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Comparative analysis of the returns to education by industries in Kazakhstan

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Abstract

This paper uses the Household Budget Survey data to estimate returns to education by industries in Kazakhstan for 2019. The comparative analysis by industries has shown that the returns to schooling tend to be relatively high and statistically significant. The expectations on estimates of returns were partially fulfilled with Education and Finance industries having the highest returns to schooling. The results of the study show that most of the industries that formally require higher educational attainment (Education, Information and communication, Financial and insurance activities) have greater returns to schooling.

Keywords

Returns to education, industries, Kazakhstan, comparative analysis.

Abbreviations

HBS	Household Budget Survey
TVET	Technical and vocational education and training
PhD	Doctor of Philosophy
OLS	Ordinary Least Squares
KZT	Kazakhstani Tenge

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Introduction

The returns to education is one of the essential concepts in economics, which shows how additional years of schooling affect the wage of an individual (Sianesi, 2003). The study applies the Mincer-type wage equation (Mincer, 1974) by using the Household Budget Survey data developed by the Bureau of National Statistics. The purpose of the study is to make a comparative analysis of the returns to schooling between the industries represented in the data.

Historically, education started to gain emphasis after Kazakhstan gained its independence in 1991. According to OECD (2015), the number of educational institutions grew considerably and 146 universities offered tertiary and post-secondary education in 2011. The establishment of Nazarbayev Intellectual Schools and scholarship programs such as the Bolashak program made education more affordable. Therefore, it is essential to estimate how additional years of schooling affect the real wages of individuals. In particular, leading industries should be identified.

With the multiple regression model, we found that the returns to schooling were relatively high (5-16.1%) and most of the industries had statistically significant estimates except for Real estate activities and Professional, scientific and technical activities. This can be caused due to the sample size since the former had 20 and the latter had 78 respondents. The highest returns to schooling were in Education and Information and communication industries, which can be explained by the formal requirement to hold a certain educational degree to operate in this industry. The potential weakness of the following approach is the endogeneity and the presence of unobservable factors affecting wages (motivation, skills).

This research paper is organized as follows. The next section is devoted to literature review. Section 2 and 3 discusses empirical strategy and data. Section 4 discusses the estimates of returns to schooling across industries. Section 5 discusses the limitations of the study. Section 6 concludes.

Literature review

There is a rising debate concerning the correlation between wages and years of schooling, and according to Sianesi's research (2003), this question is the subject of dispute between the economists. Nevertheless, very few studies have examined returns to schooling in Kazakhstan. Existing studies on the returns to schooling have found a decrease in returns due to the age effect and general glut (Kemelbayeva, 2020).

Most of the studies in this field used the wage regression model also known as the standard Mincer equation to estimate returns to schooling. Ordinary Least Squares (OLS) is used for estimation procedure and as Brunello et al. (2000) mentioned this approach has several drawbacks. One of the main disadvantages of this approach is omitted variable bias. As Sianesi & Reenen (2002) have mentioned in their study, different unobservable variables such as personal skills, and unobservable ability of the individual can be correlated with schooling. The majority of studies used panel data to tackle this methodological problem.

Moreover, most of the studies have shown a positive relationship between wages and a worker's education. For instance, Li (2003) explains that investments in human capital, which include educational attainment and working experience, should increase wages, so the correlation between years and income is positive. However, the duration of schooling does not always indicate the quality of knowledge and the ability to apply it in real life. As Toybazarova & Nazarova (2018) argue that the modernization of the education system in Kazakhstan is a necessary factor for the development of the country's economy in the context of modern globalization. A highly effective education system will improve the quality of human capital, which affects the income of citizens and the standard of living in the country.

Also, we used additional sources related to the consideration of Kazakhstan as a developing country. AllahMorad (2021) claims that both the country itself as a whole and the education in

Kazakhstan are in a state of development. However, it was confirmed by other studies that the importance of the level of education in the country can be increased. Thus, all three studies conducted by Andrén et al. (2005), Fleisher et al. (2005), and Pastore and Verashchagina (2006) had a conclusion that after successful reforms in the field of education, other developing countries were able to increase the value of education and thereby raise the returns to education.

Empirical strategy

The data from the Household Budget Survey by the Bureau of National Statistics are used. To study the returns to education by industries, OLS (multiple regression) with log-transformed variables will be implemented. This research method was chosen because it is one of the well-known approaches in economics for being intuitive and robust. To be more specific, a commonly used Mincer-type statistical wage equation is applied, which can be represented as follows:

$$\log r = \beta_0 + \beta_1 schooling + \beta_2 age + \beta_3 age^2 + \beta_4 gender + \beta_5 region + \beta_6 residence + \beta_7 company + \varepsilon$$

where

r – real income

ε – error term.

In this case, age is in quadratic terms, which acts as a control variable. The natural logarithm of real income is the dependent variable for all models. Schooling is a numeric variable representing the minimum required years of schooling derived from the education levels recorded by the data (Kemelbayeva, 2020).

- No education: 0 years of schooling
- Primary education: 4 years of schooling
- Basic secondary education: 9 years of schooling
- General secondary education and TVET: 12 years of schooling
- Higher education: 15 years of schooling

Models also control for age, gender, region, residence (urban or rural), and company ownership (private or public).

Based on theory, the real income of an individual is determined by investment in human capital. In other words, the returns to education measure how an additional year of schooling affects the wage of an individual (Li, 2003). Generally speaking, it is assumed that an individual with the highest educational attainment should have higher wages. For our study, we will make log-transformed models for each industry for 2019 and make a comparative analysis of the estimated returns to education by these industries. These estimated returns are then compared to average schooling in the Household Budget Survey data.

Data

The data on which the study is based is Household Budget Survey (HBS) for the period from 2011 to 2019, which is carried out by the Bureau of National Statistics in Kazakhstan. The HBS aims to obtain primary statistical data on the population's standards of living. The Survey is based on the principles of voluntary participation of selected households through interviews and self-completion of statistical forms by respondents. This is repeated cross-sectional data, where new households are surveyed each year.

The survey covers 18 regions consisting of urban and rural areas except for Almaty, Astana, and Shymkent cities, which are entirely urban. The data collected contained information about gender, age, level of education, income, and employment. The Survey conducted covers 583,203 respondents aged 15 to 62 for all four quarters of nine years with various levels of education and employment in different industries.

The study is based on the fourth quarter of 2019 with 13,901 respondents. Self-employed individuals are excluded from the sample due to doubt of an absence of direct dependence of their income on the years of schooling. 51.9% are men, and 48.1% are women. The age range is from 16 to 62 years, and the average age of the respondents in the sample is 40 years. The 19 of 20 industries are considered during the study to understand which industry has the highest return

to education, highest average salary, highest employment rate, and the highest labor productivity. The activities of household as employers, which is excluded from the study due to the small number of respondents and the insignificance of the result.

The statistical information about labor productivity is used in our study to understand the significance of industry in terms of the country's economy. The information covers all 20 industries of Kazakhstan producing goods and services. The Mining and quarrying sector has the highest output per worker with 35,837 million tenge. The lowest labor productivity with 1,677 million tenge in the Education sector.

Table 1 provides information about the share of employees by industries in the total number of respondents in the fourth quarter of 2019. According to the table, the most significant industries in terms of employment are Education and Wholesale trade.

Table 1: Share of the employees by industries in 2019

Industry	2019
Accommodation and food service activities	2.23%
Administrative and support service activities	3.03%
Agriculture, forestry and fishing	7.14%
Arts, entertainment and recreation	2.22%
Construction	6.11%
Education	19.95%
Electricity, gas, steam and air conditioning supply	3.15%
Financial and insurance activities	3.09%
Human health and social work activities	6.86%
Information and communication	2.01%
Manufacturing	5.55%
Mining and quarrying	5.34%
Other service activities	5.11%
Professional, scientific and technical activities	0.56%
Public administration and defense; compulsory social security	7.24%
Real estate activities	0.14%
Transportation and storage	8.17%

Water supply; sewerage, waste management and remediation activities	1.55%
Wholesale and retail trade	10.52%
Source: Household budget survey	

Average income measurement by levels of education

The data used in our study record the level of education that respondents achieved. This section reflects our expectations on the return to education in Kazakhstan by presenting an overview of schooling, visualization of the respondents' level of education, and average income depending on it.

Kazakhstan has a unified education system developed at the national level. It consists of such levels as preschool, primary, basic secondary, secondary, higher, and graduate education. The pupils have a choice to receive technical and vocational education after nine years of schooling. Secondary schools, regardless of their type, private or public, have their curricula developed by the Ministry of Education, while technical and vocational and higher education institutions develop their curricula but overall are subordinated by the Ministry.

Nowadays, the improvement of the education system in Kazakhstan is a high-priority aspect for the country. After all, education is one of the significant factors that ensure the recovery of the national economy and the standard of living of citizens. There is a necessity to apply reforms and to revise the approach to the education of the future society. According to the results of the large-scale international studies, TIMSS and PISA, students have a sufficient level of knowledge in subjects but are unable to apply it in the context of real life (Toybazarova & Nazarova, 2018).

The analysis of the collected data from the Bureau of National Statistics in Kazakhstan demonstrates that the most common type of education is general secondary education and TVET. According to Figure 1, the number of respondents with general secondary education and TVET is 8,715, which is 63% of the respondents. After the collapse of the USSR, the level of education in the country decreased due to a lack of funding and the crisis. However, the share of higher education increased in 2019 compared with 2011. By observing the descriptive statistics one can

notice that the level of education in the country is increasing, and this is indeed the case. According to Table 2, the participation rate in tertiary education in Kazakhstan is 61.7% in 2019, which is 13% higher than in 2011.

Table 2: Participation in education

Higher education	2011	2012	2013	2014	2015	2016	2017	2018	2019
Gross enrolment ratio	48.7 %	51.6%	50.4%	48.8%	46.4%	46.6%	50.1%	54%	61.7%
Source: UNESCO. Institute for statistics									

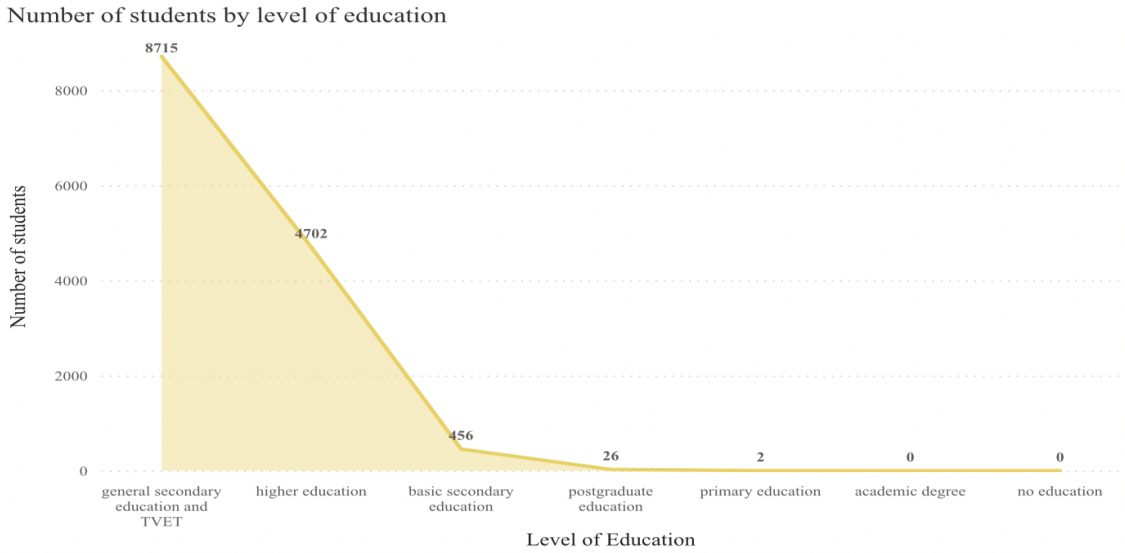

Figure 1: Number of students by level of education in 2019

Source: Household Budget Survey. Authors' calculation

Figure 2 demonstrates the average income of the respondents by the level of education in 2019. According to the figure, we can assume that the average income of individuals depends on the duration of schooling achieved. The average wage for respondents with postgraduate education is the highest with 267,105 KZT in 2019. The Empirical results section of the study will reveal more about the correlation between wages and education.

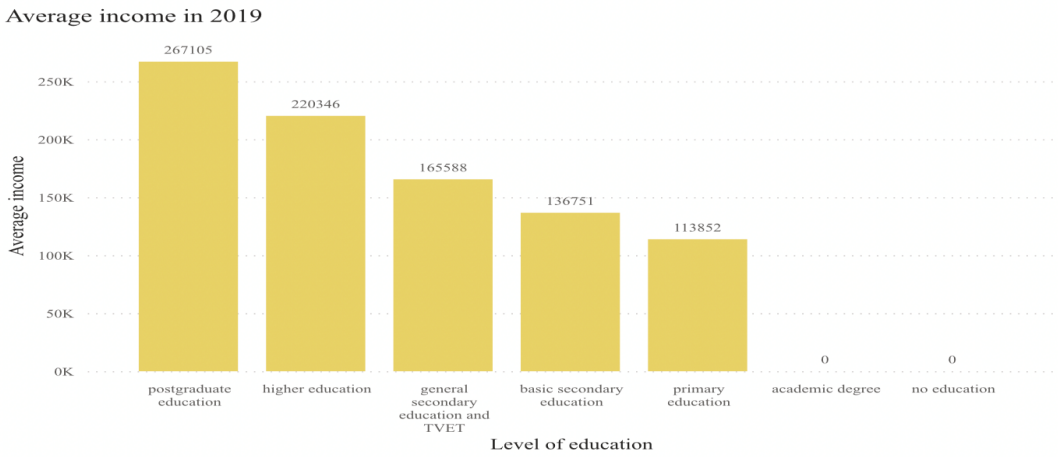

Figure 2: The average income in 2019

Source: Household Budget Survey. Authors' calculations

Average income measurement by industries

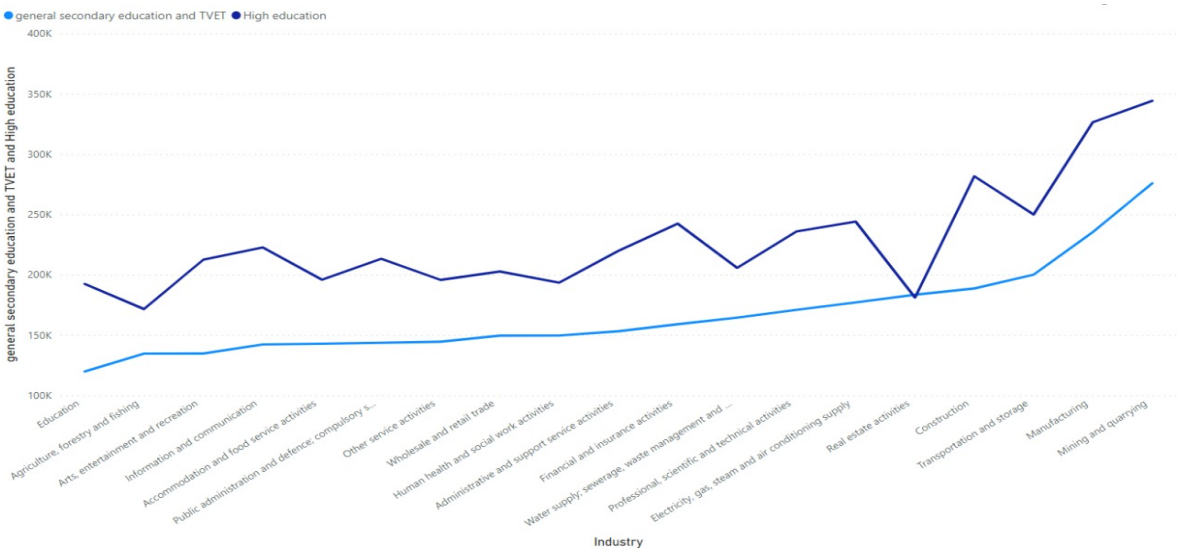

Figure 3: The average income by the level of education in industries in 2019

Source: Household Budget Survey. Authors' calculations

The graph above illustrates the average income among people with general secondary and TVET, and higher education in different industries in Kazakhstan in 2019. As can be seen from the graph, people with higher education earn more than people with general secondary education except in the real estate industry there is a slight difference in wages with 183,428 and 181,092 KZT. According to the graph, people in Mining and quarrying earn approximately 344,252 and 275,834 KZT. In the Education industry, the average income is about 182,390 and 119,794 KZT.

Generally, we can observe that people with the highest average wages work in the Mining and quarrying, and manufacturing industries, whereas this indicator is lowest for Education, Agriculture, foresting and fishing industries. Therefore, it is crucial to estimate returns to schooling across industries to identify where educated people are most valued. For instance, the highest salary will be in Mining and quarrying, but the returns to schooling may not be very high there. Whereas in Education wages are comparatively low, but the returns can be relatively higher.

Another point that should be noted is that only 26 out of 13920 respondents have postgraduate education degrees. Despite the fact that there are few of them, their average salary is about 267,105 KZT. The graph below represents the income of nine industries in Kazakhstan in 2019. In four of these industries, people make more than 300,000 KZT, whereas in the previous graph people with a high education level only in 2 industries can do so. Consequently, it leads to the point that a few years of schooling can increase returns in the future.

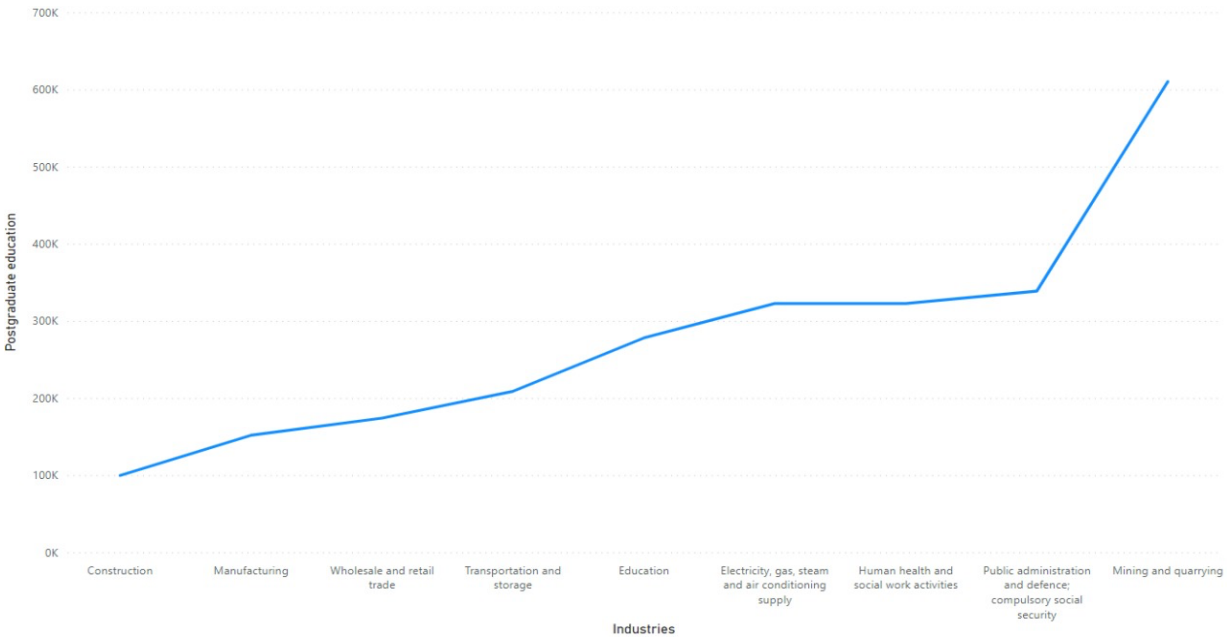

Figure 4: The average income of people with postgraduate education in industries in 2019

Source: Household Budget Survey. Authors' calculations

Returns to education expectations

It is commonly known that investment in human capital is one of the key drivers of economic growth (Brunello et al., 2000). This economic growth can be achieved by implementing policies that make education more affordable for the population. According to human capital theory, incomes are highly dependent on work experience and educational attainment (Li, 2003). Incomes will reach a peak when human capital is at its maximum. However, in the middle of the career, human capital depreciation will eventually take its place and incomes will decrease (Dickson & Harmon, 2011).

In our research, we compare returns to education by industries. In our case, we can assume that more people with graduate and postgraduate education (Master's degree or Ph.D.) are likely to work in Education or Finance rather than Agriculture or Mining and quarrying (exploration and extraction of minerals) because the latter requires more physical labor. Although someone can work as a driver, security guard, or receptionist in Finance, still the majority of the workers in these fields should have at least higher education. We expect that returns to education will be the highest in the Education industry because this field requires a degree. Most of the researchers with Master's or Ph.D. degrees work in the Education field and returns to education for them should be higher. Also, we can expect that individuals with a lower level of educational attainment are less likely to be employed in industries with a high return to education compared to those workers with high educational attainment.

Empirical results

The results of the returns to education for all 19 industries that were used in our data are represented below.

Table 3: Returns to education by industry and other industry characteristics

Industry	**Returns to schooling**	**R-squared**	**NOBS**	**Mean (schooling)**	**Average wage (KZT)**	**Labour productivity (thousand KZT)**

Real estate activities	16,1	84,9	20	13,95	181 910	9 207.2
Education	13,96***	31,43	2773	13,54	158 830	1 677
Information and communication	12,95***	43,32	279	13,3	177 395	8 343.7
Administrative and support service activities	12,2***	41,78	421	13,14	179 382	5 475.4
Financial and insurance activities	11,34***	34,64	429	14,24	221 408	11 726.2
Arts, entertainment and recreation	9,79***	35,17	309	13,06	163 907	3 583.5
Public administration and defence; compulsory social security	9,45***	38,13	1007	13,44	178 191	2 373.2
Construction	8,63***	22,86	850	12,58	209 048	5 996.3
Accommodation and food service activities	8,55***	28,99	310	12,44	151 288	4 028.7
Human health and social work activities	8,35***	24,78	954	12,77	161 025	2 638.4
Electricity, gas, steam and air conditioning supply	7,5***	34,72	438	12,82	195 635	6 531.3
Other service activities	6,86***	23,9	711	12,74	158 693	6 944.2
Manufacturing	6,85***	42,85	772	12,57	254 863	13 660.8
Transportation and storage	6,82***	25,48	1136	12,68	212 114	8 762.4
Agriculture, forestry and fishing	5,4***	14,07	1010	11,94	135 945	2 466
Water supply; sewerage, waste management and remediation activities	5,36*	35,08	216	12,57	172 757	2 078.9
Mining and quarrying	5,18***	33,92	742	12,62	290 725	35 837.2
Wholesale and retail trade	5,08***	32,62	1462	12,59	161 482	8 237.6
Professional, scientific and technical activities	1,09	37,91	78	13,27	201 441	11 946.7
Notes:						

(1) Returns to schooling and R-squared – the results of the models' estimations. 19 models for each industry were estimated separately. Corresponding coefficients with the sign. codes and R-squared are presented.
(2) Mean of schooling and average wage are the average years of schooling and mean wage per industry in the sample.
(3) Labour productivity by industry – country level national statistics for 2019 (https://stat.gov.kz/).

As it can be seen from table 3, the highest returns to education are in the Real estate activities sector with a predicted increase in wages by 16,1%, when schooling increases by one year; this result is however not statistically significant, possibly due to very small sample size. Therefore, among the significant coefficients, the education industry generates the highest returns for an additional year of study. Information and communication; Administrative and support service activities and Financial and insurance activities are also among the industries with the high returns to education.

The smallest and statistically insignificant rate of returns is observed in the Professional, scientific and technical activities sector with the predicted increase of wages by only 1,09%. This industry includes consulting and auditing companies, which normally have top tier specialists with high background in education. Considering this assumption, we expected higher returns for this industry. However, the estimate of returns to schooling for this sector is unexpectedly low, and possibly should be explained by a high mean in the schooling of the respondents in the sample - or, in other words, smaller variation in the respondents' level of education. Among the industries with statistically significant results, the lowest returns are observed in Agriculture, forestry and fishing; Water supply; Mining and quarrying and Wholesale and retail trade.

Excluding statistically not significant results, the table suggests that the industries with relatively higher returns to education are those that hire relatively better-educated workers (as measured by their average years of schooling), while the industries with the lower returns tend to employ people with lower educational attainment. This is likely a two-way causality – the industries requiring more educated workers pay them a better premium for education than other

industries, to attract them, and this makes better-educated workers self-select into industries that value education more.

The majority of those industries, however, are not the best-paid industries in Kazakhstan. Besides Financial and insurance activities and Professional, scientific and technical activities, the best-paid industries (such as Mining and quarrying; Manufacturing; Transportation and storage and Construction) are characterised by lower returns to education and less educated employees. The wages in turn seem to be positively correlated with the industry labour productivity: the higher the productivity (the output per worker), the higher the wage.

Thus, we can conclude that the production process in the economy of Kazakhstan is rather primitive and, with few exemptions, does not require a better-educated labour force.

R-squared results explain how much variation in wages in our model is explained by the joint variation in all explanatory variables. The data used captures on average only 35 percent of a variation of the real wage, with the most unexplained component in Construction; Transportation and storage; Human health and social work and other services). Thus, there are other systematic and random (non-systematic) factors affecting wages that are left unexplained due to the data unavailability.

Limitations of the study and further recommendations

The study has two main limitations such as unobservable variable bias and possible endogeneity. For example, both schooling and wages can be affected by other factors such as individual abilities and skills which are often left unobserved due to data unavailability. This limitation may be solved by using panel data or instrumental variables methodologies. Also, the opportunity cost of doing education is higher for those who have lower abilities. It means that people may spend a different number of years studying to get the degree they need due to some external and internal obstacles. For instance, some students can fail and retake courses, thus they

may not graduate at the same time as their peers. Consequently, it may lead to uncertainties in estimating the years of schooling.

For further research, we can do a comparative analysis between Kazakhstan and other emerging economies elaborating on possible similarities and differences.

Conclusion

This paper complements existing studies related to the returns to education in Kazakhstan. By making comparative analysis of the returns to education by industries for 2019, we concluded that industries with higher returns to education prefer to employ people with higher education, whereas, for example, the sector of Agriculture, forestry and fishing generating very low returns, predominately hires workers with low level of education.

After analyzing the average wages, it was identified that some industries with a high demand for educational attainment tend to pay less. Whereas, for example, the Financial and insurance activities industry needs highly qualified workers with higher education, and, accordingly, they pay more, thereby attracting workers. Thus, a more educated person can choose the industry to work in, and most likely will prefer the industry where his higher education will be valued and paid higher than in industries dominated by physical labour.

In addition, we were able to identify a positive correlation between average wages and industry labour productivity. Those industries with relatively low labour productivity are also characterized by relatively low wages. Thus, we concluded that the production process of Kazakhstan is rather typical for a developing country. As well as the whole country, education is at the stage of development in Kazakhstan (AllahMorad, 2021). Many manufacturing industries do not require highly educated workforce, and office-based industries recruit more educated people. However, based on similar studies done in other countries with transition economies, a continuation of market reforms leads to the development of returns to education trend (Andrén et al, 2005; Pastore and Verashchagina, 2006). Thus, according to Fleisher et al. (2005) returns to

education tended to increase immediately after educational reforms in Russia, Estonia, the Czech Republic, Poland, and Slovenia. Therefore, with the development of the Kazakhstani economy, the value of higher education can also grow in direct proportion in our case.

In general, despite the limitation of our study due to endogeneity, which is a fairly common limitation for any empirical study using micro-data, the results are expected and justified.

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