduction. To foster social and economic progress in Armenia's border regions, the government enacted legislation in 2015 establishing enterprise zones, which offer tax exemptions to businesses operating in targeted areas. Specifically, enterprises in rural border regions are exempt from turnover, VAT, profit, and license taxes, with the exception of certain activities like passenger transportation or totalizators. Existing literature predominantly questions the efficacy of tax exemption policies. It suggests that such measures are primarily warranted to address market failures [Howel, et al., 2002, 1500], with the program's impact contingent on policy design, broader tax environment, and unique regional characteristics [Lerch, 2004, 16]. Givord, Rathelot, and Sillard's [2011, 159-162] analysis of France's enterprise zones program indicates that while it positively influenced economic activity within targeted areas, any benefits generated were counterbalanced by adverse effects on neighboring regions. On the other hand, it is important to evaluate the results from all of the perspectives, Baghdasaryan and Sarikyan [2023] evaluated the tax exemption impact with difference-in-differences fixed effects estimator and initially found a negative impact on income. However, as the results were counterintuitive findings, they decided to assess the administrative factors and after including audit probabilities into the analysis and the decreased probabilities of those enterprises explained the negative results.

Data provided by the State Revenue Committee of RA for academic inquiry, comprises an exhaustive unbalanced panel spanning from 2013 to 2017, totaling 24,785 observations. It includes only taxpayers for the interested areas and covers 4 years of data, as a result all of the visualizations and analysis are based solely on that data in order to examine the operations of enterprise zones in detail. One notable advantage of this research is its inclusion of the relevant population, thus avoiding sampling or selection biases. The dataset segregates businesses into border (treated) and non-border (control) groups based on their actual operational presence in exempted regions. Addressing a challenge in identifying operational addresses (as tax declarations only furnish legal addresses), the data utilizes turnover information specific to border regions for classification.

The primary contribution of this paper lies in its thorough exploration and analysis of the data, particularly through in-depth exploratory techniques. Furthermore, it offers a comprehensive evaluation of results using survival analysis methods. The results reveal a

pronounced disparity between the intensive and extensive margins in border regions, with the former notably outweighing the latter. This suggests that the majority of turnover variation can be attributed to factors associated with the intensive margin, indicating a substantial reliance on existing business activities rather than the creation of new enterprises.

Methodology. In order to understand the dynamics and trends of the region, this paper examines whether the positive change in the turnover is attributed to the rise of the number of new businesses in the region (extensive margin) or the improved operations of existing businesses (intensive margin). In the majority of cases, the change is attributed to the interaction effects of the two factors and it is essential to measure magnitude and influence of each margin on the observed output. Implementing the same framework as Fernandes, Klenow, Meleshchuk, Pierola, and Rodríguez-Clare [2018, 6], the variation in overall turnover across regions is estimated by intensive margin elasticity (IME). IME is the slope of the regression line and is determined by an OLS regression of ln(xi) on ln(Xi) with the origin and destination FE, for a given year. The paper discusses group wise analyzes for each year and each region and then compares results. More specifically, the average number of companies is calculated for each community in both groups per year, which was merged with the original data of individual companies.

Equation 1.

$$Lnx_{ij}=\alpha*\ln X_{ij}+\varepsilon_{IJ}$$

Xi is the total turnover for each year per region i, Ni is the total number of businesses, xi= Xi/Ni is the average turnover per year for region i, ln[xi] and ln[Ni] are intensive and extensive margins respectively. Extensive margin elasticity [EME] is the opposite of intensive margin and satisfies the following equation; EME=1-IME.

Literature Review. This section aims to outline the key theoretical concepts and academic background relevant to our research and its methodology. Numerous studies have explored the impact of tax exemptions on businesses and economic development, yielding conflicting findings. Lerch [2004, 20] suggests that taxes have a limited influence on business decisions and economic activity, with their effect contingent on policy design and the broader tax framework. In "Design and Assessment of Tax Incentives in Developing Countries" [2018], the cost-benefit analyses of tax incentives against lost tax revenue or economic activity indicate that, from a purely analytical perspective, tax incentives are consistently less effective than nationwide tax reforms, as they fail to target specific sectors. James [2013, 55] infers that incentives should be used as minimal as possible and ideally should be linked to investment growth. Moreover, according to him, the incentives have a greater possibility of being successful if the government is effective and more democratic. Glaeser [2001, 11-14] states that place-based tax incentives will improve the efficiency of firms' location decisions and will maximize total social surplus, in all cases except the cases when these incentives are driven by corruption or other

influence types. Lockwood and Shawn [2015, 5-9] state that enterprise zones become attractive to households and the reduction in poverty can be because of high-income households' migration into the area, thus the program's purpose of aiding the most in need group of residents has a little impact. Moreover, Baghdasaryan and Sarikyan [2023, 12] found that the location-based incentives in reality, positively affect the employment which is very important for overall well-being in the rural regions. Nevertheless, governments continue to promote the development of economic activities through tax exemptions. To enhance the business landscape and attract investment while fostering rural development, the Armenian government enacted a dedicated legislation known as the HO-156-N bill in January 2015. This bill established enterprise zones, delineated geographical areas where specific tax incentives and regulatory exemptions are offered to bolster economic growth in those regions. A total of 30 areas were designated under this legislation, each benefiting from tailored tax exemptions aimed at stimulating local development. The strategy of targeting geographically challenged areas to address their decline is a widely recognized approach, as seen in France's implementation of Zones Franches Urbaines (ZFU) and Zones de Revitalisation Urbaine (ZRU) in 1997, 2004, and 2006. ZFU provided substantial tax exemptions, including business and corporate taxes, and social security contributions, particularly benefiting the most disadvantaged regions. Givord, Rathelot, and Sillard [2011] studied the impact of the second phase of ZFU, where 41 firms were relocated from ZRU to ZFU regions. Their findings indicate a positive effect of ZFU on efficiency, reducing the number of existing firms (intensive margin) and potentially boosting the creation or relocation of new firms (extensive margin) in treated regions. However, the benefits were tempered by negative effects on surrounding regions, notably a decline in the growth rate of new and relocated businesses.

Neumark and Kolko [2010, 24-29] assessed California's Enterprise Zone policy, focusing on incentives for hiring "disadvantaged" employees. They found a consistent negative impact on employment, attributed to California's unique tax system allowing retroact-tive credit claims up to four years. Mayneris and PY [2013] argue that while most research on the efficacy of enterprise zones assumes uniform policies across all sectors, there is inherent heterogeneity. Factors such as the initial characteristics of the zone, industrial sector involvement, and policy design specifics can significantly impact effecttiveness. Hence, thorough analysis of regional heterogeneity is crucial for optimizing policy outcomes.

Scientific Novelty. The novelty of this study resides in its detailed investigation and examination of the data, employing intensive exploratory metrics. Additionally, it provides a comprehensive assessment of outcomes utilizing survival analysis techniques. Findings expose a significant contrast between the intensive and extensive margins within border regions, with the former demonstrating considerable dominance over the lat-

ter. This implies that the primary drivers of turnover variation are linked to factors pertaining to the intensive margin, highlighting a substantial dependency on established business operations rather than the inception of new ventures. The results are also confirmed by high survival rates in border regions, indicating potential barriers to entry for the new firms, due to well-established practices or simply small market in rural underprivileged regions.

Analysis. The dataset comprises unbalanced panel data, characterized by a wide range of observations, encompassing all existing businesses within the Tavush Region, totaling 24,785 entries spanning from 2013 to 2017. This comprehensive dataset was graciously provided by the State Revenue Committee of RA (SRC) in response to an official request for academic research purposes. To safeguard the confidentiality of business-specific details and prevent any inadvertent disclosure of personal information, stringent measures were taken to anonymize the data and uphold tax secrecy regulations. The information extracted from tax reports, completed by taxpayers, includes distinct entries for non-taxable turnover associated with border trade and production, aiding in the identification of privileged businesses. Additionally, each company's registered address, serving as its legal domicile, is documented in the report, which may differ from its actual operational location. However, SRC has confirmed that in the majority of cases, these addresses align. Therefore, it is presumed, based on expert insights, that the legal address corresponds to the actual place of operation for most businesses. The variables which were provided are the business establishment date, status change date, region, sector, paid taxed and other fees, the taxable amount of VAT and total circulation, borderline trade and production turnover, the total number of employees, and salary budget.

It is important to note, that being in the privileged zones does not necessarily ensure that the enterprise is utilizing the tax exemption opportunity. Therefore, the labeling was not done based on the tax-exempted locations, but rather, based on the tax declarations, as whether the borderline trade or production cell was filled in any year between 2015 and 2017, as it ensures that the enterprise is taking the advantage of the exemption opportunity. Data contains a significant number of missing values, all of which were imputed with 0 and includes outliers. As a result, there are a total of **2,632** borders and **22,153** non-border observations. Table 1 presents total number of companies each year:

Table1. Number of Companies per Region

Region	2013	2014	2015	2016	2017
Border	414	461	555	593	609
Non-border	4,015	4,152	4,347	4,656	4,983

Meanwhile, it is assumed that there is a difference whether the firm stopped operation in that year or even was not established yet and the fact that the particular values were 0 for the analyzes. Therefore, the data includes only active companies, that is the company

with 0 turnover is included in the data only if its status is "Active". Baghdasaryan and Sarikyan [2023, 4] extensively discuss the institutional setup for the policy and ways for identifying whether or not the companies are truly operating in the privileged regions. It is important to note that while the main population of interest is the same in both of the papers, for survival analysis purposes the author included the whole population operating in the selected region. Therefore, this part of the paper presents the results of descriptive analytics, which was implemented for unfolding the main trends and patterns in the data.

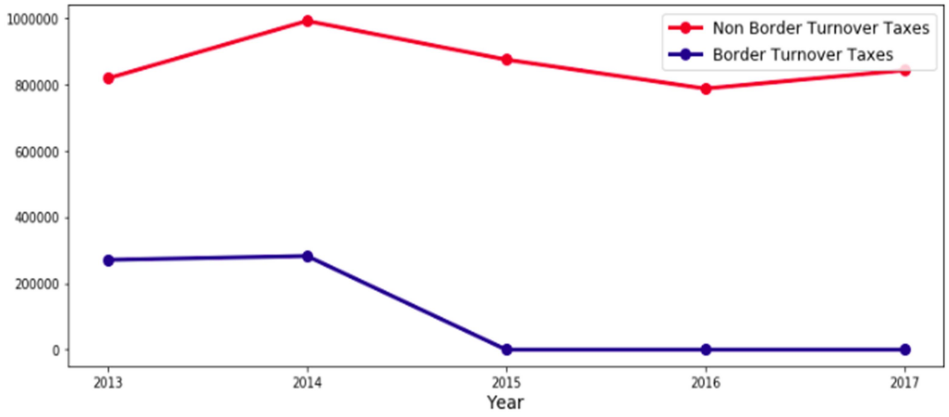

Figure 1. Total turnover taxes for border and non-border regions over time

Figure2 demonstrates that the increased total tax payments in the frontier region were mainly attributed to the increase of the employment mean in 2017, which was expected as the law does not affect the tax payments connected to the workforce.

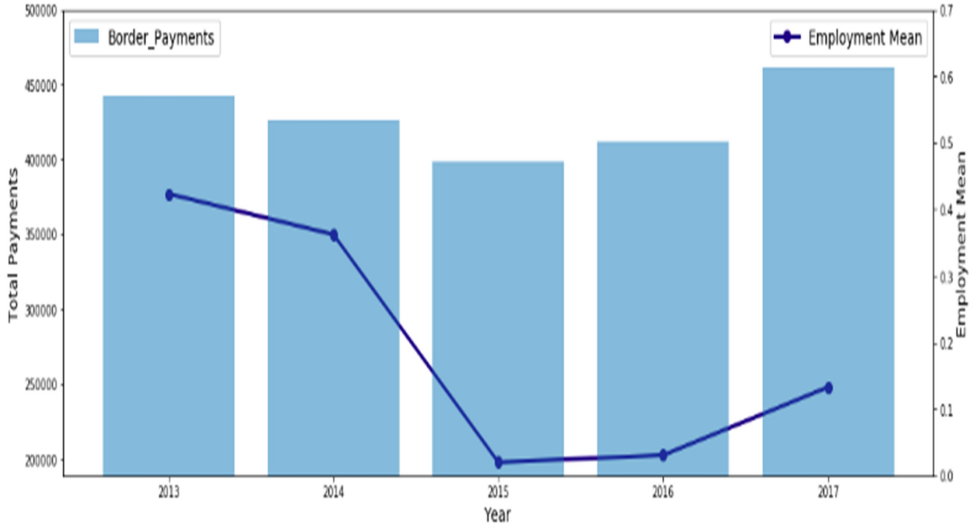

Figure 2. Borderline average number of employees and total tax payments

Figure 2 reveals that from 2013-2016, the mean of employment in the borderline mostly was constant and from 2016 it experienced a slight increase. Moreover, t-test inferential statistical technique between the employment means of two groups and between the pre-treatment and post-treatment period was implemented. Expectedly, there is a signifycant difference between the treated and control groups, as a p-value is smaller than 0.05 threshold. However, the difference between the pre-treatment and post-treatment period for both groups was not significant, they have p-values higher than 0.05 threshold.

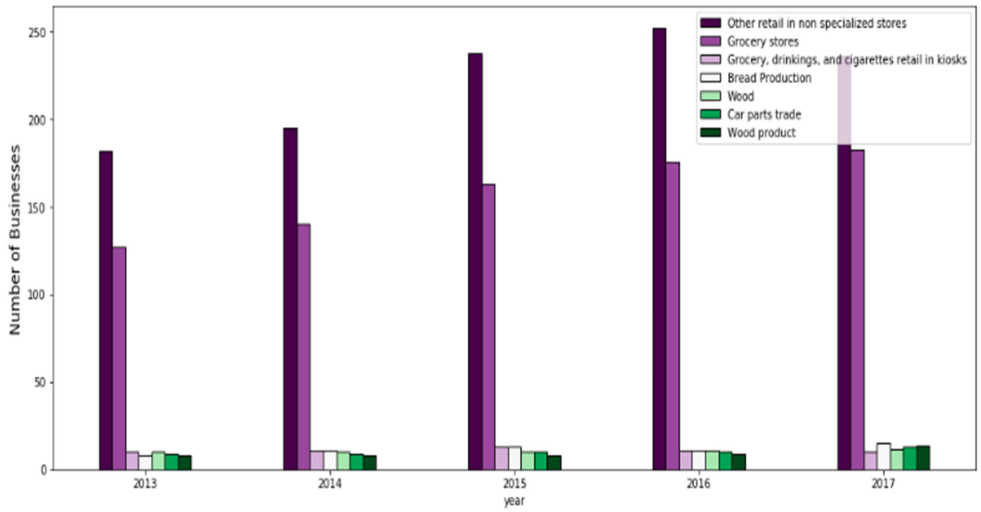

Figure3. Sector category breakdown

The findings suggest that the policy has not influenced employment. Figure3 demonstrates the total number of companies in the top 5 occupied sectors.

Table2. Surviving rate for the reference[1]

Reference Year/ t	Border region					Non-Border region				
	2014 (%)	**2015 (%)**	**2016 (%)**	**2017 (%)**	**2018 (%)**	**2014 (%)**	**2015 (%)**	**2016 (%)**	**2017 (%)**	**2018 (%)**
2013	93	90	76	76	69	71	48	37	34	34
2014		90	85	77	67		66	52	46	39
2015			83	66	60			69	54	47
2016				87	68				71	56
2017					82					79

The survival rates estimation indicates that the rates in both regions are similar to each other.

[1]Location-Based Tax Incentives for Non-Farm Rural Enterprises in Armenia: www.tandfonline.com

Interestingly only the top 2 most occupied sectors, which are related to the trade experience growth of companies. In order to identify the major behavioral patterns in the region, it is essential to consider and evaluate the percentage of surviving firms. The survival rate is defined as the number of companies born in x-year that exist till t-base year, divided by the total number of companies established in x year [Baghdasaryan and Sarikyan, 2023, 9]. In survival analysis, we use information on event status and follow up time to estimate a survival function, in this study, the outcome is how long does the particular company operated.

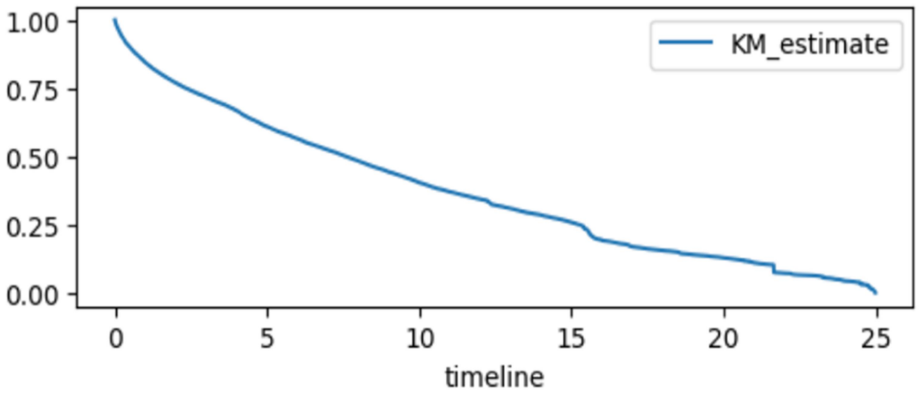

Figure 4. Survival curve estimated with Kaplan-Meier Filter

Figure4 shows Kaplan-Meier Curve, a simple non-parametric visualization of survival likelihood function. We can see that probability of a company operating longer than 1 years is around 88%, but probability of surviving longer than 5 years is dropped to 63%.

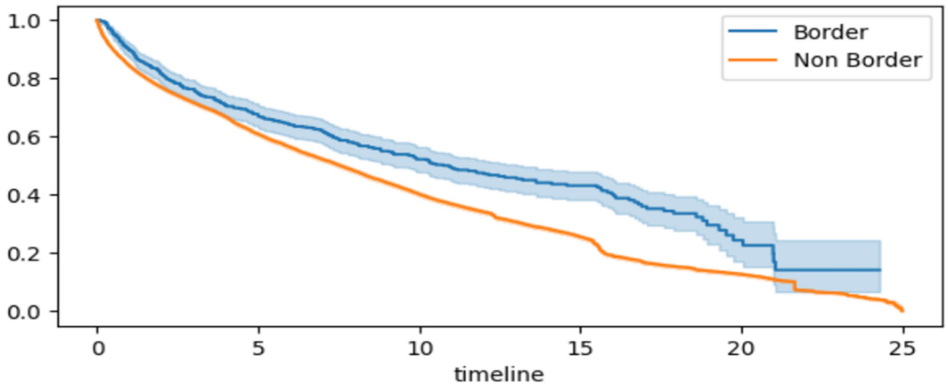

Figure5. Survival Function for border and non-border regions

A Kaplan-Meier plot can also be used to analyze the differences in survival risk for border and non-border regions. Figure5 shows the survival probability for treatment and control groups separately, and interestingly the companies in border regions have higher

survival likelihood, meaning higher probability to operate longer. Interestingly this is also confirmed based on the results from the table2, where again survival rate is overall higher in border regions. The analysis of intensive and extensive margin results for both groups during the 2013-2017 are presented below;

Table 3. Intensive (IM) and extensive (EM) margin results

	IM	EM
Border	75.2%	24.8%
Non-Border	60.7%	39.3%

The results suggest that e intensive margin (IM) exhibits a greater magnitude in the border region, with linked fluctuations in average turnover per enterprise, rather than number of companies. Taking into account the results of survival analysis, this can be explained that in border regions companies exist longer and have established practices, which can make it difficult for new companies to enter the market.

Conclusion. In conclusion, this study delves into the impact of enterprise zones in Armenia's rural border regions, designed to stimulate social and economic advancement through tax exemptions. Through an assessment of both extensive and intensive margin outcomes, the effectiveness of the program in driving development is evaluated. The results suggest that IM is higher in the borderline region, indicating that around 75.2% of variation in the total turnover is attributed to the variations in the average turnover per enterprise, while only 24.8% to the number of companies. In addition, by employing intensive exploratory techniques and survival analysis methods, the study meticulously investigates and interprets the data, uncovering a notable gap between intensive and extensive margins within border regions. This indicates a significant reliance on pre-existing business activities rather than the establishment of new enterprises. In summary, this research substantially contributes to the comprehension of tax policy efficacy and offers crucial insights for policymakers aiming to boost economic development in Armenia's border regions.

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Arsine SARIKYAN

Enterprise zone tax exemption policy impact evaluation in rural regions of Armenia

Key words: tax exemptions evaluation, economic development, descriptive data analysis, extensive and intensive margins, survival analysis

This paper investigates the impact of enterprise zones in Armenia's rural border regions, established to promote social and economic progress through tax exemptions. By focusing on extensive and intensive margin outcomes, it evaluates the effectiveness of the program in fostering development. While the initiative aims to encourage new business creation, the study finds that turnover variation, particularly among existing enterprises, significantly influences the program's impact. This challenges prevailing notions about the efficacy of tax exemption policies, suggesting a need for nuanced approaches tailored to address specific market failures. An advantage of this research lies in its inclusive population sampling, which minimizes biases and ensures the reliability of findings. Utilizing data from the State Revenue Committee spanning 2013 to 2018, the study differentiates between treated and control groups based on operational presence in exempted regions. Overcoming challenges in identifying operational addresses, the data utilizes turnover information specific to border regions for classification. The study employs intensive exploratory techniques and survival analysis methods to thoroughly explore and analyze the data, revealing a pronounced disparity between intensive and extensive margins in border regions. This suggests a substantial reliance on existing business activities rather than the creation of new enterprises. In summary, this research contributes to the understanding of tax policy effectiveness and offers valuable insights for policymakers seeking to foster economic development in Armenia's border regions.

JUSTIFICATION OF THE ECONOMIC EFFICIENCY OF THE APPLICATION OF COMBINED FRONT PLOUGH FOR SMOOTH PLOWING

Gevorg KARAPETYAN
Ph.D. student, Chair of TAM
Armenian National Agrarian University

Key words: combined plough, incurred expenses, productivity, branch cost, fuel consumption, operating costs, economic efficiency

Introduction. In modern agriculture, new technologies are rapidly developing through intensive methods. Technical complexes for the mechanization of agriculture are being implemented. Designers are striving to make aggregators more modern, introducing proposals aimed at optimizing structures, increasing productivity, and improving the quality of technological processes. The active investment in intensive technologies contributes to the widespread use of combined aggregators. Against this backdrop, new technologies for minimum tillage are being developed, where the inclusion of plowing is considered mandatory. The rationale behind this is that plowing enables the utilization of the relatively deeper soil layers for the growth and development of plants.

Methodology. The foundation of this work lies in the economic analysis of the proposed combined plough for smooth plowing, offered by our team. The proposed aggregator operates following the scheme "plowshare-disc-roller." This scheme ensures, in a single pass, initial plowing up to a depth of 25 cm, where part of the soil layer is turned over. This is followed by disc harrowing up to a depth of 15 cm, which breaks up the clods formed by the plowshare and cultivates the surface, cutting remaining weeds and leveling the field. Subsequent rolling compacts and smoothen the soil surface up to a depth of 5 cm. To assess the economic value of the proposed machine, it was virtually divided into three separate machines: plough, disc harrow, and roller. The economic indicators of each were determined individually, followed by a comparative analysis of their cumulative indicator versus the corresponding indicator of the proposed combined machine. As a result, the feasibility of using the proposed machine was substantiated.

Literature Review. The efficiency of the application of the proposed combined machine for basic and surface soil tillage depends on the correct selection of its place and role in the agricultural system [Yerzamaev, Pavlovich, 2012]. It should be noted that every rational agricultural method has a dual significance: on one hand, it contributes to the improvement of the quality of the performed process, and on the other hand, it requires certain expenses. The suitability of the application should be determined by the combination of these two factors [Trubilin, et al., 2008, 654-672]. The new method of soil cultivation and the technical means should contribute to increasing the productivity of crops with minimal labor expenses [Pavlushin, 2010, 5; Brusentsov, 2016, 75]. It is accepted to

evaluate the efficiency of the new machine by comparing it with the base machine actually used in production [Afonin, 2007]. The suitability of creating and investing in new technology is determined by the performance indicator of the expenses incurred in the work done [Zazulya, et al., 2015, 117-126.]. The annual economic efficiency based on the incurred expenses represents the total economic management of all production resources, including labor, materials, primary investments, and other expenses that arise during the production and utilization of the new machine [Shmonin, et al., 2014, 120-122]. It is calculated using the following formula.

$$Э_a = (З_b - З_n)A_a, \quad (1)$$

Where $З_b$ and $З_n$ are the expenses incurred on the unit of work for the base and new machines respectively. A_a is the annual volume of work.

Scientific novelty. A combined plough for smooth plowing has been proposed, which consists of a frontal plough without turner plow, a shaped disc harrow, and a roller (see Fig.1) [Yesoyan, et al., 2023].

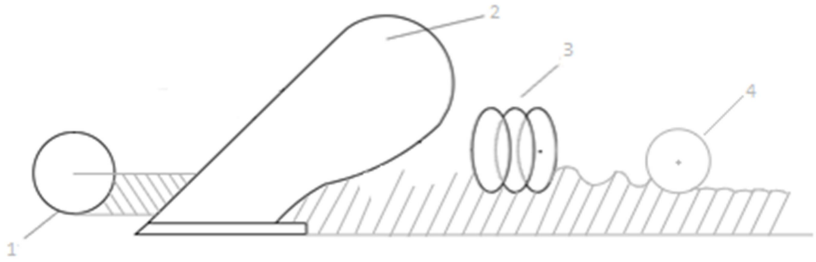

Figure 1. Schema of the combined plough for smooth plowing 1 - Shaped disc blade, 2 - frontal plough without turner plow, 3 - Shaped disc harrow, 4 - Roller.

The proposed machine has compact dimensions, which ensures its maneuverability in areas with uneven terrain. With this machine, the aggregator can maintain efficiency without reducing maneuverability in such challenging fields. The machine, in a single pass, ensures the necessary surface preparation for seeding. This reduces the number of passes required in the field, consequently decreasing operational costs.

Analysis. The main parameters determining the efficiency of agricultural machinery are considered to be the productivity and the price of the machine [Turusov, et al., 2016, 78-80]. The calculation of these parameters has been performed for the proposed combined plough for smooth plowing (aggregated with the T-150K tractor) and for the base machine. Calculation of the productivity of the aggregate: The productivity of the aggregate is determined by the following formula [Tseddies, et al., 2000, 400].

$$W_h = 0{,}1 \cdot B_o \cdot V_o \cdot \tau, \text{ha/hour} \quad (2)$$

Where:

B_o is the machine's operational coverage width

V_o is the aggregate's operational speed

τ is the time utilization factor

$0{,}1$ is the hectare conversion factor

For a more effective comparison of the new and base machines, the operational parameters of the combined machine are taken at their minimum values as per the assignment, while for the base machine, at their maximum values. The proposed parameters for the combined machine are as follows: B=2.1m, V=5.2 km/h, τ=0.85.

Therefore $W_h = 0.928\ ha/hour$.

The base machine includes three aggregates, each of which performs one technological process:

1.Plowing with a ПФН-2А plow, aggregated with a Т-150К tractor, B=2.1m, V=5.5 km/h, τ=0.89. Therefore, W_h=1.03 ha/hour.

2.Harrowing with a БДН-3 harrow, aggregated with a МТЗ-80.1 tractor: Bo= B·β=3·0.95=2.85m (B=3m is the constructive coverage width of the harrow, β=0.95 is its utilization factor), V=8 km/h, τ= 0.91. Therefore, W_h=2.07 ha/hour.

3. Rolling with a 3-ККШ-6 roller, aggregated with a МТЗ-80.1 tractor: Bo= B·β=6·0.95=5.7m, (B=6m is the constructive coverage width of the roller, β=0.95 is its utilization factor), V=7.8 km/h, τ=0.85. Therefore, W_h=4.09 ha/hour.

Calculation of the Branch Cost. The data for the base machine have been taken from the corresponding sources [Pavlushin, 2010]. The calculation was made only for the proposed combined plough for smooth plowing, which is divided into three rings (frontal plough without turner plow, shaped disk coulters, and roller), and the branch cost has been calculated separately for each. The branch cost is calculated by the formula:

$C_o = G(\lambda HK + M) + d,$ (3) *where.*

G is the net weight of the machine without wear parts, in kg,

λ is the construction complexity coefficient,

H is the cost of one kilogram of weight produced, in drams,

K is the variation coefficient, depending on the volume of production,

M is the cost of raw materials per one kilogram of net weight, in drams,

d is the cost of wear parts, including added transportation costs, in drams.

For the frontal plough without turner ploughs: G=950 kg, H=900 drams, K=1.1, M=600 drams, d=6000 drams, λ=1.0.

For the shaped disk coulters: G=65 kg, H=900 drams, K=1.4, M=1600 drams, d=36600 drams, λ=1.2.

For the roller: G=50 kg, H=900 drams, K=1.1, M=1600 drams, d=16000 drams, λ=1.0.

By substituting the corresponding values, we obtain: For the frontal plough without turner plows: C_{01}=1516500 drams, For the shaped disk coulters: C_{02}=238280 drams, For

the roller: C_{02}=145000 drams. Thus, the branch self-cost for the combined flat varied facade plow will be: $C_0 = C_{01} + C_{02} + C_{03}$=1900280 drams.

Calculation of the Machine's Balance Value. The balance value of the machine is determined in the following way.

$B = C_0.K_b$ where K_b is the coefficient for design of average balance value, K_b =1.148.

By substituting the values, we will obtain B=2181521 drams

Calculation of Operational Expenses. The operational expenses for the compared options are determined by the following formula.

$U=A+P+X+C_f+W$ drams/hour (4) where:

A is the sum of amortization allowances, in drams,

P is the allowances for current, major repairs and technical maintenance, in drams,

X is the sum of allowances for the storage of machinery, in drams,

C_f is the cost of fuel and lubricants, in drams,

W is the wage of the tractor-driver/machine operator, including bonuses, in drams.

The sum of amortization allowances is calculated using the following formula

$A = \frac{B \cdot a}{T \cdot 100}$, drams/hour, (5) where:

a is the annual norm of amortization allowances, in percentages. It is set at 14.2%.

T is the annual workload of agricultural machinery, in hours. Let's assume 325 hours. By substituting the corresponding values, for the combined plough for smooth plo-wing, we will obtain A=953 drams/hour.

From professional literature, we have for the ПФН-2А plow A=980 drams/hour, for the БДН-3 harrow 103 drams/hour, and for the 3-ККШ-6 roller 97 drams/hour. Therefore, for the base machine, the operational expenses are A_b =1153 drams/hour.

Assuming the annual norm for main, current repairs, and technical maintenance is 9.0%, and the norm for the preservation of machinery is 0.3%, we have calculated:

-The allowances for repairs and technical maintenance for the combined plough for smooth plowing: P_m =324 drams/hour, and for the base: P_b =390 drams/hour.

- The costs of machinery preservation for the combined plough for smooth plowing: X_m =20 drams/hour, and for the base: X_b =45 drams/hour.

The wage for the tractor-driver/machine operator, including bonuses, is set at 2000 drams/hour for operating the combined plough for smooth plowing, 1500 drams/hour for operating the ПФН-2А plow, and approximately 1000 drams/hour for harrowing and rolling. Consequently, the labor cost for the base is 3500 drams/hour. To determine the cost of fuel and lubricants, first, we calculate the hectare consumption of fuel according to technological processes, which is determined by the following expression.

$Q_{ha}=G_h/W_h$ (6) where:

G_h is the hourly fuel consumption under normal load conditions. For the T-150K tractor aggregated with the combined plough for smooth plowing, according to our experimental research, the average hectare fuel consumption is 38.9 liters/ha. The productivity of the mentioned aggregate is 0.928 ha/hour. Therefore, the hourly fuel consumption is 36.1 liters/hour. According to the technical characteristics of the base machines, the fuel consumption is as follows:

- For operating with the ПФН-2А plow: 31.5 liters/ha or 26.2 liters/hour [Yesoyan, 2006, 180].
- For harrowing with the БДН-3 harrow: 7.56 liters/ha or 6.28 liters/hour.
- For rolling with the 3-ККШ-6 roller: 3.67 liters/ha, or 3.05 liters/hour.

Thus, the total fuel consumption for the base machine is 42.73 liters/ha or 35.53 liters/hour.

Considering the cost of one liter of diesel fuel is approximately 500 drams, the hourly fuel cost in monetary terms will be: for the new machine - 18050 drams/hour, for the base - 17765 drams/hour. Therefore, the direct operational expenses for the compared options will respectively be:

$U_m = 953 + 324 + 20 + 18050 + 2000 = 21347$ drams/hour,

$U_b = 1151 + 390 + 45 + 17765 + 3500 = 22851$ drams/hour.

Knowing the total operational expenses, we can also determine the incurred expenses.

$I_i=U+EK$ (7) where

E is the coefficient of capital investment efficiency for agricultural machinery, E=0.15.

K represents the specific costs of capital investments per unit of technology or per unit of cultivated land area, and is calculated using the following formula.

$K=B/W_h \square T$ drams/hour (8)

By substituting the corresponding values for the compared options, we will obtain. K_m=7233 drams/hour, K_b=8420 drams/hour:

By substituting the values, we will obtain the incurred expenses for the studied options.

$I_m = 21347 + 0.15 \times 7253 = 22434$ drams,

$I_b = 22851 + 0.15 \times 8420 = 24114$ drams.

Knowing the sum of the incurred expenses, we can determine the annual economic efficiency of the proposed machine.

$Э_a=[(U_b+E_bK_b)-(U_m+E_mK_m)]Q_s=[(22851+0,15 \square 8420)-(21347+0,15 \square 7233)]180=302949$ drams (9) where Q_a is the annual volume of work. Q_a = 180 ha.

Thus, by combining three technological processes, we achieve a cost saving of 1683 drams per hectare. It's important to note that this saving is calculated solely based on the reduction of operational costs. The use of the proposed combined machine also contri-

butes to environmental sustainability from the perspective of soil conservation and erosion reduction, among other benefits, which we will consider separately.

Conclusions.

1. One of the direct ways to reduce operational expenses in soil cultivation processes is the creation of combined machines, which allow completing two or more consecutive technological processes in one pass.
2. A new technology of minimum tillage has been proposed, which differs from similar technologies by integrating three technological processes, including mandatory inclusion of plowing.
3. A combined plough for smooth plowing has been proposed, which performs both primary and surface soil cultivation in one pass. The annual economic efficiency of the proposed machine is 302,949 drams.
4. The use of the proposed machine will reduce the hectare fuel consumption by 3.83 liters, or 8.9%.
5. The application of the new machine will reduce fuel consumption and the number of passes, thereby decreasing operational expenses and contributing to the reduction of harmful effects on the soil and the environment.

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Gevorg KARAPETYAN

Justification of the economic efficiency of the application of combined front Plough for Smooth Plowing

Key words: combined plough, incurred expenses, productivity, branch cost, fuel consumption, operating costs, economic efficiency

The main directions of the development of modern agriculture have been outlined. Emphasis has been placed on technologies for minimum tillage, considered mandatory processes. This is justified by the need to involve the relatively deeper layers of the soil in cultivation. The economic efficiency of applying new technical means in the agricultural sector has been presented, along with the peculiarities of assessing the economic efficiency of using machines and the methodology for their economic purpose. A technological scheme for a new combined plough for smooth plowing, capable of performing three technological operations in one pass, has been introduced, including its principle of operation. It consists of a frontal plow, disc-shaped cutting organs, and a roller. The machine performs plowing up to a depth of 25 cm, surface soil cultivation at a depth of 10-15 cm, harrowing, cutting of weeds, and rolling in one pass.The annual economic efficiency of the proposed technology has been determined based on the cost indicators of the work performed. All production resources have been taken into account: labor, materials, major investments, and other expenses incurred during the production and use of the machine. The productivity of the proposed machine, its branch self-cost, balance value, and operational expenses have been determined.

ECONOMIC EFFICIENCY OF ASIC PROCESSOR WITH LOW POWER CONSUMPTION DUE TO FFT CALCULATIONS

Margarita YEGHIAZARYAN
Ph. D, Doctor of Science in Economics
Yerevan State University
Erik KARAPETYAN
Analog Design Engineer, NPUA, Bachelor student
Chair of Microelectronic circuits and systems
Edgar PAPYAN
Layout Design Engineer, NPUA, Master student
Chair of Microelectronic circuits and systems

Key words: discrete fourier transforms, fast fourier transforms, application specific integrated circuits, digital signal processors, parallel architectures, transport architectures, power consumption, sales promotion

Introduction. This paper describes a processor architecture optimized for radix-4 and coupled-radix FFT algorithms, which are simpler than radix-2 algorithms. The processor is based on a transport architecture and several optimizations have been used to improve power efficiency. The processor was synthesized using standard 4nm cell technology, and analysis shows that the programmable solution can achieve energy efficiency comparable to fixed-function ASICs.

FFT has typically been implemented as a fixed function in integrated circuits because it provides better power consumption and performance than software implementations. Such implementations have recently been presented, e.g., in [Wey, 2007,783], implementations based on radix-2 FFTs are presented, and examples of radix-4 FFTs can be found, e.g., in [Hung, 2004, 833-836]. Implementations based on paired-radix algorithms are presented in [Liu, 2007, 44-47].

This article describes a processor architecture optimized for FFT calculations. Several optimizations have been used to improve CPU power consumption. This paper shows that a programmable solution can have an energy consumption comparable to a fixed function. The processor is optimized for radix-4 and conjugate-radix FFT algorithms and supports multiple transform lengths.

FFT Algorithm: The Fast Fourier Transform (FFT) is an algorithm that computes the Discrete Fourier Transform (DFT) of a sequence. FFT can also be used in different ways. Fourier analysis transforms a signal from its original region (often temporal or spatial) to a representation in the frequency domain and vice versa. The DFT is obtained by dividing the sequence of values into components of different frequencies. This operation is useful in many areas, but computing it directly from the definition is often too slow to be practical. FFT quickly computes such transformations by multiplying the FFT matrix by

products of sparse (mostly zero) factors. The speed difference can be huge, especially for long data sets where the order can be in the thousands. In the presence of rounding error, many FFT algorithms are much more accurate. There are many different FFT algorithms based on a wide range of published theories, from simple arithmetic of complex numbers to group theory and number theory.

Methodology. The proposed processor is based on the transport architecture [Corporaal,1997, 330-341], which is a class of statically programmable instruction-level parallelism architectures. In the transport architecture programming model, the program only passes data over the network of interconnections, and the actual operations occur as a "side effect" of the data transfer. The operands of the function block are entered through ports, and one of the ports acts as a trigger. Whenever data is transferred to the trigger port, the function block initiates the action. When the input ports are registered, the operands for the operation can be stored in the registers of previous instruction cycles, and the trigger port transfer starts the operation on the operands stored in the registers. In this way, operands can be distributed between different functions, block operations, reducing data conflicts in the interconnection.

A processor configured for FFT must support a complex data type, and here the data is split into two parts. Complex units of multiplication and addition are also introduced. A complex addition block computes any four-operand operation defined in a 4-point FFT, and the structure is shown in Figure in 1.

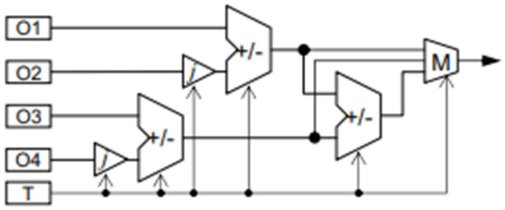

Figure 1. Block diagram of a complex adder

In this block, the opcode is used as a trigger port, so that when four operands are passed to the input ports, the four outputs can be triggered by passing the opcode to the trigger code without having to pass the operands.

Literature review. Currently, when the size of transistors has reached 2 nm [Song, 2019, 1-2], high-speed systems have become more energy-efficient because they have begun to operate at lower supply voltages. The operating frequencies of the systems have reached tens of gigahertz [Patel, 2010, 2-4]. Despite these advantages, it has become

more difficult to ensure stability, reliability and timing constraints in the system. High operating frequencies result in a ASICmatch between clock signals and data signals.

Scientific novelty. Currently, the market for integrated circuits is fixedly growing, and companies whose semiconductor devices do not have flexibility in the face of non-standard conditions are considered uncompetitive. The only way to develop a more competitive product is to develop an integrated circuit that meets the criteria for stability and reliability in an unstable environment. The proposed architecture allows to minimize the power consumption of the processor, which leads to the reduction of the cost and to be more competitive in the market.

Analysis. The processor was designed in Verilog so that the rotation coefficient generator block supports the capacity of two FFT's up to 16 KB, that is, the lookup table of the rotation coefficient block contains 2049 complex coefficients. The device has two pipeline stages and the lookup table is implemented as hard logic. The processor has 32-bit resolution, which allows complex data to be represented using a 16-bit real part and a 16-bit imaginary part. Clock signal protection has been implemented to reduce the power consumption of inactive function blocks. This provides savings on low load units.

The project was synthesized using standard 4 nm cell technology. Energy consumption estimates are obtained using valve-level simulations. Outcome characteristics are shown in Table 1. The rotation factor block uses about 23% of the core area and 7% of the power consumption, so the rotation factor block improves the power efficiency of FFT calculations. The most significant energy savings compared to the previous results of [Pitkanen, 2006, 84-88] are related to the data memory, since two parallel single-port memories were used here instead of two ports, which halved the memory energy consumption.

```
main () {
    initialization (); /* 8 to 42 instructions */
    prologue (); /* 14 instr. */
    for (idx=0; idx <(N⌈log4N⌉)/16-1; idx++)
    kernel (); /* 16 instr. */
    epilogue; /* 17 instr. */
    }
```

Figure 2. Code depicting the structure and management procedure of the program code

The energy efficiency of a FFT implementation is often compared by measuring how many 1024-point FFTs can be calculated with 1 mJ of energy, so a few examples from the literature representing FFTs with different technologies have been selected. The results of the comparison are shown in Table 5.6. The Intel Pentium-4 [Deleganes, 2002, 230-233] is a general-purpose RISC, and the StrongArm SA-1100 [Intel, 1999, 12-16]

can be considered a general-purpose processor for mobile devices because it uses specialized circuit, clock signal protection and supply voltage reduction. Examples of general-purpose DSP processors are the TI TMS320C6416, which is a VLIW machine, and the Imagine [Rixner, 1998,3-13], which is designed for multimedia applications. Both processors use pseudo-ordered data path partitioning. Additionally, the C6416 uses pass-gate multiplexer circuitry. The implementation of FFT on C6416 is described in [Texas Instruments, 2003,11-17]. It should be noted that the 6002 cycle count is achieved through eight memory ports, while the Proposed processor uses only two. The Spiffee processor [18] is designed for FFT, and power consumption is reduced by low supply voltage. An FPGA solution with specially built-in FPGA logic is described in [Lim, 2004, 230-233]. [Wey, 2007, 783-787] report a custom scalable IP core using a single-clock signal-protected memory architecture, and [Wang, 2005, 310-31 9] describe a custom variable-length FFT processor using unidirectional radix-2/4 /8 delay algorithm. A highly optimized FFT implementation using the subthreshold circuit technique is described in [Wang, 2005, 310-319]. A comparison in Table 2 shows that the energy efficiency of the Proposed CPU is equivalent to fixed-function ASIC implementations, even though the implementation is programmable.

Table 1. Specifications of proposed processor synthesized using 4nm ASIC technology

Recommended sizes of FFTs	**64 – 16384**
Number of cycles	207 – 114722
Execution time	828 nm - 459 μs
Energy consumption	60 – 73 mW
Maximum frequency of the clock signal	255 MHz

Table 2. Processor specs by footprint

Nucleus	**38 (*1000 gates)**
Instruction memory	2 (*1000 gates)
Data memory	240 (*1000 gates)
General	280 (*1000 gates)

Table 3. 1024- point FFT

Number of cycles	**5160**
Energy consumption	60.4mW, 0.9V, 250MHz 29.8mW, 0.675V, 140MHz

Table 4. 8192-point FFT

Number of cycles	**5 7396**
Energy consumption	68.7 mW, 0.9 V, 250 MHz

Table 5 . Power consumption comparison for a 1024-point FFT

Project	Technology nm	Power supply V:	t_{clk} : MHz	t_{FFT} mkv	FFT/mJ
Recommended	4	0.9	250	21	809
[Lim, 2004]	4	0.75	100	13	149
[Wey, 2007]	4	0.8	500	8	100
[Deleganes, 2002]	4	0.75	300	24	1
[Rixner, 1998]	7	1.2	232	160	16
[Lim, 2004]	14	1.5	6	430	1428
[Wey, 2007]	14	1.5	20	282	43
[Wang, 2005]	28	1.8	45	23	93

Table 6 . Power consumption comparison for an 8192-point FFT

Recommended	**4**	**0.9**	**250**	**230**	**63**
[Lin, 2004]	14	1,2	20	717	55
[Wey, 2007]	14	1.5	22	908	35
[Liu, 2007]	28	1.8	12	1198	4

Conclusion. This paper proposed a low-power, dedicated processor for FFT calculations that used several techniques to reduce power consumption: special function blocks, parallel memory, clock signal protection, and code compression. The processor was synthesized using 4nm ASIC technology and the power consumption analysis showed that the proposed processor is 26.8% energy efficient without significant performance degradation, which promotes sales volumes by 23%.Performance can even be improved by adding more computing resources.

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Margarita YEGHIAZARYAN, Erik KARAPETYAN, Edgar PAPYAN
Economic efficiency of a specialized processor with low power consumption due to FFT calculations
Key words: discrete fourier transforms, fast fourier transforms, application specific integrated circuits, digital signal processors, parallel architectures, transport architectures, power consumption, sales promotion

Nowadays when semiconductor device sizes reached a few nanometers, high-speed processors became less power-consuming, and systems operating frequencies reached dozens of gigahertz. Despite these advantages, devices became more vulnerable against temperature-voltage drifts. Also, because of dozens of gigahertz frequency data transASICsion, it became more complicated to meet timing constraints in processors. With the help of FFT calculations, it becomes possible to design more affordable ASIC processors with low power consumption. Currently, the integrated circuit market is fixedly growing, and companies whose semiconductor devices do not have flexibility in non-standard conditions are considered uncompetitive. The only way to develop a more competitive product is to develop an integrated circuit that meets the standards of stability and reliability in unstable conditions. The proposed architecture reduces processor power consumption by 26.8%, which leads to a 23% reduction in costs and increased competitiveness in the market.

ESTIMATION OF THE IMPORTANCE OF FACTORS AFFECTING THE INVESTMENT ENVIRONMENT

Ashot TAVADYAN
Doctor of Science in Economics, Professor, RAU
Gevorg PETROSYAN
Ph.D. student, Department of Economics, RAU, Yerevan, Armenia

Key words: investment, estimation, gradient boosting algorithm, investment environment, importance

Introduction. Very often, macroeconomic data are scarce and incomplete, which makes it difficult to work with them and carry out analysis that can reveal important ideas related to the subject of study. For this reason, various researchers and analysts face the problem of applying linear regression models. Estimation of linear regression models is subject to several limitations that apply to the data, but the most common are the linearity of the data and the availability of adequate data for the number of variables or factors under study [Maxwell, 1975]. However, macroeconomic data are mostly presented on an annual or quarterly basis, which may not be sufficient to conduct valuable analyses. For this reason, there are many other models and algorithms that can be applied to work with similar data. The choice of models can depend on several circumstances. The first of them has already been partially mentioned: the appearance and quantity of data. Other reasons may be the nature of the dependent variable and the purpose of the study. If the goal is to obtain a specific numerical expression that represents the current situation of the dependent variable depending on the independent variables, then linear regression models of general appearance are used. If the goal is to evaluate the degrees of importance of the influence of independent variables, then linear or non-linear vector or decision methods are used. For this purpose, the gradient boosting algorithm is used in this work, which performs brilliantly with both linear and non-linear data, and the limitation of the amount of data is not so relevant.

Methodology. As mentioned above Gradient Boosting algorithm is used in work to conduct analysis for understanding the importance of the chosen factors which affect the investment environment of Republic of Armenia. Data is taken from the World Bank development database. Data covers the timeline of 1990-2023 and at first is taken as a yearly one. Afterwards exponential interpolation method has been used to artificially enlarge the dataset to make it in a quarterly basis. Overall, 37 factors were taken from the database. Different statistical tests have been conducted to understand the usability of the created dataset, also linear regression models were estimated to have the first glance to the dependent variable which is the FDI inflows to Armenia.

Literature review. The works of various researchers and economists were studied, where attempts were also made to assess the degrees of influence of the factors affecting the investment environment. In 2004, the World Bank initiated a large-scale study in this area by establishing the Investment Climate Study Group. Various analyzes were conducted at both the micro and macro levels, but the author paid great attention to the analyzes conducted at the macro level. Such is the work of O. Ovchynnikova, T. Zavhorodnia and M. Ignatyshyn called "Modeling of Investment Processes by Methods of Regression Analysis" (2019), specialists in automated systems and modeling of Khmelnytskyi University, in which the analysis of Ukraine's investment environment is carried out using several artificially created factors. A regression model was estimated. The work of D.Plikynas from Vilnius University and Y. H. Akbar from Central European University of Vienna called "Explaining Foreign Direct Investment Patterns in Central and East Europe: a Neural Network Approach" (2006) also played an important role in the creation of this work. In that work, neural networks were used to perform macroeconomic analysis, which is an exceptional example and has no similarity.

Scientific novelty. With this work, the author aims to develop a model which could predict and estimate at first the importance of the factors which affect the investment environment. To assess the degree of importance of the factors affecting the investment environment in Armenia, such a model as the Gradient Boosting algorithm has not yet been applied. It enables high efficiency as well as logical results with incomplete or non-linear data.

Analysis. The data is divided into 2 parts: 20 percent of the total data is merged exclusively randomly for testing, and the other 80 percent is used for obtaining the actual results and evaluating the model. First of all, the mean square deviation of the data series was estimated, the function of which has the following form:

$MSE = \frac{1}{n}\sum_{i=1}^{n}(Y_i - \hat{Y}_i)^2$ where

MSE is the mean squared deviation,

n is the number of data,

Y_i are the values to be studied,

Yˆ_i - predicted values.

The smaller the mean square deviation, the closer the predicted values of the model are to the actual or studied values. It is an important sign of the high quality of the model. The mean square deviation was calculated for the collected data, which was 0.22 for all factors. In order to understand how small the mean squared deviation is considered a good result, it should be compared with the dimensionality of the dependent variable. It lies in the limit [0,9.98] in the studied series. 9.98 represents that a maximum of 998 million US dollars foreign direct investment was made in Armenia. Thus, having a mean

square deviation of 0.22 in the given range indicates the high quality of the model. However, it is not the only indicator of the quality of the model.

As with the PC method, the quality of the model or the coefficient of determination (R-Squared) to explain the dependent variable of the independent variables was evaluated here. The function of the coefficient of determination has the following form:

$R^2 = 1 - \frac{RSS}{TSS}$ where

R^2 is the coefficient of determination,

RSS, sum of squares of residuals,

TSS: total sum of squares.

The estimated model coefficient of determination for all factors is 95%. It is a rather high indicator, which is another sign of the high quality of the mo-del. Compared to 80 percent of randomly selected data, the model's predictions look like this, where the blue dots indicate the actual values, and the red line represents the model's predictions.

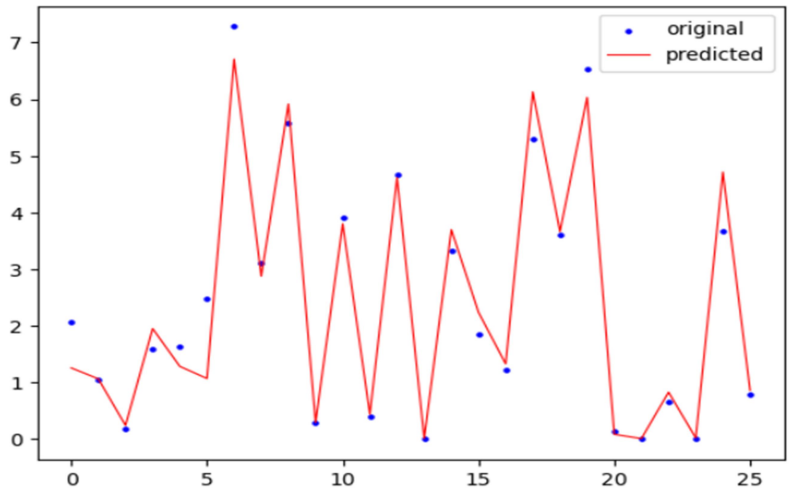

Figure 1. All factored model predictions along with available data

As can be seen from Figure 1, the deviation between predictions and existing values is not very large. Having the above-mentioned results, it is possible to evaluate the degree of importance of independent variables. The importance scoring function looks like this:

$I = \sum_{f\epsilon\ i} \frac{f\ amount\ of\ data\ per\ node}{Amount\ of\ all\ data} xR(f)$ where

i is the factor number,

f is the factor node,

F_i is the number of all nodes,

R(f) is the root mean square deviation of node f.

First, a model with all factors was estimated. However, the majority of selected factors were unimportant and for this purpose the model was evaluated a second time, this time only with 10 most significant factors.

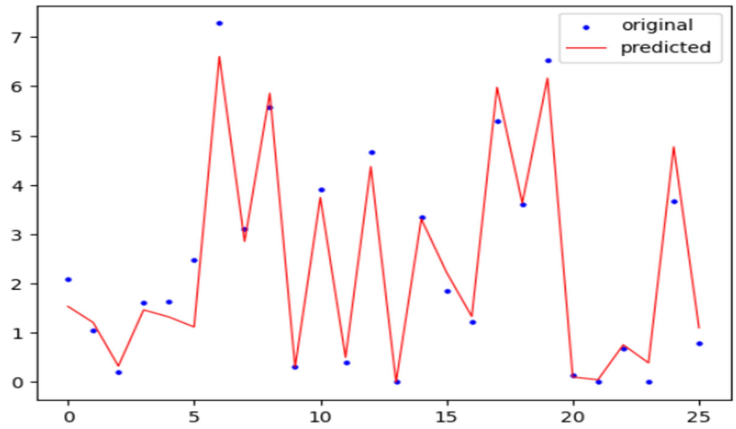

Figure 2. Estimated model predictions by the 10 most important factors along with available data

There is a simple method to check the quality of the model, which is to assign values to the selected factors and predict the value of the dependent variable. If we assign the data recorded as of December 2023 to 10 independent variables, we will get USD 908 million.. Thus, we had a deviation of 90 million US dollars. Since the value of December 2023 for FDI is the maximum in Armenia, it is normal value outside the distribution, but due to its important nature and model type, it was not removed from the data set.

Firms using banks to finance investments (% of all comp.)	0.685
Unemployment rate (national estimate)	0.096
Inflation rate	0.065
GDP volume	0.054
Annual growth of exports of goods and services	0.041
Time to start a business	0.003
Government spending on education (% of GDP)	0.02
Consumer spending (% of GDP)	0.01
Profit tax (% of all commercial profits)	0.008
Gini index	0.013

Figure 3. Final importance ranks of the 10 selected factors

However, it was assumed that such a deviation could be obtained only in the case of 10 variables. All models are evaluated using the Python programming language, scikit-learn and statsmodels statistical packages, and all calculations can be seen in the Appendices

section. Thanks to these calculations, it is also possible to carry out a non-automated, private calculation, where you can download any logical value for each selected factor and make a forecast for the Republic of Armenia. In the case of the 10 selected factors, the coefficient of determination was 95.5 percent. And in the case of the 10 selected factors, the degrees of importance had the following final form, in which the Organizations that use banks for investment financing (% in all comp.) factor has 68.5 percent of total importance.

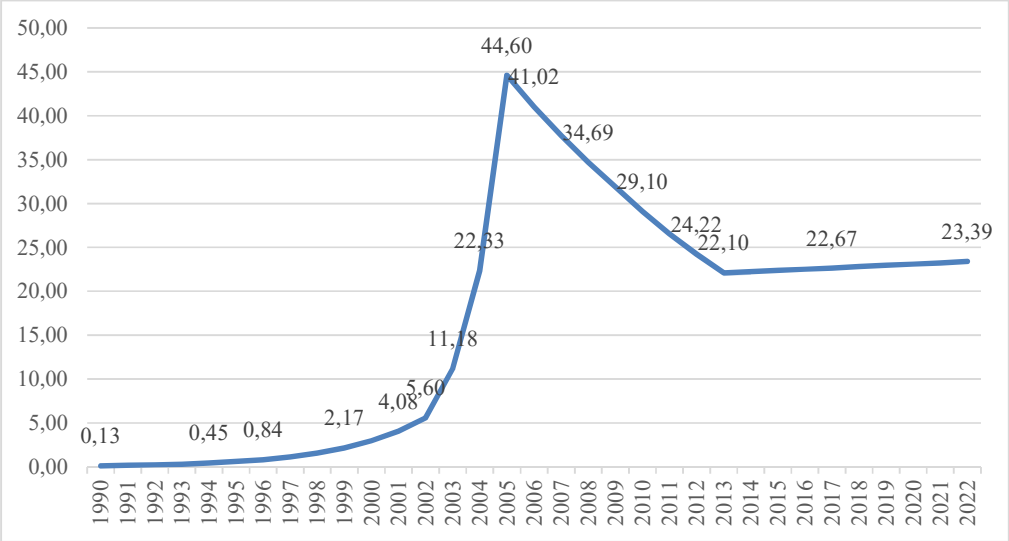

Figure 4. Firms using banks to finance investments (% of all comp.) 1990-2022

Since the independence of the Republic of Armenia, many changes have been implemented in the financial and banking system of the Republic of Armenia. The RA financial banking system is controlled and regulated by the Central Bank. Before the decision No. 15 of November 19, 1993, by which the Dram was adopted as the state currency of the Republic of Armenia, the Soviet ruble was in circulation. It was a legacy of the broken Soviet financial system. Along with that, military operations had started in Nagorno-Karabakh, and there was also a hyperinflationary period in the economy. All this could not leave its impact on the RA investment environment, which one could say did not exist. There were no basic laws that could regulate the RA investment environment and make it attractive for investors. Only in 1996 was the RA Law "On Banks and Banking Activities" adopted. It was one of the first steps in the creation and development of the RA investment environment. In 2002, full-scale amendments and additions were made to the Law of the Republic of Armenia "On Banks and Banking Activities", because of which the powers of the Central Bank Council were expanded, with the aim of preventing the circulation of funds obtained through criminal means in the territory of the Republic of Armenia in banks

and credit organizations. It was a big step in the direction of reducing the risks of banking and investments made through banks. This certainly could not remain inconsequential and as we can see from table 4, the values of the most important factor resulting from the estimated model, Organizations that use banks to finance investments (% of all comp.), start to increase sharply until the financial and economic crisis of 2008. It reaches from 5.6 percent to 44.6 percent. This meant a sharp increase in confidence in the RA financial and banking system. However, after the financial and economic crisis of 2008, as in almost all countries, trust in the financial and banking system began to decrease in RA, which in turn led to a reduction in the volume of investments. During that period, the assets of investment companies in RA began to grow at a slower rate.

If in 2008 the assets of investment companies increased by 24.1 percent compared to the previous year, then in 2009 the assets of investment companies increased by only 7.3 percent. The number of organizations that use banks to finance investments is also sharply decreasing. The downward trend continues until 2014, after which it becomes more static. As early as 2010, the RA Law "On Investment Funds" was adopted. Its purpose is to protect the rights of investors in the Republic of Armenia, to develop a collective investment system and to establish common rules for the creation and operation of investment funds and investment fund managers, to increase financial intermediation and to involve the broad masses of the population in the securities market. After the adoption of this law, since the financial and economic crisis, the first increase in the volume of investments is registered.

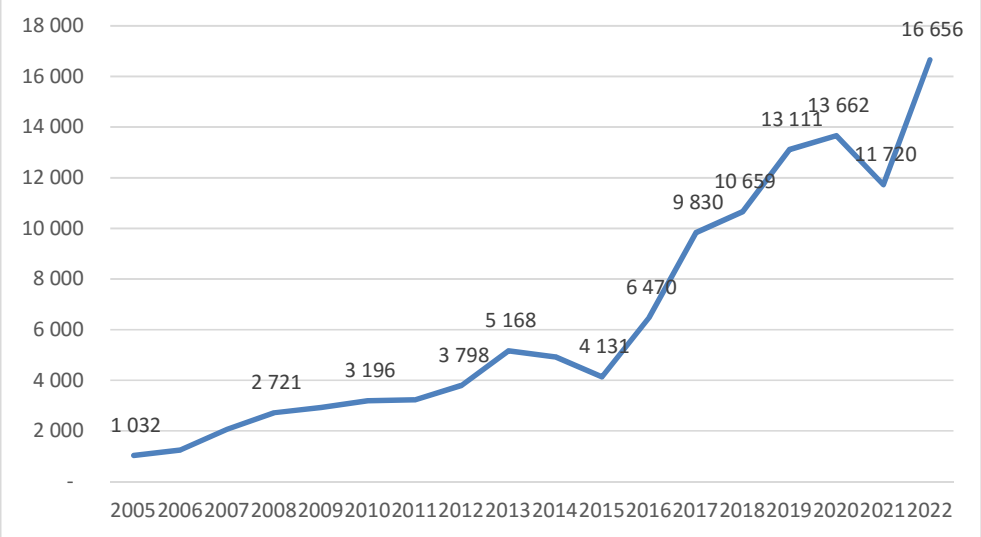

Figure 5. Assets of investment companies in Armenia from 2005-2022

However, the uncertain behavior towards the financial and banking system continues, which leads to a decrease in the volume of investments in the following years. In 2015, the currency crisis of the Russian Federation also had its impact on Armenia, which directly led to a decrease in the volume of investments. However, during that period, it was possible to maintain the increase in the number of organizations that use banks for investment financing. Along with all this, the Law of the Republic of Armenia "On Banks and Banking Activities" was constantly being amended, the purpose of which was to adapt to the current situation. However, the global crisis caused by the coronavirus of 2020 nullified any changes and investment volumes fell due to natural causes only. Due to the steady increase in the number of organizations that use banks for investment financing, it was possible to ensure a sharp increase in the volume of investments, which reached a historical maximum of 998 million USD by the end of 2023.

Conclusions. From this it can be concluded that no matter how many changes are implemented in various RA laws in order to make them more up-to-date, behavioral manifestations are also an important factor. In our example, it is the behavior towards banks and banking activities, which has not yet reached the maximum indicator of 44.6 percent.

The sum of the degrees of importance of the first 5 factors is 94.1 percent and three of them are exclusively macroeconomic indicators, which can be influenced by many other subordinate factors. This shows that the attractiveness of the investment environment is directly related to the behavior of investors towards the economic, political and social aspects of the country.

Studying the obtained results, it can be noticed that the influence of endogenous factors on the investment environment is much greater than that of exogenous factors. Both in the linear regression model estimated by the PC method and in the gradient stimulation algorithm, only one exogenous factor was included, but different exogenous factors. Among the 10 factors selected in the gradient boosting algorithm, the importance of the influence of endogenous factors was estimated at 95.9 percent, and the importance of the only exogenous factor was only 4.1 percent. If we try to estimate the total importance of exogenous factors among all collected factors, it is only 4.65 percent. Of course, this is explained by the number of selected external factors and several factors that indirectly affect the investment environment, unfortunately, it is difficult to find reliable data for these factors or to conduct an analysis with them, because they are more qualitative than quantitative factors.

The evaluated models can be used both by economists and analysts, and by investors, to realize the forecast of the volume of investments expected in Armenia, as well as to evaluate the weights and degrees of importance of various endogenous and exogenous

factors over time. It will give an opportunity to be better prepared for economic, legal and political changes, as well as to reduce risks.

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Ashot TAVADYAN, Gevorg PETROSYAN

Estimation of the importance of factors affecting the investment environment

Key words: investment, estimation, gradient boosting algorithm, investment environment, importance

In various countries, economic, political, socio-cultural reforms are continuously taking place, which pursue many and various goals and interests. One of the important goals is the creation of the most favorable investment environment. From the theoretical point of view, the study of the factors affecting the social order, legal framework, business activity and investment environment has an important empirical significance. Identifying the factors affecting the investment environment and their coordination in external and internal spheres will enable the strategists to obtain greater information for the creation or improvement of investment opportunities in various spheres. It is also of great importance for reducing and managing negative factors affecting investments. This will lead to a reduction in the level of risks, which will certainly make the country even more attractive for investors, who can more easily evaluate and forecast their investments.

NLP ALGORITHMIC SOLUTION FOR GOODS CATEGORIZATION IN ACCORDANCE WITH THE COMMODITY NOMENCLATURE OF FOREIGN ECONOMIC ACTIVITY GIVEN TAX DOCUMENTS: A CASE STUDY IN ARMENIA

Zaruhi NAVASARDYAN
Ph.D. applicant, Mathematical Modeling of Economy, ASUE

Key words: taxation system, natural language processing, goods classification, keyword extraction, text similarity matching.

Introduction. Between and within country trade is subject to various taxes. Given that taxes apply based on the categories of good in trade, taxpayer have incentives to internationnally misclassify good for economic gains. Thus, the standardization of good classification is a key to correct tax collection. This consistency is pivotal in reducing ambiguity, minimizing errors, and fostering a shared understanding among stakeholders involved in trade. In the realm of international trade, customs data often stands as a paragon of meticulous categorization, adhering to the specific guidelines. The unified categorization approach is not merely a technical advancement; it is a transformative force that harmonizes the language of trade, ensuring a standardized understanding of goods across borders. This, in turn, facilitates smoother international transactions, reduces errors in reporting, and bolsters the overall integrity of trade data. However, a critical gap emerges within the internal trade dynamics, specifically in transactions between taxpayers using invoices and the final customer, documented through receipts. While these documents are carefully collected by the tax authorities and meticulously describe the products, they frequently lack the systematic categorization found in customs data.

Currently in Armenia, there is an issue of proper matching of customs data with tax returns data. Obviously, the problem exists not at the taxpayer aggregate data level, but at a more granular level. As tax legislation in the Republic of Armenia does not require unified classification for internal trade purposes. In particular, the customs data includes detailed coding of goods which are based on standard approach (in particular, the Eurasian Economic Union Commodity Nomenclature of External Economic Activity at 10-digit level). The application of product codes in tax documents (invoices, fiscal receipts) instead is optional (or fragmented). The only remaining option to track the goods within the supply chain is to use the textual unstructured data, which brings up a serious complication due to high variety of possible inputs for the same item. This research aims to apply a combination of machine learning and analytical tools to automate the product classification and matching to respective unified taxonomy. The economic purpose of the research is making the huge textual unstructured data, now subject only for limited manual analysis, easily usable for analytics and thus contribute to better fraud detection system. Different natural language processing (NLP) approaches were applied to classify the

textual data into product categories and items. Given the limited human resources, only a limited set of products undergo manual classification and analysis at SRC, the automation of the process by the application of NLP techniques will give the chance to extend the classification for a bigger set of good with no or very small adjustments.

The insights and methodologies and results presented in this paper lay the foundation for further analysis of the internal trade patterns and the make it possible to track the flow of the goods from import to final consumer. The practical contribution of the research is its direct applicability in planning and implementing targeted tax audits and upgrading the current methods applied by tax authorities. It will also contribute to the fulfilment of the requirements imposed by the Eurasian Economic Union towards increasing the tracking capacity of the customs and tax authorities. Obviously, the challenge of accurate goods classification is compounded by several factors:

Armenian language used. Modern natural language processing models especially transformer based large language models demand huge textual datasets and substantial computational resources for effective training. However, Armenian stands out as a low-resource language, compounding the difficulty of acquiring sufficient data. This unique linguistic context presents a distinctive challenge, as, at the time of this research, the unavailability of pretrained models capable of delivering high-quality results in Armenian makes the task of goods categorization more complicated and highlights the need for more innovative approaches.

The product description filled in manually. This manual input introduces a layer of subjectivity and variability, as taxpayers enjoy complete freedom in crafting these descripttions. Consequently, these descriptions may lack specific information about the product, leading to a potential loss of crucial details. Moreover, the absence of standardized abbreviations and the allowance for grammatical errors further contribute to the complexity of the categorization process.

The rest of this paper presents the following: methodological approach, highlighting both machine learning models applied and steps necessary to operationalize them in practice, data overview, and the results, followed by brief conclusions.

Methodology. The data for 2019 was extracted from SRC database ans used for analysis. The main resources used for research purposes:

- Import data with labeled product codes (11 digits), product definitions;
- Tax receipt data with human labeled 4-digit ADG codes (may not be 100% correct) and product definitions;
- Invoice data with product descriptions only (textual data).

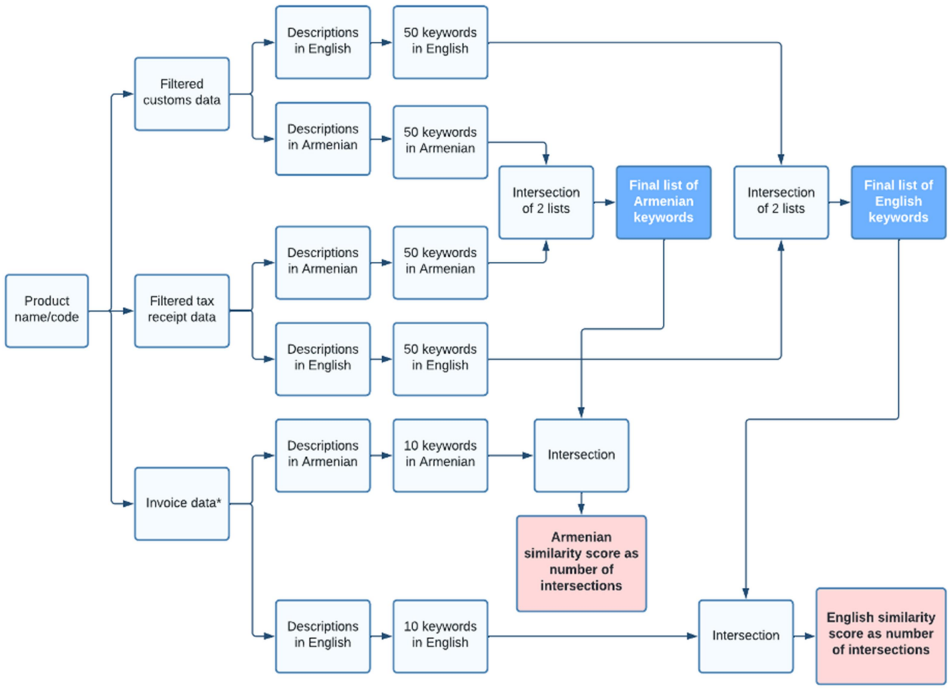
The data first underwent deep descriptive analysis, which includes checking the number of unique descriptions, number of unique importers of the chosen good, understanding the frequency and volume of imports, comparing unit prices. For some of these

goods the data is cross-checked with alternative sources to make sure no material errors are present. Considering that the data subject to analysis operates at the product level, it is essential to acknowledge that each individual invoice or tax receipt typically encompasses multiple products. This characteristic leads to a substantial increase of data points within the resultant dataset. Given the limited human and computation resources, the research was framed in the context of a small set of products, which would later serve as a base for an automated framework applicable to the full list of products. The list of products was chosen by compromise between complexity and verifiability (including using expert opinions). As all textual descriptions in the data are in Armenian which makes the analysis and the usage of state-of-the-art ML approaches complicated because of a very limited NLP research available in Armenian, thus all the textual information required for the task was translated into English using the Google Translation API. The main approach used for product categorization was text similarity approach based on the descriptions for imported goods. The approach consists of 2 main components: first is the keyword extraction and second the text similarity capturing. For keyword-based similarity identification unsupervised keyword extraction algorithm YAKE [Campos et al., 2018, 806–810] was used. This approach was chosen based on experimentation and result comparison between several approaches including TextRank a graph based method leveraging order in text for text summarization and keyword extraction [Mihalcea et al., 2004] and Rake. While Thushara et al. [2019, 969-973] get the best score for document keyword extraction performance with Rake, Yake is the faster and simpler alternative with similar performance. It is a frequency based automatic keyword extraction framework. The main advantage of the algorithm is that it does not use any fixed dictionary or 3rd source information for extraction, and it relies on features extracted from text, making it applicable to textual documents in different languages and domains without the need of prior domain knowledge. As the algorithm is language independent, it was applied to Armenian versions of product descriptions as well. First, keywords from text (both from Armenian and English) were extracted, then were later used instead of full descriptions.

The list representing the intersection of top 50 keywords extracted from labeled descriptions in customs and tax receipts data was built. Then for each product definition in invoice data a similarity score was calculated as the number of intersections or the number of keywords with similarity above threshold for Armenian and English respectively. To calculate similarity between 2 text entities the text is transformed into vectors and then cosine similarity between 2 vectors is computed. The second component of the similarity approach was the full description similarity estimation. For this purpose, Bidirectional Encoder Representations from Transformers - BERT [Devlin et al., 2019] model was used. Transformer architecture is one of the latest achievements of researchers in the deep learning sphere and is widely applied in natural language processing. A pre-trained BERT model developed and pre-trained by Google on a huge textual corpus and de-

signed in a way to take into account the context and to be able to learn contextualized embeddings was used.

Figure 1. Retrieving the text similarity from various transaction documents.



The other reason to choose this model for the task was the extensive use of BERT and its predecessor models for product description classification in the literature. Specifically, Jahanshahi et al. (2021) aimed to classify the product descriptions of several top online grocery platforms in Turkey. They compared the traditional methods such a bidirectional LSTM with more advanced NLP language models (BERT, ROBERTA etc.). While none of the techniques was an absolute winner, the advanced techniques outperformed in most cases. In ProBERT: Product Data Classification with Fine-tuning BERT Model [Zahera et al., 2020, 3] the authors fine-tuned the pre-trained BERT model for multiclass classify-cation and used it for the end-to-end classification. The advantage of the approach is that it solves the task with a single model and ProBERT will provide the class given the desc-ription, but it is not scalable and will need repetitive training whenever new ca-tegories appear. The similarity-based approach helped to exploit the ability of the pre-trained BERT to provide representative embeddings for product descriptions and bypass the sca-lability issue. As a result, 3 similarity scores are generated, among those are:

- Intersection of keywords in Armenian. For this point only the invoice descriptions ha-ving more than 1 keyword that match the keywords in the extracted list are assigned the given product class.

- Similarity of keywords in English. The criteria of similarity for this approach is to have at least one keyword from the keywords list that was built on labeled description translated into English.

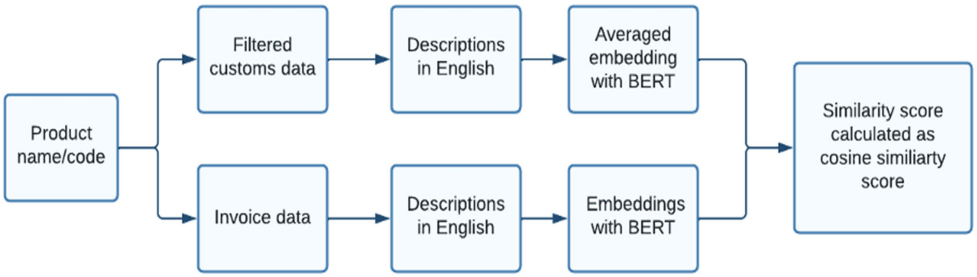
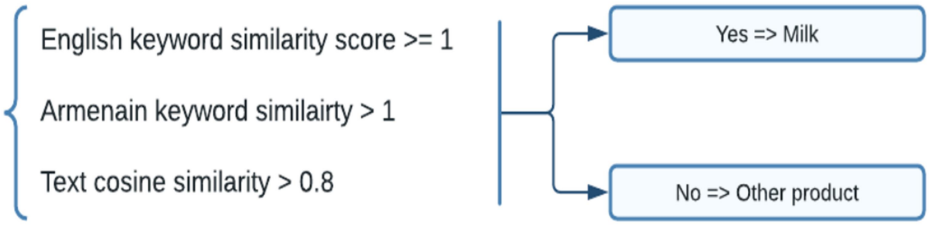


Figure 2. Using BERT to derive cosine similarity score.

- Similarity of full description. For similarity estimation of full descriptions, cosine similarity was used as a metric and the similarity threshold equal to 0.8 was taken as the optimal one for text matching[1].

Finally, the description was categorized as a specific type of product only if the above-mentioned 3 criteria are satisfied altogether. The decision criteria are summarized in the figure below.

Figure 3. Categorizing product as milk based on 3 criteria.



*Note: The similarity threshold can be adjusted based on some labeled examples.

Literature review. With the technological progress and given the level of automation that artificial intelligence can provide machine learning become more and more applicable in the state level systems. The applicability of such algorithms is especially high for tax authorities as the data is fully collected and documented in databases. While the usage of structured data is much simple, important information is often hidden in unstructured textual information. In their study on the data from United States Department of Agriculture researchers showcase the valuable role that artificial intelligence can play in

[1] The similarity score varies between 0 and 1. The threshold of 0.8 was identified based on manual check of the description after applying the threshold and considering that it is better to miss several milk products (false negatives) then to misclassify many other products as milk (false positives).

automating product classification at scale and, more generally, in empowering decision-makers with the information from unstructured data [Marra de Artiñano et al., 2023, 404-411]. In their study Chen et al. highlight the importance of correct product classification as inaccuracies not only pose duty risks but also undermine revenue collection efforts. They present an automated solution leveraging machine learning techniques to alleviate tand introduce a novel model based on off-the-shelf embedding encoders to cvalidate product classification in tax documents. On the human labeled data from Dutch customs officers they achieve 71% accuracy which is a promising result [Chen et al., 2021, 8-9]. Another approach used by researcher for text categorization is keyword extraction and matching. In their study named Domain classification of research papers using hybrid keyphrase extraction method researchers use RAKE: Rapid Automatic Keyword Extraction Algorithm for keyword extraction to classify the domain of documents and get interesting results [Thushara et al., 2018, 387–398].

Scientific novelty. The main scientific novelty of this applied research is the contribution to the field of good categorization by introducing and implementing Natural Language Processing (NLP) algorithmic solutions, particularly in the context of Armenia, where the challenges of a low-resource language and manual input of product descriptions on invoices and receipts have hindered the application of advanced NLP models.

Analyis. Withing the scope of the research, the experiment was meticulously executed, focusing on two key products: milk and rice. The selection of these products was guided by a comprehensive assessment of various characteristics inherent to them. This decision was carefully made through a thorough descriptive analysis and the incorporation of expert opinions. Multiple attributes were considered, such as the number of importers, the diversity within product descriptions, and the potential for false positives, considering the inherent nature of each product.

The evaluation of the NLP algorithmic solutions encompasses two pivotal components:

Human expert evaluation

A cadre of human experts, drawn from the State Revenue Committee (SRC) and independent researchers, meticulously conducted a manual evaluation of the classification results. The outcomes underscored the efficacy of the NLP algorithms, showcasing an average alignment of approximately 90% with human expert labeling. It is essential to note that labeling errors may occur in human labeled data as well. The results not only highlight the algorithm's prowess but also emphasize the importance of considering human opinion in the evaluation process.

Evaluation on test sets from human labeled tax receipt data and customs data.

To evaluate the algorithm's performance without direct human intervention, two distinct test sets were crafted, each representing 20% of taxpayer-labeled tax receipt and import data descriptions, respectively. The tax receipt labeling, marked by its lack of cont-

rol, introduces the possibility of labeling errors. On the other hand, the diversity within the textual content renders the evaluation more realistic, capturing the intricacies of varied expressions. On the contrary, the customs data descriptions exhibit precision, making the meaning explicit and facilitating straightforward classification. Acknowledging the advantages and drawbacks inherent in both datasets, the experiment was rigorously evaluated on both fronts. The table below presents the results of three distinct approaches for milk products, offering a detailed glimpse into the algorithm's performance across diverse datasets with varying characteristics. Recall was used as an evaluation metric. Recall shows the proportion of identified relevant products in the whole set of relevant products. In this context, false positives can be important as well as different product types to classify will be all pooled in one set. True positive rate was chosen as the main metric of evaluation as false positives are easier to identify and filter out based on other sources of information such as average price, quantity etc.

Table 1. Evaluation of 3 matching approaches for milk.

Approach	Recall	
	Tax receipts	Custom's data
Keyword extraction and simple intersection	0.83	1
Keyword extraction and similarity with Glove	0.83	1
Text similarity with Bert	0.93	1

The findings from the first and second approaches exhibit a remarkable level of concordance across nearly all cases. However, a difference emerges with the text similarity-based approach. This variance signifies that while the first and second methodologies align closely, the text similarity-based approach introduces a distinctive perspective. This difference, rather than being a discrepancy, underscores the complementary nature of these approaches, hinting at their potential synergies when employed in ensemble. The slight variations revealed by the text similarity-based approach could serve as valuable insights, contributing to a more comprehensive understanding of goods categorization. The prospect of ensembling these approaches emerge as a strategic consideration, harnessing their collective strengths to refine and elevate the accuracy of the overall classification process. This dual-layered evaluation approach not only ensures a comprehendsive understanding of the algorithm's performance but also establishes a robust framework for validating its accuracy and applicability across diverse datasets. The strategic

selection of milk and rice as the experimental focus adds depth to the evaluation, considering the specific characteristics of these products and their implications for goods categorization within the Armenian trade context.

Conclusion. Thus, this study presents a pioneering exploration into the realm of goods categorization, employing innovative Natural Language Processing (NLP) algorithmic solutions within the intricate context of the Armenian tax system. The results of the experiment, validated through human expert evaluation and meticulous assessments on diverse datasets, showcase the efficacy of the NLP approaches. The achieved accuracy, averaging around 90% alignment with human expert labeling, demonstrates the robustness of the NLP algorithms, despite the challenges posed by the low-resource nature of the Armenian language and the uncontrolled tax receipt labeling. The successful application of these methodologies not only enhances goods categorization precision but also lays the foundation for broader implications in the taxation system.

Moving forward, several avenues for future research and development emerge from this study. Firstly, the methodology can be extended to encompass a broader spectrum of products, beyond the initial focus on milk and rice. This extension will provide a comprehensive evaluation of the NLP algorithms' adaptability and effectiveness across diverse product categories, contributing to the generalizability of the proposed solutions. Moreover, the construction of a product flow network stands out as a promising next step. This involves mapping the flow of various products within the trade ecosystem, starting from the import and following the path up to the final consumer. Such a network will not only enhance our understanding of goods movement but also open avenues for optimizing supply chain management and trade policies. In essence, this study serves as a stepping stone for advancing the field of goods categorization, and the outlined future work provides a roadmap for continued exploration, refinement, and innovation in this dynamic and critical domain. The insights derived from this study not only contribute to academic discourse but also hold the promise of substantial real-world impact in automated framework for tax control and fraud detection practices.

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Zaruhi NAVASARDYAN

NLP algorithmic solution for goods categorization in accordance with the Commodity Nomenclature of Foreign Economic Activity given tax documents: A Case Study in Armenia

Key words: taxation system, natural language processing, goods classification, keyword extraction, text similarity matching

Well organized and transparent tax systems are essential for the proper functioning of any country's economy. These systems are responsible for collecting and processing tax-related data from individuals and businesses and ensuring compliance with tax laws and regulations. This article introduces a pioneering approach to goods categorization within the context of internal trade through invoices and tax receipts in Armenia, leveraging cutting-edge Natural Language Processing (NLP) algorithms. Focused on addressing the challenges presented by the low-resource Armenian language and lack of control on the product description provided by taxpayers, the study meticulously evaluates the performance of the NLP algorithms through a case study involving products sample such as milk and rice. The ensemblling approach, by combining the nuanced contextual understanding of semantics with the structural accuracy of syntax, showcase enhanced adaptability and resilience in the face of linguistic diversity. Results indicate an average alignment of approximately 90% with human expert labeling, showcasing the robustness of the algorithms in achieving precise goods categorization. This study contributes valuable insights and empowers tax authorities with practical tools and algorithms with direct implycations for improving the efficiency and transparency of internal trade transactions.