

## THE IMPACT OF R&D ON ECONOMIC GROWTH OF UZBEKISTAN

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### Abstract

This paper aims to determine factors influencing the economic growth of the country and its quantity. According to the World Bank, in recent years, 2-2.5% of global GDP is spent on research and development activities, of which 2.5% in high-income countries and 1.5% in low- and middle-income countries. Investigation of the crisis, importance, and impact of the market of intellectual goods and services in Uzbekistan is one of the most pressing issues today. This article is based on data provided by the Statistical Committee of the Republic of Uzbekistan on research and development of the forecast of foreign investments for 2018-2030. As a result, scientifically grounded proposals and recommendations have been developed to achieve sustainable economic growth in Uzbekistan and the growth of R&D.

**Keywords:** GDP, economic growth, econometric analyze, R&D, RI, HEI

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### Abbreviations:

Gross Domestic Product (GDP)  
Research and Development (R&D)  
Research Institutes (RI)  
Higher education institutions (HEI)

### INTRODUCTION

Today, economical analysis and the development of scientifically based forecasting of the future are of great importance. It is advisable to study the interaction of several factors to analyze the market of intellectual products and services. For patenting and commercialization of college R&D [Bercovitz and Feldman, 2007] was established a Technology Transfer Office (TTO) in 1998. Subsequently, integration of the Bayh-Dole Act [Mowery, 2001, 2002; Mowery and Ziedonis, 2002; Shane, 2004] the number of patents was growth, however, few patents of universities were given license.

In Uzbekistan, the focus on scientific research in the development of human factors and intellectual potential has been high over the years, which in turn includes a sufficient basis for the development of intellectual products and services. However, there is a need for research on such issues as global competitiveness, self-efficacy, consumer discovery, legal protection, development, and improvement of these R&D projects.

The market for intellectual products and services in Central Asia has been around since ancient times. Still, its modern interpretation can be developed in scientific research institutes, universities, technology parks, and other research centers of the Academy of Sciences of the Republic of Uzbekistan and the private sector. The second key issue is to determine the quantitative impact of SMEs on economic growth and to predict the industry accordingly.

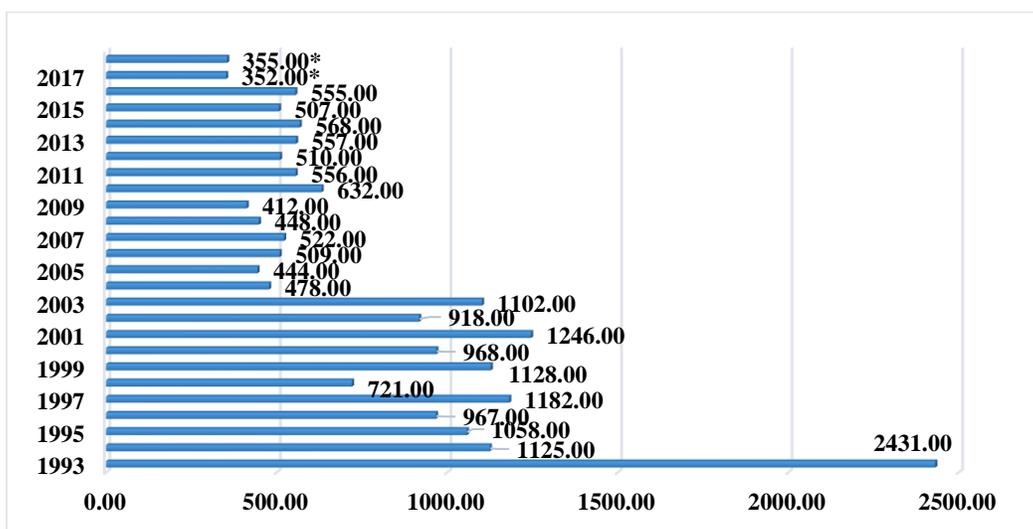


Figure 1. Number of patents (residents and non-residents) in the territory of Uzbekistan (1993-2018)

Source: The author's development based on data from the World Bank

Intellectual property registered by the Agency for Intellectual Property of the Republic of Uzbekistan is shown in Figure 1, according to data published on the official website of the World Bank. Based on statistical data, it is worth noting that in 1993, 2431 patents were obtained, of which 2136 are recipients of residency and 295 are non-patent patents. There was a sharp decline in 1994, more than doubling the number of patentees. But in recent years, it has been relatively low on the whole period and is a vivid demonstration of current problems in the industry.

Intellectual property is one of the main factors influencing high-tech growth and innovative development. According to the results of 9 months of 2018, the Agency for Intellectual Property of the Republic of Uzbekistan received 6363 (6000) applications for intellectual property, 6301 (6222) state examination. and 2498 (2688) intellectual property objects are included in the State Register, which is a 7.1% decrease compared to the previous year. (Figure 2)

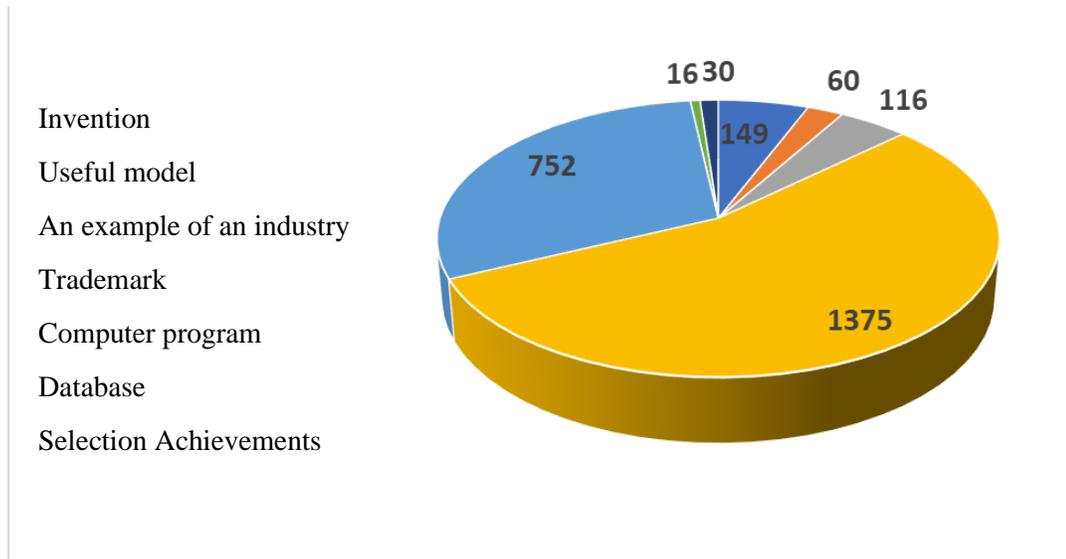


Figure 2. Number of state registration of intellectual property objects for 9 months of 2018

Source: Agency of the Republic of Uzbekistan for Intellectual Property

**RESEARCH DATA AND METHODS**

The task of the research was to retain or quantify the future impact of factors by econometric analysis of the impact of the factors reflected on GDP, the key indicator of economic growth, and to quantify new trends and laws affecting economic growth. To accomplish this task, primary data were obtained from the Republic of Uzbekistan's Statistics Committee and econometric analyzes were performed. During 2003-2018, the following factors were considered statistically significant or insignificant as factors affecting the GDP of the Republic of Uzbekistan - GDP. Based on comparative analysis and scientific abstraction, scientifically grounded suggestions and recommendations for the future are developed.

Given the significant part expected by the R&D variable in this ponder, it is beneficial to talk about in detail what is planning by R&D in our database, since R&D estimation might take after distinctive bookkeeping hones totally different nations over the world. In specific, the R&D investment included venture money which is supported by the companies themselves, whereas it avoids R&D embraced beneath contract for clients such as governments or other companies. Hence, our R&D pointer is reliable and homogeneous over all the considered nations and alludes to the veritable stream of current extra information assets.

**LITERATURE REVIEW**

Organization considers around have emphasized university and scientific research institutes compensate centers that promote the study of commercialization [Baldini et al., 2007; Friedman and Silberman, 2003; Markman et al., 2004] office degree as TTO [Ambos et al., 2008; Carl], university TTO back structures [Ambos et al., 2008; Carlsson and Fridh, 2002; Friedman and Silberman, 2003; Siegel et al.,2003], university organization structures or inquire about office degree [Azagra-Caro et al., 2003; Bercovitz et

al., 2001], and campus-wide measures towards ask approximately commercialization [Argyres and Liebeskind, 1998; Owen-Smith and Powell, 2001]. Explore has as well showed up that mechanical subsidizing propels charmed in associated examine, era of commercialization of yields and mental property security [Friedman and Silberman, 2003; Siegel et al., 2003; Agrawal and Henderson, 2002]. Obvious capacity shifts over areas of science, as a result, investigate to produce more promptly commercial developments [Azoulay et al.,2007; Moutinho et al., 2007; Stephan et al.,2007]. it gets more prominent maintained collaboration intrigued by potential licensees [Juanola-Feliu et al.,2012]. Pries and Society [2011] also illustrate that the innovative characteristics of university developments decide the trade models and the consequent commercialization out-comes. On the whole, there's considerable proof that organization variables clarify variety in university authorizing out comes. Individual-level ponders appeared that researcher discernments, foundation and encounters clarify penchant to lock action of commercialization. One of example can be senior workforce are more likely to urge included in patent-related exercises since they have accomplished a certain degree of career security [Allen et al.,2007; Bercovitz and Feldman, 2008; Stephan et al., 2007].

Consequently, the writing clearly illustrates the significance of individual-level determinants of university authorizing outcomes. As well as earlier work has essentially moved forward our understanding of commercialization of college developments, there's a need for a synthesized system to direct experimental considers on the determinants of licensing and authorizing behavior in colleges. A coordinates system would distinguish instruments through which the organization and person variables decide choices to seek after inquiring about commercialization.

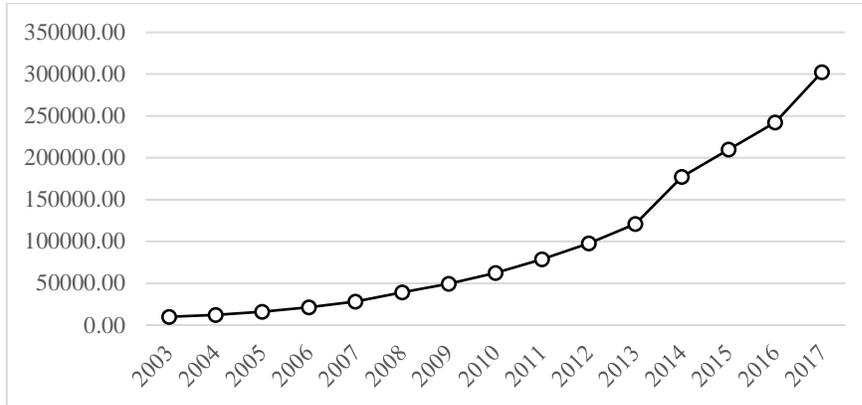
Additionally, earlier considers capture inclusion in investigate

commercialization employing a check of innovation divulgences [Friedman and Silberman, 2003; Foltzetal., 2000]. There's an opportunity to look at encouraging why a few college innovations are taken up by the advertising, but others are not. Uzbekistan system of commercialization of results of scientific research centralized by the Ministry of Innovative Development of the Republic of Uzbekistan and in each university or scientific research institute located Department of Commercialization

scientific and innovative products and services.

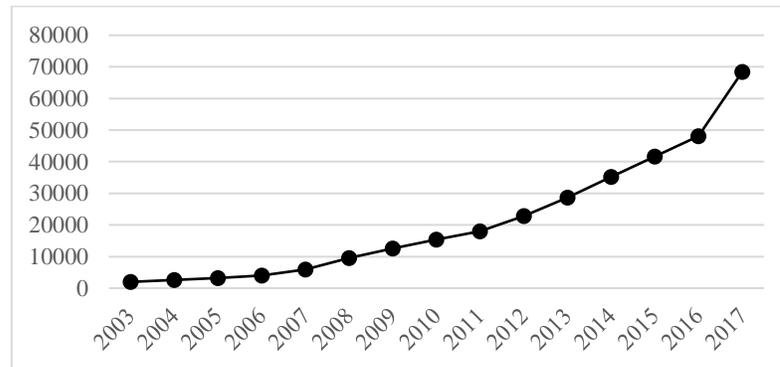
**Results**

According to the results of the study, two factors that statistically significant to the GDP of the Republic of Uzbekistan -  $Y_t$ , which are  $FDI_t$  and  $R\&D_t$ . It can also be seen from Figure 3 that the variables have a growing trend.



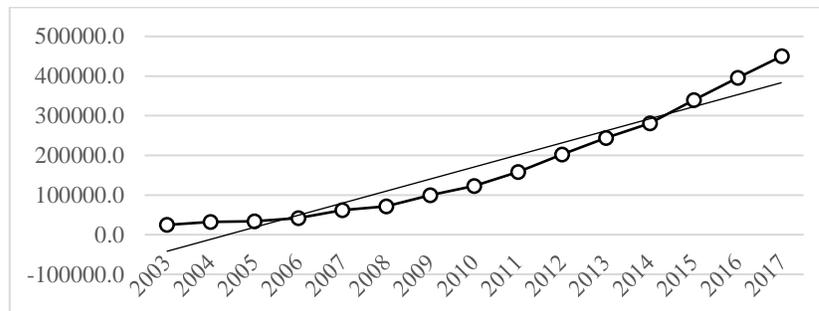
**Figure 3. Dynamics of GDP Gross Domestic Product in the Republic of Uzbekistan for 2003-2018 (billion UZS)**  
 Source: Developed by the author on the basis of data from the Statistical Committee of the Republic of Uzbekistan

Figure 3 shows that the endogenous factor has a growing trend, with an average of 97866.7 billion UZS. The standard deviation of GDP is 93433,1 hectares



**Figure 2. Growth Rates of Foreign Investments and Loans in the Republic of Uzbekistan for 2003-2018 (billion UZS)**  
 Source: Developed by the author on the basis of data from the Statistical Committee of the Republic of Uzbekistan

As can be seen from Figure 2, growth rates of foreign investments and loans are also on the upward trend. Besides, the average exogenous factor is 21199.9 billion UZS, the standard deviation is 19732,4 and the dispersion is 38937.7.



**Figure 3. Dynamics of R&D volume growth in the Republic of Uzbekistan by own organization for 2003-2018 (billion UZS)**  
 Source: Developed by the author on the basis of data from the Statistical Committee of the Republic of Uzbekistan

Figure 3 shows the dynamics of growth in the volume of research

and development activities undertaken by the organizations during the period 2003-2018, and this exogenous factor also has a growing trend. The average of this factor is 170619,3, the standard deviation is 141642,6 and the dispersion is 2006264. With this information, we can determine the following regression equation parameters:

$$Y_t = \beta_0 + \beta_1 FDI_t + \beta_2 R\&D_t + \varepsilon_t \quad (1)$$

Here, the coefficients  $\beta_k$  represent the effect of the factors obtained on GDP.  $\varepsilon_t$  is the stochastic part of the regression equation and represents the model of randomness. The quantitative data of these statistically significant factors were included in the STATA 14 program and the following results were obtained:

**Table 1 The values of the regression equation parameters**

$Y_t$	Coef.	Std. err.	T	P> t	95 % Conf. Interval	
$FDI_t$	2.789	0.799	3.49	0.004	1.0487	4.5287
$R\&D_t$	0.270	0.111	2.43	0.032	0.0279	0.5128
Cons.	-7385.262	4257.101	-1.78	0.101	-16442.81	1672.3

According to the results of Table 1, the significance of model parameters with respect to GDP (t-Statistic) is  $\alpha = 0,05$  and  $t_{tab} = 1,782$  when  $df = 12$ ,  $FDI_t = 3,49$ ,  $R\&D_t = 2,43$  if  $t_{tab} < t_{result}$  condition is statistically significant for all variables  $FDI_t$  and  $R\&D_t$ .

According to the regression equation, the increase in foreign investment and loans by one unit in the current period, unless other factors have changed, will increase GDP by an average of 2.789 per unit. The analysis shows that foreign investments and loans, as well as the amount of independent research and development projects, are important for ensuring economic growth in the country.

The following regression equation can be generated using data from Table 1:

$$Y_t = -7385.262 + 2.789 * FDI_t + 0.270 * R\&D_t + \varepsilon_t \quad (2)$$

**Table 2 Results of the criterion test of the regression equation**

Source	SS	Df	MS	Number of obs.	=	15
Model	1.2123e+11	2	6.0617e+11	F(2,12)	=	740.38
Residual	982480267	12	81873355.6	Prob>F	=	0.000
Total	1.2222e+11	14	8.7298e+09	R-squared	=	0.9920

The adequacy of the econometric analysis is required to evaluate each developed regression equation based on additional criteria. As a result, our study investigates both the regression equation and a number of criteria (Table 2). According to the table, the regression equation is found to be adequate and reliable. One of the main criteria is that the p-value of F statistics is very small (0.000) and the coefficient of determination ( $R^2$ ) is 99.9%.

equations:

1) For foreign investments and loans:

$$FDI_t = 5329.843 - 1923.567 * t + 378,13 * t^2 \quad (3);$$

2) For research and development activities performed by the organizations themselves:

$$RD_t = 31912,55 - 6478,99 * t + 2304,9 * t^2 \quad (4);$$

The time-dependent trend formulas for each factor obtained using the model defined in the regression equation were entered to determine the reliability of the following parabola equation: 99.8% based on regression analysis on linear or parabolic

However, this regression equation 1 considers the overall trend for 2000–2018. In this case, we will base 2010-2018. By replacing each of the parameters in the regression equation with time, the GDP is summarized in the results of Table 3 below

**Table 3 The basic forecasting option**

Year	GDP, billion UZS	Foreign Investments and Credits, billion UZS	The R&D, carried out by the organizations on their own, billion UZS
2018	302536,8	68423,9	449,905
2019	351242,3	71354	591,189
2020	400696,7	81908,7	665,328
2021	453504,9	93219,7	744,075
2022	509667,1	105286,9	827,433
2023	569183,1	118110,4	915,401
2024	632052,9	131690,2	1007,978
2025	698276,6	146026,2	1105,166
2026	767854,1	161118,5	1206,963
2027	840785,5	176967	1313,369
2028	917070,8	193571,8	1424,386
2029	996709,9	210932,9	1540,012
2030	1079702,8	229050,2	1660,248

In recent years, the Republic of Uzbekistan has been actively attracting investments into the economy. The priority of the Strategy of actions for further development of the Republic of

Uzbekistan is the modernization of the economy through technical and technological renewal, structural changes, increasing the export potential of the country, strengthening of macroeconomic

stability and sustainable high economic growth. increasing the level of employment and real incomes, their mobilization. In this regard, the results of the implementation of the scientific forecasts

of the impact of FDI on the annual growth rate of GDP, performed by the Foreign Investments and Loans and Organizations, are shown in Figure 4.

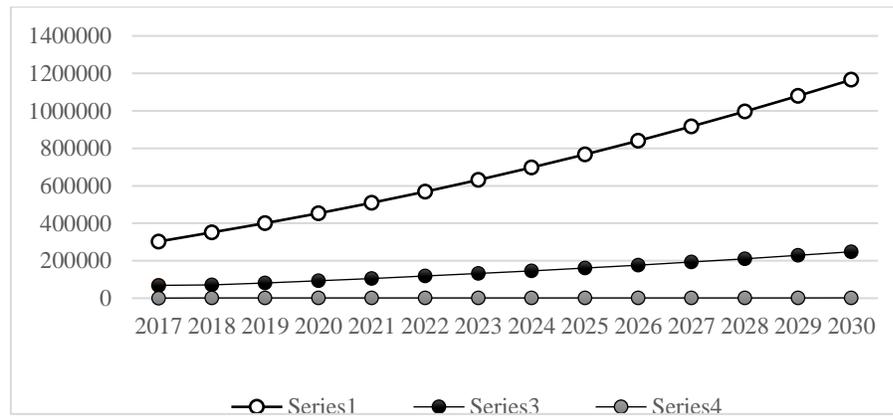


Figure 4. Forecasted Influence of Foreign Investments and Credits on the GDP in 2019-2030  
Source: Designed by the author

**DISCUSSION AND SUGGESTIONS**

According to the research based on the basic variant, it is projected that GDP growth rate will increase from 116% to 156% in 2019-2030. From the above regression analysis the following conclusions can be drawn:

First, one of the important factors of economic growth in the Republic of Uzbekistan is the active foreign investment and the pursuit of a sound policy on R&D.

Second, the results of an empirical analysis of the impact of foreign investments and loans on economic growth have a regression coefficient (2.789), as well as the coefficient of the R&D factor (0.270) performed by the organizations themselves. This means that in the Republic of Uzbekistan in 2000-2018 foreign investments and loans are more effective than the amount of R&D performed by the organizations themselves.

Thirdly, from the GDP estimates, it is evident that active foreign investment and credit policies have shown the largest economic growth. If the projected values of this scenario arise, then by 2030 the real GDP will increase by 3.5 times.

From this point of view today's full innovative development needs small businesses in the industry, along with large enterprises. Economic freedom and openness are key to achieving sustainable economic growth and development, and the development of mechanisms for promoting science, introducing it to the real sector and encouraging developers, and ensuring the integration of education, science and production.

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