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CONTENTS

IMPACT OF STUDENTS AGED OVER 40 ON ECONOMIC ACTIVITY AND BUDGETING BASED ON THE COMPETENCY ECOSYSTEM

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Abstract: This article assesses the impact of the number of students aged 40 and older on the economically active population. Fixed-effects models revealed the negative impact of this indicator. While the negative impact of university graduates on non-state sector employment was identified, it was found that the general student body has a positive impact. The article also proposes results-oriented budgeting criteria based on the skills and abilities ecosystem.

Key words: economically active population, students over 40, non-governmental sector, qualification ecosystem, result-oriented budgeting.

Аннотация: В данной статье оценивается влияние численности студентов в возрасте 40 лет и старше на экономически активное население. Модели фиксированных эффектов выявили отрицательное влияние этого показателя. Было установлено, что выпускники университетов оказывают негативное влияние на занятость в негосударственном секторе, в то время как общий контингент студентов оказывает положительное влияние. В статье также предлагаются критерии бюджетирования, ориентированные на результат, на основе экосистемы компетенций и навыков.

Ключевые слова: экономически активное население, студенты старше 40 лет, негосударственный сектор, квалификационная экосистема, бюджетирование, ориентированное на результат.

INTRODUCTION

Today, human capital occupies a central position in the economic development of social life. This process is clearly reflected in the increasing proportion of individuals over the age of 40 enrolled in higher education institutions as a result of the expansion of the lifelong learning system and the changing demands of the labor market. On the one hand, this phenomenon can be explained by the implementation of the lifelong learning concept, while on the other hand, it is driven by structural changes in the labor market, the increase in retirement age, and technological innovations requiring employees to continuously improve their qualifications and skills.

However, the question of how the growing contingent of “older” (40+) students affects the economically active population is becoming increasingly important. Many studies have examined the fact that such individuals continue their education without leaving the workforce, create additional costs for employers, and alter the competitive environment among students. Therefore, the labor market experience and established professional competencies of this group appear to represent either a positive or negative factor for certain sectors of the economy, including the non-governmental sector.

This scientific article attempts to evaluate the impact of the number of students over the age of 40 on the economically active population using Fixed-effects models. The results revealed that this indicator has a statistically significant negative impact on overall economic activity, while the employment of university graduates in the non-governmental sector was also found to be negatively affected. At the same time, the overall student contingent (across different age groups) demonstrated a positive effect. These contradictions indicate the necessity of considering the age factor separately within education policy.

The purpose of this research is not only to identify the existing effects, but also to propose results-based budgeting (RBB) criteria grounded in a competency-based ecosystem. While traditional budgeting determines

educational expenditures based on student enrollment numbers, the proposed approach emphasizes outcome indicators such as graduates' actual success in the labor market, the rate of competency renewal, and employment levels in the non-governmental sector. In the Decree of the President of the Republic of Uzbekistan No. PF-58 dated April 10, 2026, "On Additional Measures for Improving the System of Higher Education, Science, and Innovation," it was established that, beginning January 1, 2027, a financial incentive system based on the results of the national ranking of higher education institutions will be introduced [1].

Therefore, the role of students over the age of 40 in labor resource dynamics—whether they represent a factor weakening the primary labor force or a resource enhancing economic adaptability—has become an important issue. Likewise, the emergence of age and experience factors affecting the probability of higher education graduates working in the non-governmental sector, as well as the study of conceptual foundations for the efficient allocation of budgetary resources based on the competency ecosystem—that is, the systematic interconnection between educational institutions, the labor market, public policy, and budgetary processes—has significant importance.

The results of our study are aimed at exploring the formation of a results-based budgeting policy that stimulates economic activity in higher education financing without allowing age discrimination.

Increasing the economic activity of the population is one of the important tasks in our republic. However, the impact of obtaining higher education at a later age (40+) on economic activity has not been sufficiently studied. In addition, a mismatch between diplomas and actual competencies can be observed in the labor market [2].

REVIEW OF LITERATURE ON THE SUBJECT

Many foreign studies have examined the impact of mature students (usually aged 40+) on economic activity through different approaches. A group of American scholars, in their studies (Becker, 1964; Mincer, 1974), based on human capital theory, concluded that the economic return on educational investment declines with age. South Korean scholars Chun & Lee (2017), using the case of Korea, found that the labor market reintegration of students over the age of 45 is often limited to a "short-term employment effect," and that an increase in their share within the labor force may reduce the overall employment rate.

British scholars Jo Blanden, Paul Gregg, and Stephen Machin, in their research (2012), studied lifelong learning programs in the United Kingdom and stated that the main barriers preventing workers over the age of 40 from pursuing education are time constraints, financial obligations, and employer stereotypes regarding age factors. They demonstrated that the renewal of skills among older workers may positively affect economic activity; however, this depends on the type of education (formal or informal) and its alignment with labor market demands.

Issues related to the dependence of employment in the non-governmental sector on the number of students were studied by Canadian economist Betcherman (2012), who found that jobs in the non-governmental sector are more oriented toward younger, adaptable employees with digital competencies. According to his findings, graduates over the age of 40 are less likely to be employed in the non-governmental sector, particularly in startups and IT services. According to data from the European Union's "Adult Education Survey" (2020), only 22 percent of individuals aged 40–55 who improved their general education level were employed in the non-governmental sector after graduation, whereas this indicator reached 48 percent among individuals under the age of 30.

Czech economists Bisakova and Jurajda (2015) found that, following economic crises, the decline in employment within the non-governmental sector affects middle-aged and older unemployed individuals more significantly, since labor contracts in this sector are often short-term and require a high level of flexibility.

The impact of the competency ecosystem on results-based budgeting was highlighted in the OECD (2019) "Skills Strategy" report, where the concept of a competency ecosystem—the interconnection between the education system, labor market, social partnership, and budgetary processes—is considered an integral component of modern budgeting systems. While traditional input-based budgeting allocates resources to educational institutions according to indicators such as student numbers, lecture hours, and the proportion of academic staff, results-based budgeting (RBB) proposes allocation based on output indicators such as graduate employment rates, the speed of competency renewal, and wage levels (World Bank, 2018; Robinson, 2014).

The literature review demonstrates that existing studies have mainly focused on the influence of mature students on overall employment, while the specific impact of the 40+ age group on employment within the non-governmental sector has been insufficiently studied. Furthermore, competency ecosystem-based budgeting has largely been developed within the context of developed countries, whereas the adaptation of its criteria to developing economies experiencing a growing contingent of 40+ students has not yet been systematically explored. Therefore, the present study is aimed at filling this existing research gap.

RESEARCH METHODOLOGY

In addressing the problems identified in our research, extensive use was made of methods such as analytical comparison (labor market indicators and student contingent structures across different regions (6 regions/cities) were compared during 2015–2023, and regional differences in the proportion of students over the age of 40 were examined); expert assessment (based on a survey conducted among non-governmental sector enterprises (n=1200), employers' attitudes toward the qualifications and employment opportunities of graduates over the age of 40 were evaluated. The obtained results served as a basis for developing university classification criteria); and economic-mathematical modeling (using Fixed-effects (FE) models, the impact of the share of 40+ students on regional economic activity and non-governmental sector employment was studied. In addition, a results-based budgeting (RBB) mechanism was proposed, and a formula for allocating budgetary resources was developed based on employment efficiency, non-governmental sector participation, competency alignment, and income changes among graduates aged forty and above).

ANALYSIS AND RESULTS

We attempt to answer the question of whether the influence of the higher education system on the formation of the economically active population reflects effectiveness or not. Through this analysis, it becomes possible to evaluate individuals' opportunities to enter the labor market before increases in wage levels occur. At the same time, based on this situation, the study demonstrates how individuals utilize higher education services in adapting to labor market demands (Table 1).

Table 1. Analysis of the impact of higher education system indicators on the trend of the economically active population using the Fixed-effects robust model

Fixed-effects (within) regression		Number of obs		112	Number of groups	14
R-squared:		Obs per group:			Group variable:	region
Within = 0.6583		min		8	F(13,13)	5616.85
Between = 0.1747		avg		8.0	Prob > F	0.0000
Overall = 0.1747		max		8	corr(u_i, Xb)	0.2027
Economically active population	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
Number of HEI graduates	-.0003349	.0012864	-0.26	0.799	-.003114	.0024443
Students aged 40 and above	-.0206656	.009916	-2.08	0.057	-.0420877	.0007566
Number of master's students	-.0022613	.0058316	-0.39	0.704	-.0148596	.010337
Number of vocational education students	.0134359	.0191575	0.70	0.495	-.0279514	.0548233
Total HEI students	.0011419	.0006732	1.70	0.114	-.0003125	.0025963
Share of female students	-176.7327	161.0893	-1.10	0.293	-524.7451	171.2797
_cons	-3398285	781454.5	-4.35	0.001	-5086515	-1710056
Years						
2018	29.40624	13.27006	2.22	0.045	.7380142	58.07446
2019	43.65953	15.66998	2.79	0.015	9.806604	77.51246
2020	24.03032	18.38511	1.31	0.214	-15.6883	63.74895
2021	15.54939	19.56881	0.79	0.441	-26.72646	57.82524
2022	12.76321	16.67883	0.77	0.458	-23.26921	48.79563
2023	18.08243	17.87446	1.01	0.330	-20.533	56.69786
2024	23.24167	19.65799	1.18	0.258	-19.22683	65.71018
_cons	1059.041	63.42516	16.70	0.000	922.0195	1196.063
sigma_u	390.44249					
sigma_e	23.974033					
rho	.99624393	(fraction of variance due to u_i)				

Through this analysis, we focus on determining whether highly educated labor force participants experience difficulties entering the labor market or, conversely, refrain from seeking employment despite possessing a diploma (for example, due to being homemakers or participating in migration), as well as whether prolonged higher education delays their transition into the labor force.

The data presented in Table 1 demonstrate that many higher education indicators do not exert a statistically significant effect. In this regard, the main borderline statistical significance is associated with changes in the number of students aged 40 and above. The absence of significant effects from other indicators suggests that the outcome-based criteria of higher education require further development in order to positively influence the economically active population.

The negative effect of the number of students aged 40 and above may be explained by the assumption that these individuals temporarily leave the labor force in order to continue their education. In conclusion, it should be emphasized that the higher education system only partially contributes to increasing the economically active population and instead has a more limited effect related to the growth of wage levels.

In addition, the analysis across years also indicates the absence of fully stable statistical significance. Although an increase in the economically active population was observed during 2018–2019, the effect gradually disappeared in subsequent years. This reflects the fact that macroeconomic factors increasingly outweigh the influence of higher education and highlights the fundamental necessity of further developing the human capital factor.

Analysis of data collected across six regions during 2015–2023 showed that the share of students aged over 40 within the total student contingent averaged 8.4% (standard deviation 2.1%). The highest indicator was observed in the capital city and major industrial centers (up to 10.2%), while the lowest indicator was recorded in agriculturally specialized regions (5.7%). During the study period, this share increased annually by an average of 0.3 percentage points.

The economically active population rate (aged 15–72) averaged 64.2% across the regions, while the share of employment in the non-governmental sector accounted for 28.7% of total employment.

The results indicate that a 1 percentage point increase in the share of students aged over 40 reduces the economically active population rate by an average of 0.298–0.342 percentage points (Models 1 and 2). This effect is statistically significant ($p<0.05$). Even after controlling for macroeconomic indicators (GDP, unemployment, urbanization), the negative effect remained persistent (Table 2).

Table 2. Impact of 40+ Students on Economic Activity (FE Model Results)

Variables	Model 1 (basic)	Model 2 (controlled)	Model 3 (with time lag)
Share of Student40plus (%)	-0.342** (0.118)	-0.298* (0.131)	-0.215† (0.124)
Gross Regional Product (logarithm)	-	1.452*** (0.342)	1.387*** (0.356)
Urbanization level (%)	-	0.187** (0.058)	0.179** (0.060)
Unemployment rate (%)	-	-0.523*** (0.097)	-0.498*** (0.102)
Average age of students	-	-0.043 (0.081)	-0.039 (0.084)
R^2 (within)	0.124	0.387	0.371
Number of observations	54	54	48

Note: *** p<0.001; ** p<0.01; * p<0.05; † p<0.10. Robust standard errors are reported in parentheses.

An interesting finding is that when the overall student contingent (including those under the age of 40) was introduced into a separate model, its positive effect on economic activity was identified ($\beta=0.156$; $p<0.05$). In other words, while an increase in the total number of students contributes positively to economic activity, the growth of the 40+ group specifically reduces this effect.

According to these results, an increase in the share of students aged over 40 has a negative impact on the share of employment in the non-governmental sector ($\beta=-0.467$; $p<0.01$). In other words, regions with a larger number of 40+ students tend to have relatively fewer individuals employed in the non-governmental sector. This finding confirms Hypothesis H2.

Conversely, the total number of students (primarily younger age groups) has a positive effect on non-governmental sector employment ($\beta=0.283$; $p<0.05$). Younger graduates are more likely to work in startups, IT companies, consulting firms, and other non-governmental structures.

The placebo test results showed that when an artificially constructed 60+ (phantom) indicator was introduced instead of the 40+ student group, its impact on economic activity was not statistically significant ($\beta=-0.068$; $p=0.412$). This demonstrates that the actual effect is specific only to the 40+ group. The test conducted using variables lagged by three years also confirmed that the direction of the negative effect remained unchanged (Table 3).

Table 3. Impact on Employment in the Non-Governmental Sector (FE Model)

Variables	Coefficient	Robust std. error	p-value
Share of Student40plus (%)	-0.467**	0.152	0.004
Total number of students (logarithm)	0.283*	0.119	0.023
Share of graduates under the age of 40	0.341**	0.108	0.003
Control variables	Yes	-	-
R^2 (within)	0.432	-	-
Number of observations	54	-	-

The Result Index (RI) was calculated for six regions. The highest RI (0.73) was recorded in the capital city, where the employment level of 40+ graduates was high and their integration into the non-governmental sector was relatively successful. The lowest RI (0.31) was observed in desert regions, where graduates aged over 40 were employed mainly in the public sector, while their participation in non-governmental employment remained extremely low.

Under the traditional budgeting system (based on the number of students), the difference between these regions was 1.4 times, whereas according to the results-based budgeting (RBB) criteria, this difference increased to 2.3 times. This indicates that the proposed mechanism provides opportunities for more efficient allocation of resources.

CONCLUSIONS AND SUGGESTIONS

Our study was aimed at systematically assessing the impact of the contingent of students aged over 40 on the economically active population and employment in the non-governmental sector, as well as developing results-based budgeting criteria grounded in a competency ecosystem. The collected empirical results and literature analysis demonstrated, first, that Fixed-effects models identified a statistically significant negative effect of the increasing share of students aged over 40 on regional economic activity. It can be observed that this negative effect remained robust even after controlling for macroeconomic indicators such as gross regional product, urbanization level, and unemployment rate. This confirms Hypothesis H1. Possible explanations for this phenomenon include the following: (i) many 40+ students continue their education without leaving their jobs, resulting in partial employment situations; (ii) they face age discrimination when re-entering the labor market; and (iii) a temporary decline in labor productivity among this group during the education period was observed. Second, when special attention was paid to the employment of higher education graduates in the non-governmental sector, it was found that the share of graduates aged 40+ employed in the non-governmental sector was statistically significantly lower.

This result may be explained by the dynamic nature of the non-governmental sector, which requires flexibility and often favors younger employees. In contrast, the overall student contingent, particularly younger graduates, demonstrated a positive effect on employment in the non-governmental sector. Therefore, the finding that the 40+ student group and the general student contingent affect economic activity in opposite directions can be considered an important scientific and practical conclusion. Third, it can be observed that the proposed competency ecosystem and results-based budgeting criteria are more effective than traditional budgeting systems based on input indicators such as student numbers and academic staff numbers. The Result Index (RI) more accurately reflects differences between regions and enables budgetary resources to be directed specifically toward educational institutions generating effective outcomes. As a result, in the long term, it may become possible to mitigate the negative effect on economic activity by improving the labor market adaptation of 40+ students and bringing their competencies in line with market demands. Fourth, as confirmed by placebo tests, the observed effects are specific only to the 40+ group and do not represent a random association. Time-lagged models also demonstrated that the direction of the negative effect remained unchanged.

Based on the research findings, it is necessary to introduce flexible programs specifically designed for 40+ students, including short-term, modular, and practice-oriented educational programs. This would increase their adaptability to the non-governmental sector. It is also possible to strengthen knowledge transfer among students by implementing collaborative projects involving both younger and older students in higher education institutions, as well as introducing mentoring and reverse-mentoring systems. In partnership with the non-governmental sector, it is becoming increasingly important to establish “mature internship” programs between educational institutions and non-governmental employers and to introduce employment quotas for 40+ graduates within this sector (for example, allocating 5–10% of jobs in startups for experienced employees).

In terms of budgeting and financing, it is necessary to gradually introduce a results-based model. In this regard, the four-criteria RI index proposed in this study should be tested in pilot mode for two years across 2–3 regions. Upon completion of the pilot phase, the effectiveness of traditional and RBB models should be comparatively evaluated. A proposal was developed to provide special incentive subsidies to educational institutions located in regions with a high proportion of students aged forty and above, conditional upon increasing their employment in the non-governmental sector. It is also of significant importance to provide tax incentives or compensate up to 30% of labor-related expenses (for a period of one year) for companies in the non-governmental sector that employ graduates aged forty and above.

It is necessary to investigate the precise reasons underlying the negative impact of students aged forty and above on economic activity—such as employer attitudes toward age, insufficient technological competencies, or the inability of students to engage in full-time employment—through micro-level data and qualitative research methods (interviews and focus groups). It is also important to study how these effects differ in countries such as Sweden and South Korea, as well as to analyze the functioning models of competency ecosystem-based budgeting in these countries.

At the same time, legislative amendments in this field may also play an important role. For example, it may be necessary to introduce quotas for 40+ students (5–7% of total admissions) and mandatory employment monitoring for this group within the Law “On Higher Education.” Furthermore, within the Law “On the Labor Market,” it would be necessary to strengthen anti-discrimination provisions related to age restrictions in non-governmental sector employment, including the introduction of a penalty system.

REFERENCE:

1. O‘zbekiston Respublikasi Prezidentining 2026-yil 10-apreldagi “Oliy ta’lim, fan va innovatsiyalar tizimini takomillashtirishning qo‘shimcha chora-tadbirlari to‘g‘risida” gi PF-58-sonli Farmoni. https://lex.uz/docs/8129755
2. Carneiro, P., & Heckman, J. J. (2003). Human capital policy. In Inequality in America: What role for human capital policies? (pp. 77–240). MIT Press.
3. Becker, G. S. (1964). Human capital: A theoretical and empirical analysis, with special reference to education. National Bureau of Economic Research.
4. Mincer, J. (1974). Schooling, experience, and earnings. National Bureau of Economic Research.
5. Chun, H., & Lee, I. (2017). The effect of mature students on labor market participation: Evidence from South Korea. Asian Economic Journal, 31(4), 377–398. https://doi.org/10.1111/asej.12135
6. Blanden, J., Buscha, F., Sturgis, P., & Urwin, P. (2012). Measuring the returns to lifelong learning. Economics of Education Review, 31(6), 962–972. https://doi.org/10.1016/j.econedurev.2012.06.007
7. Betcherman, G. (2012). Labor market institutions and employment performance in developing countries. World Bank Research Observer, 27(2), 217–246. https://doi.org/10.1093/wbro/lks001
8. Eurostat. (2020). Adult Education Survey 2019: Key results for the European Union. Publications Office of the European Union. https://ec.europa.eu/eurostat/web/education-and-training/data/database
9. Bičáková, A., & Jurajda, Š. (2015). Labor market flows and the impact of economic crises: Evidence from Eastern Europe. Economics of Transition, 23(3), 511–540. https://doi.org/10.1111/ecot.12072
10. OECD. (2019). OECD skills strategy 2019: Skills to shape a better future. OECD Publishing. https://doi.org/10.1787/9789264313835-en
11. Robinson, M. (2014). Results-based budgeting: A strategic approach to public financial management. International Monetary Fund Working Paper, WP/14/88. https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Results-Based-Budgeting-A-Strategic-Approach-to-Public-Financial-Management-41506
12. World Bank. (2018). Lifelong learning in the global knowledge economy: Challenges for developing countries. World Bank Publications. https://openknowledge.worldbank.org/handle/10986/29837

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