Comparing Eastern and Western Europe: has Communism succeeded in increasing Educational Attainments?

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Abstract: The paper researches the influence of Communist regime on educational attainments in Eastern Europe in comparison to Western Europe. Education policy in Communism influence area had distinctive qualities: it centrally regulated, free, encouraged to be undertaken by all, supported financially and endorsed equality between genders. The effectiveness of this policy is tested by comparing countries that were subject to regime's influence with those that were not part of it, and searching for observable differences between people who made education choices under the influence of the regime compared to those that were not. This research suggests that Communist regime had a significant effect towards educational attainments of people who experienced it. There are observable differences between education completion rates, gender behaviour in two parts of Europe. Regressions' results support the idea of Communism having a positive effect towards primary and especially secondary education completion. There is an ambiguous effect towards tertiary education. Data suggests higher secondary and tertiary education completion rates and a smaller gender gap in educational attainments in post-Communist countries. This would advocate the relative effectiveness of this education policy.

Keywords: educational attainments, Communism, Eastern bloc, Western Europe,

1. INTRODUCTION

Educational attainments are an important component in the production function as they in major part represent social capital and skill distribution which in turn should mostly determine the productivity of labour input in a country. This is why education is important in economic context; raising educational attainments is a constant policy objective in most countries. Throughout the history European countries have undergone different policies and regimes tackling this question differently. It is also generally agreed that education is an important factor in determining personal income thus should be considered in inequality studies. Studies identify that raising the level of educational attainments in a country is difficult as the effectiveness of education policies is mainly limited by low intergenerational education and occupation mobility; other problems include: high education costs on a personal and country level, and creating the incentives to seek more education. That is why it is important to try to answer the question what can help increase educational attainments and how historical evidence can contribute to that.

In 19th and 20th centuries most countries in Europe introduced change in schooling systems, with a goal in mind of raising educational attainment levels; the number of years of compulsory education kept on being increased, and in the second half of 20th century the aim was to provide most people with some sort of secondary education and encourage university participation (Grendler; Houston (2011)). Around 1900 there was regional division by literacy and economic development levels in Western Europe: Protestant north, which was mainly literate and economically developed, a centre with regional variations, and south, which was less literate and underdeveloped (Houston (2011)). Eastern Europe was seen to lag behind and was similar to the far south, but progress was still made (Grendler; Houston (2011)). Statistics about education attainment levels and literacy rates in countries during this period is scarce, Foley (2007) notes that at the time of the Bolshevik Revolution literacy rates in Russia were extremely low: 37.9% for the male population above seven years old and 12.5% for the female population.

Communism came after and was a prevalent regime in most countries in Eastern Europe for more than half a century. One of the objectives of this regime was an increase in educational attainments' level because of high illiteracy rates and many intellectuals being exiled or fleeing the country due to nonconformity to ideology of the regime; so since the end of 1930 education was compulsory to every adult (Charque (1932)). This regime offered its own original method of achieving this objective: all education was free, encouraged, supported with scholarships to all full-time students, non-discrimination between genders was promoted, education completion was incentivised by job offers at the end (Charque (1932)); on the other hand, returns to higher levels of education were lower in comparison to Western Europe, and Eastern bloc suffered from tight wage grit (Müünich et al. (2000)), which reduced inequality in their general populations, which also was one of the regime's objectives. But that did not mean education was completely classless as children of high ranking officials were more privileged compared to the rest, but did improve and narrow the gap in educational attainments between other classes and genders (Grandler). Education in Communist regime

area was strictly regulated centrally, religion was taken out of education system, pedagogy was uniformed, there was not much choice in curriculum of education (Heyneman (1997)). Schooling was used to teach certain political and social values, preparing for socialist society; a lot of attention was paid to technical schools to ensure that regime was able to meet the demand for workers needed for plans of heavy industrialisation – education was not liberal and its main goal was to produce socially thinking specialists (Grandler; Charque (1932)).

Research on the effects of Communist regime in Europe is in short supply. Gerard Roland is one of the main names in this field, he looked into institutional change in post-communist countries (Roland (2002)), researched changes in law enforcement in transition economies (Roland (2003)), looked into the effect Communism had on cultural values and longetivity of this change (Roland (2010)), etc. Other important studies: Alesina and Fuchs-Schuldeln (2007) researched the differences in redistribution preferences between eastern and western Germany; Müünich et al. (2000) studies returns to education and wage grit in transition economies in Europe. To our best knowledge, effect of centralized Communist regime on educational attainments in Eastern bloc was not yet researched, while the educational achievements comparison with Western European countries was made in some other studies (Ammermüller et al. (2005), Braga et al. (2013)), none of them looked into such a large sample of European and some other post-Communist countries though. So the aim of this study is to fill this gap in knowledge and to see what the effect of Communist regime's education policy on educational attainments was. Descriptive statistics, data and some literature suggest such reforms could have been effective in increasing level of education in population. This is being tested by comparing countries that have undergone Soviet regime's influence with those that were not part of it and searching for observable differences between people who made education choices under the influence of the regime compared to those that did not. This question should be intriguing because a large number of countries in Europe were subject to this education policy that lasted throughout the life of Communist regime, so this is the only case where the effect of this education policy was so widespread and long-lasting. Results of this research could be useful in gaining insight for education policy decisions.

The data used for this research was taken from European Values Survey database. The data is available for 48 European and post-soviet countries which are divided into two groups: Western and Eastern European, depending if they were subject to Communist regime. The effect of Communism on educational attainments was assessed with a dummy for Communism, which is equal to 1 for those respondents who made education decisions under the influence of the regime. Regressions for secondary, primary and tertiary educations were run separately with three different models: linear probability model, probit, and SNP, following the same specification; bivariate probit and SNP2 models were used for simultaneous estimation of vocational and university preparation secondary educations' regressions.

This paper finds communist regime having a statistically significant positive effect on secondary and primary educations attainments, the effect on tertiary education being ambiguous. Data suggests higher secondary and tertiary education completion rates and a smaller gender gap in educational attainments in post Soviet countries. This would advocate the effectiveness of Soviet Union's education policy.

Next section presents relevant literature review; section 3 explains methodology used in this study; section 4 examines the data and descriptive statistics; section 5 presents the results and their analysis; section 6 concludes and offers discussion.

2. PREVIOUS LITERATURE

A number of studies looked into the determinants of educational achievements. The level of educational attainments was found to depend on a number of factors: parental education, parental background, financial constraints, labour market conditions, personal characteristics. The most relevant research for this study will be reviewed here.

One of the most important determinants of educational attainments level is found to be parents' background. Here we consider parents background as their education level, financial status, occupation, and cultural level as they are interrelated. Most studies find very low intergenerational mobility between parents and their children in terms of education and occupation. Aina (2013), who studied tertiary education drop-out rates in Italy, and finds strong persistence of intergenerational correlations in education. Her research suggests that children with parents with higher than compulsory education have a higher chance of their child continuing the studies. Dropout rates tend to be higher for males and for children with parents with lower education; this result is not affected by parents' income. Children from better cultured background tend to choose the type of education that is leading towards university, while children from less educated backgrounds tend to choose more labour orientated education. Ben-Halima et al (2014) found a significant rise of importance of parents' backgrounds on educational attainments, especially through family income, from 1993 to 2003 in France. They claim that intergenerational persistence is higher for males. Similarly, Schütz et al (2008) made a comparison between 54 countries of how strong is family background influence on children's educational performance. Main indicator for family background was chosen to be the number of books at home. Their results advice that variation between countries is due to systematic failures of country's education system, that the longer pre-primary education the smaller are the effects of parental background. Checchi (1997) discovered that almost half of observed immobility in occupations in Italy, Germany and United States is accountable to educational attainment level. Galindo-Rueda and Vignoles (2005) researched the importance of cognitive ability in comparison to parental background in Britain. They find its importance is declining and while parents' background remains very important; they estimate there was a large increase in educational attainments by children with low ability but good parental background, which stresses its importance. Triventi and Trivellato (2009) also found family background being very important for university participation rates in Italy. Even though, Checchi et. al. (2013) observe an improvement in educational mobility in Italy, children with parents from lower cultural backgrounds remain at disadvantage. Bratti et. al. (2008) researched the impact of expansion of higher education in Italy, and found that reduction of inequality of university education access improved enrolment rates but not completion rates. Braga et al (2013) researched the relationship between education reforms and attainments in 24 European countries and also confirm strong correlation between parents and children's educational attainments. All these studies show

how important parental background is and, even though there is small variation, that intergenerational immobility is very persistent.

Intergenerational mobility is directly related to the issue of inequality. Gruber and Kosack (2014) also look into education and inequality issue and find that higher primary enrolment rates are related to slightly higher inequality in the future. It is explained by higher primary education rates reducing wage premia previously enjoyed by a smaller number of people. Tertiary tilt, country focussing its finances towards tertiary education, is common in a lot of developed countries, while developing countries with high primary education demands tend to focus their finances on primary education due to lack of educated workers. They find that only Eastern Europe and Central Asia did not exhibit clear tertiary bias towards benefiting mainly wealthier citizens which could be due to political history and communism regime effects. Braga et al. (2013) find a positive relationship between education reforms and reduction of inequality. Newell and Reilly (1999) ran a cross-country comparison study of rates of return to education in transitional economies ranging through central and Eastern Europe, Russia and former Soviet Union countries in Asia. They find the rise in rates of return during the transition period which comes with an increase in inequality. Triventi and Trivellato (2009) suggest that inequalities tend to persist over time with only a slight reduction in Italy. Similarly, Ben-Halima et al (2014) find a decrease in inequality in general in France since 1970s but higher inter-generational inequality persistence and lower social mobility. There seems to be a general consensus that inequality is persistent, even though it slightly decreased in Western European countries, Eastern European countries experienced the opposite due to transition and raising returns to education.

Another important aspect to consider while comparing education levels between countries – the quality of education. Hanushek (2013) claims that human capital is difficult to measure which makes comparison between countries problematic. The main available measurement being average years of education does not provide much information about the quality. He studies differences between educational attainments in developed and developing countries and finds skill deficits in developing countries. Ammermuler (2005) also studied schooling quality in seven Eastern European countries using Third International Mathematics and Science Study data. Education experienced quick decentralisation and other reforms in education systems and institutions were undertaken in transition economies. Central European countries, that made reforms earlier, were found to catch up and surpass the Western European countries in terms of test scores, while Baltic states were found lagging behind, with a distribution closer to other post-communist countries. Another factor to consider in quality of education is class size. Lazear (2001) researched the effect of class size on educational achievements. It was found that larger classes provide better outcomes for better students and discipline plays a more important role than class size. Grouping students by ability was found optimal and naturally happening through self-selection into private schools by more attentive students. These studies suggest that schooling quality tends to be worse in post-Communist countries.

In this context it also seems relevant to take into account the effect of education policies, reforms and regional effects on educational attainments. Braga et al. (2013) found that schooling reforms affect the entire distribution of educational attainments and tend to have a positive effect on average years of education in the population. Another important factor to

consider – autonomy of the school, Hanushek et al (2013) found that level of autonomy tends to affect the performance of schools. This effect was found to be positive in developed countries and negative in developing ones. It is argued that standardisation could be important for decisions related to academic content but less important for process operations and management of employees. Autonomy tends to provide better results where there is external accountability and where opportunistic behaviour is limited. Gruber and Kosack (2014) suggest that tertiary tilt, country focussing its finances towards tertiary education, is common in a lot of developed countries, while developing countries with high primary education demands tend to focus their finances on primary education due to lack of educated workers. They find that only Eastern Europe and Central Asia did not exhibit clear tertiary bias towards benefiting mainly wealthier citizens which could be due to political history and communism regime effects. In terms of regional effects on a smaller scale, Aina (2013) suggest that educational attainments are correlated with geographical area of residence, while Cappellari and Lucifora (2009), looking into enrolment rates for university after tertiary education reform in Italy, relate regional effects to unemployment rates: areas with lower unemployment rate and better possibilities tend to discourage university participation. This information suggests that education reforms are likely to have an effect on educational attainments; that there is an observed distinction between developing and developed countries and different policies might be effective in them; differences in how effective reforms are and educational achievements can also be influenced by smaller regional effects.

Referring to the findings in this literature, it is possible to expect that educational reforms undertaken by Communist regime had a good chance of increasing schooling attainments due to a couple of factors: it affected a set of developing countries, so lack of autonomy in schooling, central organisation and standardisation or curriculum could have had a positive effect; ideas of equality, non-discrimination and non-sexism and heavy financing of education could have had a positive effect on equality and a negative effect on intergenerational persistence, which in turn could free from dependency on parental background. Unfortunately this study does not increase the knowledge regarding the question of the quality of education and its comparison between the two parts of Europe as it only takes into account highest education level achieved.

3. METHODOLOGY

In order to check if Communism had a statistically significant effect on educational attainments in Eastern Europe, the main functional form is:

$$\text{Educvar}_{ei} = \alpha_{e0} + \alpha_{e1}\text{Communism}_i + \alpha_{en}P_i + \alpha_{em}X_i + \alpha_{e10}T_i + \alpha_{ez}C_i + u_{ei}$$

Where Educvar stands for three different binary education variables: tertiary, secondary and primary education, they are equal to 1 if individual has attained this level of education, and equal to 0 if not. Subscript e indicates and differentiates between these three education levels. Subscript i indicates individual level variation. In this regression specification the main

explanatory variable of interest – Communism, which is also a dummy and is equal to 1 if country was under the influence of Communist regime and respondent was born between 1940 and 1975, and 0 otherwise. Two sets of equations are run: with and without Communism dummy.

P stands for information about parents, which includes: binary variables for parents' tertiary, secondary and primary education attainments; and occupation, which is a proxy for their income, background and need for education, this variable takes a lowest value of 1 with meaning of 'higher controllers' and value of 11 meaning 'self-employed farmer', if assumption is correct this would indicate lesser need for higher education the higher the value of parental occupation. Subscript n differentiates between these four variables.

X indicates individual data, that includes gender (if male equal to 1, 0 otherwise), six age cohorts (15-24, 25-34, 35-44, 45-54, 55-64, 65+, first one being excluded to avoid dummy variable trap) and a dummy for living in a city, which is identified as living in a place with 50,000 or more inhabitants. Subscript m differentiates between these variables.

T stands for time trend which is calculated by subtracting 1881, which is a date of birth of the first available observation for this estimation, from a year of birth of an individual. C indicates country dummies and u – standard errors of the regressions.

Several different estimators and models were used in the estimation process. The first one is Linear Probability Model that uses Ordered Least Squares estimator. OLS requires Classical model assumptions to hold and offers easily interpretable results but in most cases, due to imposed linearity, LPM errors would be heteroscedastic and thus non-normal. In order to relax a strict assumption of linearity a second model was used – Probit which uses Maximum Likelihood estimator, errors are assumed to be independent, identically distributed – Gaussian, which is a strong assumption. Unlike in LPM, marginal effects of the model had to be estimated separately. Average Marginal Effects were calculated after each regression results to assess the average impact effect over all the individuals in the sample, which seemed to provide more interpretable information than Marginal Effects at the mean, which would give the information only about the mean observation. This set of regressions was followed by SNP equations, a semiparametric approach, in which unknown densities of error terms are approximated to derive pseudo-Maximum Likelihood estimator, so the assumption of Gaussianity of error terms is relaxed. For each dependent educational attainments dummy variable there were a couple of regressions run each time: one excluding Communism dummy and one including it.

This analysis of educational attainments in general was followed by bivariate regressions for Vocational secondary and University preparation secondary education choices in order to identify the differences between the individuals that choose one option rather than the other and see if there are significant differences between the attainments and two parts of Europe that could be related to the influence of Communism regime. This method allows simultaneous estimation of both dependent variables using the same set of explanatory variables as long as the correlation of error terms of equations is high enough and significant.

Firstly, Bivariate Probit regressions were run. Errors are assumed to be independent identically distributed – Gaussian, as in previous Probit regressions. Secondly, Bivariate SNP2 regressions for the semiparametric approach, where the Gaussianity of error terms is relaxed and densities

estimated as in SNP regressions. Functional form is the same as provided above, only the two regressions are run simultaneously.

In all of the models mentioned above apart from SNP and SNP2 models clustered standard errors were used in order to account for possible heterogeneity between countries in error terms. In SNP models robust standard errors were used as clustering is not available.

Exogeneity of variable 'city' is questionable since it is difficult to determine if living in a city influences educational attainments or educational attainments influence the choice between living in a city or more rural area, both of these effects could be happening at the same time, but is included due to literature indicating that geographic area affects can be important. 'Parents' occupation' only assumes that with each additional level of status need for education and financial status are reduced, in some cases this might not be the case, so works only as an imperfect proxy for family income; literature suggests though that social status is an important determinant in educational achievements and choices thus is included. In some cases 'Parents' education' could also be affected by Communist regime, thus making it more difficult to assess the true effect of Communism on educational attainments.

4. DATA AND DESCRIPTIVE STATISTICS

European Values Survey (EVS) data was used for this research. It provides individual information of opinions and values in such areas as: life, family, work, religion, politics and society in European countries. There is data released from 4 surveys (years: 1981, 1990, 1999, 2008) and combined within one longitudinal file. Only the last survey data was used for this study because it was the only one that had information of respondents' parents' educational attainments and occupation.

Table1: Countries and Nr. of Observations

E. Europe country	Nr. of obs.	W. Europe country	Nr. of obs.
Albania	1,176	Austria	1,290
Azerbaijan	1,086	Belgium	1,353
Armenia	1,274	Cyprus	895
Bulgaria	1,356	Northern Cyprus	369
Belarus	1,101	Denmark	1,339
Bosnia Herzegovina	932	Finland	927
Croatia	970	France	1,356
Czech Republic	1,486	W. Germany	840
Estonia	1,347	Greece	1,344
Georgia	1,240	Iceland	643
E. Germany	811	Ireland	841
Hungary	1,318	Italy	1,180
Kosovo	714	Luxembourg	1,467
Latvia	1,221	Malta	1,349
Lithuania	1,163	Netherlands	1,379

E. Europe country	Nr. of obs.	W. Europe country	Nr. of obs.
Macedonia	890	Norway	970
Moldova	1,298	Portugal	1,272
Montenegro	966	Spain	1,311
Poland	1,212	Sweden	964
Romania	851	Switzerland	1,131
Russian Federation	1,251	Turkey	1,656
Serbia	1,007	Great Britain	1,310
Slovak Republic	1,289	Northern Ireland	417
Slovenia	962	Total:	25,603
Ukraine	1,351		
Total:	28,272		

Table 1 provides the list of countries in the sample with number of observations used from each. The sample of 48 countries was divided into two parts: Western European countries (23) and Eastern European countries (25). A country is classified as Eastern European if it was part of the Eastern bloc. Total number of observations used is 53,875; 25,603 of which belong to Western Europe and 28,272 – to the Eastern Europe.

Table 2: Variables and Summary statistics

Dep. Variables:	Obs.	Mean	Std. Deviation
Tertiary educ.	53540	0.1034	0.3044
Secondary educ.	53540	0.6059	0.4887
Primary educ.	53540	0.9754	0.155
Vocational secondary educ.	53540	0.0939	0.2918
Uni. Prep. Secondary educ.	53540	0.512	0.4999
Explanatory Variables:			
Communism	53875	0.3084	0.4618
Parental tertiary educ.	51258	0.1434	0.3505
Parental secondary educ.	51258	0.3829	0.4861
Parental primary educ.	51258	0.907	0.2904
Parental occupation	53875	6.7207	3.3827
Sex	53871	0.4427	0.4967
City	53875	0.2537	0.4351
Time trend	53712	80.9211	17.633
Cohort 1	53875	0.1282	0.3344
Cohort 2	53875	0.1746	0.3797
Cohort 3	53875	0.1818	0.3857
Cohort 4	53875	0.1826	0.3864
Cohort 5	53875	0.1505	0.3576
Cohort 6	53875	0.1791	0.3834

Table 2 summarizes the variables used in the reported regressions. The impact of Communism was assessed on three education levels separately: primary, secondary and tertiary, also on two secondary education choices: vocational or university preparation, providing five dependent dummy variables. Those variables were extracted from an 8 choice variable for 'Highest educational level attained by respondent' which takes these values: 1 – respondent has not had any or has not completed primary education; 2 – completed primary education; 3 – incomplete vocational secondary education; 4 – completed secondary vocational education; 5 – incomplete secondary university preparation education; 6 – completed secondary university preparation education; 7 – incomplete university, university without a degree; 8 - completed university, having a degree. The implication is made that if respondent indicated achievement of some higher level of education then lower levels of education were attained. Also it is assumed that respondent has completed either vocational secondary education or university preparation secondary education but not both. Having done some university is regarded as having completed preparation for university secondary education.

Tertiary education is a binary variable where 1 means completed tertiary (university) education with a degree, and 0 unfinished or no tertiary education. For secondary education 1 means completed vocational or university preparation education also includes those observations of incomplete or finished tertiary education, 0 – incomplete or no secondary education. Primary education takes value of 1 if it is completed and if respondent had any secondary or tertiary education and 0 if unfinished or no primary education. Vocational secondary education equals 1 if it is completed by respondent and 0 – if incomplete or no secondary education. University preparation takes value of 1 if completed and includes those observations of people that did some university or finished it, and 0 – if no secondary education or it is incomplete.

The averages of these variables suggest that 97.5% of the sample population have completed primary education; 60.6% have finished one of the two secondary educations; 10.3% have a degree. Vocational secondary education is more than five times less popular compared to university preparation secondary education over the sample with 9.39% and 51.2% completion rates respectively.

The main explanatory variable of interest – communism is a binary variable and takes value of 1 if a respondent comes from a country that was part of Eastern bloc and was born between 1940 and 1975, and 0 otherwise. There are two reasons for the choice of dates: firstly, by 1945 the division between which countries belonged to Eastern bloc and which ones to Western Europe became clear and remained unchanged until the collapse of Communism in Eastern Europe, so the person born in 1940 would be of age of 5 when this happened and would be affected by Communist education policy; secondly, years before age of 16 are called 'impressionable' years according to Giuliano and Spilimbergo (2009), which means that a young person is more affected by the outside circumstances in the process of personality shaping and decision making about the future. This would imply that a person falling into the given time gap would make education decisions under the influence of Communism regime, since regime fully collapsed in 1991 and the youngest affected respondent would be of the age of 16 at this time. 30.84% of the sample have experienced the Communist regime as defined

earlier. This variable is key in testing the assumption of Communism having an effect on education choices.

'Parental education' is a multiple choice variable that has the same choice categories as respondent's highest attained education and varies between 1 and 8. It is expected though that this variable is also influenced by Communism regime and cannot be treated as purely exogenous. There are three dummy variables derived from parental education: primary, secondary, and tertiary education for parents. Parental primary education takes a value of 1 if completed or higher levels of education were started or attained and 0 if incomplete; parental secondary education is 1 if either secondary education was completed or tertiary education was started or finished and 0 otherwise; parental tertiary education is equal to 1 if parent had any tertiary education and 0 otherwise. 14.34% of respondents' parents have had at least some tertiary education, 38.29% have completed secondary education and 90.7% have completed primary education. Apart from tertiary education, these rates are lower compared to respondents' average achievements, which is logically sound. Higher proportion of parents with tertiary education in comparison to their children is explained by the variable including non-completed university education which is not the case for respondents.

Parental occupation is used as a proxy for parental income (not given in the dataset) and demand for education, which should influence how much they value it. It is an 11 choice variable: 1. Higher controllers, 2. Lower controllers, 3, Routine non-manual, 4. Lower sales-service, 5. Self-employed with employees, 6. Self-employed with no employees, 7. Manual supervisors, 8. Skilled worker, 9. Unskilled worker, 10. Farm labour, 11. Self-employed farmer. It is expected to observe a negative relationship between dependent variables and parental occupation as both: parents' income and parents' educational attainments should be lower with every higher category number of occupation.

The rest of the variables help distinguish between different personal characteristics. Sex is a dummy variable that equals 1 if respondent is male and 0 if female, 44.27% of the sample are male so it shows a quite balanced sample in this respect. City is a dummy variable that takes value of 1 if respondent lives in a place that has 50,000 people or more and 0 otherwise; 25.37% of respondents live in cities. Time trend is calculated by deducting 1881 (a year of birth of the oldest respondent within the sample) from a year of birth of the respondent, this helps account for the time trend effects in educational attainments. Cohorts 1-6 take into account age cohort effects of respondents, grouped by age: 15-24, 25-34, 35-44, 45-54, 55-64, 65+ respectively, from their means it is seen that the sample is very balanced in terms of representation of age groups.

Table 3: Respondent's highest educational attainments summarized by region

| Highest educational level attained respondent | Part of Europe East/West | | | | Total |
| | West Europe | | East Europe | | |
	Nr. of Obs.	Ratio with population	Nr. of Obs.	Ratio with population	
Inadequately complete primary educ.	1,058	0.0417	261	0.0093	1,319
Completed (compulsory) primary educ.	3,782	0.1489	1,012	0.0360	4,794
Incomplete secondary vocational educ.	4,929	0.1941	3,889	0.1382	8,818
Complete secondary vocational educ.	1,642	0.0646	3,388	0.1204	5,030
Incomplete secondary: university prep.	2,724	0.1072	3,443	0.1224	6,167
Complete secondary: university prep.	4,992	0.1965	8,979	0.3191	13,971
Some university without a degree	4,254	0.1675	3,653	0.1298	7,907
University with degree	2,019	0.0795	3,515	0.1249	5,534
Total	25,400		28,140		53,540

Table 4: Parental highest educational attainments summarized by region

| Highest educational level attained father/mother | Part of Europe East/West | | | | Total |
| | West Euro | | East Euro | | |
	Nr. of Obs.	Ratio with population	Nr. of Obs.	Ratio with population	
Inadequately complete primary educ.	3,247	0.1364	1,520	0.0554	4,767
Completed (compulsory) primary educ.	7,399	0.3109	4,107	0.1496	11,506
Incomplete secondary vocational educ.	4,404	0.1850	6,245	0.2274	10,649
Complete secondary vocational educ.	1,345	0.0565	3,286	0.1197	4,631
Incomplete secondary: university prep.	2,288	0.0961	2,419	0.0881	4,707
Complete secondary: university prep.	2,229	0.0937	5,420	0.1974	7,649
Some university without degree	1,799	0.0756	2,175	0.0792	3,974
University with degree	1,090	0.0458	2,285	0.0832	3,375
Total	23,801		27,457		51,258

Table 3 summarizes the differences between highest education achievements between Eastern and Western Europe. In both parts of Europe the highest proportion of population completed preparation for university secondary education: in Western Europe it is 19.65% or roughly 1 person in 5, and in Eastern Europe – 31.91%, or 1 in 3. The second largest proportion of people have incomplete vocational secondary education as their highest educational attainment in both pats of Europe: in the West amounting to 19.41% (this is close to the proportion of people with completed university preparation secondary education), and in the East – 13.82%. Table 3 shows that for each education level Eastern Europe has a lower proportion of population that has not completed it compared to Western Europe. For completed educational attainments Western part has a higher proportion of population only in primary education as the highest attainment, which is about 4 times larger in comparison to

Eastern part. Incomplete university preparation education has similar rates in both parts, while incomplete vocational education is much higher in the West. University education is started by a similar proportion of people in both regions but in the West only roughly 1 in 3 amounting to 7.95% of population would graduate with a degree, while in the East nearly 1 in 2 or 12.49%. This table suggests the tendency of higher completion rates and higher educational attainments in Eastern Europe compared to the Western part. Since one easily identifiable difference is Communist regime it raises a question if it had an influence on these results, maybe their education policy, encouragement to seek education and offered motivation to complete different stages of it have been successful in securing a higher level of educational attainments.

There is a similar pattern in highest educational attainments of respondents' parents given in table 4. Highest proportion of people in the Western Europe (31.09%) have primary education as their highest educational attainments while in the Eastern Europe it is incomplete vocational secondary education with 22.74% of population and complete university preparation secondary education has somewhat lower rate of 19.74%. Apart from primary education, the rest of three categories (vocational and university preparation secondary educations and university education) have around twice higher completion rates in the Eastern bloc than in the Western part. This statistics reinforces the hypothesis of Communism having an effect on educational attainments as most of the parents of the respondents in the sample in Eastern Europe would have been affected by the regime. It could be argued that due to higher educational attainments of parents in Eastern Europe the respondents were bound to have even higher educational attainments, but this cannot explain the behaviour of parents as their parents and grandparents were suffering very low literacy rates.

Tables 5 and 6 summarize the difference between sexes, age groups, types of education, and parts of Europe. Three education dummies were derived from the highest educational attainment variable as explained before. In all three education categories, all age groups, and between both sexes the mean is higher, if difference is statistically significant, in the Eastern Europe compared to the Western Europe. Differences tend to be smallest between primary education rates and grow larger for secondary and tertiary education. Rank-sum tests were performed in order to check if the difference between the means of the two parts of Europe is statistically significant. Wilcoxon Rank-sum test, also known as the Mann-Whitney U test, is a nonparametric test with a null hypothesis of two populations being the same; the alternative is populations being different. It is more efficient than the t-test with populations that have a non-normal distribution and almost as efficient with the ones with a normal distribution. Results show that only for primary education attainments in men's first two age cohorts and men's tertiary education cohorts: 25-34, 35-44, 45-54 the differences are not statistically significant. This makes higher average educational attainments in Eastern Europe statistically significant within the sample.

These tables suggest some differences between genders and two parts of Europe. On the Eastern side, women have higher rates of completed tertiary education compared to men in the middle four age groups (between ages 25-64), the rate is lower only in the last age group. On the Western side, the rates for tertiary education for women are marginally higher than

men's only in the first age group; for the rest of age groups men have higher rates and the difference is more pronounced.

The differences for secondary education attainments are smaller but follow a similar pattern: in Eastern Europe women have higher or similar rates in the first five age groups and the opposite for the last one; in Western Europe women have higher completion rates in the first and third age groups, in the rest of the groups the effect is opposite and larger.

For the primary education differences between genders and parts of Europe are negligible, but the completion rates in Eastern Europe tend to be higher. The only age group that has more noticeable differences between sexes and geographical locations is 65+ and could be associated with the times new education policies were started in Eastern Bloc.

Another interesting observation to be made – there is a noticeable tendency for women in Eastern Europe to be on average better educated than men, unless they belong to the oldest age group, while men seem to have better educational attainments in Western Europe in comparison to women in most age groups apart from the first. These observations are in accordance with our expectations: Communist regime encouraged equal treatment of sexes and equal access to education. With this freedom higher numbers of women got educated, surpassing the numbers of educated men. This statistics also shows the process of women catching up with the educational attainments of men in Western Europe which suggests that gender gap started closing in Eastern Europe before Western Europe, at least in education.

Tables 5: Tertiary, Secondary and Primary education by age group for women

Variable for education	Tertiary											
Age group	15-24		25-34		35-44		45-54		55-64		65+	
Part of Europe	East	West	East	West	East	West	East	West	East	West	East	West
Mean	0.070	0.027	0.182	0.127	0.156	0.105	0.142	0.077	0.139	0.046	0.083	0.021
Std. Deviation	0.255	0.161	0.386	0.333	0.363	0.307	0.349	0.266	0.346	0.209	0.277	0.143
Ranksum test	0.0000***		0.0000***		0.0000***		0.0000***		0.0000***		0.0000***	
Obs.	2281	1391	2828	2205	2840	2645	2987	2509	2302	2228	2672	2854

Variable for education	Secondary											
Age group	15-24		25-34		35-44		45-54		55-64		65+	
Part of Europe	East	West	East	West	East	West	East	West	East	West	East	West
Mean	0.761	0.650	0.786	0.665	0.745	0.594	0.725	0.512	0.665	0.386	0.475	0.221
Std. Deviation	0.427	0.477	0.410	0.472	0.436	0.491	0.447	0.500	0.472	0.487	0.499	0.415
Ranksum test	0.0000***		0.0000***		0.0000***		0.0000***		0.0000***		0.0000***	
Obs.	2281	1391	2828	2205	2840	2645	2987	2509	2302	2228	2672	2854

Variable for education	Primary											
Age group	15-24		25-34		35-44		45-54		55-64		65+	
Part of Europe	East	West	East	West	East	West	East	West	East	West	East	West
Mean	0.998	0.994	0.996	0.988	0.998	0.987	0.998	0.972	0.991	0.942	0.952	0.839
Std. Deviation	0.042	0.080	0.059	0.110	0.042	0.114	0.048	0.165	0.093	0.234	0.214	0.367
Ranksum test	0.0196**		0.0003***		0.0000***		0.0000***		0.0000***		0.0000***	
Obs.	2281	1391	2828	2205	2840	2645	2987	2509	2302	2228	2672	2854

Tables 6: Tertiary, Secondary and Primary education by age group for men

Variable for education	Tertiary											
Age group	15-24		25-34		35-44		45-54		55-64		65+	
Part of Europe	East	West	East	West	East	West	East	West	East	West	East	West
Mean	0.069	0.022	0.150	0.134	0.124	0.118	0.116	0.109	0.113	0.087	0.121	0.066
Std. Deviation	0.253	0.148	0.357	0.341	0.330	0.322	0.320	0.311	0.316	0.282	0.326	0.248
Ranksum test	0.0000***		0.1315		0.5067		0.4439		0.0116**		0.0000***	
Obs.	1889	1304	2385	1948	2223	2059	2318	1970	1670	1859	1666	2346

Variable for education	Secondary											
Age group	15-24		25-34		35-44		45-54		55-64		65+	
Part of Europe	East	West	East	West	East	West	East	West	East	West	East	West
Mean	0.709	0.615	0.744	0.680	0.738	0.589	0.707	0.568	0.653	0.488	0.575	0.335
Std. Deviation	0.454	0.487	0.436	0.467	0.440	0.492	0.455	0.495	0.476	0.500	0.494	0.472
Ranksum test	0.0000***		0.0000***		0.0000***		0.0000***		0.0000***		0.0000***	
Obs.	1889	1304	2385	1948	2223	2059	2318	1970	1670	1859	1666	2346

Variable for education	Primary											
Age group	15-24		25-34		35-44		45-54		55-64		65+	
Part of Europe	East	West	East	West	East	West	East	West	East	West	East	West
Mean	0.996	0.997	0.996	0.994	0.998	0.989	0.996	0.989	0.986	0.968	0.982	0.914
Std. Deviation	0.065	0.055	0.065	0.075	0.047	0.105	0.062	0.103	0.117	0.175	0.133	0.280
Ranksum test	0.5962		0.4931		0.0003***		0.0080***		0.0004***		0.0000***	
Obs.	1889	1304	2385	1948	2223	2059	2318	1970	1670	1859	1666	2346

Tables 7 and 8 summarize the two types of secondary education attainments by age, gender and location. According to the tables, University preparation was much more popular compared to Vocational training for both genders and all age groups. Men tend to have higher Vocational/technical secondary education completion rates compared to women in both parts of Europe. This difference tends to be larger in Eastern Europe. The tendency of Eastern Europe having higher completion rates remains, this difference is only smaller for women in the first two age groups in Vocational education. The differences are not significantly different between East and West Europe only for women's 1st and 2nd age cohorts. This suggests larger differences between genders in Vocational secondary education in Eastern Europe, which could be related to heavy industrialisation in Eastern bloc during the period in question.

The difference between the rates for University preparation tends to be larger between two parts of Europe in comparison to Vocational education. The difference by age group is more distinct for women compared to men. In first five age cohorts more women from Eastern Europe have completed University preparation compared to men; on the Western side women's ratio is higher only in the first and third age cohorts. These findings support similar conclusions about the effectiveness of Communist educational policies. Much larger differences between East and West in Vocational education are in line with Communist regime paying a lot of attention to technical professions and jobs due to industrialisation.

Tables 7: Vocational and University preparation secondary education by age group for women

Variable for education	Vocational/technical secondary education											
Age group	15-24		25-34		35-44		45-54		55-64		65+	
Part of Europe	East	West	East	West	East	West	East	West	East	West	East	West
Mean	0.074	0.070	0.079	0.069	0.111	0.063	0.123	0.068	0.113	0.053	0.088	0.034
Std. Deviation	0.262	0.256	0.270	0.253	0.314	0.243	0.328	0.251	0.317	0.225	0.283	0.182
Ranksum test	0.6805		0.1690		0.0000***		0.0000***		0.0000***		0.0000***	
Obs.	2281	1391	2828	2205	2840	2645	2987	2509	2302	2228	2672	2854

Variable for education	University preparation secondary education											
Age group	15-24		25-34		35-44		45-54		55-64		65+	
Part of Europe	East	West	East	West	East	West	East	West	East	West	East	West
Mean	0.687	0.579	0.707	0.596	0.634	0.531	0.602	0.444	0.552	0.333	0.387	0.187
Std. Deviation	0.464	0.494	0.455	0.491	0.482	0.499	0.490	0.497	0.497	0.471	0.487	0.390
Ranksum test	0.0000***		0.0000***		0.0000***		0.0000***		0.0000***		0.0000***	
Obs.	2281	1391	2828	2205	2840	2645	2987	2509	2302	2228	2672	2854

Tables 8: Vocational and University preparation secondary education by age group for men

Variable for education	Vocational/technical secondary education											
Age group	15-24		25-34		35-44		45-54		55-64		65+	
Part of Europe	East	West	East	West	East	West	East	West	East	West	East	West
Mean	0.096	0.073	0.123	0.084	0.163	0.080	0.179	0.076	0.188	0.077	0.140	0.052
Std. Deviation	0.294	0.260	0.329	0.277	0.369	0.271	0.384	0.264	0.391	0.267	0.348	0.221
Ranksum test	0.0232**		0.0000***		0.0000***		0.0000***		0.0000***		0.0000***	
Obs.	1889	1304	2385	1948	2223	2059	2318	1970	1670	1859	1666	2346

Variable for education	University preparation secondary education											
Age group	15-24		25-34		35-44		45-54		55-64		65+	
Part of Europe	East	West	East	West	East	West	East	West	East	West	East	West
Mean	0.614	0.542	0.621	0.597	0.575	0.509	0.527	0.492	0.465	0.410	0.435	0.283
Std. Deviation	0.487	0.498	0.485	0.491	0.494	0.500	0.499	0.500	0.499	0.492	0.496	0.451
Ranksum test	0.0001***		0.1007		0.0000***		0.0231**		0.0012***		0.0000***	
Obs.	1889	1304	2385	1948	2223	2059	2318	1970	1670	1859	1666	2346

5. RESULTS

5.1 Secondary education

The same equation with dependent variable being secondary education was estimated with three different models: Linear Probability Model (LPM), Probit and SNP. LPM is the first and simplest model that imposes linearity in the relationship between dependent and explanatory variables, Probit allows for non-linear relationship between the two but imposes a strong assumption of Gaussianity of the residuals of the equation, and SNP relaxes this assumption and estimates the densities of the residuals. Table 9 provides LPM results and average marginal effects (AME) for Probit and SNP equations.

In LPM equations R^2 measures indicate that specification without Communism explains 27.73% of variation in dependent variable and 27.82% with Communism dummy. In Probit results inclusion of Communism dummy also somewhat improves Pseudo R^2 measure. Communism dummy has a positive effect towards secondary education attainments and is statistically significant at 1% significance level in all three specifications. LPM estimates this positive impact of being from Eastern Europe amounting to 0.053 increase in probability of 'success' keeping other factors constant. In Probit and SNP this increase is similar, equal to 0.048 and 0.050 respectively all other factors held constant. Little variation in the estimated effect provided by all three models suggest that Communism was a significant factor in increasing secondary education attainments in Eastern Europe.

Other statistically significant explanatory variables in all specifications are: parents' secondary and primary education dummies, parents' occupation, age cohorts, city and time trend. Parents' educational attainments have some of the largest effects on secondary education achievements. Their estimated impact size does not change much between all three models as

we do not observe much variation in statistically significant marginal effects. Parents' tertiary education is not significant in LPM but is highly significant in Probit and SNP models. It has the smallest marginal effect out of all parents' education dummies, it varies between: 0.04 – 0.048. This could be due to relatively small proportion of respondents' parents having some tertiary education within the sample (only 14.34%), and most parents with any level of completed education probably encouraging their children to finish secondary education as the demand for educated people was growing. Their secondary and primary education dummmies are significant at 1% level and have quite similar positive coefficients in all specifications, especially in SNP. These results show high importance of parents' educational attainments on their children's accomplishments which is in line with the literature.

Table 9: Results for Secondary education attainments

Model	LPM		Probit		SNP	
	1)	2)	3)	4)	5)	6)
Communism		.0534*** (0.008)		.0484*** (0.006)		.0495*** (0.000)
Ptertiary	.01698 (0.146)	.0178 (0.122)	.0397*** (0.001)	.0400*** (0.001)	.0482*** (0.000)	.0471*** (0.000)
Psecondary	.1591*** (0.000)	.1591*** (0.000)	.1484*** (0.000)	.1487*** (0.000)	.1494*** (0.000)	.1516*** (0.000)
Pprimary	.2056*** (0.000)	.2035*** (0.000)	.1887*** (0.000)	.1868*** (0.000)	.1598*** (0.000)	.1572*** (0.000)
Poccupation	-.0169*** (0.000)	-.0169*** (0.000)	-.0168*** (0.000)	-.0167*** (0.000)	-.0170*** (0.000)	-.0169*** (0.000)
Sex	.0125 (0.182)	.0123 (0.185)	.01155 (0.203)	.0113 (0.209)	.0163*** (0.000)	.0163*** (0.000)
Cohort2	.1006*** (0.000)	.0914*** (0.000)	.1060*** (0.000)	.0973*** (0.000)	.1047*** (0.000)	.0943*** (0.000)
Cohort3	.1300*** (0.000)	.0946*** (0.003)	.1297*** (0.000)	.1002*** (0.000)	.1292*** (0.000)	.0959*** (0.000)
Cohort4	.1652*** (0.000)	.1269*** (0.000)	.1558*** (0.000)	.1240*** (0.000)	.1607*** (0.000)	.1215*** (0.000)
Cohort5	.1500*** (0.000)	.1104*** (0.006)	.1412*** (0.000)	.1076*** (0.001)	.1509*** (0.000)	.1075*** (0.000)
Cohort6	.0958** (0.015)	.0713* (0.081)	.0973*** (0.002)	.0740** (0.038)	.1136*** (0.000)	.0806*** (0.002)
City	.0557*** (0.000)	.0559*** (0.000)	.0607*** (0.000)	.0610*** (0.000)	.0632*** (0.000)	.0636*** (0.000)
T	.0043*** (0.000)	.0040*** (0.000)	.0040*** (0.000)	.0037*** (0.000)	.0043*** (0.000)	.0038*** (0.000)
Cons_	-.2451*** (0.001)	-.1991*** (0.007)				
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
R2/Pseudo R2	0.2773	0.2782	0.2387	0.2395		
Nr. of obs.	50865	50865	50865	50865	50865	50865

Note: Communism is 1 if country was in Soviet Union's influence area and a person was born between 1940 and 1975; Ptertiary – 1 if parents had any tertiary education, 0 otherwise; Psecondary – 1 if parents finished secondary education, 0 otherwise; Pprimary – 1 if parents finished primary education, 0 otherwise; Poccupation – proxy for parental income – parental occupation: 1. I:Higher controllers, 2. II: Lower controllers, 3. IIIa: Routine Nonmanual, 4. IIIb: lower sales-service, 5. IAa: Self-employed with employees, 6. IVb: Self-employed with no employees, 7. V: Manual supervisors, 8. VI: Skilled worker, 9. VIIa: unskilled worker, 10. VIIb: farm labour, 11. IVc: self-employed farmer; sex=1 if male and =0 if female; Cohorts 1-6 – by age respectively: 15-24, 25-34, 35-44, 45-54, 55-64, 65+, Cohort1 omitted; City = 1 if has 50,000 people or more, 0 otherwise; T = (year of birth)-1881;
(p-values in parentheses).
* - significant at 10% significance level; ** - significant at 5% significance level; *** - significant at 1% significance level.

Parents' occupation is statistically significant at 1% significance level in all specifications and has a negative effect. That is because the higher the value of this variable would imply the smaller demands for parents' educational attainments and is expected to be associated with lower income within the family which should result in lower educational attainments by their children. An increase by 1 unit in this variable (marginally lower social status level) decreases the probability of finishing secondary education by 0.017 keeping all other factors constant in every specification provided in table 9.

Dummy for living in a city is significant at 1% level and has a positive effect towards secondary education attainments in all given specifications. The estimated effect ranges between 0.56-0.64 which suggests it to be a robust estimate. The magnitude of this effect is close to the one of Communism, and since it is logically sound to think that all higher than primary education levels are more important in cities than rural areas it also stresses the comparative significance of having experienced Communist regime.

All age cohorts are statistically significant in provided specifications. First age cohort (15-24) is excluded to avoid dummy variable trap so marginal effects of other cohorts show how they compare to the first one. It is noteworthy that estimated effect of being in any age cohort changes (diminishes) most with inclusion of Communism dummy, this would justify the idea that Communism affected certain age groups, the change is most noticeable for 3rd, 4th and 5th age cohorts. All age cohorts exhibit positive effect towards having secondary education in comparison to the first cohort, which is probably partially explained by the fact that some people within this cohort would be too young to have finished secondary education. This corresponds to descriptive statistics for the first three age cohorts (in 2nd and 3rd are on average more people who have completed it), but not for the last three (as the average secondary education completion rates are lower for these age groups). It is surprising then that the estimated marginal effect for the 4th cohort is largest and only somewhat smaller for the 5th one. The effect of being in a certain age group is sizeable in comparison to most other explanatory variables.

Gender is only significant in SNP regressions and suggests that being male increases the probability of having primary education by a small proportion. This estimation fits the data for the last age cohort for both parts of Europe and for all Western Europe age cohorts apart from the first one, but does not correspond to the averages from first 5 age cohorts in Eastern bloc, where more women than men tend to have secondary education within this sample. This result suggests that overall in Europe there are marginally more men with secondary education than women, but the opposite seems to be true for Eastern bloc, which would imply that communist non-discriminatory education policy was effective.

Overall, the results indicate communism having a statistically significant positive effect on secondary education attainments in Eastern Europe, which would suggest education policy in Eastern bloc being effective. This information is reiterated by all three models used. The robustness of estimated effects of other important explanatory variables advocates the same conclusion. Due to similarity of the results from all three models inefficient SNP estimations might seem unnecessary, but LR test rejects Gaussianity assumption at 1% significance level when comparing SNP model to Probit, which justifies the inclusion of these results.

5.2 Choice between vocational and university preparation secondary education studies

In this section we look into the underlying differences between agents and their secondary education choice: vocational or university preparation. The same regression specification as in previous section was used to estimate bivariate probit and SNP2 models to reveal those differences, there are two sets of regressions for each model: with and without Communism dummy. Bivariate probit model assumes that its errors are independent, identically distributed as in probit model. Athrho test in bivariate probit reveals that correlation between two regressions residuals is significant at 1% level, thus this running bivariate regressions is justified: choices of both outcomes can be estimated simultaneously as decisions are interdependent. This is intuitive since it is likely that agent would choose only one type of secondary education. SNP2 regressions, as with SNP regressions, relax the assumption of Gaussianity of residuals. Estimate of the correlation coefficient between these residuals is provided and is high and negative at -0.76 in both estimations. Wald Chi2 test shows that all regressors are jointly statistically significant in all sets of equations at 1% significane level. Results are provided in table 10.

Two models provide quite similar marginal effects for the main variable of interest, Communism, but different significance levels. This dummy is significant at 5% level only for vocational secondary education but not for university preparation in bivariate probit estimation, but highly significant at 1% level for both types of education in SNP2. Communism is estimated to increase the possibility of completing vocational school by 1.4-1.6% holding other factors constant by both models. This supports descriptive statistics and historical information of Soviet regime being interested in educating a lot of skilled labour for factories, manufactories etc. This meant nearly guaranteed income from the age of 16. Communism is estimated to be not statistically significant for bivariate probit, but significant at 1% level for SNP2 estimations. SNP2 model measures Communism increasing the probability of choosing university preparation secondary education by 2.6% other variables kept constant, which is higher than the effect on vocational education. This corresponds with descriptive statistics because it shows eastern Europe consistently having higher means of university preparation secondary education than western Europe, while means are very similar and not statistically different from each other for vocational education for women in the first few age cohorts. These results advocate Communism having a positive effect towards completion rates of both types of secondary education, which corresponds to previous section indicating Communism having a statistically significant positive effect on secondary education.

Parents' educational attainments are mostly statistically significant in both models. In all four sets of equations all parents' education dummies have a positive effect towards choosing university preparation, the marginal effects do not change much in bivariate probit estimations with or without Communism dummy, but the results are quite different in SNP2 estimations if Communism dummy is included. Since marginal effects of parents' education decrease in value with inclusion of Communism, this could suggest that parents' education partially included the effect of Communism. The values of marginal effects for parents' educations seem intuitively likely, since educated parents would probably encourage their children to undertake university preparation secondary education, which could lead to university. While for vocational

education choice only parents' primary education dummy has a positive effect in both models, parents' secondary education is less significant, and their tertiary education has a significant negative effect. These results support general intuition of more educated parents tilting their children's choices towards the possibility of higher levels of education, which is why parents with some university experience or a degree increase the probability of their child attending university preparation and reduce the probability of choosing Vocational secondary education.

Table 10: Results for Vocational and University Preparation secondary educations

Model	Bivariate Probit				SNP2			
	Vocational	University Preparation	Vocational	University Preparation	Vocational	University Preparation	Vocational	University Preparation
Communism			.0144** (0.047)	.0150 (0.371)			.0156*** (0.000)	.0263*** (0.000)
Ptertiary	-.0437*** (0.000)	.0899*** (0.000)	-.0441*** (0.000)	.0898*** (0.000)	-.6738*** (0.000)	.5751*** (0.000)	-.0433*** (0.000)	.1249*** (0.000)
Psecondary	-.0054 (0.267)	.1388*** (0.000)	-.0059 (0.233)	.1385*** (0.000)	-.0798* (0.073)	.6469*** (0.000)	-.0052* (0.072)	.1404*** (0.000)
Pprimary	.0306*** (0.000)	.1870*** (0.000)	.0300*** (0.000)	.1862*** (0.000)	.4473*** (0.000)	.6434*** (0.000)	.0278*** (0.000)	.1387*** (0.000)
Poccupation	.0045*** (0.000)	-.0194*** (0.000)	.0045*** (0.000)	-.0194*** (0.000)	.0448*** (0.000)	-.0948*** (0.000)	.0029*** (0.000)	-.0204*** (0.000)
Sex	.0181*** (0.000)	-.0202** (0.044)	.0179*** (0.000)	-.0202** (0.044)	.2382*** (0.000)	-.0154 (0.384)	.0150*** (0.000)	-.0031 (0.421)
Cohort2	.0143* (0.096)	.0810*** (0.000)	.0136 (0.117)	.0798*** (0.000)	.1853*** (0.002)	.2226*** (0.000)	.0106*** (0.006)	.0454*** (0.000)
Cohort3	.0371*** (0.006)	.0840*** (0.000)	.0275* (0.053)	.0763*** (0.002)	.3489*** (0.000)	.0950** (0.010)	.0130*** (0.005)	.0084 (0.321)
Cohort4	.0489*** (0.003)	.0962*** (0.000)	.0405** (0.017)	.0894*** (0.001)	.4257*** (0.000)	.0389 (0.335)	.0187*** (0.000)	-.0037 (0.689)
Cohort5	.0530*** (0.007)	.0797*** (0.004)	.0468** (0.016)	.0743** (0.017)	.3127*** (0.000)	-.1316*** (0.004)	.0126** (0.032)	-.0395*** (0.000)
Cohort6	.0267 (0.232)	.0294 (0.403)	.0300 (0.160)	.0306 (0.399)	-.0895 (0.412)	-.4629*** (0.000)	-.0055 (0.427)	-.1015*** (0.000)
City	-.0227*** (0.000)	.0781*** (0.000)	-.0224*** (0.000)	.0782*** (0.000)	-.2781*** (0.000)	.3652*** (0.000)	-.0176*** (0.000)	.0790*** (0.000)
T	.0005 (0.136)	.0025*** (0.000)	.0007** (0.045)	.0026*** (0.000)	-.0008 (0.691)	.0011 (0.251)	.00003 (0.792)	.0003 (0.144)
Country dummies	Yes		Yes		Yes		Yes	
Athrho	-3.189758 (0.000)***		-3.166512 (0.000)***					
rho					-.7608118		-.7638831	
Wald Chi2 test	0.0000***		0.0000***		0.0000***		0.0000***	
Nr. of obs.	50865		50865		50865		50865	

Note: Communism is 1 if country was in Soviet Union's influence area and a person was born between 1940 and 1975; Ptertiary – 1 if parents had any tertiary education, 0 otherwise; Psecondary – 1 if parents finished secondary education, 0 otherwise; Pprimary – 1 if parents finished primary education, 0 otherwise; Poccupation – proxy for parental income – parental occupation: 1. I:Higher controllers, 2. II: Lower controllers, 3. IIIa: Routine Nonmanual, 4. IIIb: lower sales-service, 5. IAa: Self-employed with employees, 6. IVb: Self-employed with no employees, 7. V: Manual supervisors, 8. VI: Skilled worker, 9. VIIa: unskilled worker, 10. VIIb: farm labour, 11. IVc: self-employed farmer; sex=1 if male and =0 if female; Cohorts 1-6 – by age respectively: 15-24, 25-34, 35-44, 45-54, 55-64, 65+, Cohort1 omitted; City = 1 if has 50,000 people or more, 0 otherwise; T = (year of birth)-1881; (p-values in parentheses).
* - significant at 10% significance level; ** - significant at 5% significance level; *** - significant at 1% significance level.

Multinomial variable for parents' occupation also has an opposite effect on choosing either vocational or university preparation studies in both models. It has a negative effect on university preparation choice and positive on choosing vocational studies, which seems intuitively true keeping in mind that every increase in parents' occupation variable value is related to reduction in social status and relative need for education. This confirms the same result: the lower is the need for parents to have higher levels of education, the higher are the chances of their children choosing vocational education and the lower probability for them going for university preparation. The marginal effects are very similar in both specifications of bivariate probit equations, and differ somewhat with the inclusion of Communism dummy for SNP2 regressions. Marginal effects produced with this inclusion are close to bivariate probit values.

Gender is significant in all bivariate probit equations, but not significant for university preparation in both specifications of SNP2. Being male is more significant and has a positive effect to vocational studies and is less significant having a negative effect to university preparation studies. This corresponds to the information from descriptive statistics as there was less difference between genders in university preparation studies and more male bias in vocational studies.

Marginal effects for age show that all age groups have a higher chance of choosing vocational studies in comparison to the first age group (15-24), while in university preparation equations in SNP2 model last two age cohorts have a negative effect towards university preparation choice, this would suggest that university preparation secondary education choice is becoming more popular with younger age groups.

Living in a city is statistically significant in all provided regressions. It increases the probability of choosing university preparation but reduces the chance of undertaking vocational studies, which is probably explained by cities being the centres of education and having a higher possibility of also having a university in them.

5.3 Tertiary education

Results for tertiary education follow similar format as those for secondary education and are given in table 11. Results include LPM, probit and SNP estimations, half of them including Communism dummy, and the other half excluding it.

Table 11: Results for Tertiary education attainments

Model	LPM		Probit		SNP	
	1)	2)	3)	4)	5)	6)
Communism		.0036		-.0051		-.0057
		(0.640)		(0.440)		(0.205)
Ptertiary	.1215***	.1216***	.0696***	.0695***	.0585***	.0584***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Psecondary	.0364***	.0364***	.0368***	.0369***	.0368***	.0369***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Pprimary	.0207**	.0206**	.0485***	.0487***	.0615***	.0619***
	(0.035)	(0.036)	(0.000)	(0.000)	(0.000)	(0.000)
Poccupation	-.0095***	-.0095***	-.0086***	-.0086***	-.0086***	-.0086***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex	.0054	.0054	.0070	.0070	.0068***	.0068***
	(0.210)	(0.211)	(0.111)	(0.112)	(0.006)	(0.006)
Cohort2	.1171***	.1165***	.1502***	.1519***	.1202***	.1213***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cohort3	.1111***	.1088***	.1431***	.1485***	.1174***	.1214***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cohort4	.1092***	.1066***	.1423***	.1480***	.1182***	.1224***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cohort5	.1033***	.1007***	.1375***	.1435***	.1137***	.1180***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cohort6	.0855***	.0839***	.1112***	.1143***	.0973***	.0996***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
City	.0587***	.0587***	.0524***	.0524***	.0480***	.0480***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
T	-.0001	-.0001	-.0001	-.00003	.00002	.00004
	(0.757)	(0.720)	(0.877)	(0.915)	(0.946)	(0.914)
Cons_	-.0247	-.0216				
	(0.375)	(0.458)				
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
R2/Pseudo R2	0.1645	0.1645	0.2404	0.2404		
Nr. of obs.	50865	50865	50865	50865	50865	50865

Note: Communism is 1 if country was in Soviet Union's influence area and a person was born between 1940 and 1975; Ptertiary – 1 if parents had any tertiary education, 0 otherwise; Psecondary – 1 if parents finished secondary education, 0 otherwise; Pprimary – 1 if parents finished primary education, 0 otherwise; Poccupation – proxy for parental income – parental occupation: 1. I:Higher controllers, 2. II: Lower controllers, 3. IIIa: Routine Nonmanual, 4. IIIb: lower sales-service, 5. IAa: Self-employed with employees, 6. IVb: Self-employed with no employees, 7. V: Manual supervisors, 8. VI: Skilled worker, 9. VIIa: unskilled worker, 10. VIIb: farm labour, 11. IVc: self-employed farmer; sex=1 if male and =0 if female; Cohorts 1-6 – by age respectively: 15-24, 25-34, 35-44, 45-54, 55-64, 65+, Cohort1 omitted; City = 1 if has 50,000 people or more, 0 otherwise; T = (year of birth)-1881; (p-values in parentheses).
* - significant at 10% significance level; ** - significant at 5% significance level; *** - significant at 1% significance level.

For this set of results R^2 and Pseudo R^2 measure are lower than for the secondary education, which shows a worse fit. Communism dummy does not add much explanation since these measures do not increase with the inclusion of the dummy, even if regressions Wald Chi2 test

shows that all regressors are jointly significant in SNP estimations. Communism dummy is not significant at any of the estimations. This partially corresponds to descriptive statistics since tertiary education differences between Eastern and Western Europe were found to be non-significant for 3 out of 6 men's age groups; the differences are statistically significantly higher in all women's age groups for Eastern Europe though. Nonetheless, in all three levels of education, university completion rates are least different between two parts of Europe for men, but the gender gap in Western Europe seems more pronounced. This could be explained with lack of incentives to undertake university education due to low returns to education in Communist countries and higher earnings foregone during additional years of education. But since in Eastern Europe education was promoted equally between sexes, women had a better chance of entering university, while men were more likely to choose higher earnings instead of education.

Apart from parents' tertiary and primary education dummies the rest of the explanatory variables' marginal effects are very similar in all three models. Parents' education dummies are statistically significant at least at 5% level and have a positive impact for university completion throughout the estimations. The positive effect is largest for their tertiary education in LPM and probit models, while rather similar to parents' primary education in SNP. It is normal to expect parents' tertiary education to have a large impact to their children's university completion due to low education intergenerational mobility as literature suggests.

Parents' occupation is statistically significant at 1% significance level and has a very similar negative marginal effect in all equations, which follows similar explanation as in secondary education equations. Gender is significant at 1% level only in SNP regressions and has a small positive marginal effect towards tertiary education attainments. This information is reinforced with descriptive statistics for Western Europe but not for Eastern Europe, where tables show more women completing university than men. Marginal effects for age cohorts are highly statistically significant and are positive in all estimations. This suggests respondents in older age categories have higher attainments than those in first cohort which fits the descriptive statistics since some of the respondents in the first age cohort would not have had enough time to finish university. Dummy for living in a city is also significant at 1% level in all equations and has a positive effect towards tertiary education attainments. This makes intuitive sense since it is likely to expect more people with higher education in cities rather than rural areas.

Overall, results provide somewhat different information from that in descriptive statistics. Descriptive statistics suggests higher tertiary education completion rates for women and some men cohorts in Eastern Europe, but estimations do not capture this neither through Communism nor through gender dummies. This could be due to parents' education absorbing this effect since some of their education choices would have been influenced by the regime as well. Another possibility is looking into interaction between Communism and gender or Communism and parents' education, which could potentially help answer these questions.

5.4. Primary education

Results for primary education are following the same method as previously, they are provided in table 12 below.

In LPM equations R^2 measures for primary education are quite low, but Pseudo R^2 for Probit is relatively high, in both cases inclusion of Communism dummy increases the goodness of fit, but only marginally. The number of observations varies between the models, it is lower for Probit model since it exluded some countries from estimating process due to prediction of perfect 'success'. Communism is statistically insignificant in LPM but significant at 5% level in Probit and SNP. The effect of Communism is estimated to be positive in both: Probit and SNP models. In the first one it increases the probability of respondent having completed primary education by 0.9%, in the second one – by 0.6%, other variables kept constant. This is a much smaller positive effect in comparison to secondary education, but this fits descriptive statistics quite well, where the difference between two parts of Europe was much smaller for primary education.

All three parents' education dummies are significant at least at 10% level in LPM and SNP regressions, but their tertiary and secondary education are not significant in Probit model. Coefficients next to parents' tertiary education are small and negative, small positive next to secondary education, and larger positive next to primary education. This suggests that parents' tertiary and secondary attainments are not very important in determining if their child has completed primary education, this is probably because it was compulsory.

Parents' occupation status is statistically significant at 1% significance level in all three models and has a negative effect on primary education completion. This effect is much smaller compared to that of tertiary or secondary education, which again could be explained by primary education in most places being compulsory, and expecting that most people without it would come from families with lower social backgrounds.

Gender is statistically significant at least at 5% level in all equations. Being male increases the probability of having primary education by a small proportion; this is probably explained by older age cohorts and more men than women having been educated, while the difference between younger age cohorts is miniscule.

Dummy for living in a city is significant at 1% level in all regressions and has a much small positive effect in comparison to secondary and tertiary educations. Intuitively it would mean that secondary and tertiary educations are more important for life in city compared to primary education.

Overall, the results indicate communism having a statistically significant positive effect on primary education attainments in Eastern Europe, even though this affect is small, which is understandable knowing the compulsory nature of this type of education and correspondence to descriptive statistics.

Table 12: Results for Primary education attainments

Model	LPM		Probit		SNP	
	1)	2)	3)	4)	5)	6)
Communism		-.0036		.0089**		.0060**
		(0.579)		(0.023)		(0.046)
Ptertiary	-.0071***	-.0072***	-.0123	-.0118	-.0120*	-.0117*
	(0.001)	(0.001)	(0.126)	(0.130)	(0.077)	(0.071)
Psecondary	-.0106***	-.0106***	.0063	.0063	.0162***	.0154***
	(0.002)	(0.002)	(0.113)	(0.107)	(0.005)	(0.005)
Pprimary	.1485***	.1486***	.0587***	.0582***	.0294***	.0297***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Poccupation	-.0015***	-.0015***	-.0023***	-.0023***	-.0018***	-.0018***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Sex	.01111**	.01113**	.0132***	.0132***	.0125***	.0125***
	(0.018)	(0.018)	(0.001)	(0.001)	(0.000)	(0.000)
Cohort2	.0237***	.02428***	.0123***	.0110***	.0113***	.0101**
	(0.003)	(0.005)	(0.000)	(0.003)	(0.006)	(0.015)
Cohort3	.0492***	.05160***	.0211***	.0183***	.0200***	.0179***
	(0.003)	(0.009)	(0.000)	(0.000)	(0.000)	(0.000)
Cohort4	.0715***	.07409***	.0265***	.0231***	.0241***	.0216***
	(0.004)	(0.008)	(0.000)	(0.000)	(0.000)	(0.000)
Cohort5	.0838***	.0865**	.0242***	.0198	.0193***	.0162***
	(0.006)	(0.011)	(0.001)	(0.010)	(0.000)	(0.001)
Cohort6	.0764**	.0780**	.0225**	.0182*	.0169***	.0141***
	(0.016)	(0.020)	(0.034)	(0.092)	(0.002)	(0.009)
City	.0068***	.0068***	.0078***	.0079***	.0061***	.0062***
	(0.004)	(0.003)	(0.002)	(0.002)	(0.000)	(0.000)
T	.0025***	.0025***	.0014***	.0013***	.0011***	.0010***
	(0.003)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)
Cons_	.6043***	.6011***				
	(0.000)	(0.000)				
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
R2/Pseudo R2	0.1769	0.1770	0.4260	0.4268		
Nr. of obs.	50865	50865	38862	38862	50865	50865

Note: Communism is 1 if country was in Soviet Union's influence area and a person was born between 1940 and 1975; Ptertiary – 1 if parents had any tertiary education, 0 otherwise; Psecondary – 1 if parents finished secondary education, 0 otherwise; Pprimary – 1 if parents finished primary education, 0 otherwise; Poccupation – proxy for parental income – parental occupation: 1. I:Higher controllers, 2. II: Lower controllers, 3. IIIa: Routine Nonmanual, 4. IIIb: lower sales-service, 5. IAa: Self-employed with employees, 6. IVb: Self-employed with no employees, 7. V: Manual supervisors, 8. VI: Skilled worker, 9. VIIa: unskilled worker, 10. VIIb: farm labour, 11. IVc: self-employed farmer; sex=1 if male and =0 if female; Cohorts 1-6 – by age respectively: 15-24, 25-34, 35-44, 45-54, 55-64, 65+, Cohort1 omitted; City = 1 if has 50,000 people or more, 0 otherwise; T = (year of birth)-1881; (p-values in parentheses).
* - significant at 10% significance level; ** - significant at 5% significance level; *** - significant at 1% significance level.

6. DISCUSSION AND CONCLUSIONS

This research suggests that Communist regime had a significant effect towards educational attainments of people who experienced it. There are observable differences between education completion rates, gender behaviour and two parts of Europe. Regressions' results support the idea of Communism having a positive effect towards primary and especially secondary education completion. There is an ambiguous effect towards tertiary education: descriptive statistics suggests higher proportion of people with tertiary education in the Eastern Europe, but it is not supported by regressions' results.

A significant effect towards respondent's educational attainments is accounted to parents' education – the higher parents' educational attainments, the higher are those of a respondent, which runs in line with findings in the literature of low intergenerational mobility in education. But since some of parents' educational choices would have been influenced by Communist regime, and knowing that educational attainment levels used to be much lower in Eastern Europe, this would seem to advocate relative success of this education policy. This would suggest Communism having an indirect effect. Distinguishing between these two effects was not explored within this study, maybe future research will help answer this question.

These results seemingly confirm the idea of Communist education policy being successful; encouraging education for all people despite the gender and financial status should increase the attainments. This does not include the analysis of how cost efficient such policy is and does not offer a way to assess the quality of education. It should also be noted that there also is a possibility of self-selection into the sample, which could be due to some incentivising structure, mentality differences etc. It should be useful to find methods to consider such factors in future research since they should add interesting explanation. Centrally governed regimes have not been researched much and they could have a deeper effect on mentality of people affected by the regime that could be long-lasting.

REFERENCES:

Aina, C. (2013). Parental background and university dropout in Italy. *Higher Education*, 65(4), 437-456.

Alesina, A. and Fuchs-Schndeln, N. (2007). Good-Bye Lenin (or Not?): The Effect of Communism on People's Preferences. *American Economic Review*, 97(4), 1507-1528.

Ammermüller, A., Heijke, H. and Wößmann, L. (2005). Schooling quality in Eastern Europe: Educational production during transition. *Economics of Education Review*, 24(5), 579-599.

Ben-Halima, B., Chusseau, N. and Hellier, J. (2014). Skill premia and intergenerational education mobility: The French case. *Economics of Education Review*, 39, 50-64.

Braga, M., Checchi, D. and Meschi, E. (2013). Educational policies in a long- run perspective. *Economic Policy*, 28(73), 45-100.

Bratti, M., Checchi, D. and De Blasio, G. (2008). Does the Expansion of Higher Education Increase the Equality of Educational Opportunities? Evidence from Italy. *Labour*, 22, 53-88.

Cameron, A. C. and Trivedi, P. K. (2010). Chapter 12 Testing methods; Chapter 14 Binary outcome models; Chapter 15 Multinomial models. In: Trivedi, P. K. ed. *Microeconometrics using Stata*. Revised edition. edn. College Station, Tex.: College Station, Tex. : Stata Press.

Cappellari, L. and Lucifora, C. (2009). The " Bologna Process" and college enrollment decisions. *Labour Economics*, 16(6), 638-647.

Checchi, D. (1997). Education and Intergenerational Mobility in Occupations. *American Journal of Economics and Sociology*, 56(3), 331-351.

Checchi, D., Fiorio, C. V. and Leonardi, M. (2013). Intergenerational persistence of educational attainment in Italy. *Economics Letters*, 118(1), 229-232.

De Luca, G. (2008). SNP and SML estimation of univariate and bivariate binary-choice models. *The Stata Journal*, 8(2), 190-220.

Foley, K. (2007). *Literacy and Education in the Early Soviet Union* [Online]. Available from: http://www.portalus.ru/modules/english_russia/print.php?subaction=showfull&id=1190296667&archive=&start_from=&ucat=22& [Accessed 3/24/2015].

Galindo-Rueda, F. and Vignoles, A. (2005). The Declining Relative Importance of Ability in Predicting Educational Attainment. *Journal of Human Resources*, 40(2), 335-353.

Grendler, P. F. *Education in Europe - Nineteenth-and Twentieth-Century Education - Schools, University, Secondary, and Press - JRank Articles* [Online]. Available from: http://science.jrank.org/pages/9080/Education-in-Europe-Nineteenth-Twentieth-Century-Education.html [Accessed 3/18/2015].

Gruber, L. and Kosack, S. (2014). The Tertiary Tilt: Education and Inequality in the Developing World. *World Development*, 54, 253-272.

Hanushek, E. A. (2013). Economic growth in developing countries: The role of human capital. *Economics of Education Review*, 37, 204-212.

Hanushek, E. A., Link, S. and Woessmann, L. (2013). Does school autonomy make sense everywhere? Panel estimates from PISA. *Journal of Development Economics*, 104, 212-232.

Heyneman, S. P. (1997). Educational Choice in Eastern Europe and the Former Soviet Union: A Review Essay. *Education Economics*, 5(3), 333-339.

Houston, R. A. (2011). *Literacy* [Online]. Available from: http://ieg-ego.eu/en/threads/backgrounds/literacy/robert-a-houston-literacy [Accessed 3/24/2015].

Lazear, E. P. (2001). Educational Production. *The Quarterly Journal of Economics*, 116(3), 777-803.

Müünich, D., Svejnar, J. and Terrell, K. (2005). Returns to Human Capital Under The Communist Wage Grid and During the Transition to a Market Economy. *Review of Economics and Statistics*, 87(1), 100-123.

Newell, A. and Reilly, B. (1999). Rates of Return to Educational Qualifications in the Transitional Economies. *Education Economics*, 7(1), 67-84.

Roland, G. :. (2010). The Long-Run Weight of Communism or the Weight of Long-Run History?. *Wider Working Papers* [Online], 2010/83.

Roland, G. (2002). The Political Economy of Transition. *Journal of Economic Perspectives*, 16(1), 29-50.

Roland, G. and Verdier, T. (2003). Law enforcement and transition. *European Economic Review*, 47(4), 669-685.

Schütz, G., Ursprung, H. W. and Wößmann, L. (2008). Education Policy and Equality of Opportunity. *Kyklos*, 61(2), 279-308.

Triventi, M. and Trivellato, P. (2009). Participation, performance and inequality in Italian higher education in the 20th century. *Higher Education*, 57(6), 681-702.