Policy Research Working Paper 9117

# Returns to Education in Azerbaijan

## Some New Estimates

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WORLD BANK GROUP
Education Global Practice
January 2020

Policy Research Working Paper 9117


## Abstract

This paper estimates private and social returns to investment in education in Azerbaijan, using the 2015 Azerbaijan Monitoring Survey for Social Welfare. The private rate of return to education is 6 percent; this is the first estimate of returns to schooling in Azerbaijan since 1995. The returns to schooling are 6 percent for men and 8 percent for women, even controlling for selection. In addition, the paper estimates the returns for higher education; for this level, the rate of return is 9 percent. Finally, using the full discount method, the private rate of return to tertiary education is 9 percent, and the social rate of return is 8 percent. One policy implication is to re-examine the funding of higher education and for its expansion.


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JEL Codes: I21, I26, J23, J24, J31

Keywords: Education, Returns to Education, Azerbaijan

[1] The views expressed here are those of the authors and should not be attributed to the World Bank Group. Thank you to Elvira Anadolu and Sabina Guliyeva for helping access official cost data, and thanks to Naveed Naqvi, Katia Marina Herrera Sosa, Lire Ersado, Nina Arnhold, Alexandria Valerio, Flora Kelmendi and Igor Kheyfets for motivation and providing access to studies. I also thank George Psacharopoulos, Eduardo Velez and Chris Sakellariou for comments.

## Introduction

Oil wealth has served Azerbaijan well, helping the country achieve high growth rates, significant poverty reduction, accumulation of large foreign exchange reserves and reduction in debt levels. Economic growth averaged 13 percent a year during 2002-12 and Azerbaijan transitioned into a middle-income country. Azerbaijan is the 77th largest exporting economy in the world (MIT 2018). The oil industry is the primary sector in the economy, which covers 93 percent of the country's exports. Azerbaijan's economy is not diversified, which means that the economy is fragile due to the dependence on oil prices. The country's further advances in economic development, given anticipated declining oil production, will critically depend on the country's underlying asset base of human capital.

The country's basic (primary and secondary) education system has experienced significant expansion in the last few decades. There is almost full universal enrollment in primary and secondary education (UNESCO 2018). This is despite relatively low spending on education, at 2.5 percent of GDP, and only 7 percent of public expenditures. But enrollment in tertiary education is only 27 percent, slightly higher for women at 30 percent, compared to men at 26 percent.

Azerbaijan's productivity of human capital is below potential. According to the Human Capital Index, a child born in Azerbaijan today will be 60 percent as productive when she grows up as she could be if she enjoyed complete education and full health (World Bank 2019). This is because although a child who starts school at age 4 can expect to complete 11.6 years of school by her 18th birthday, given the quality of education in Azerbaijan, expected years of school is only 8.8 years when adjusted for learning. Azeri employers claim that it is difficult to find workers with the

required skills. The shortage is particularly pronounced in the case of modern, innovative firms, which tend to require more advanced skills (Rutkowski 2015).

In this paper we report on a cost-benefit analysis of Azerbaijan's education system with an emphasis on the tertiary level. The key statistic we are using in the analysis of efficiency and equity issues in Azerbaijan education is the rate of return of investment in education, from the private and the social point of view. The returns to investment in education have been a popular empirical analysis in research to study the relationship between schooling and earnings. Human capital has a central role in explaining the wealth of nations and "a large fraction of the cross-country differences in output are due to differences in the quality of human capital" (Manueli and Seshadri 2014: 2755).

Private returns can also explain the private demand for education. The literature suggests that each additional year of schooling produces a private (that is, individual) rate of return to schooling of about 8 to 10 percent a year (Psacharopoulos and Patrinos 2018; Montenegro and Patrinos 2014). Globally, the returns to tertiary education are highest, followed by primary and then secondary schooling; this represents a significant reversal from many studies' prior results. Policy makers can learn much from Mincerian results; for instance, further expansion of university education appears to be very worthwhile for the individual, meaning that governments need to find ways to make financing more readily available, and that high rates of return are found through investment in girls' education.

A comparison of social returns to education to the discount rate used in social projects gives an indication of the social efficiency of the investment. Since the advent of human capital theory in economic thought, estimating the returns to investment in education has been a very popular subject among researchers (see Psacharopoulos and Patrinos 2018 for a recent review on the subject). We distinguish between private and social returns. We provide estimates using the Mincerian earnings function as well as the full-discounting method.

This paper provides the first estimate of the returns to education in Azerbaijan since 1995 (Newell and Reilly 1999). Newell and Reilly (1999) estimated a high 13.8 private return to tertiary education. Using the same data, a very low return of 3.7 percent overall, and 5.5, 4.2 and 4.0 percent for primary, secondary and tertiary education, as well as 3.8 and 4.5 percent for males and females, was estimated by Peet et al. (2015). Montenegro and Patrinos (2014) obtain a 7.2 percent return overall return, but 19.8, 2.2 and 8.1 for primary, secondary and tertiary education.

There is a sizeable overall gender wage gap in Azerbaijan's workforce (Pastore et al. 2016). Using a unique database from a survey of young people ages 15-29 years shows that new labor market entrants begin with little or no gender differences in earnings, but a wage gap gradually emerges over time closer to the childbearing years. The gender wage gap grows from virtually zero, or even a small, positive gap in favor of women, until age 20 years, to about 20 percent two years later and even more than 30 percent at age 29 years.

The remainder of the paper is organized as follows. The next section describes the methodology and data. The following section presents results of the returns to investment to education. The last section discusses and concludes the main findings.

**Methodology**

The Mincer equation—arguably the most widely used in empirical work—can be used to explain a host of economic, and even non-economic, phenomena. One such application involves explaining (and estimating) employment earnings as a function of schooling and labor market experience. The Mincer equation provides estimates of the average monetary returns of one additional year of education. This information is important for policy makers who must decide on education spending, prioritization of schooling levels, and education financing programs such as student loans (Patrinos 2016). In that respect, the Mincer equation is the most used econometric framework for estimating the rate of return in education.

However, to properly consider the full social and private costs and benefits of investing in education, the discounting method is used to compute not only the private rate of return but also the social rate of return. These estimations are possible because the discounting method takes into account private and social costs.

Earnings function method

The classic Mincerian framework estimates the effect of education, as a direct measure of human capital stock, on earnings. A simple specification of the earnings function is:

$$\ln W_i = \alpha + \beta S_i + \gamma_1 EX_i + \gamma_2 EX_i^2 + \varepsilon_i$$

where *W* is the individual's hourly earnings, *S* the number of years of schooling and *EX* years of labor market experience defined as *Age - S - School starting age.* We use hourly earnings to compare individuals across education levels, full- and part-time workers. For example, individuals with higher levels of schooling tend to work more, the resulting return to schooling will be greater when using weekly or annual earnings than hourly earnings (Patrinos 2016). In this function, the $\beta$ coefficient on years of schooling can be interpreted as the average rate of return to one additional year of schooling regardless of the education level to which it refers. The functional form of earnings is linear in schooling but quadratic in experience.

The return of higher education is estimated with this formula:

$$lnWi = \alpha + \beta_1 PriEdi + \beta_2 Seced + \beta_3 HigherEdi + \gamma_1 EXi + \gamma_2 EX^2 i + \varepsilon i$$

where we derive the return (r) to higher education from:

$$r(HigherEd) = (\beta 3 - \beta 2) / (HigherEd - SecEd)$$

The equation includes dummies for each level of education, where *PriEd* is the dummy for primary education, *Seced* is the dummy for secondary education, and *HigherEd* is the dummy for higher education. The rate of return of higher education is defined as the difference between the coefficients of these levels of education divided by the time spent during higher education.

Discounting method

Schooling represents an investment for individuals, and an additional year of schooling entails opportunity costs in the form of forgone earnings, tuition, and some other costs. The discounting method estimates the relationship between schooling and earnings over the life cycle, comparing costs to the discounting stream of expected earnings. The private rate of return, under the

discounting method, includes direct private costs assuming that they are the only cost of education. Using this method, the social rate of return to investment in education is estimated when the social costs of education are included in the estimation.

This paper uses the discounting method to estimate the private and social rate of return to investment in college education. According to the discounting method, the private and social rate of return to investment in college is estimated by finding the rate of discount ($r$) that equalizes a stream of discounted benefits to the costs at a given point in time. In the case of university education lasting five years, for example, the formula for the social rate of return is:

$$\sum_{t=1}^{42} \frac{(W_u - W_s)_t}{(1+r)^t} = \sum_{t=1}^{5} (W_s + C_u)_t (1+r)^t$$

where ($W_u$-$W_s$) is the earnings differential between a university graduate (subscript $u$) and a secondary school graduate (subscript $s$). $C_u$ represents the direct costs of university education (tuition, fees, books), and $W_s$ denotes the student's foregone earnings or indirect costs. To be even more precise about the private costs and the social costs, one can define them as follows: Private costs include foregone earnings while studying and tuition, fees, books and incidentals (referred to as direct private costs). Social costs include teacher and other personnel salaries, rentals for buildings (referred to as direct social costs) plus foregone taxes (referred to as indirect social costs). Ideally, one would use the total private costs in computing the private returns and the total social costs in computing the social returns to education. A similar calculation can be made for the other levels of education.

One limitation to this methodology is that the discounting method requires specific information that is not easily accessible or available in surveys or censuses. For example, earnings surveys do

not include data for ages below the legal working age, which makes it impossible to estimate the rate of return to primary education, although many children in developing countries work and therefor have foregone earnings if in school. For this reason, the Mincerian method is more convenient than the full discounting method.

Estimation comparison between these two methods.

The two methods, and as demonstrated below, compute different estimates of the returns to education. The Mincerian function method produces only private returns, and only in special cases are these returns similar to the marginal internal rate of return in particular conditions (Heckman et al. 2008). The Mincer regression may underestimate the private returns (downward bias) (Bhuller et al. 2017; Heckman, et al. 2008). In this sense, the discounting method is a precise empirical procedure to estimate private and social returns, as it allows to incorporate true direct and indirect costs of schooling.

**Data**

We use data from Azerbaijan's 2015 Monitoring Survey for Social Welfare (AMSSW), covering nearly 38,700 individuals. The survey is nationally representative. We use wage and other information for individuals aged 15-65 in full-time dependent employment. We estimate the number of years of schooling of the individual based on the highest educational level completed and considering the changes in the required years of schooling for a degree over time. Table 1 presents summary statistics of the sample of the AMSSW.

**Table 1: Descriptive Statistics of Key Variables**

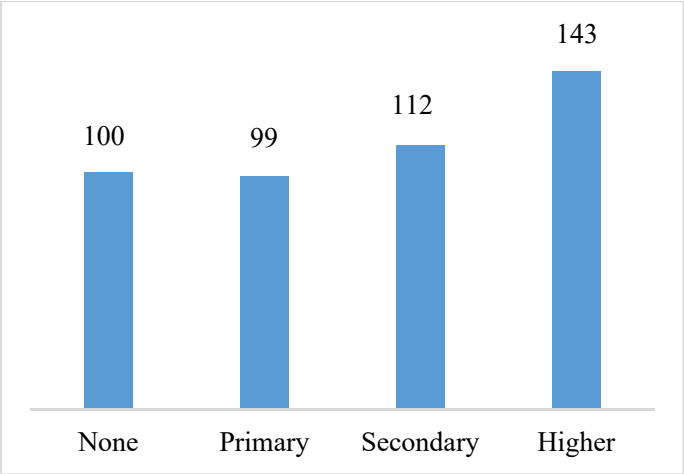
| | Mean | S.D. |
|---|---|---|
| Hourly Wage | 1.4 | 1.6 |
| Log(wage) | 0.0838 | 0.7307 |
| Schooling (years) | 12.8 | 2.3 |
| Experience (years) | 20.6 | 12.5 |
| Experience-squared | 581.5 | 560.4 |
| *Level of education (percent)* | | |
| No schooling | 0.3 | 0.1 |
| Primary | 10.2 | 3.0 |
| Secondary | 69.4 | 46.1 |
| Tertiary | 20.1 | 40.1 |

Source: AMSSW 2015

On average, the population of Azerbaijan has completed 13 years of schooling. That is, 69 percent of this sample has completed high school, 20 percent higher education, and only 10 percent of the population did not complete high school. This country has made a significant achievement in terms of high school graduation, but this accomplishment is not translated into higher graduation in university. On average, the labor force in Azerbaijan has 21 years of experience, suggesting a middle-aged workforce population. In this sample, the male employment rate is higher (see Tables A1 and A2 in the Annex). However, female workers have half a year more schooling, and almost two years of more experience than men do.

There is not much variation in earnings in Azerbaijan until the tertiary level. The earnings advantage of secondary education is minimal. But those with higher education earn 1.4 times more than those with primary education (Figure 1).

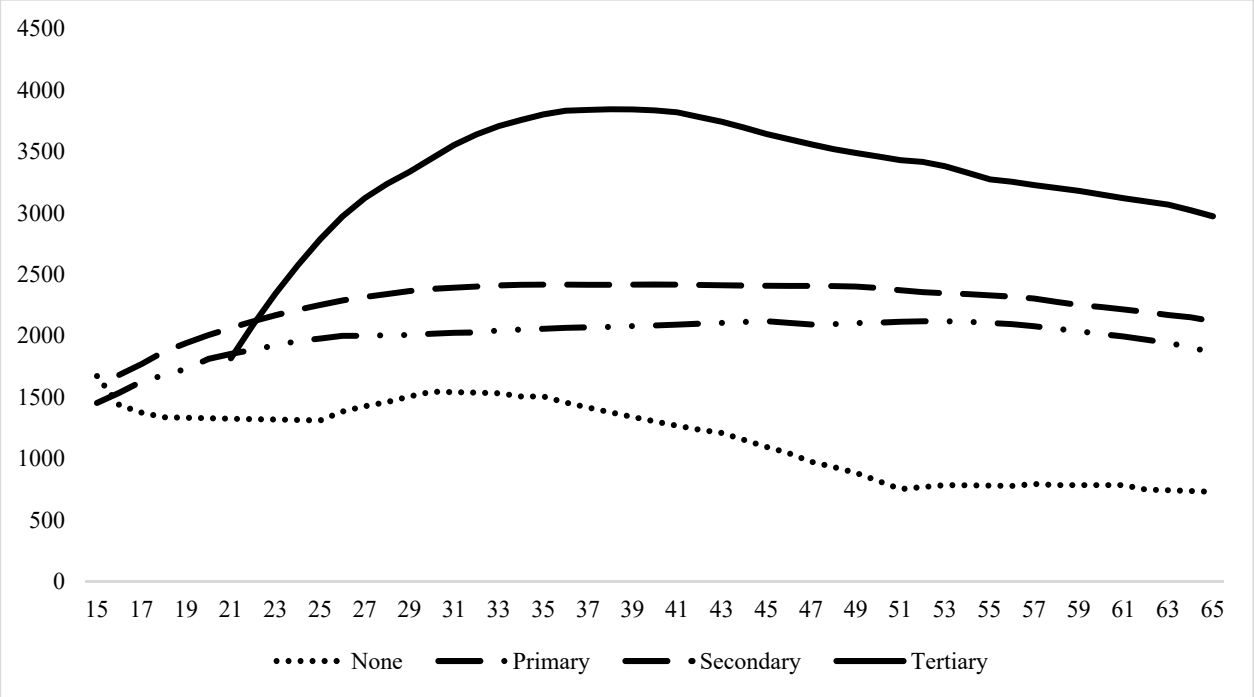
**Figure 1: Earnings Ratio by Educational Level (No education = 100)**




Source: AMSSW 2015

Figure 2 shows the age-earnings profile. Only the curve for tertiary education is well-behaved. For the lower levels of education, age-earning profiles are substantially lower and mostly flat. The age-earnings profile for individuals with no education has the lowest earnings and a decreasing trajectory.

**Figure 2: Age-earning Profiles by Level of Education**




Source: AMSSW 2015

**Mincer Estimates**

Table 2 shows the Mincer earnings function estimates of the average private rate of return to one extra year of schooling. Tables A3, A4 and A5 in the annex present this rate of return by sex, economic sector and level of education.

There are several points to note in Table 2. First, the private return to investment in education is 6.1 percent, which is positive but below the global average of 8-10 percent. In fact, these returns are low compared to worldwide averages. Second, the returns to schooling for women are higher by two percentage points, at 8.3 percent, compared to 6.2 percent for men. In their global survey,

Psacharopoulos and Patrinos (2018) also report higher returns for females than for males as a general pattern for many countries. The earnings functions are relatively well behaved.

To correct for any selection bias, we apply the Heckman two-step correction model (see Annex Table A3). Conceptually, this is achieved by explicitly modeling the individual sampling probability of each observation (the so-called selection equation) together with the conditional expectation of the dependent variable (the so-called outcome equation). The results suggest that the returns to education for females are not biased.

We also estimate the returns to education by economic sector (Annex Table A5). The results show that the private rate of return to an additional year of schooling is highest in the manufacturing sector, at 8.0 percent, followed by services, at 5.0 percent, and agriculture, at 3.0 percent.

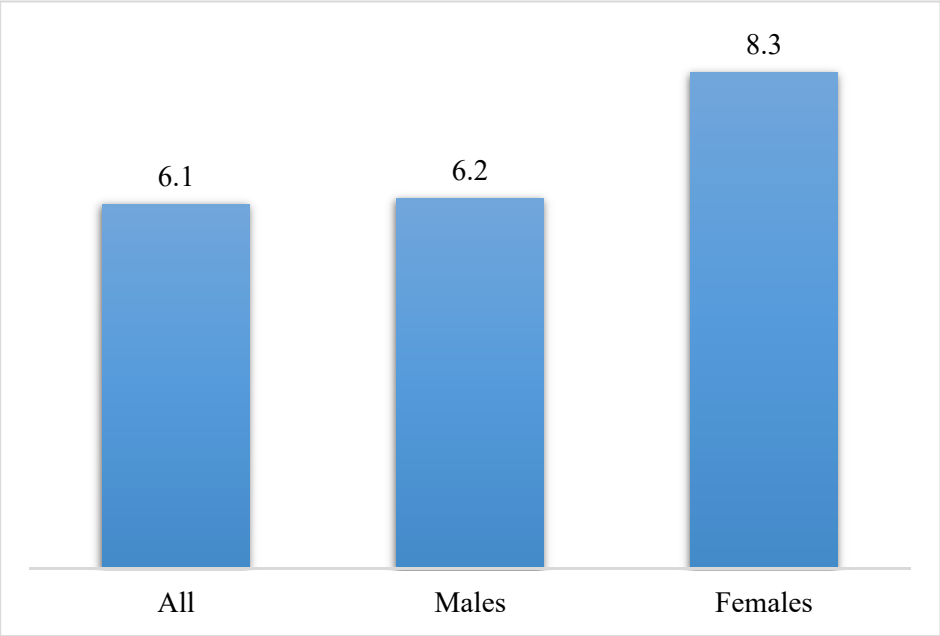
**Table 2: Private Mincerian (OLS) Estimates of the Returns to Education, Azerbaijan 2015**

| | All | Males | Females | Females Heckman correction |
|---|---|---|---|---|
| Returns (%) | 6.1 | 6.2 | 8.3 | 8.3 |
| N | 9,890 | 6,122 | 3,768 | 5,712 |

Source: Authors' calculation using AMSSW 2015; see full results in Annex Tables A3 and A5

Figure 3 shows the average rate of return to investment in education in Azerbaijan in 2015. The gender gap is 2.1 percentage points, and the return is significantly higher for women.

**Figure 3: Average Returns to Schooling by Sex (percent), Azerbaijan 2015**




Source: AMSSW 2015

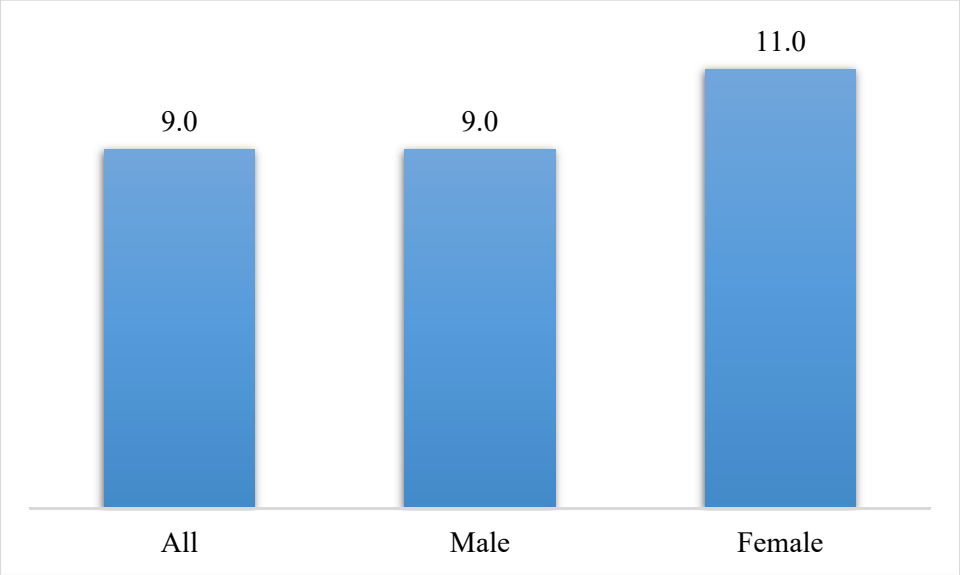
We also estimated the returns to schooling by level of education (full results in Annex Table A6). The estimates for primary and secondary education were insignificant given the small earnings differences and the near universal enrollment at these levels. The econometric results only find significant outcomes at the tertiary level. The overall private rate of return to tertiary education (relative to secondary) is 9 percent. It is higher for females, at 11 percent, compared to 9 percent for males. These are summarized in Table 3 and Figure 4.

**Table 3: Private Mincerian (OLS) Estimates of the Returns to Tertiary Education, Azerbaijan 2015**

| | All | Male | Female |
|---|---|---|---|
| Returns (%) | 9.0 | 9.0 | 11.0 |
| N | 9,890 | 6,122 | 3,768 |

Source: Authors' calculation using AMSSW 2015; see full results in Annex Tables A3 and A5

**Figure 4: Average Returns to Tertiary Education by Sex (percent), Azerbaijan 2015**




Source: AMSSW 2015

**Cost-Benefit Estimates**

The discounting formula presented above was applied to the earnings profiles to estimate the returns assuming a 4-8-4 duration of primary, secondary and higher education. In 2017, there were 38 public and 13 private higher education institutions in Azerbaijan. The Azerbaijani higher education system continues to be characterized by low levels of tertiary education enrollment

(World Bank 2018). In 2016, there were 138,301 higher education students, of which 88,559, or 64 percent, paid for the cost of their education. The other 36 percent were fully subsidized by the government. There is a high degree of cost recovery in Azerbaijan. On average, students spent 1,950 *manat* in 2019. Student admission quotas are tightly controlled by the government. These quotas have resulted in limiting access to tertiary education for young people; the quota-to-applicant ratio has been declining since the mid-1990s. As a result, a smaller proportion of the young generation has graduated from universities and technical vocational colleges than that of their parents (World Bank n.d.). The cost for private tutoring, which is essential to prepare students for the university entrance examinations, is equivalent to an average of 30 to 50 percent of per capita income for households in the bottom three quintiles. This makes it unlikely for students from poorer families to be among the highest scoring students who qualify for the merit-based tuition-free places. Second, tuition fees for public universities are prohibitively high for poor people, amounting to 20 to 160 percent of the per capita income of the bottom quintile; few poor students who did not qualify for funding and who have lower grades are unable to afford tuition. Private universities are even more costly (World Bank 2011).

Public funding of higher education is relatively low in Azerbaijan. In 2018, public education spending accounted for only 3 percent of GDP. Only 10 percent of the total education budget goes towards tertiary education. Higher education institutions receive per capita student payments and for some universities infrastructure costs (World Bank 2018). The direct resource cost of schooling appears in Table 4. The nominal cost for tertiary education is calculated based on the fact that 64 percent of students pay tuition, at 1,800 manat, while the rest are covered by a public subsidy, or 1,700 manat, for an average cost of 1,764 manat. Figure A1 in the Annex shows the distribution

of tuition costs using the AMSSW 2015. The average cost for those who paid was 1,719 manat in 2015, but some individuals paid much higher tuition amounts.

**Table 4: Cost per Student/Year** (nominal *manat* 2015)

| Level of Education | Cost | Enrollment | Per-capita Cost | |
|---|---|---|---|---|
| | | | Tuition | Public scholarship |
| Primary and Secondary | 1,074,854,820 | 1,378,019 | | 780 |
| Tertiary | 243,962,964 | 138,301 | 1800 | 1700 |
| All | 1,318,817,784 | 1,516,320 | | |

Source: Azerbaijan Ministry of Education

Notes: Local currency, *manat*; currently, 1 *manat* is equivalent to $ US 0.59.

The discounting formula presented above was applied to the earnings profiles to estimate the returns assuming a 4-8-4 duration of primary, secondary and tertiary education. The resulting returns appear in Table 5. Estimating the rate of return using the discounting formula, the private return to investment in tertiary education is 9.7 percent, which includes the forgone earnings as the private cost of education.

**Table 5: Private and Social Returns to Investment in Tertiary Education by Full Discount Method (%)**

| Private | Private return paying tuition | Social |
|---|---|---|
| 9.7 | 5.4 | 5.6 |

Source: Authors' calculations using AMSSW 2015

Attending tertiary education in a public institution in Azerbaijan leads to two different returns to investment in education estimates, depending on whether the student paid tuition or not. The distinction is created by the tuition costs, where 64 percent of the students pay tuition and 36 percent of the students receive a scholarship and do not pay any tuition. For those students who pay tuition, the rate of return to investment in education is almost 50 percent lower than for those students who receive a scholarship.

**Conclusion**

Azerbaijan is a highly educated country, at least in terms of years of schooling and levels of education completed. There is still a need to improve the quality of education in terms of student learning outcomes. In 2015, the average level of schooling was 12.8 years. Very few 15-64-year-olds have no schooling. In fact, 69 percent of the labor force has a secondary school education. Only 10 percent have only primary, while 20 percent have tertiary education. The enrollment rate for tertiary is low. Sizable differences in earnings only appear at the tertiary level. Women have more schooling than men, at 13.2 versus 12.6 years of schooling.

We use the 2015 Azerbaijan Monitoring Survey for Social Welfare to estimate the returns to education. This is the first estimate of returns to schooling in Azerbaijan since 1995. This results in a private rate of return of 6 percent. This is low compared to the global average of 8-10 percent, and it is low for the Europe and Central Asia region. The returns to schooling for men are 6 percent and 8 percent for women, even controlling for selection; this is in line with global findings. For higher education, the rate of return is 9 percent; 9 percent for males and 11 percent for females. Only returns at the tertiary level are significant given the fact that almost everyone in the labor force has secondary education. Returns to schooling are highest in the manufacturing sector, at 8 percent; followed by services at 5 percent; and agriculture and other at 3 percent. Overall, the returns to education in Azerbaijan are low, and have not changed much in the last 20 years.

Using the full discounting method, the private return to tertiary education is estimated at 9 percent and the social rate of return is 8 percent. There are two types of students attending higher education institutions in Azerbaijan, those who receive state scholarships and those who pay tuition, even for

attending a public institution. Therefore, it follows that attending tertiary education in a public institution in Azerbaijan leads to two different returns to investment in education estimates, depending on whether the student paid tuition or not. The distinction is created by the tuition costs, where 64 percent of the students pay tuition and 36 percent of the students receive a scholarship and do not pay any tuition. For those students who pay tuition, the rate of return to investment in education is almost 50 percent lower than for those students who receive a scholarship. This obviously has implications for equity. One policy implication is to re-examine the funding of higher education and its expansion.

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**Annex Tables**

**Annex Table A1: Descriptive Statistics, Males**

| Variable | Mean | S.D. |
|---|---|---|
| Hourly Wage | 1.6 | 1.7 |
| Log(wage) | 0.2 | 0.7 |
| Schooling | 12.6 | 2.3 |
| Experience | 20.0 | 12.5 |
| Experience Square | 556.4 | 555.0 |
| No Schooling | 0.00 | 0.10 |
| Primary | 0.11 | 0.31 |
| Secondary | 0.71 | 0.45 |
| High School | 0.17 | 0.38 |
| N | 6,122 | |

Source: AMSSW 2015

**Annex Table A2: Descriptive Statistics, Females**

| Variable | Mean | S.D. |
|---|---|---|
| Hourly Wage | 1.1 | 1.3 |
| Log(wage) | -0.1 | 0.7 |
| Schooling | 13.2 | 2.4 |
| Experience | 21.7 | 12.3 |
| Experience Square | 622.1 | 566.7 |
| No Schooling | 0.0 | 0.1 |
| Primary | 0.10 | 0.28 |
| Secondary | 0.67 | 0.47 |
| High School | 0.25 | 0.43 |
| N | 3,768 | |

Source: AMSSW 2015

**Annex Table A3: Private rates of return to one year of schooling, Mincer regression estimates (%)**

| | All | Male | Female |
|---|---|---|---|
| Schooling | 0.061 | 0.062 | 0.083 |
| | (0.003) | (0.004) | (0.005) |
| Experience | 0.011 | 0.017 | 0.004 |
| | (0.002) | (0.003) | (0.004) |
| Experience Square | -0.0002 | -0.0004 | -0.0001 |
| | (0.00005) | (0.00007) | (0.00008) |
| Constant | -0.789 | -0.716 | -1.278 |
| | (0.0509) | (0.064) | (0.076) |
| Observations | 9,890 | 6,122 | 3,768 |
| R Square | 0.043 | 0.049 | 0.081 |

Source: AMSSW 2015

**Annex Table A4: Private rates of return to one year of schooling, Mincerian estimates (%)**

| | Female | Female-Heckman |
|---|---|---|
| Schooling | 0.083 | 0.083 |
| | (0.005) | (0.005) |
| Experience | 0.004 | 0.005 |
| | (0.004) | (0.004) |
| Experience-squared | -0.0001 | -0.0001 |
| | (0.00008) | (0.00008) |
| Constant | -1.278 | -1.139 |
| | (0.076) | (0.091) |
| Marital status | | 0.085 |
| | | (0.017) |
| Constant | | 0.290 |
| | | (0.032) |
| Rho | | -0.391 |
| | | (0.139) |
| Sigma | | 0.688 |
| | | (0.020) |
| *Lamda* | | -0.269 |
| | | (0.102) |
| Observations | 3,768 | 5,712 |
| R Square | 0.081 | |

Source: AMSSW 2015

**Annex Table A5: Private rates of return to one year of schooling, Mincerian**

| | Manufacturing | Agriculture | Services | Other |
|---|---|---|---|---|
| Schooling | 0.080 | 0.030 | 0.050 | 0.030 |
| | (0.007)*** | (0.014)*** | (0.004)*** | (0.012)*** |
| Experience | 0.010 | 0.021 | 0.009 | 0.012 |
| | (0.004)*** | (0.007)*** | (0.003)* | (0.007)* |
| Experience Square | -0.0002 | -0.00028 | -0.0002 | -0.00045 |
| | (0.00009)* | (0.0001)** | (0.00007)*** | (0.0001)*** |
| Constant | -0.806 | -1.023 | -0.574 | -0.610 |
| | (0.094)*** | (0.167)*** | (0.0655)*** | (0.1633)*** |
| Observations | 3,170 | 1,339 | 4,546 | 970 |
| R Square | 0.065 | 0.033 | 0.032 | 0.028 |

Source: AMSSW 2015

*** 99%, ** 95%, * 90%

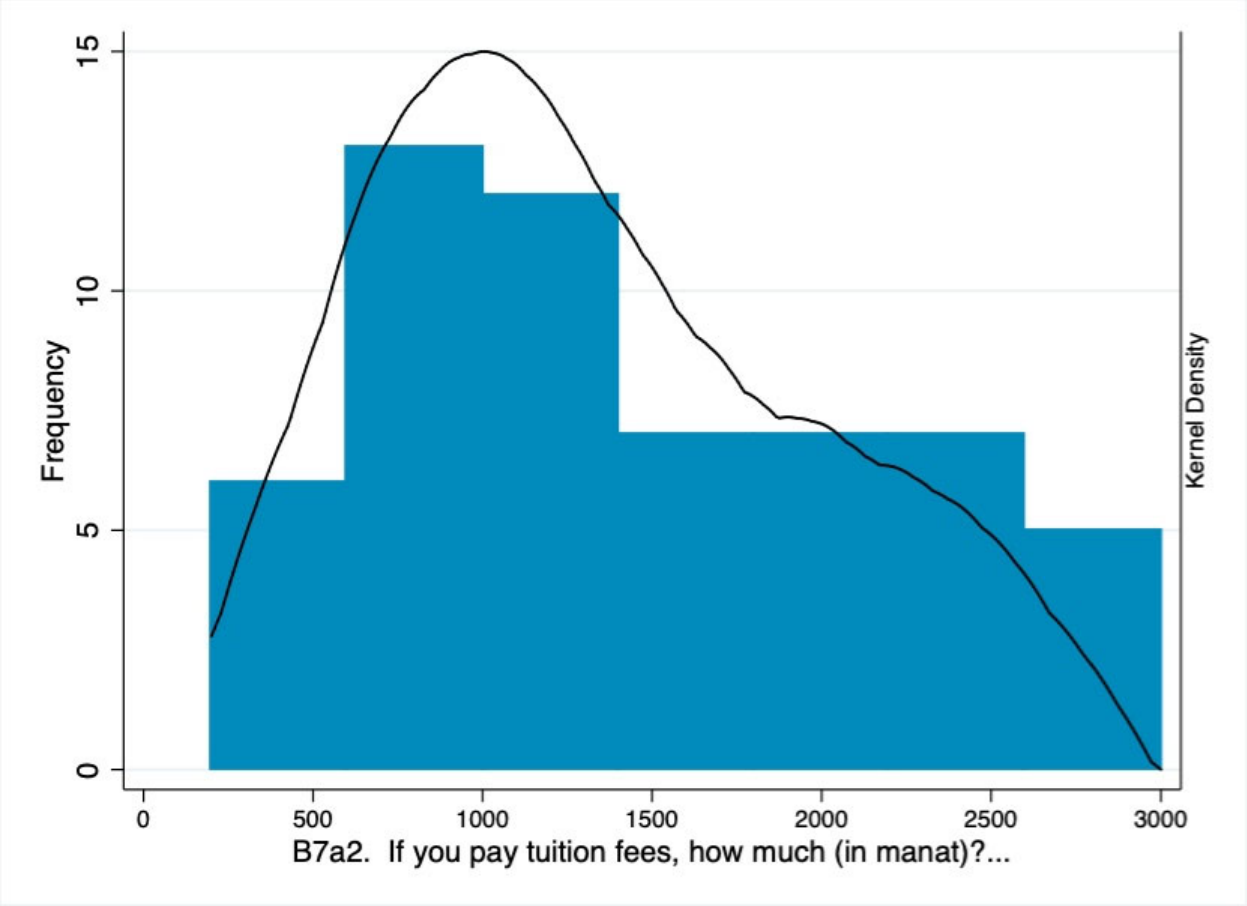
**Annex Table A6: Mincerian estimates for Azerbaijan, 2015**

| | All | Male | Female |
|---|---|---|---|
| Primary Ed | -0.100 | -0.090 | 0.010 |
| | (0.159) | (0.288) | (0.155) |
| Secondary Ed | 0.020 | 0.060 | 0.090 |
| | (0.158) | (0.206) | (0.152) |
| Tertiary Ed | 0.380 | 0.420 | 0.530 |
| | (0.159)** | (0.207)** | (0.153)*** |
| Experience | 0.010 | 0.020 | 0.010 |
| | (0.002)*** | (0.003)*** | (0.003)*** |
| Experience Square | -0.0003 | -0.0004 | -0.0002 |
| | (0.00005)*** | (0.00007)*** | (0.00008)** |
| Constant | -0.130 | -0.070 | -0.440 |
| | (0.159) | (0.208) | (0.153)*** |
| Observations | 10,029 | 6,210 | 3,819 |
| R Square | 0.054 | 0.057 | 0.084 |

Source: AMSSW 2015

*** 99%, ** 95%, * 90%

**Figure A1: Distribution of tuition costs in Tertiary Education, Azerbaijan 2015**




Source: AMSSW 2015