The Signalling Role of Education in a Transitional Economy: Evidence from Kazakhstan

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Abstract

In this paper, we examine the signalling role of education in Kazakhstan. Using the 2001 Kazakhstan Household Budget Survey, we find some evidence in favour of weak screening for some quantiles of the income distribution but not strong screening.

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1. Introduction

Human capital theory proposes a positive relationship between education and earnings. The explanation is that education raises an individual's earnings through augmenting his/her productivity (Becker, 1964; Mincer, 1974). The proponents of the screening theory argue that that the higher earnings of better educated individuals are a reflection of employers' willingness to use educational credentials for screening purposes. According to this view all education does is to sort individuals into able and less able employees (Spence, 1973; Arrow, 1973; Stiglitz, 1975). Thus the screening hypothesis argues that education is simply a reflection of inherent ability and does not affect productivity per se.

During Communism, graduates in Kazakhstan were assigned to industries and jobs, with wages set according to a tariff wage grid. In effect, the central planner used educational qualifications to distinguish high-ability workers from low-ability workers. However, recent labour market reforms changed dramatically the nature of employment (Rutkowski, 2006). Thus, it is likely that private firms avoid a strong reliance on educational qualifications when making this distinction.[1] On the other hand, in the public sector, where the Soviet-type graduate placement is still in place and the wage setting is conducted in a centralised manner as defined in the *ETKS* (Common Tariff and Qualification Guide of Work Positions), we assume that education continues to act as a screening device. If true, this has very important implications for the educational funding policies. In particular, if the sole purpose of education is to screen the employees, there is a private benefit to the individual from post-primary education, but no social benefit.

[1] As discussed by Brown & Sessions (2006), it is plausible to assume that any signal derived from education is potentially noisy given the human capital and consumption aspects of education. In Kazakhstan, prior to transition, the consumption value of education was an important factor behind the individual's education choice (Aage, 1996).

To address these issues, we test two versions of the screening hypothesis, the strong screening hypothesis (SSH) and the weak screening hypothesis (WSH). The SSH suggests that education has little or no productive qualities whereas the WSH suggest that education has two functions, informational and productivity enhancing. As identified by Brown & Sessions (1998, 1999), in particular, the WSH presumes that screened workers, in addition to investing in education, also invest in a signal of productivity. Unscreened workers, by contrast, have no need to make this additional to human capital investment. Subsequently, we expect their wages to be relatively less correlated with education, implying that that returns to education for the latter group represent a 'pure' return to investment in education since they gain nothing from education as a signal. Screened workers, on the other hand, need to signal their ability. Therefore, they receive a return from both the signaling and productivity aspects of education. Hence the WSH implies a higher return for the screened relative to the unscreened workers. The SSH, on the other hand, implies a significant return for the screened workers only. In this paper, we estimate earnings functions for public sector employees (the screened group), private sector employees and the self-employed. The latter two categories form two separate unscreened control groups. We expect that wages in these two control groups to reflect productivity. Previous empirical studies evaluate screening hypothesis at the mean wage (e.g., Arabsheibani & Rees, 1998; Brown & Sessions, 1999). However, these studies ignore that it may vary across the distribution of earnings. To explore this possibility, we apply the quantile regression (QR) methodology.

2. Background

Labour market conditions in Kazakhstan worsened after independence, when central planners withdrew from managing the state-owned enterprises. High

unemployment rates in the initial stages of economic transition followed enterprise restructuring. As a result, the decline in recorded employment was heavily concentrated in the industrial sector. Industrial employment declined by 41% over the period 1989-97 (UNECE, 2005). Self-employment grew substantially following labour market adjustment, rising from 16.6% in 1995 to 37.8% in 2004 (NAS, 2005). The growth in self-employment reflects the collapse of formal sector jobs and wages more than the emergence of new private opportunities. Many who are on forced or unpaid leave would temporarily engage in private sector activities to compensate for the loss of income from the main job. Agriculture, hunting and related service activities are the most common forms of self-employment in Kazakhstan The share of self-employed in these three sectors (as percentage of total self-employed workers) was 62.2% in 2001, 67.4% in 2003, but then declined to 66% in 2005 (NAS, 2005; NAS, 2006). Labour market conditions tightened between 2001 and 2004, with real wages increasing by 14% (IMF, 2005). The unemployment rate declined from 13.5% in 1999 to 8.2% in 2005 (NAS, 2005; NAS, 2006). Despite job losses the employment rate in Kazakhstan remains high by international standards. According to our data, the employment rate was 58% in 2001.

At the onset of transition Kazakhstan enjoyed high levels of human capital. However, the provision of the basic forms of education deteriorated in the initial stages of transition. Expenditure on education, measured as a share of GDP, fell from 6.5% in 1991 to 3.2% in 2001 (NAS, 2002). The decline in enrolment rates has been especially dramatic in the early reform period. Enrolment rates in the nursery level of education for children between one and six years of age declined from 43.9% in 1992 to 10.2% in 1998. Secondary education enrolment rate fell from 95% in 1992 to 78.7% in 1996. In

the late 1990s over 30% of vocational schools were closed, and the number of vocational students fell from 225,600 in 1991 to 87,327 in 2001 (NAS, 2002).

In the last five years Kazakhstan has witnessed a long awaited economic recovery. Enrolment rates improved following the rise in education expenditure. However, quality of education deteriorated, particularly in rural and remote areas (UN, 2004); high youth unemployment, a large pool of long-term unemployed, regional differences in the unemployment and employment rates, and wage inequalities continue to dominate the transition process (Rutkowski, 2006).

3. Data

We use data from the 2001 Kazakhstan Household Budget Survey (KHBS). This survey covers around 12,000 randomly selected households comprising 45,736 individuals. Table 1 reports summary statistics on earnings, schooling, demographic characteristics and locality. However, this sample does not provide information on the number of years of schooling and the respondents are asked about their highest achieved level of education. Consequently, we impute our years of schooling variable from the highest educational degree level completed.

The KHBS asks questions about earnings in each of the twelve months of 2001. In this paper we use information from December 2001 file. This month is used because it is the most recent in the survey with the least number of missing cases. The dependent variable used in the earnings equations is the log of monthly cash earnings received from the main job. Main job wages are net of payroll and income taxes, and exclude pensions and welfare payments.

Our empirical analysis of earnings is restricted to the sample of men whose wage was positive at the time of the survey. Our sample consists of 6,690 individuals between the age of 16 (the school-leaving age) and 63 (the state retirement age). With respect to earnings and education Table 1 shows that public sector workers have higher earnings but they are slightly older and more educated than private sector workers and the self-employed.

4. Estimation strategy

We adopt the QR approach introduced by Koenker & Bassett (1978). The basic QR model can be written as:

$$\ln Y_{\theta i} = \beta_\theta X_i + u_{\theta i} \qquad \text{with } Q_\theta(\ln Y_i \mid X_i) = \beta_\theta X_i \tag{1}$$

where $\ln Y_i$ denotes the logged monthly gross wage of an individual *i*, $Q_\theta(\ln Y_i \mid X_i)$ denotes the conditional quantile θ of $\ln Y_i$, conditional on the regressor vector X_i.

In the above specification $u_{\theta i}$ is defined by $u_{\theta i} = \ln Y_{\theta i} - \beta_\theta X_i$. Koenker & Bassett (1978) define θ^{th} regression quantile as a vector β_θ that minimizes:

$$\min_{\beta \in R^k} \left\{ \sum_{i:\ln Y_i \geq \beta X_i} \theta \mid \ln Y_i - \beta_\theta X_i \mid + \sum_{i:\ln Y_i < \beta X_i} (1-\theta) \mid \ln Y_i - \beta_\theta X_i \mid \right\} \tag{2}$$

This is normally written as:

$$\min_{\beta \in R^k} \sum_i \rho_\theta(\ln Y_i - \beta_\theta X_i) \tag{3}$$

where $\rho_\theta(\varepsilon)$ is the check function defined as:

$$\rho_\theta(\varepsilon) = \theta_\varepsilon \qquad \text{if } \varepsilon \geq 0 \tag{4}$$

$$\rho_\theta(\varepsilon) = (\theta - 1)\varepsilon \qquad \text{if } \varepsilon < 0 \tag{5}$$

The model specifies the θ^{th}-quantile of the conditional distribution of $\ln Y_i$, given the covariates X_i, as:

$$Q_{\ln Y_i}(\theta \mid X_i) = \beta_\theta X_i, \theta \in (0,1) \quad (6)$$

We obtain different quantiles by increasing θ from 0 to 1. As θ is increased, the entire distribution of $\ln Y_i$ is traced conditional on X_i. We assume that both $\ln Y_i$ and X_i are observed with no error and that Equation (1) is correctly specified. Thus we can view the model as the best linear predictor for the conditional quantile. However, the distribution of the error term is left unspecified and we only assume that the θ^{th} quantile of the error term is zero. Quantile regression is usually defined by minimizing the sums of the absolute errors rather than minimizing the sum of squared errors as in the OLS framework.[2]

5. Empirical Results

In Table 2, we present our estimates. We find that the OLS rate of return of 5.4% for the screened is higher (lower) than for the private sector (self-employed) by 0.1 (2.5) percentage points. These results indicate a very weak case in support of the WSH and lead us to reject the SSH based on the self-employed *vs*. the screened. The OLS estimates of the returns to education are similar in magnitude to the median (50^{th} quantile) estimates. Quantile regression estimates show some evidence of weak screening at the 10^{th}, 25^{th} and 50^{th} quantiles when comparing the public sector employees to the private sector employees. However, at the top of the wage distribution

[2] Quantile regression estimates of Equation (1) may produce biased results if sector choice is endogenous. However, using Lee's (1983) multi-nominal sample selection approach, we found no evidence to support endogeneity of sector choice. Thus we report OLS estimates alongside QR estimates. Estimates based on Lee's (1983) model are available on request.

(75th and 90th quantiles) we reject both the WSH and the SSH. Moreover, we find no evidence in support of the screening hypothesis at different points of the conditional wage distribution when comparing the screened group to the self-employed. In particular, the gap between the QR estimates for the self-employed and the screened widens with from 0.7 percentage points at the 25th quantile to 7.4 percentage points at the 90th quantiles. This is a very strong result in favour of human capital theory since returns to education for the self-employed are viewed as a 'pure' return to investment in education as those who are self-employed have no need to signal their productivity.

Our results demonstrate the importance of possible variations in the returns to a year of education across the conditional wage distribution. For the screened group, we find that returns to a year of education rise between the 10th and the 25th quantiles but then show a sharp decline after the median. For each sub-group the Wald χ^2 (4) statistics reports the results of testing the equality of the return to schooling across the five quantile estimates presented. In the case of the private sector, we cannot reject the null hypothesis of equality of the coefficients.

6. Conclusions

Analyses of the signalling effects of education have focused almost entirely on the developed economies. The purpose of this paper is to fill the gap that exists in the literature on transition. In particular, we investigate whether education has productive value in transition. Using the 2001 KHBS, our study contributes to the literature by examining the signalling role of education in a transitional setting. We find some evidence in support of the WSH at the sample mean (OLS) as well as at the 10th, 25th and 50th quantiles of the earnings distribution when comparing the potentially screened

group (public sector employees) to one of our unscreened control groups (private sector employees). Comparing the screened to the other unscreened group (self-employed), we find no evidence in support of the SSH and strong evidence in support of the human capital theory at the sample mean and across the wage distribution. The results are line with majority of empirical studies that find no evidence in support of the SSH (e.g., Arabsheibani & Rees, 1998; Brown & Sessions, 1998) and some evidence in support of the WSH (e.g., Riley, 1979; Cohn, Kiker, & Mendes De Oliveira, 1987).

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Table 1
Descriptive statistics

Sector:	Public	Private	Self-employed
Ln(Wage)	9.224*(0.734)*	9.059*(0.834)*	8.547*(1.080)*
Age	40.121*(10.174)*	38.937*(10.647)*	38.980*(10.342)*
Age squared	1713.215*(833.106)*	1629.46*(842.577)*	1626.377*(832.611)*
Schooling	11.810*(2.315)*	10.932*(2.004)*	10.579*(1.897)*
Asian	0.661(*0.005)*	0.463*(0.006)*	0.756*(0.005)*
Single	0.126(*0.004)*	0.171*(0.004)*	0.161*(0.004)*
Village	0.353(*0.005)*	0.334*(0.005)*	0.666*(0.005)*
Average city	0.048(*0.002)*	0.103*(0.003)*	0.043*(0.002)*
Large city	0.331(*0.005)*	0.321*(0.005)*	0.167*(0.004)*
Astana	0.026(*0.001)*	0.028*(0.002)*	0.015*(0.001)*
Almaty	0.057*(0.002)*	0.105*(0.003)*	0.017*(0.001)*
N	2,359	2,754	1,577

Note: Standard deviations are in parentheses.

Table 2
OLS and QR estimates of returns to an additional year of education

Panel A: Public sector

	OLS	10th	25th	50th	75th	90th
Schooling	0.054***	0.069***	0.063***	0.060***	0.044***	0.023***
	(0.006)	(0.008)	(0.008)	(0.006)	(0.009)	(0.010)
N			2,359			
R^2/Pseudo R^2	0.164	0.115	0.109	0.093	0.077	0.070
Wald χ^2 (4)				13.96***		

Panel B: Private sector

	OLS	10th	25th	50th	75th	90th
Schooling	0.053***	0.048***	0.055***	0.056***	0.053***	0.058***
	(0.007)	(0.013)	(0.008)	(0.008)	(0.009)	(0.014)
N			2,754			
R^2/Pseudo R^2	0.216	0.103	0.126	0.147	0.137	0.112
Wald χ^2 (4)				0.88		

Panel C: Self-employed

	OLS	10th	25th	50th	75th	90th
Schooling	0.078***	0.005	0.070***	0.075***	0.076***	0.097***
	(0.013)	(0.011)	(0.018)	(0.011)	(0.016)	(0.020)
N			1,577			
R^2/Pseudo R^2	0.130	0.142	0.096	0.075	0.072	0.078
Wald χ^2 (4)				29.52***		

Notes: (i) Bootstrapped standard errors are in parentheses. The standard errors for the estimated coefficients are based on the bootstrapping procedure with 100 replications. (ii) All regressions include age, age squared, dummies controlling for place of residency (village, average city, large city, Almaty, and Astana), dummies controlling for ethnicity (Central Asian) and marital status (single). (iii) Wald is a test for combined equality of the reported schooling coefficients across all quantiles. (iv) Full results are available on request.

*** Significance at the 1 % level.