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**From Soviet to Europe:
Returns to education puzzle in Bulgaria**

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From Soviet to Europe: Returns to education puzzle in Bulgaria

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Abstract

This paper makes a systematic presentation of returns to education in Bulgaria, a country that has witnessed a number of dramatic structural changes over the last two decades. It examines the headway of returns to education for Bulgaria in two obverse economic regimes - from communism to EU membership. The findings show a steady increase in returns to education for both males and females until 2003. The average returns to one additional year of education rose from 1.1% in 1986 to 5.1% in 2003 for males and from 2.1% to 5.9% for females. Quantile regression estimations, between 1986 and 2003, evince that the most prominent increase in the wage premium occurred at the top end of the distribution, where the rate of returns to education, in particular for females increased from a negative and insignificant sign in 1986 to 7% in 2003. However, this increasing trend in returns to education seems to take an inverted-U-shape in 2007, the year when the country joined the EU, which poses a new puzzle to be resolved. To this end, the current paper introduces possible explanations for such a puzzle and sheds lights on a number of insightful policy implications.

Keywords: returns to education, transition countries, quantile regression

JEL classification: I21, J31

1. Introduction

The transition from a centrally planned to a market based economy have affected the living standards and employment outcomes of millions of Eastern Europeans, who faced the changes

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being endowed with education acquired under communism and having experienced a completely different economic system and incentive mechanisms. Changing conditions in the labour market, and in the education system, suggest that returns to education may have not been constant over time. A number of studies have shown that transition process had significant effects on labour market outcomes and the distribution of income¹. In Eastern European countries, returns to education rose immediately following the reforms, but the speed of changes shows great diversity across countries. Andrén et al. (2005), for example, find that returns to education in Romania increased from 3% during the pre-transition period to 8.5% in 2000. A similar pattern is reported by Campos and Jolliffe (2003) for Hungary, where the returns to education rose from 6.4% in 1986 to 11.2% in 1998. München et al. (2004) find for the Czech Republic that in 1989 women with a university education earned on average 45% more than women with secondary education and that this had increased to 85% by 2002. München et al. (2004) also show that the major increase in the rate of return to education occurred in the first phase of transition (1989-1996) and no further changes were observed in the later phase (1996-2002). Similarly, a study by Fleisher et al. (2005) suggests that the sharpest increase in returns to education took place during the early transition (around the early 1990s).

There is an alternative hypothesis, however, namely that the rate of returns to education experiences a fall from the pre-transition to transition period. Education was poorly rewarded in many transition economies in the initial stages of transition and directed toward the productive and ideological goals of the communist regimes. Returns to schooling were low and hence have been limited in its ability to respond to the changing economic and employment patterns essential for success of the market economy (Laporte and Ringold, 1997). An interesting view among researchers on transition economies is that education obtained under central planning was too narrow and firm specific, and not appropriate for the new market environment (Kertesi et al., 2002; Filer et al., 1999). Some individuals (in particular, low-educated or women) were more likely to become unemployed and to experience more difficulties in moving out of unemployment into a job, whereas for the young educated people it was relatively easy to find a new job.

Despite the large number of empirical studies on returns to education in transition economies, the results for the pre-1989 transition period are limited. Understanding the changes in returns to education is important because it not only reflect the progress of reform, but also affect wage structures, income distribution, and incentives for investing in human capital. It is interesting to examine whether the transition process has caused changes in economic returns to education in a country which went through a radical economic transformation after the 10th of November 1989 and joined the EU in 2007. In the light of the above, the present paper complements the existing literature in several ways. First, we address the question of what has happened to returns to human capital in Bulgaria before, during and after the transition from a centrally planned to a market economy by examine the evolution of returns to education for the period of 1986 to 2012. As the changes and reforms came with the move to democracy, the analysis is equivalent to comparing returns in two different political regimes in Bulgaria. The subsequent analysis is undertaken separately for men and women. The paper also considers the sample selection induced by nonemployment following Petrongolo and Olivetti (2006), where the wages of non-employed

¹See for example Fleisher et al. (2005) analysis of returns to education. They use metadata between 1975 and 2002 collected from 33 studies of 10 transition economies, to assess changes in the returns to education over the transition period.

are imputed at zero and then median regressions retrieve the true parameters of interest. Finally, we provide evidence on how returns to schooling in Bulgaria have evolved at various points along the conditional wage distribution.

This paper is organized as follows. In Section 2, we briefly describe the Bulgarian education system. In Section 3 the data sets and empirical methodological framework are presented. The main results are discussed in Section 4, and finally Section 5 draws some conclusions.

2. Bulgarian education system in transition to a market economy

The Bulgarian education system is dominated by government-owned institutions at all levels, and although fundamentally national in character, has significant foreign influences. The Soviet influence was most evident during the period of the national revival in the nineteenth century and reflected the ideas of Slavophilism and pan-Orthodoxy. The communist regime wanted to establish a system of education similar to that of the Soviet Union, but at the same time they wanted to maintain the national culture. The primary aim of the communist educational authorities was to increase the number of students at each educational level. During the period 1990 to 2006, a number of democratic changes affected society as a whole and the educational system in particular. A serious attempt was made to harmonize Bulgarian educational legislation with the standards of other European countries, while preserving the achievements of the Soviet era (Eurybase, 2005).

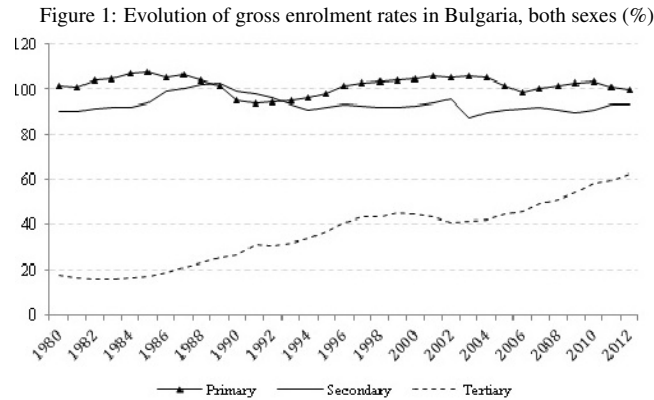
Bulgaria was not among the countries invited to join the EU in 2004. However, it signed an EU accession treaty in April 2005 and joined in January 2007. The main challenge in the education sector during this period was to adjust the system to a declining school-age population following the general demographic decline and emigration. The Government's strategy was to improve the efficiency of education spending without major increases in public expenditure by gradually decentralizing the management of resources and by increasing the low student-teacher ratio. However, between 1997/98 and 2003/04 school years, the student-teacher ratio dropped from 12:4 to 11:8, which partly reflected the negative demographic trend and emigration of skilled persons (Ognitchev, 2005).

In general, access to education at national level in Bulgaria is found high. For instance, the primary school net enrolment ratio was 97.8 percent; the secondary school net enrolment ratio was 78.3 percent, and access to tertiary education was also among the highest in the region at 44 percent². In general, enrolment rates in Bulgaria were related to the level of family income. Children of poorly educated parents tended to complete fewer years of education. While enrolment rates in primary and secondary education did not vary much over the last 30 years, enrolment in tertiary education has increased. As Figure 2 indicates, between 1980 to 2012, the gross enrolment rates at tertiary level increased from 17.2 percent to 62.7 percent³.

Education is compulsory for children aged between 7 to 16 years old. Children at the age of 6 can also be enrolled as first-grade pupils, if their physical and mental development allows it. Since 2003-2004 pre-school education became compulsory (Eurybase, 2005). Prior to entry

²UNESCO EFA Global Monitoring Report 2008.

³The most widely available indicator of the education quantity is the gross enrolment rate, defined as total number of children enrolled in a particular level of education.



Source: UNESCO database.

into higher education, the education system in Bulgaria consisted of 12 school grades, organized into two major levels of study: basic and secondary. Basic education (grades one to eight) is divided into two sub-levels: elementary (grades one to four) and pre-secondary (grades five through eight). Secondary education normally encompasses grades eight to twelve and there are two major types of secondary schools: secondary comprehensive, usually called gymnasia (high school) and secondary vocational, most often referred to as *technikum* (vocational school). University education is provided at universities and specialized higher schools academies or institutes. It includes three stages: first stage, a course of study of at least four-years, leading to a Bachelor degree upon graduation; second stage, a course of study of at least five-years, or one-year following a bachelor degree, leading a master degree upon graduation; third stage a three-year course of study following a master degree, leading to a doctoral degree.

3. Data and methodology

3.1. The Data

The empirical analysis in this paper is based on several household surveys covering the period of 1986 to 2012, the longest time span for which data are available. One is administrated before transition and the others after the initial economic reforms were held. The 1986 Town and Village Survey, conducted by the Institute of Sociology of the Bulgarian Academy of Science in Sofia, was carried out in conjunction with the national census delivered in the winter of 1985 and contains information on the structure of Bulgarian wages prior to the transition (Giddings, 2002). This survey is the only existing pre-transition survey in Bulgaria. The sample is representative of the population and contains 10,333 respondents. After eliminating those who reported zero earnings and excluding individuals who were not of working age, the sample consists of 6,451 individuals. The next data sets come from the nationally representative Bulgarian Living Standard Measurement Surveys (LSMS) collected in 1995, 1997, 2001, 2003 and 2007. Exclusion of individuals who do not report wages accounts for a substantial reduction in sample sizes. Our final working samples consist of 1,317 individuals in 1995, 1,531 individuals in 1997, 1,438

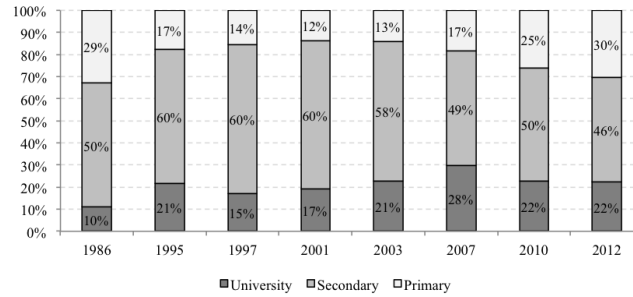
individuals in 2001, 2,482 individuals in 2003 and 8,641 individuals in 2007. Finally, data for 2010 and 2012 are taken from the European Social Survey (ESS) rounds 5 and 6.

The dependent variable used in the analysis is a logarithm of hourly earnings resulting from the primary occupation and excludes earnings from secondary jobs, or from agricultural production, and non-monetary benefits. Wages are net of taxes. The variable also includes all additional payments in cash, in kind and bonuses. Education is represented by binary variables measuring the completion of indicated levels of schooling. These levels consist of primary, secondary, and university education. However, our empirical analysis is based on the total number of years in education, which are also available within the data sets. It comprises of the number of educational grades completed by the individual and takes on 18 different values: from 0 in the individual achieved no grade to 18 if the individual has a postgraduate education. The binary variable Bulgarian takes value 1 if an individual is ethnic Bulgarian and 0 if an individual is a member of an ethnic minority group, of which the main groups are Roma and Turkish. The vector of exogenous control variables used in the estimations also includes potential experience (linear and quadratic terms), dummy variables for individuals years of tenure within the firm (less than 1 year, between 1 and 2 years, between 3 and 5 years, between 6 and 10 years and more than 10 years) and urban settlement. We have also included a public sector dummy so as to control for the remaining effect of the old public sector wage structure.

In Table 1 we report descriptive statistics corresponding to the resulting samples derived using sample weights for the effect of sample design and nonresponses. For all years, except 2007, the average log hourly wage rate is higher for men. Interestingly, in 1986 in terms of the hourly wages and education, there is no significant difference between the genders mainly explained by the socialist ideology of equality and wage setting structure. Wages under the communist regime were paid under highly centralized wage grids and differentials were kept within certain limits. Moreover, under communism, tuition was free and all students were eligible for textbooks and meals that were subsidised by the state. The descriptive statistics show a dramatic fall in wages in 2001, and the reason for that is the 1999 redenomination of the Bulgarian currency. Furthermore, 9.9% of employed men and 9.5% of employed women in 1986 have a university degree. Potential experience, defined as $age - schooling - 7$, is higher for females in 1986, 2007 and 2010. However, potential experience might overstate womens actual labour market experience as it does not account for female absence due to childbearing activities. It is also interesting to compare particular social groups with a certain level of education and the completed education levels of their offspring. The 1986 Town and Village Survey provide information of the educational level of the respondents' fathers and mothers. According to the data, 13% of respondents' mothers had a high degree (university and college education), which indicates that our respondents were slightly better educated than their parents. In contrast to the 1986 data, the 1995, 1997, 2001 2003 and 2012 samples indicate that women earn less than men, which support the thesis that transition has resulted in increased gender inequality and large changes in the distribution of wages. For the whole period, women have more years of schooling, measured as a number of total years in education. Moreover, the data show a higher proportion of employed women with university degrees. For instance, 26.3% of employed women in 1995 had a university degree compared with 17.4% for men. Women have higher participation rate in the public sector and we can see that for the period 1986-2007 the percentage of public sector workers significantly decreased (from 82% of working women employed in public sector in 1986 to 27% in 2007). The majority of working males and females live in urban areas (see Table 1).

All the cross-section data clearly indicate that in the beginning of the period, the majority of the working sample was poorly educated and only a small proportion had university degrees.

Figure 2: Educational structure of employed % respondents in Bulgaria over time



Source: Author's calculation based on survey data. Note: The difference to 100% due to those with no education;

For the period 1986-2007 the percentage of working individuals with secondary and university education increased, while the proportion of those with primary education decreased from 29% in 1986 to 17% in 2007 (see Figure 3.1). Significant changes in the educational structure of the working population, which were expressed in a 10% increase of the share of secondary and university graduates, took place in 1995 and 2007. Overall, individuals with secondary education dominated the educational structure. This might be an indication for the transition wage structure, which did not provide adequate incentives to invest in education. There is clear reduction in the share of university graduates after 2007. The fall can be partially explained by the increasing number of students continuing their higher education abroad after accession of Bulgaria to the EU⁴.

3.2. Econometric methodology

We consider the following (augmented) Mincer equation:

$$\ln(w_i) = \alpha + \beta_1 S_i + X_i' \beta_2 + u_i \quad (1)$$

where $\ln(w_i)$ is the log of earnings, S_i is schooling for individual i , X_i includes all other covariates, such as potential experience, ethnicity, tenure, marital status, urban settlement and public sector employment. The paper also considers a possible sample selection induced by non-employment following Petrongolo and Olivetti (2006) and running a median regression where wages of non-employed are imputed at zero⁵. The method does not require assumptions on the actual level of missing earnings, as is typically required in the matching approach, nor does it require the

⁴The 2011 census data confirmed that Bulgaria has been a net emigration country since 1992. Over the twenty-year period, emigration represented a 6% loss in the total population, and a 10% loss considering only the active population. High emigration levels were accompanied by natural decrease, related to low fertility rates, which contributed a further 12% to total population loss over the same period. Figures on declared emigration show an increase from 19,000 in 2009 to 27,700 in 2010. Actual outflows, however, are considered to be much greater, based on immigration statistics of the main destination countries (NSI, Statistical data, external migration). The intention to emigrate for short-term mobility has also increased from 26 per cent in 2001 to 42.4 per cent in 2007 (National Representative Survey, 2007).

⁵We find no sample selection effects by using number of dependent young children as identified restriction in a two-stage selection models

Table 1: Descriptive statistics Bulgarian working samples, 1986-2012

Variable	1986		1995		1997		2001		2003		2007		2010		2012	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
log hourly earnings	0.96	0.94	4.91	4.62	5.91	5.66	1.52	1.34	1.62	1.46	2.01	2.02	2.7	2.75	2.78	2.75
	[0.46]	[0.46]	[0.59]	[0.61]	[0.85]	[0.77]	[0.67]	[0.54]	[0.56]	[0.52]	[0.58]	[0.57]	[0.48]	[0.45]	[0.48]	[0.48]
years in education	10.14	10.19	11.18	11.45	11.68	12.13	11.41	12.10	13.06	13.88	10.26	10.29	11.53	12.00	12.16	12.33
	[3.36]	[3.46]	[3.08]	[3.04]	[2.84]	[2.86]	[3.20]	[3.30]	[3.42]	[3.42]	[3.69]	[3.79]	[3.17]	[5.02]	[2.94]	[3.66]
1 if primary	0.30	0.28	0.20	0.15	0.15	0.12	0.14	0.10	0.15	0.11	0.28	0.28	0.25	0.23	0.17	0.20
	[0.46]	[0.45]	[0.40]	[0.35]	[0.36]	[0.33]	[0.35]	[0.30]	[0.36]	[0.31]	[0.45]	[0.45]	[0.43]	[0.42]	[0.38]	[0.39]
1 if secondary	0.50	0.49	0.61	0.58	0.64	0.56	0.64	0.56	0.62	0.53	0.50	0.49	0.59	0.48	0.63	0.49
	[0.50]	[0.50]	[0.49]	[0.49]	[0.48]	[0.50]	[0.48]	[0.50]	[0.49]	[0.50]	[0.50]	[0.50]	[0.49]	[0.50]	[0.49]	[0.50]
1 if university	0.10	0.09	0.17	0.26	0.13	0.17	0.14	0.21	0.17	0.26	0.17	0.18	0.15	0.27	0.19	0.29
	[0.30]	[0.29]	[0.38]	[0.44]	[0.33]	[0.38]	[0.34]	[0.41]	[0.37]	[0.44]	[0.37]	[0.39]	[0.38]	[0.45]	[0.41]	[0.46]
potential exp	30.07	31.37	22.47	20.94	22.34	20.25	21.79	20.25	19.97	18.65	22.30	24.20	28.04	29.01	28.32	28.19
	[14.64]	[15.24]	[11.40]	[9.94]	[10.84]	[9.47]	[11.74]	[10.80]	[12.26]	[11.18]	[17.47]	[18.57]	[14.70]	[14.08]	[13.19]	[13.22]
1 if less 1 year	0.03	0.04	0.15	0.13	0.31	0.26	0.14	0.16	0.27	0.23	0.14	0.14	0.19	0.16	0.81	0.77
	[0.18]	[0.19]	[0.36]	[0.33]	[0.46]	[0.44]	[0.34]	[0.37]	[0.44]	[0.42]	[0.34]	[0.34]	[0.40]	[0.36]	[0.39]	[0.41]
1 if 1-2 years	0.03	0.03	0.06	0.05	0.07	0.06	0.07	0.07	0.18	0.16	0.17	0.15	0.04	0.04	0.04	0.04
	[0.17]	[0.16]	[0.24]	[0.22]	[0.26]	[0.24]	[0.26]	[0.26]	[0.38]	[0.37]	[0.38]	[0.36]	[0.19]	[0.20]	[0.19]	[0.18]
1 if 3-5 years	0.09	0.09	0.13	0.12	0.14	0.10	0.15	0.13	0.19	0.21	0.20	0.20	0.05	0.08	0.05	0.08
	[0.29]	[0.29]	[0.33]	[0.33]	[0.35]	[0.29]	[0.36]	[0.34]	[0.39]	[0.40]	[0.40]	[0.40]	[0.21]	[0.26]	[0.22]	[0.27]
1 if 6-10 years	0.16	0.17	0.15	0.19	0.13	0.20	0.26	0.24	0.12	0.14	0.15	0.16	0.06	0.05	0.04	0.05
	[0.36]	[0.38]	[0.36]	[0.39]	[0.34]	[0.40]	[0.44]	[0.43]	[0.33]	[0.35]	[0.36]	[0.37]	[0.21]	[0.22]	[0.19]	[0.21]
1 if more 10 years	0.68	0.67	0.51	0.51	0.35	0.39	0.39	0.39	0.24	0.26	0.34	0.35	0.06	0.07	0.06	0.06
	[0.46]	[0.47]	[0.50]	[0.50]	[0.48]	[0.49]	[0.49]	[0.49]	[0.43]	[0.44]	[0.47]	[0.48]	[0.23]	[0.25]	[0.23]	[0.24]
1 if married	0.82	0.86	0.81	0.82	0.82	0.82	0.76	0.73	0.68	0.73	0.57	0.56	0.53	0.60	0.54	0.55
	[0.39]	[0.35]	[0.40]	[0.39]	[0.38]	[0.38]	[0.43]	[0.45]	[0.47]	[0.44]	[0.50]	[0.50]	[0.50]	[0.49]	[0.50]	[0.50]
1 if Bulgarian	0.85	0.87	0.92	0.91	0.91	0.91	0.88	0.92	0.90	0.90	0.80	0.81	0.78	0.79	0.79	0.80
	[0.36]	[0.34]	[0.27]	[0.29]	[0.29]	[0.28]	[0.33]	[0.27]	[0.30]	[0.31]	[0.40]	[0.40]	[0.42]	[0.40]	[0.40]	[0.40]
1 if in public	0.81	0.82	0.81	0.86	0.74	0.82	0.43	0.44	0.31	0.39	0.25	0.26	0.26	0.36	0.26	0.37
	[0.39]	[0.39]	[0.39]	[0.35]	[0.44]	[0.38]	[0.50]	[0.50]	[0.46]	[0.49]	[0.43]	[0.44]	[0.42]	[0.47]	[0.44]	[0.48]
1 if urban	0.53	0.54	0.74	0.77	0.78	0.79	0.75	0.81	0.77	0.81	0.75	0.76	0.66	0.72	0.65	0.71
	[0.50]	[0.50]	[0.44]	[0.42]	[0.41]	[0.41]	[0.43]	[0.39]	[0.42]	[0.39]	[0.43]	[0.43]	[0.42]	[0.44]	[0.47]	[0.44]
N	3213	3238	708	609	727	804	729	709	1296	1186	4301	4340	601	760	570	768

arbitrary exclusion restrictions often invoked in two-stage Heckman (1979) sample selection correction models⁶.

Distributional approach is based on the use of the quantile regression (QR) method of Koenker and Bassett Jr (1978)⁷ which provides estimates of the effect of education on earnings at different points in the earnings distribution. Estimating the effect of education at conditional quantiles, therefore, allows for heterogeneity in the returns to education. Just as OLS models the conditional mean of the dependent variable w relative to the covariates X used in the analysis, QR gives estimates of the effect of covariates at different percentiles of the conditional earnings distribution⁸. In a wage equation setting, the QR model can be written as:

$$\ln(w_{\theta i}) = X_i \beta_{\theta} + u_{\theta i}, \text{ with } Q_{\theta}(\ln w_i | X_i) = \beta_{\theta} X_i \quad (2)$$

where as before, the notation $\ln(w_i)_i$ denotes the logarithm of hourly earnings for the sample of individuals $i = 1, \dots, n$, $Q_{\theta}(\ln w_i | X_i)$ denotes the conditional quantile θ of $\ln w_i$, conditional on the regressor vector characteristics X_i , β_{θ} denotes the vector of quantile regression coefficients and $u_{\theta i}$ denotes the random error term with unspecified distribution. The θ^{th} regression quantile,

⁶See Petrongolo and Olivetti (2006).

⁷Among many others, Buchinsky (1998) and Powell (1986) extend the use of QR to get information about the effect of exogenous explanatory variables on the dependent variable at different parts of the distribution.

⁸Another advantage of QR is that it tends to be less sensitive to the presence of outliers in the dependent variable. This is because in the QR the residuals to be minimized are not squared as in the OLS, and as a result outliers receive less emphasis. Moreover, if the error term of the regression is not distributed normally, the QR may be more efficient than the mean regression (Buchinsky, 1998).

$0 < \theta < 1$ are defined as a solution to the problem:

$$\min_{\beta \in R^k} \left\{ \sum_{i: \ln w_i \geq \beta X_i} \theta |\ln w_i - \beta X_i| + \sum_{i: \ln w_i < \beta X_i} (1 - \theta) |\ln w_i - \beta X_i| \right\} \quad (3)$$

This is written as:

$$\min \sum_i \rho_\theta(\ln w_i - \beta X_i) \quad (4)$$

where $\rho_\theta(\epsilon)$ is the check function defined as $\rho_\theta(\epsilon) = \theta \epsilon$ if $\epsilon \geq 0$, or $\rho_\theta(\epsilon) = (\theta - 1)\epsilon$ if $\epsilon < 0$. The model specifies the θ^{th} quantile of the conditional distribution of the $\ln Y_i$ given the covariates X_i as:

$$Q_{\theta_i}(\theta|X_i) = \beta_\theta X_i, \theta \in (0, 1) \quad (5)$$

We obtain different quantiles by increasing θ from 0 to 1. As θ is increased, the entire distribution of $\ln w_i$ is treated conditional on X_i . Estimates at different quantiles can be interpreted as showing the response of the dependent variable to the regressors at different points in the conditional wage distribution. The relative positioning of workers in the conditional wage distribution, therefore, can be related to systematic differences in unobservables, which generically may be referred to as ability and include a diverse range of attributes like motivation, labour market connections, family human capital, school quality, etc (Arias et al., 2002).

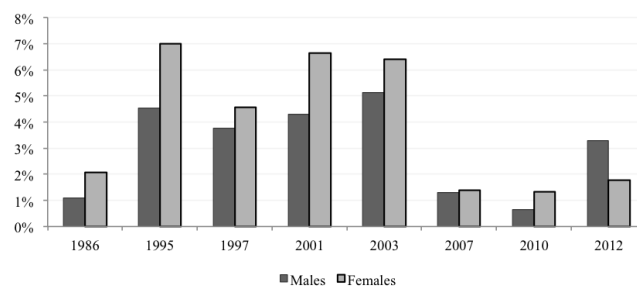
4. Empirical results

Table 2 and Figure 4 report the estimated linear and median regressions of returns to education coefficients for both males and females in eight different years. We have attempted to fit comparable specifications to the samples across years, to put the analysis in a common framework. The vector of control variables includes respondents' potential experience (linear and quadratic terms), variables for years of tenure with the current firm, being married, Bulgarian ethnicity, public sector, urban settlement and living in the capital city.

The estimates indicate for both men and women an increase in the returns to education in the 1995, followed by a decline in 1997. Overall, the returns to education in Bulgaria are increasing over time up to 2003 with a sharp decline in 2007, which still persistent in 2010. Moreover, the estimated returns are higher for women than for men. For instance, the estimated return to education in 2001 was 4.3% for males and 6.6% for females. By 2003 the estimated return to education for males increased to 5.2%, while female's coefficient fell slightly to 5.9%. Theories of skilled-biased technical change typically predict that periods of fast economic growth go together with an increase in the relative demand for skilled labour and hence an increase in the returns to education. The OLS estimate of the rate of returns to education for men increased from 1.1% in 1986 to 5.1% in 2003 and from 2.1% to 5.9% for women. This finding is in line with Arandarenko et al. (2006) who conclude that in Bulgaria the returns to all types of educational degrees increased substantially between 1995 and 2003. The upward trend in the returns to education during the transition period found here is in line with some previous findings. For example, in the Czech Republic the returns to education for men rose from 2.4% to 5.2% between 1983 and 1993 (Chase, 1998). Similarly, increases in returns to schooling also occurred in Poland (Rutkowski, 1996) and Slovenia (Orazem and Vodopivec, 1995). The very low return to education in 1986 suggests that

the structure of wage rates in a centrally planned economy does not create incentives for obtaining more education. The returns of 1.1% for males and 2.1% for females in 1986 are also in line with Hung (2008), who reports return to education of 1.9% for Bulgaria in 1989/1990. Fleisher et al. (2005) report that most of the transition economies had very low returns to education until the 90s. A low return to education is also reported in Sweden by De la Fuente and Jimeno (2005) who attribute this to the country compressed wage structure, which is similar to the wage grid in most of East Europe and Russia before the transition reforms. Clearly, there is a marked downturn in estimated returns after 1995, which might be due to the recession of 1996/97⁹. Accordingly, there is a recovery after 2001 when the Bulgarian economy improved. Turning to the market forces, Bulgaria has experienced an increase in the supply of higher education over the period between 1995 and 2002, the number of university graduates increased from 33,000 to 50,000¹⁰. In addition, the number of higher education students in the 2006/07 academic year increased by 7% compared with the 2002/2003¹¹.

Figure 3: Returns to education over time in Bulgaria 1986-2012, males and females



Source: Author's estimates.

There are several potential explanations for the increasing trend in returns to education in Bulgaria during transition. In the literature, a lot of emphasis has been placed on the role of skill-biased technical changes. By shifting the relative demand of educated labour relative to available supply, skill-biased technical change has increased the returns to education (Funding et al., 2001). Skill-biased technical progress increased the relative productivity of skilled labour and generated a continuous upward shift in its demand (see (Acemoglu and Autor, 2011), for a recent discussion). Supply and demand factors affecting the returns to education include changes in the relative supply of educated workers, the changing composition of the labour force as retiring cohorts were replaced with younger workers over time, skill-biased technological change and globalization of the economy, i.e. international trade (Zhang et al., 2005). Desjonquieres et al. (1999) emphasizes that the rise in the skills premium has been accompanied by an increase in the ratio of skilled to unskilled employment in all sectors. Moreover, the skill premium has risen in less-developed and newly industrializing countries as well as in OECD countries. The steady

⁹In 1996, the Bulgarian economy collapsed due to an unstable and decentralized banking system, a wave of hyperinflation throughout several countries of Eastern Europe, and slow reforms, which led to the collapse of the Bulgarian currency. In 1997 the government set up a currency board to stabilize the currency.

¹⁰Country Profile (2006) Bulgaria, Library of congress country studies program.

¹¹National Statistical Institute, Bulgaria.

Table 2: Returns to education in Bulgaria 1986-2012 by gender

	<i>MALES</i>		<i>FEMALES</i>	
	OLS	Median	OLS	Media
	(1)	(2)	(1)	(2)
1986	0.0110***	0.0068**	0.0207***	0.0114***
	0.003	0.0029	0.0029	0.0026
<i>N</i>	3213	3275	3238	3275
1995	0.0453***	0.0347***	0.0700***	0.0685***
	0.0097	0.009	0.0113	0.0094
<i>N</i>	708	723	609	656
1997	0.0397***	0.0489***	0.0454***	0.0370***
	0.0119	0.0171	0.0115	0.0148
<i>N</i>	727	895	804	988
2001	0.0431***	0.0319*	0.0664***	0.0745***
	0.0117	0.0189	0.0094	0.0153
<i>N</i>	729	886	709	826
2003	0.0512***	0.0025	0.0598***	0.0066**
	0.0048	0.0021	0.0046	0.0028
<i>N</i>	1296	1965	1186	1731
2007	0.0134***	0.0159***	0.0145***	0.0155***
	0.0025	0.0037	0.0024	0.00335
<i>N</i>	4301	5030	4340	5115
2010	0.0064	0.0163	0.0133	0.0122**
	0.0051	0.0124	0.0082	0.0059
<i>N</i>	761	1057	1026	1367
2012	0.0332***	0.0469***	0.0178***	0.0249**
	0.0065	0.0147	0.0049	0.0091
<i>N</i>	735	955	1014	1014

increase in the returns to education until 2003 can be explained by the transition from a system of government compressed wage scales to a market-oriented system.

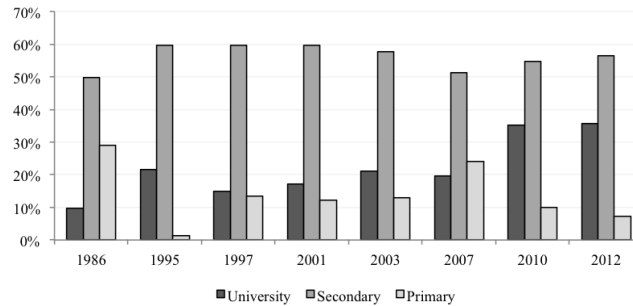
However, the average returns to education in Bulgaria is found to decline from 5.1% for an extra year of schooling in 2003 to 1.3% in 2007 for males and from 5.9% to 1.4% respectively for females, and was found insignificant in 2010 for both males and females. The decrease in returns to education is in line with Coup and Vakhitova (2012) who found decrease in estimated returns in Bulgaria, Latvia and Poland in 2007, and an increase in the Czech Republic, Russia, Slovakia and Slovenia. The natural question to ask is why the returns to schooling has dropped? There are several possible reasons that could lead to a decline in returns to education in Bulgaria during the years of the EU accession: a reduction in the relative demand for skilled workers; an increase in the relative supply of skilled workers; an increase in minimum wage and unionization rates benefiting low-wage workers more than high-wage workers; and a degradation of tertiary education (Lustig et al., 2013). Colclough et al. (2010) explains that the relative decline in the wage returns to primary education over time may be due to both supply-side and demand-side factors, working separately or in a combination. Azevedo and Dávalos (n.d.) show that the decline in the skills premium has been driven by an increase in the supply of experienced and educated workers. Hence, the excess supply of skilled labour in 2007, as shown in Figure 2, can lead to low returns to education. Another interpretation, following Fersterer and Winter-Ebmer (2003) of this empirical phenomenon would be a decreasing quality of education. A decreasing quality could come from increasing student - teacher ratios, declining quality of teachers, curriculum changes or simply a decreasing average quality of students. However, according to the official statistical data the student - teacher ratios have not increased in Bulgaria. Between 2003 and 2007, student - teacher ratios decreased from about 13.7 to 12.8 at the upper secondary level¹². Furthermore, if enrolment in school is based on the relative abilities of students, rising enrolment should bring more less able students into higher education. Finally, the decreasing trend in the rates of return to education could also be linked to the economic path the country has undergone and more importantly the recent financial crisis¹³. The decline may be due to the increased relative supply of educated labour and the decreased relative demand for labour due to the adverse labour market effects of the 2008-2009 economic crisis. As can be seen from Figure 4, the supply of university educated workers has increased in the latter period, thus we may suggest that adjustment in the labour market could have been made through the change in the supply of educated workers. Moreover, on the whole, the crisis seemed to have hit the more educated particularly hard (Coup and Vakhitova, 2010).

While the current study is unable to examine a systematic link between returns to education and economic reforms, as in Flabbi et al. (2008) we can indicate that heterogeneity in estimated returns to education coefficients suggests that non-competitive forces might have determined wage levels and their distributions in Bulgaria. We draw this conclusion from the QR estimates showing how returns to education has evolved at different points of the earning distribution. Table 3 shows

¹²Source:Eurostat.

¹³Some other studies show that rates of return start declining once higher levels of development have been achieved. In particular, during the 2000s, in Ecuador, Brazil, Paraguay, Peru and Chile, where the overall inequality declined, the return to primary, secondary and tertiary education versus no schooling or incomplete primary schooling declined (Lustig et al., 2013). Unless the growth of physical capital kept up or technological change took place, returns had to fall. Thus, the falling return to higher education is evidence of positive economic development a labour force where the share of the workforce with some primary education is rising (Fox and Gaal, 2008).

Figure 4: Employed persons by education level in Bulgaria, 1986-2007



estimated returns to education over time at the main quantiles for males and females, respectively. The results demonstrate that the average returns to education in Bulgaria, for both males and females, were driven by an increasing trend in returns at the upper end of the conditional wage distribution. In 1986 the point estimates at the top of the distribution were insignificant and even negative. In 2003, the rate of return to education at the 90th quantile rose to 5.9% for males and 6.7% for females. For females, the changes in returns to education at the lower part of the distribution are roughly proportional over time. The spread in returns between the 10th and 90th percentile was higher for males as compared with females. Interesting, the gap ($\ln q_{90} - \ln q_{10}$), has widened indicating an increase in wage inequality. In 2010, while wages of the least skilled as measured by the lower quantiles of the earnings distribution are found insignificant for both males and females, the wages of the most skilled as measured by the upper quantiles of the wage distribution are found at 2.3% for males and 3.9% for females.

The findings of increased wage inequality are in line with Tsanov and Ivanova (2012) who conclude that inequality in Bulgaria increased after 2006. The increase in income inequality (2004-2010) involved a period of economic growth and the financial crisis. The enforced restrictions on incomes in the public sector during the 2008-2009 financial crisis contributed significantly to an increase in inequality. Also, to a greater extent, the economic prosperity reflected the higher earnings (Zahariev, 2011). Furthermore, Tsanov and Ivanova (2012) consider that Bulgaria is a country with a high level of external migration, which affected inequality in different aspects mainly as it changed the size and structure of the labour force towards lessening the participation rate and worsening its composition by age and attained education. Around 395,000 people (roughly 5% of the population) left the country during the period 2001-2011. The majority of these were young people (20-49 years of age).

5. Conclusion

Using extensive and comparable data sets collected between 1986 and 2012 this paper provides a broad assessment of the returns to education in Bulgaria. The framework is that evolution of income is determined by changes in human capital and the rate of return to human capital. The main question addressed concerns the hypothesis whether Bulgarian returns to education rise or fall during the transition process and what has been happening in the years after the EU accession.

Table 3: Evolution of returns to education across distribution QR, Bulgaria

Males					
QR	10th	25th	50th	75th	90th
1986	0.0281*** (0.0043)	0.0205*** (0.0034)	0.0098*** (0.0033)	-0.0005 (0.0035)	0.000 (0.0001)
1995	0.0451*** (0.0161)	0.0292*** (0.0086)	0.0236** (0.0094)	0.0308** (0.0122)	0.0395* (0.0218)
1997	0.0172 (0.0205)	0.0270 (0.0167)	0.0352*** (0.0107)	0.0450*** (0.0144)	0.0678*** (0.0161)
2001	0.0344** (0.0146)	0.0310*** (0.0090)	0.0427*** (0.0093)	0.0305*** (0.0104)	0.0166 (0.0198)
2003	0.0383*** (0.0059)	0.0463*** (0.0054)	0.0461*** (0.0054)	0.0490*** (0.0057)	0.0589*** (0.0108)
2007	0.0190*** (0.0024)	0.0188*** (0.0027)	0.0158*** (0.0027)	0.0160*** (0.0039)	0.0142** (0.0058)
2010	0.0037 (0.0047)	0.0031 (0.0041)	0.0140*** (0.0045)	0.0242*** (0.0047)	0.0232** (0.0064)
2012	0.0193** (0.0097)	0.0317*** (0.0074)	0.0363*** (0.0072)	0.0352*** (0.0079)	0.0233** (0.0118)
Females					
1986	0.0524*** (0.0050)	0.0305*** (0.0027)	0.0171*** (0.0029)	0.0082** (0.0035)	-0.0032 (0.0021)
1995	0.0557*** (0.0093)	0.0526*** (0.0058)	0.0644*** (0.0070)	0.0448*** (0.0120)	0.0458** (0.0192)
1997	0.0571*** (0.0144)	0.0383*** (0.0116)	0.0492*** (0.0153)	0.0604*** (0.0175)	0.0436** (0.0213)
2001	0.0591*** (0.0097)	0.0672*** (0.0069)	0.0566*** (0.0066)	0.0434*** (0.0130)	0.0533*** (0.0139)
2003	0.0478*** (0.0070)	0.0505*** (0.0044)	0.0625*** (0.0064)	0.0699*** (0.0068)	0.0673*** (0.0100)
2007	0.0256*** (0.0027)	0.0154*** (0.0025)	0.0157*** (0.0024)	0.0161*** (0.0034)	0.0197*** (0.0052)
2010	0.0026 (0.0034)	0.0139*** (0.0042)	0.0245*** (0.0034)	0.0311*** (0.0051)	0.0394*** (0.0072)
2012	0.0144** (0.0053)	0.0161*** (0.0068)	0.0183*** (0.0087)	0.0223*** (0.0083)	0.0224** (0.0075)

Notes: Standard errors in parentheses; * **, * and * denote significance at the 1%, 5% and 10% level, respectively

Comparing our results with previous studies suggests that being in similar position in terms of valuation of human capital in 1986, Bulgaria ended with completely different situation in 2003, more than 10 years after the starting of the transition reforms. The estimates also show that returns to education are statistically significant and lower than the international average of 7% to 8% and certainly broadly similar to other transition countries, such as the Ukraine for example. The obtained empirical results place Bulgaria close to the group of transition countries with a close rates of returns Czech Republic, Hungary, Slovenia and Slovakia. Since 1997 the country has implemented a package of substantial reforms and faced dramatic economic challenges caused by the EU accession. Moreover, the country is classified in the group of countries that are lagging behind in the reforms, compared to the advancers from Central and Eastern Europe. Therefore, one can attribute the trends in the estimated returns to the different pace of economic restructuring.

Over the period of transition, which continued until the early 2003, we find an upward trend in the evolution of returns to education in Bulgaria. The average returns to one additional year of education rose from 1.1% to 5.1% for males and from 2.1% to 5.9% for females. The findings of a low return to education in 1986 are in line with previous studies that estimate returns to education in transition economies (Brainerd, 1998; Katz, 2002; Newell and Reilly, 1996). Our results confirm that the largest increase in the rate of returns to education took place in the early transition period. For males, the OLS estimate of the return to education increased from 1.1% in 1986 to 4.5% in 1995 and from 2.1% to 7.0% for females. Estimates of earning function using data from Russia and Eastern Europe exhibit the same increasing tendency (Brainerd, 1998; Chase, 1998). These results clearly suggest that market reforms in Bulgaria led to the productivity augmenting factors being rewarded accordingly. However, the paper shows an interesting dynamics in the estimated returns. The increasing trend in the estimated returns have taken an inverted U-shape after 2003, the EU pre-accession period, which poses a new puzzle to be solved. The relatively low returns to education found in 2007 and confirmed in 2010 should be considered by the policy-makers aiming to break the vicious cycle: poor education, poor labour market outcomes, poverty, welfare dependency. The possible factors responsible for this decline are the increased relative supply of educated labour force recently and the decreased relative demand for labour due to the adverse labour market effects of the recent recession.

This paper further studies the evolution of returns to education using quantile regression techniques. Not all individuals benefited equally from education over the examined period. In the early transition, individuals at the lower part of the earnings distribution appear to have benefited more from education as compared to their counterparts at the upper part of the distribution, lending support to the notion that education could have been substituted for the low ability. Whereas the return for males in 1986 at the 10th percentile was 2.8%, it tended to be insignificant at the 90th percentile. Similarly for females, the rate of returns to education at the 10th percentile was 5.2% and it turned to negative at the top of the distribution. Over the examined period, the most prominent increase in the wage premium occurred at the top of the distribution, where the rate of returns to education, in particular for females, increased from a negative and insignificant sign in 1986 to 7% in 2003, however it dropped to 2% in 2007. An important finding is that the returns to education fall has been most market in the top end of the earnings distribution for both men and women. In particular, the returns to schooling in 2007 are found lower for the more skilled individuals, conditional on their observable characteristics. This suggests that schooling does not have a positive impact upon within-levels wage inequality. Factors such as skills mismatch, ability schooling interactions and school quality or different fields of study may

be driving this result. In 2010, while wages of the least skilled as measured by the lower quantiles of the earnings distribution were insignificant for both males and females, the wages of the most skilled as measured by the the upper quantiles of the wage distribution were found at 2.3% for males and 3.9% for females. It would be expected that the returns to education would continue rising in Bulgaria. However in order to shed further light of the magnitude and the factors driving these changes further research is necessary based on the data for more cross-sections over time.

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