ARMENIA.

# INNOVATIVE AND INSTITUTIONAL DEVELOPMENTS

## "INNOVATIVE AND INSTITUTIONAL RESEARCHES" SEL

ATOM MARGARYAN
HARUTYUN TERZYAN

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"Armenia: innovative and institutional developments" is an electronic periodical wich aims to analyseand briefly represent the overall view and trends of mains innovation and institutional developments of Armenia.

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# 1. MICROENVIRONMENT OF INNOVATIVE ACTIVITY OF RA ECONOMIC ENTITIES: facts and assessments

Strengthening the innovation component of entrepreneurship in the country is crucial for the strategic development of the Armenian economy, raising competitiveness and advantageous positioning in the global economy. From this point of view, it is very important for the innovation environment of Armenia's economic activity, such as the motivation to apply technological innovations by existing economic entities, what factors are conditioned by (or obstructing) the new-born behavior of economic entities.

Information published by the National Statistical Service of the Republic of Armenia since the 1990s till 2008-2009 The crisis has been very limited in the private sector's innovative activity, and in essence does not give a serious idea of the realities in it. However, in the post-crisis phase, qualitative shifts were made in this area, and Armenian statistics can be said to have a certain direction towards the formation of Innovation Statistics, corresponding to European standards. 2015

One of the components of the program, launched with the assistance of the European Union Twinning Project, the Innovation Statistics Program has created an opportunity to formulate a methodological system[1] for statistical recording of the innovation sphere as well as to implement an innovative study of innovative activities among over 1700 Armenian economies[2].

The above pilot study was conducted in 2016 in May and June in Yerevan and all regions. Targeted Combination of Research in the Armenian Market of Basic Types of Economic Activities (NASE) group 2 of the A-N sections of the active organizations, which included 1719 companies. The size of the organizations by the number of employees,

- 10-49 employees, small,
- 50-249 employees, average,
- 250 or more employees, large[3].

Distribution of surveys by organizations included in  NASE group 2 is presented in the table below.

[1] See Metrological Notes on Innovations. Handbook: http://armstat.am/file/article/met__notes_for_innovation_statistics_eng.pdf

[2] Report: "Pilot Investigation of Innovative Activity of Legal Entities and Individual Entrepreneurs", http://armstat.am/file/article/rep_inov_2017.pdf

[3] same place

**TABLE 1.** *Distribution of surveyed companies by organizations according to NASE clause 2[4]*

| | Total | including | |
|---|---|---|---|
| | | large and medium | small |
| **Basic (mandatory) enrollment** | | | |
| Mining industry and open pit exploitation (B 05-09) | 23 | 10 | 13 |
| Manufacturing Industry (C 10-33) | 410 | 154 | 256 |
| Electricity, gas, steam and air conditioning supply (D 35) | 40 | 8 | 32 |
| Water Supply, Sewage, Waste Management and Processing (E 36-39) | 26 | 5 | 21 |
| Wholesale trade, except for motor vehicles and motorcycles (G 46) | 69 | 22 | 47 |
| Transportation and Storage (H 49-53) | 124 | 32 | 92 |
| Information and Communication (J 58-63) | 105 | 40 | 65 |
| Financial and Insurance Activities (K 64-66) | 10 | 2 | 8 |
| Architectural and Engineering Works. technical tests and analyzes (M 71) | 27 | 11 | 16 |
| Scientific Research and Development (M 72) | 11 | 5 | 6 |
| Advertising Activity and Market Situation (M 73) | 15 | 2 | 13 |
| **More coverage** | | | |
| Construction (F 41-43) | 184 | 69 | 115 |
| Wholesale and retail trade and repair of cars and motorcycles (G 45) | 28 | 5 | 23 |
| Retail trade, except of motor vehicles and motorcycles (G 47) | 300 | 106 | 194 |
| Legal and accounting activities (M 69) | 19 | 2 | 17 |
| Activities of head offices: management consulting services (M 70) | 6 | 1 | 5 |
| Professional, scientific and technical activities (M 74) | 6 | 1 | 5 |
| Activity related to employment (N 78) | 3 | 1 | 2 |
| Security and Investigation (N 80) | 13 | 8 | 5 |
| Building Maintenance and Site Improvement Activities (N 81) | 32 | 21 | 11 |
| Real Estate Activity (L 68) | 34 | 8 | 26 |
| Accommodation and catering (I 55-56) | 146 | 38 | 108 |
| Rental and leasing (N 77) | 4 | 1 | 3 |
| Agriculture, forestry and fishing (A 01-03) | 36 | 11 | 25 |
| Activities of travel agencies, tour operators, reservation of places and other tourism services (N 79) | 19 | 5 | 14 |
| Administrative and Supplementary Activities Supporting Entrepreneurial Activity (No. 82) | 27 | 8 | 19 |
| Veterinary Practice (M 75) | 2 | - | 2 |
| **Total RA** | **1 719** | **576** | **1 143** |

Judging by the results of the NSS survey, it can be stated that the innovation sector in the Armenian economy is scarce, and the share of active enterprises in innovation is very small in the total number of enterprises. According to the surveys, 5-6% of the total number of enterprises is engaged in innovative activities. Moreover, depending on the type of innovation, the distribution of enterprises is also different (see Figure 1).

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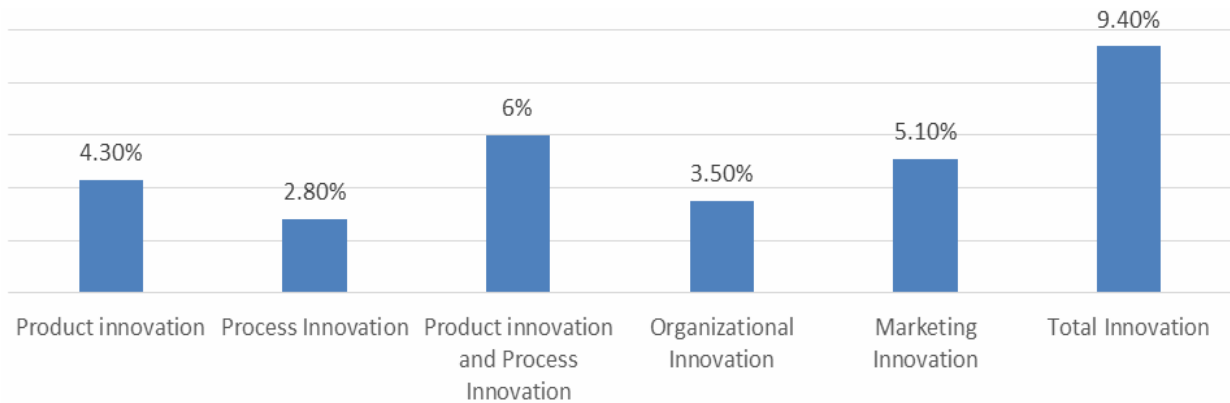[4] http://armstat.am/file/article/rep_inov_2017.pdf

**FIGURE 1.** *Innovative organizations share in organizations total number of innovation types*

Investigations in the business sector of Armenia show that most business companies are inadequate in innovation, do not tend to continually update products, technologies, and are almost free from the connections with research institutions, but at the same time do not hasten to develop their own research and experimental structures. They have a small desire to start a new risk. They do not want to acquire and develop the latest innovative information, to establish effective contacts with research and development designer organizations, consulting and leasing companies, to update their staff's knowledge and capabilities. On the other hand, more or less large enterprises are not in a hurry to upgrade their production at the expense of the newest foreign technologies. Most of them prefer to spend on buying new equipment than buying "Know-How" and working on their own technologies. Especially the small and medium-sized entrepreneurship of the Republic of Armenia in the field of innovation is inadequate because large companies do not meet the demand for technological innovations. Surveys conducted by the NSS indicate that innovation activity, which is driven by size of enterprises, is almost no different (see Table2).

**TABLE 2.** *Total number of organizations selling goods and / or services according to geographic markets and size of organizations[5]*

| | Local / Territorial Level in Armenia | | At the national level (in other regions of Armenia) | | In the European Union or associated countries | | In other countries | |
|---|---|---|---|---|---|---|---|---|
| | Total | which are of Innovation (%) | Total | which are of Innovation (%) | Total | which are of Innovation (%) | Total | which are of Innovation (%) |
| Large and medium | 386 | 10.3 | 103 | 23.3 | 31 | 32.5 | 45 | 15.6 |
| Small | 1 529 | 5.7 | 301 | 9.9 | 46 | 54.3 | 90 | 16.6 |
| *Total* | *1 915* | *6.6* | *404* | *13.4* | *77* | *45.5* | *135* | *16.3* |

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[5] http://armstat.am/file/article/rep_inov_2017.pdf

Observed companies are innovative in their domestic (local / regional or national, but not internationally) markets. Meanwhile, 1 out of 3 large and medium-sized companies in the European Union or Associated Countries 1 (32.5%) have a new product (or service), while 10.3% to 20.3% of similar companies operating in national or local markets , which applies this or that innovation. The explanation of this situation is lacking in the weakness of competitive mechanisms in national and local markets and the existence of certain monopolies. As for small or micro-companies (with 10 to 49 employees), the share of innovation companies at the national level is at least 10 percent (at the local / regional level it is lower than the 5.7 percent). Another is the situation when small national companies go to markets in the European Union, associated countries, or other countries. True, their number is relatively small, but their level of activity is far superior to the use of innovations. In particular, according to the survey, 54% of small Armenian companies operating in the European market use this type of innovation, while in other countries this share is around 17% (see Table 2).

According to the Economic Activity Index (CTS) classification companies, the largest innovation activity is demonstrated by the companies and organizations of the processing industry (Group C), Architectural and Engineering Activities, Technical Testing and Analysis (M 71 Group), Scientific Research and Development (M 72 Group) (see Table 3).

**TABLE 3.** *Total of goods sold by organizations and / or services the number of geographical markets and according to the NASE clause 2[6]*

| | Local / Territorial Level in Armenia | | At the national level (in other regions of Armenia) | | In the European Union or associated countries | | In other countries | |
|---|---|---|---|---|---|---|---|---|
| | Total | which are of Innovation | Total | which are of Innovation | Total | which are of Innovation | Total | which are of Innovation |
| A | 26 | 3 | 16 | 3 | 4 | 1 | 5 | 13 |
| B | 22 | 3 | 14 | 1 | 8 | 4 | 6 | 12 |
| C | 457 | 66 | 234 | 40 | 65 | 13 | 151 | 18 |
| D | 32 | 1 | 16 | 1 | - | - | 3 | 1 |
| E | 21 | - | 1 | 1 | - | - | - | - |
| F | 259 | 9 | 109 | 5 | 7 | 6 | 5 | 3 |
| G | 676 | 56 | 249 | 31 | 25 | 1 | 47 | 3 |
| H | 179 | 5 | 39 | - | 6 | 1 | 15 | 1 |
| I | 230 | 17 | 27 | - | 11 | 4 | 9 | - |
| J | 116 | 13 | 37 | 6 | 28 | 6 | 38 | 7 |
| K | 8 | 1 | 3 | - | 1 | - | 1 | - |
| L | 57 | 4 | 10 | 1 | 5 | 4 | 2 | 1 |
| M | 130 | 24 | 65 | 14 | 23 | 9 | 39 | 20 |
| N | 133 | 2 | 39 | 2 | 8 | - | 15 | - |
| **Total** | **2 346** | **204** | **859** | **105** | **191** | **49** | **336** | **79** |

[6] http://armstat.am/file/article/rep_inov_2017.pdf

Studies show that Armenian businessmen are not in a hurry to massively upgrade their production at the expense of advanced technologies; many entrepreneurs prefer not to go to the leading international markets but prefer to re-establish themselves in the former USSR markets because of the cost savings. The reasons are numerous and varied. Now it is very difficult to point out the cost of innovations in the structure of enterprise expenses. These costs are typically made for the purchase of new Russian or foreign equipment and machinery. And the cost of developing or acquiring new technologies is extremely small (up to 2-3%). Costs of this group include expenditures on obtaining patents, licenses, industrial designs and utility models. In Armenia, there is no clear picture of what sources are being implemented, how much is done by own means, at the expense of foreign investment, at the expense of state budget, extra-budgetary funds or bank loans.

The NSS survey also outlined the factors that greatly hinder the innovation processes. However, the distribution of opinions and answers is quite an interesting picture (see Table 4).

**TABLE 4 .** *Distribution of companies according to factors affecting innovation activities[7]*

| IA Preventing Factors | The assessment of the companies is a factor hindering innovation | | |
|---|---|---|---|
| | *Do not consider the obstacle (%)* | *It is a great hindrance (%)* | *Neutral rating (%)* |
| *EXPENSES CONTAINED* | | | |
| Extremely high costs for innovation | 36 | 20.1 | 43.9 |
| Insufficient financial resources within the organization | 29.1 | 25.2 | 56.7 |
| Lack of funding from external sources: | 44.7 | 16 | 39.3 |
| *KNOWLEDGE FACTORS:* | | | |
| Market Lack of Information: | 50.3 | 4.8 | 54.9 |
| Difficulties finding partners for innovation: | 42.9 | 5.7 | 51.4 |
| Lack of qualified staff | 45.7 | 5.7 | 48.6 |
| Lack of technology information | 59.2 | 2.1 | 38.7 |
| *MARKET FACTORS* | | | |
| Uncertain demand for product or service | 39.8 | 25.2 | 35 |
| The already established organizations dominate the market | 35.7 | 16 | 48.3 |

Particularly problematic should be considered the unfavorable impact of competitive environment factors in Armenia. Meanwhile, a healthy competitive environment creates powerful stimuli for innovations and raises their effectiveness. Unfortunately, we cannot say that under the conditions of the implemented reforms and the current economic policy, steps are being taken that promote a healthy competitive environment.

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[7] http://armstat.am/file/article/rep_inov_2017.pdf

Among the unresolved issues in this respect, the following factors can be cited:
- The rules of the competition game are incomplete and for all participants unequal,
- The impact of competitive pressures on markets, in the compulsory development of new products and new technologies,
- A large part of the economy is in the shade, as lawful taxpayers are incapable of

making improvements, and on the other hand, idle business innovators are weakening for unlawful businessmen.
- Optimal size of enterprises and research institutions.
- The existence of a large number of inefficient owners.
- Inability to work in foreign markets intense competition.

## 2. ARMENIA'S INNOVATION SECTOR DEVELOPMENT TRENDS: *Statistical Compatibility*

Number of organizations engaged in scientific research and development in the Republic of Armenia for 2005-2017 during the period fluctuated between 62-102, with a downward trend(except for 2014). The average number of employees in them is 78-85 people, with only a third of them

having a doctorate degree or a candidate's degree. These figures are disturbing, and it is desirable not only to increase the number of such organizations, but also to significantly increase the number of workers employed there.
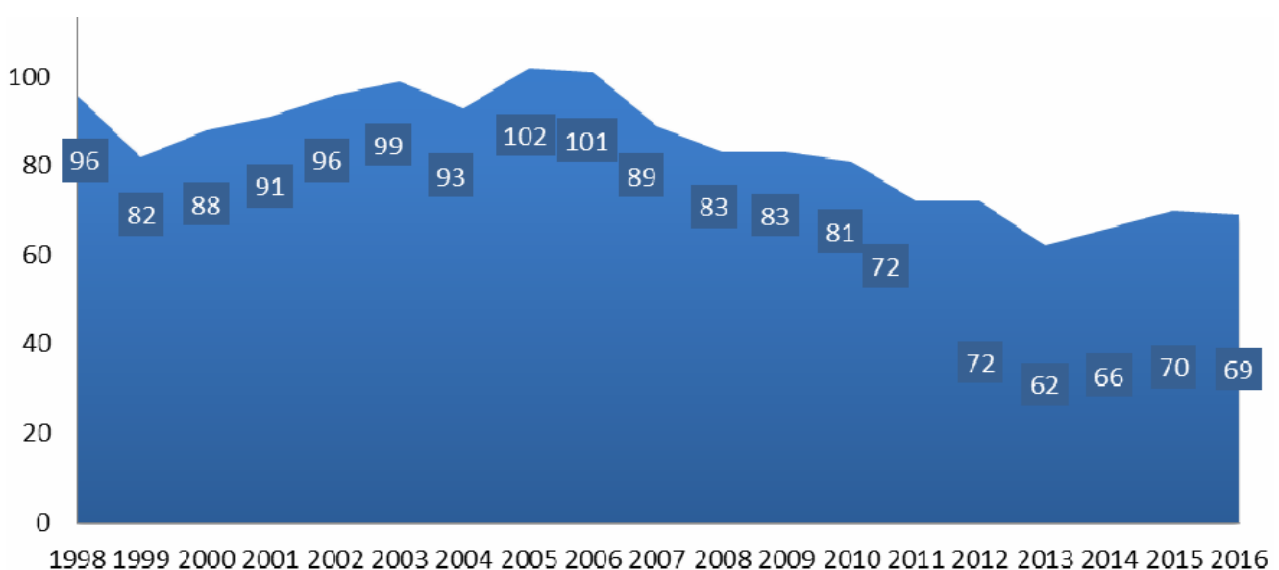


**FIGURE 1.** *The number of scientific organizations in the Republic of Armenia 1198-2016*

Financing of scientific, technical and innovative development in the Republic of Armenia in recent years does not exceed 0, 24-0, 28% of GDP. On the other hand, 9.2% of the state budget expenditures have been made in the education sector (9.7% in 2014), which is not a low indicator but clearly illustrates the separation of education and science spheres and different approaches to state policy.
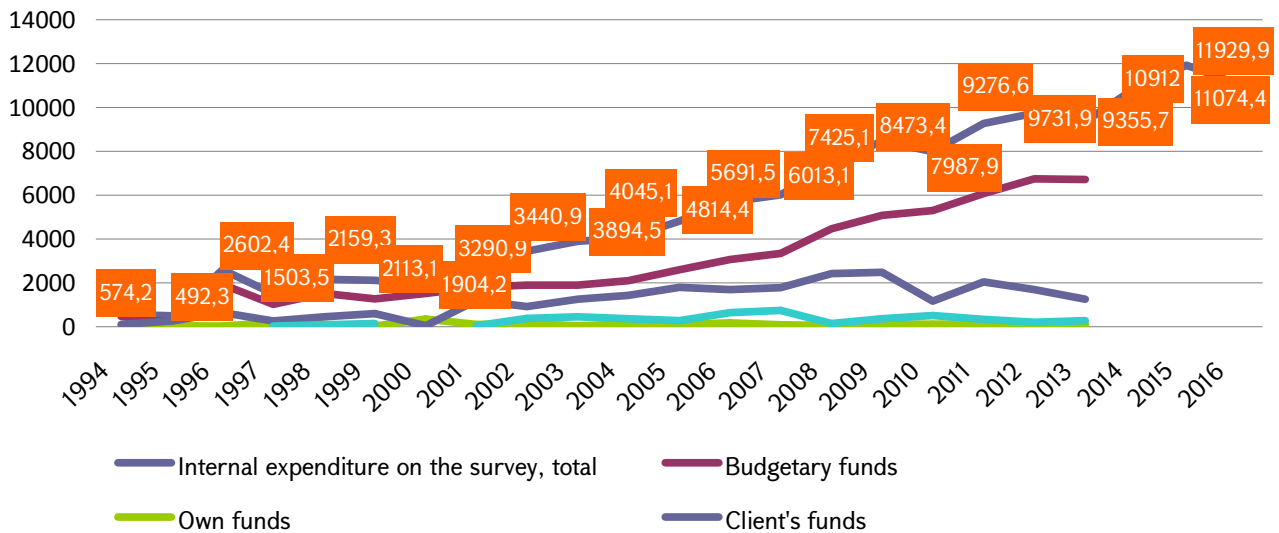


**FIGURE 2.** *Domestic expenditures on research and development by funding sources: 1994-2016 (AMD million)*

Internal expenditures on research and development fluctuate around 8-11 billion drams. A significant annual increase in expenditures (except 2013) is a positive phenomenon, but the funding for both the absolute size and the percentage proportion of scientific research and development remains at a low level.
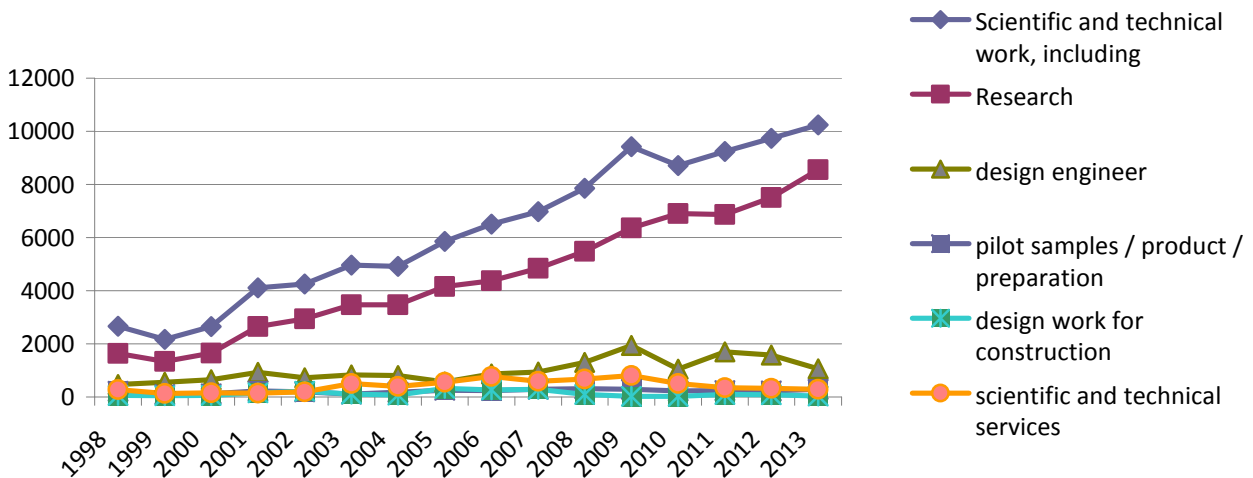


**FIGURE 3.** *Distribution of scientific and technical works by directions, 1998-2016 (AMD million)*

Compared to GDP, Armenia is comparable to that of countries with such indicators as Mongolia, Togo, Zambia and Seychelles, with averaging 2 times lower than the average world-class countries (including the World Bank classification) , The average for Latin American and Caribbean countries 3 times, South Asia 3 times, East Asia and the Pacific 10 times, and so on.

In this context it is interesting to get acquainted with the performance indicators characterizing the effectiveness of scientific activity in the Republic of Armenia. Starting in 1992, when the RA Government's Patent Office was established, the process of elaborating and approving intellectual property (IP) legislation was launched. In 2017, 28742 protected sites are registered in Armenia, with more than 86.3% (24811) share trademarks (Table 1). Only in 2017 applications for 110 inventions and 40 utility models have been submitted to the Intellectual Property Agency of the RA Ministry of RA, of which 146 are from national applicants and 4 from foreign applicants. The total number of applications for inventions and utility models as of December 31, 2017 has been 4478. The total number of applications received in 2017 compared to 2016 has increased by 24, while the number of applications from national applicants has increased by 22 and the number of applications from foreign applicants has increased by 2.

**TABLE 1.** *Number of ASO applications submitted and registered by the national and foreign applicants to the Intellectual Property Agency of the Ministry of Economy of the Republic of Armenia by 2018 As of January 1[8]*

| N | Total number of submitted applications | Including by national applicants | Including foreign applicants | Presented Period |
|---|---|---|---|---|
| **INVENTIONS** | | | | |
| Total number of submitted applications | 3934 | 3398 | 536 | 1993- |
| Number of filed applications | 3059 | 2733 | 326 | 2017 |
| **USEFUL MODELS** | | | | |
| Total number of submitted applications | 509 | 475 | 34 | 1995- |
| Number of filed applications | 461 | 428 | 33 | 2017 |
| **INDUSTRIAL NAMES** | | | | |
| Total number of submitted applications | 526 | 340 | 186 | 1995- |
| Number of filed applications | 411 | 252 | 159 | 2017 |
| **TRADE MARKS** | | | | |
| Total number of submitted applications | 94307 | 77385 | 16387 | 1994- |
| Number of filed applications | 24811 | 13209 | 11702 | 2016 |

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[8] www.aipa.am

In the Republic of Armenia, 1994–2017 during the period, the International Bureau of the World Intellectual Property Organization sent 93 international applications for inventions. 2017 3 Eurasian applications have been received, the necessary documents have been checked, their compliance with the established requirements and their delivery to the Eurasian Patent Office. Overall, in 1997-2017, Over 45 Eurasian applications for inventions were delivered to the Eurasian Patent Office over the period. 2017 The IP workshop concluded with 148 applications, with 93 applications filed on publication of an invention application in the Official Journal and granting a license, 30 applications were made on the publication of the application for the utility model in the Official Journal and for granting licenses, 19 applications were made by the inventions (utility model) the application was rejected, four applications were filed with a decision to fully refuse the grant of an invention, two applications were filed with a decision to completely reject a patent for a utility model[9]. The distribution of applications received in the Republic of Armenia by 2017 has the following picture (see Table 2).

**TABLE 2.**  *Distribution of applications received in the Republic of Armenia by technical fields*

| N | Field (according to AD class / subclass) | Number of submitted applications | the percentage of applicationes represented in the total applications, % |
|---|---|---|---|
| 1. | Medicine and Veterinary Medicine (A61- A63, excluding A61K) | 17 | 11.33 |
| 2. | Construction (E01-E06) | 16 | 10.67 |
| 3. | Inorganic Chemistry (C01-C05, C30) | 13 | 8.67 |
| 4-6 | Measurement and Optics (G01-G03) | 11 | 7.33 |
| 4-6 | Engines and Pumps (F01-F04) | 11 | 7.33 |
| 4-6 | Agriculture (A01, excluding A01N) | 11 | 7.33 |
| 7. | Clothing and Household Appliances (A41-A47) | 9 | 6.33 |
| 8. | Drugs and Medicines (A61K) | 8 | 5.33 |
| 9-11 | Materials Processing and Layered Materials (B21-B30, B32) | 7 | 4.67 |
| 9-11 | Food and tobacco (A21-A24) | 7 | 4.67 |
| 9-11 | Vehicles (B60-B68) | 7 | 4.67 |
| 12-14 | Electrical appliances (H01, H02, H05) | 5 | 3.33 |
| 12-14 | Organic Chemistry (C07, A01N) | 5 | 3.33 |
| 12-14 | Paints, fuel, animal and vegetable oils (C09-C11) | 5 | 3.33 |
| 15-24 | Other Areas: | 10 | 12 |
| | TOTAL | 150 | 100 |

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[9] www.aipa.am

In Armenia, in 2017, 74 patents for invention and 27 utility models were issued, of which foreign applicants were granted 1 utility license. According to 2017 data, Armenia has 209 patents for 3152 patent applications, and 126 of the utility model have 505 licenses. According to the data of 2017, 4958 Eurasian licenses are operating in the territory of the Republic of Armenia.

In 2017, 1,883 trademark registration applications (1,348 of which are national applicants) have been nationalized, whose distribution according to the applicants is a line. 2. An initial examination of 1767 applications was made. 10 applications

withdrawn were considered, 94 decisions were made on rejecting the registration of trademarks. 1435 trademarks were registered (1325 of which were issued by national applicants). Within the framework of the Madrid Agreement Concerning the International Registration of Marks and its Protocol, the Republic of Armenia has received 2997 notices of international registration of trademarks. 1681 international trade notices on granting legal protection to the trademark were made, 518 decisions were made on preliminary rejection and 764 on final rejection.
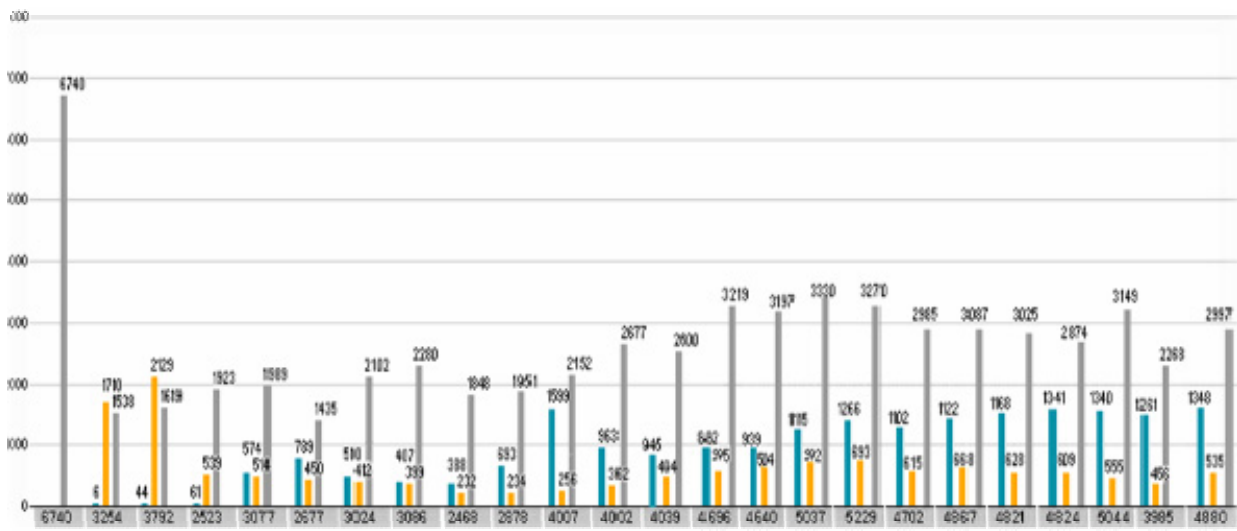


FIGURE 4.   *The Movement of Trademark Indicators in the Republic of Armenia for 1994-2017*

51 applications for international registration have been submitted from the Republic of Armenia. In 2017, the number of applications from national applicants has increased by 8, 1348 applications for 1340 applications for 2016. As regards the activity of foreign legal entities, it has grown by 535

applications in the national procedure against 456 in 2016. During the reporting period, Intellectual Property Agency submitted 58 applications for industrial designs (54 from national applicants), 34 of which received certificates.

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[10] www.aipa.am

**TABLE 3.** *Statistics on transfer / delegation of rights to intellectual property rights and registration of license agreements in 2012-2017*

|  | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| Rights Transfer Contracts | 101 | 79 | 81 | 121 | 179 | 133 |
| License agreements, sub-license contracts, and changes made to contracts | 25 | 31 | 34 | 17 | 50 | 49 |
| Franchasing Contracts | 5 | 2 | 1 | 0 | 4 | 1 |
| The total number of registered contracts | 132 | 116 | 178 | 138 | 233 | 183 |

In 2017, the number of applications for industrial designs has increased from 22 to 54, from which 54 applications have been received from national applicants for 23 applications in 2016, and six applications from foreign applicants have been received against 4 applications for 2016. In the framework of the Hague Agreement of Industrial Designs, the Republic of Armenia has received 149 notification of international registration of industrial designs in respect of 196 applications filed in 2016[11].

# 3. EVALUATION OF INFLUENCE OF INSTITUTIONAL FACTORS ON ECONOMIC GROWTH

In the context of the formation and development of the innovation economy, the work of the relevant institutions of the country has a significant role and significance, without interruptions and excessive shocks. In this regard, the developed institutional system enables to effectively manage and implement state policy on innovative development of the economy, assisting in the faster introduction and dissemination of new technologies and innovations.

The indices and rates developed and periodically published by various international authoritative institutions and research centres provide a clear idea of the economic development and competitiveness of any country, the role of institutional factors in the context of the global positioning of these indicators. From this point of view, this study focuses on indicators such as Ease of Doing Business (EDB or v2), Global Competitiveness (GCI or v3), Economic Freedom (IEF or v4) and Corruption Perceptions Index (CPI or v5).

Each of the above-mentioned methodologically indices is based on a single total, but they are based on the effectiveness of many other indicators that have a significant impact on the current and prospective development cycles of the country's institutions. On the other hand, a few indices per capita GDP of Republic of Armenia, in particular per capita GDP, expressed in USD per capita (GDP per capita or v6), calculated per capita GDP expressed in USD by purchasing power parity (GDP per capita, ppp or v8) and per capita GDP, expressed in US dollars by purchasing power parity and adjusted at 2011 prices (GDP per capita, ppp (constant 2011) or v9).

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[11] www.aipa.am

Based on the above-mentioned indicators, relevant statistics of RA have been collected, covering the 2007-2017 period[12]. Of course, a more detailed survey requires a large number of statistical data, but there are some objective reasons from these perspectives that did not allow for long ranks. The problem is mainly related to the lack of early statistics. The dynamics of all the above indicators are shown in Figure 1 below in the selected period.
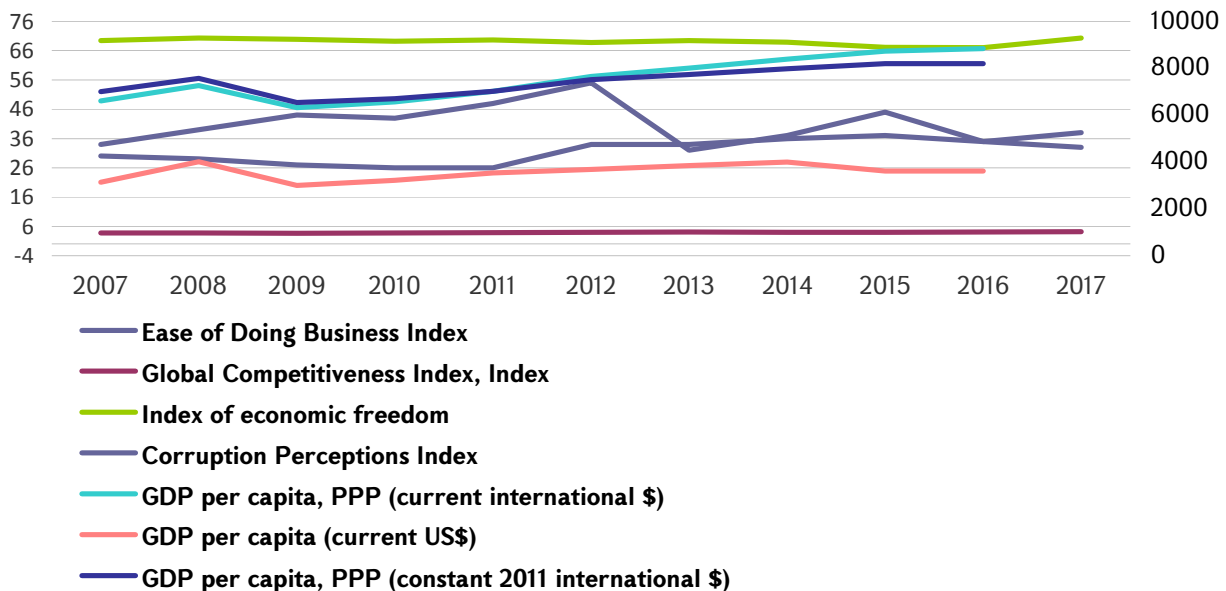


**FIGURE 1.** *Dynamics of per capita GDP of RA and institutional indices for 2007-2017*

As can be seen from Figure 1, by 2017, all indices of GDP per capita had a tendency to grow. The sharp decline was observed only in 2008, but then the recovery phase was restored. The Global Competitiveness Index (GCI) has increased by 0.12 in 2017 to 2016, with an EDB of 3 points. In terms of the economic freedom index, in 2017, an increase of 3.3 points was recorded in 2016, and the corruption perceptions index dropped by 2 points, which means a rise in corruption in Armenia, which is evidence of the ineffectiveness of anti-corruption programs.

However, by examining only the dynamics of the relevant indices, it is not possible to make concrete conclusions about the relationships and dependencies existing among them. Consequently, due to a correlation analysis[13], an attempt has been made to understand what kind of influence have the indices on per capita GDP. It should be noted that all indicators are in logarithms. The results of the correlation analysis are as follows.

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[12] http://www.worldbank.org/
[13] А.В. Гладилин, А.Н. Герасимов, Е.И. Громов, Эконометрика: учебное пособие. М., КНОРУС, 2006, стр. 71.
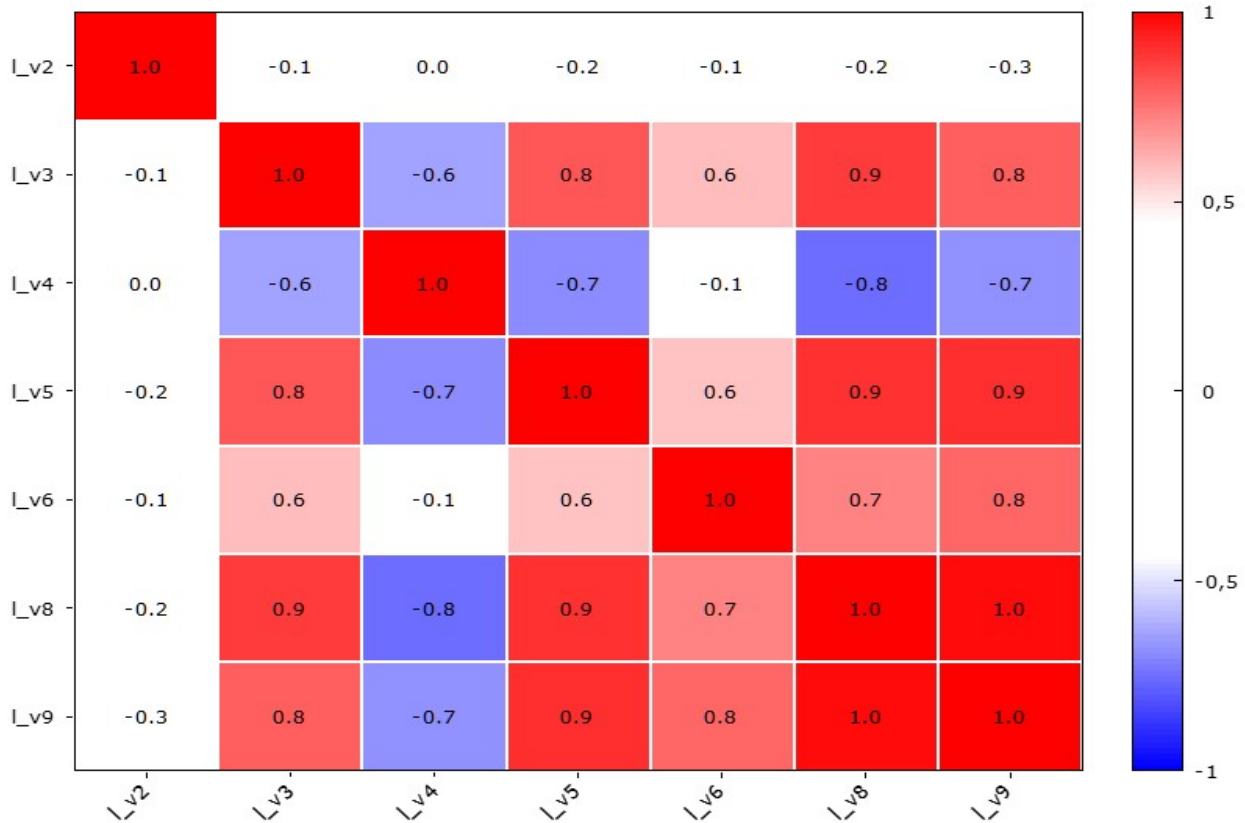
**FIGURE 2.** *The result of the correlation analysis*

Figure 2 shows that strong correlation is observed between per capita GDP (l_v8) and Corruption perceptions index (l_v5), Economic freedom index (l_v4) and Economic Competitiveness Index (l_v3).

Based on the results of the above analysis, the following econometric model was described which shows the dependence between the corresponding GDP indicator and the three strongly correlated with the latter.

$$lnGDP_{pct}^{PPP} = ln\beta_0 + \beta_1 \cdot lnGCI_t + \beta_2 \cdot lnIEF_t + \beta_3 \cdot lnCPI_t + ln\varepsilon_t \quad (1),$$

where

$lnGDP_{pct}^{PPP}$ is the GDP per capita in logarithms in the year $t$,

$lnGCI_t$ is a global competitiveness index in logarithms in the year $t$,

$lnIEF_t$ is the index of economic freedom in logarithms in the year $t$,

$lnCPI_t$ is the corruption perceptions index in logarithms in the year $t$,

$ln\beta_0, \beta_1, \beta_2, \beta_3$ are unknown parameters of the model,

$ln\varepsilon_t$ is a random error of the model in logarithms in the year $t$.

The model (1) can be estimated by the least squares method (OLS), since two of the classical conditions are preserved.

Therefore, we will have the following results:

$$\ln\widehat{GDP_{pct}^{PPP}} = \underset{(0.1140)}{12.71} + \underset{(0.1715)}{1.17} \cdot \ln GCI_t - \underset{(0.3295)}{1.59} \cdot \ln IEF_t + \underset{(0.1354)}{0.39} \cdot \ln CPI_t, R_{adj}^2 = 0.82, DW = 2.72$$

(2),

where

$\ln\widehat{GDP_{pct}^{PPP}}$ is the predicted value of the per capita GDP in logarithms in the year $t$, the numbers indicated in the brackets represent the probability of zero being the corresponding coefficients,

which $R_{adj}^2$ is the coefficient of determination,

$DW$ is the statistics of Durbin -Watson.

The results obtained show that (2) the model's coefficients are not significant, and there is autocorrelation in the model. In order to clarify the model and to meet the criteria, variables are checked on stationarity and heteroscedasticity. The results of the tests (stationary test, white test) were positive and the corresponding statistical series were stationary and there is heteroscedasticity in the model, so the model was again estimated by the least squares, but taken into account the existing heteroscedasticity. The following model was obtained after the estimation:

$$\ln\widehat{GDP_{pct}^{PPP}} = \underset{(0.0033)}{14.84} + \underset{(0.0228)}{1.46} \cdot \ln GCI_t - \underset{(0.0227)}{2.15} \cdot \ln IEF_t + \underset{(0.0361)}{0.35} \cdot \ln CPI_t, R_{adj}^2 = 0.97, DW = 2.34$$

(3),

Estimated (3) model is of high quality, and the coefficients are significant.
The results of the estimated model can be interpreted as follows:

- Growth of global competitiveness by 1%, in other equal conditions, can lead to a growth of per capita GDP of RA by 1.46% on average.
- The index of economic freedom has the opposite effect. The growth of the latter by 1%, in other equal conditions, will lead to a decrease in per capita GDP by 2.15%.
- The lower the value of corruption perceptions, the more countries are considered corrupt. Consequently, the positive coefficient on the model is interpreted as follows: if corruption perception index diminishes by 1%, in other equal conditions, per capita GDP will fall by 0.4%.

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