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Anthropometric Dividends of Czechoslovakia's Break Up

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Abstract

Processes of transition to democracy and economic liberalisation stand out as 'natural experiments' to estimate the impact of wide institutional reform on well-being. One way to measure such effects is by using changes in population stature as virtuous pointers of well-being improvements in psycho-social environments. The latter are argued to improve with democracy, at least for some population subgroups. This paper examines individual heights in the Czech Republic and Slovakia after the transition to democracy and capitalism following the split up of Czechoslovakia. We find that an additional year spent under democracy increases population height by 0.286cm for Slovaks and 0.148cm for Czech. However, these effects are largely heterogeneous. That is, they are mainly driven by changes in stature among men among men alone. Slovaks heights increased more than the Czechs in the bottom and mid tercile. Independence appears to have reduced the height gap between Czech Republic and Slovakia. Results were robust to using some alternative datasets and specifications.

JEL-Code: O520.

Keywords: height, democracy, transition, secession, Czechoslovakia, gender dimorphism.

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1. Introduction

Physical stature is regarded a retrospective indicator of “how well the human organism fares during childhood and adolescence in its socio-economic and epidemiological environment” (Komlos & Snowdon, 2005, Steckel, 2009) ¹. That is, a child’s exposure to conditions that are less than optimal might impact the capacity to realize his or her height potential (Eveleth and Tanner, 1976). Approximately 20 percent of the variation in human height is due to ‘environmental’ factors both adverse and beneficial (Silventoinen, Kaprio, Lahelma, & Koskenvuo, 2000; Stunkard, Foch, & Hrubec, 1986). Hence, structural reforms that trigger the development of beneficial psycho-social environments (e.g., increasing social participation, reducing restrictions on freedom, ect) can influence wellbeing. Among those, the introduction of a democracy can give rise to the so called “fit through democracy” (Sen, 1999) effect. That is, democracies lead to economic and political liberalisation, and hence to the development of welfare improving institutions that are likely to make children and adolescents’ existence safer and healthier, which reflects in height increases (anthropometric returns) ².

The empirical identification of the effect of institutional changes in human heights is far from trivial, hence the importance of “natural experiments”. The meltdown of the Soviet bloc delivers such a natural experiment as it structurally reshaped the institutional constraints of family life in the countries affected (e.g., minority inclusiveness, perceptions of safety and rule of law, new welfare programs etc), stimulated of risk taking and the alteration of attitudes towards work (Collins and Rodrik, 1991). Hence, some research has focused on

¹ Eveleth and Tanner (1976) in their summary of growth studies suggest “if a particular stimulus is lacking at a time when it is essential for the child...the child’s development may be shunted...” (Eveleth & Tanner, 1976, p.222).

² However, it is important to note that such negative developments can also occur in democratic regimes (Komlos & Baur, 2004).

examining the effects of German reunification (Heineck, 2006; Hiermeyer, 2008; Komlos & Baur, 2004, Komlos & Kriwy, 2003) and heights. Consistently, West Germans were found to be taller than East Germans ((Komlos & Snowdon, 2005) but since unification there has been convergence in heights between East and West German males but, paradoxically not among females (Komlos & Kriwy, 2003). The latter finding has yet to be better understood, a priori it is not clear that everyone benefited from a process of political and economic liberalisation in the same way, and suggest that anthropometric returns to democracy and heterogeneous among socio-economic backgrounds, gender and other well known determinants of wellbeing.

This paper draws on evidence from a country that was in the Soviet bloc, but where break up followed after the transition, namely Czechoslovakia. We examine the trajectories of heights in the Czech Republic and Slovakia attributable to the the transition from communism to a liberal democracy. In contrast to the German unification example, Czechoslovakian broke up in two independent states that followed distinctive economic development institutional priorities. The combination of a transition to democracy (economic and political liberalization) and secession has lead some to regard the Czechoslovakian case as a “double bang”. That is, a rare case in history where two large liberalization forces coincided (Bookman, 1992). A country’s break up offers and opportunity to reshape each country’s institutions, reduce conflict and hence improve institutional quality (Bolton et al, 1996, Wittman, 1991, Friedman, 1977). Yet, whether the latter is indeed the case is an empirical question, which might not affect uniformly the entire population. Contentious issues include the following:

First, the benefits from transition to a liberal democratic society as well as separation of Czechoslovakia are likely to come with a lag, in part because the effect is intermediated by other reforms (e.g. the development of social protection, implementation of liberalization reforms etc). For instance, prior evidence reveals that during the time of transition, a deterioration in living standards occurred in Eastern Europe before any visible improvements took place (Adeyi, Chellaraj, Goldstein, Preker, & Ringold, 1997; Garner & Terrell, 1998; Milanovic, 1998; Stillman, 2006; Svejnar, 2002). Given the nature of elitist democracy in Eastern Europe (Przeworski, 1991), the rise of income inequalities and the reduction on gender inequality after 1989 (Heyns, 2005), we examine stature changes across age, gender and income groups. That is, we expect significant heterogeneity in the effect of economic and political liberalisation on heights. The latter is expected to help to further identify who were the winners of the transition to a liberal democracy and market economy, as well quantify the magnitude of gender and social inequalities. The latter is a question that we believe can contribute to testing some of the contentious hypotheses of the effect of democracy and secession on wellbeing (Nobles, Brown, & Catalano, 2010).

Second, most of the existing literature combines the effects of democratization across countries does compared different transition processes. The break up of Czechoslovakia allows us to identify the anthropometric effects of different trajectories³. This adds to the evidence on the democratic transition and its effects on institutions (Hausner, Jessop, & Nielsen, 1995; Inglot, 2008, 2009; Kostecki, Zukrowska, & Goralczyk, 2000; Milanovic, 1998; Whitefield, 1993; Winiecki & Kondratowicz, 1993) as well as wellbeing and health

³ The effect of the break up is even more complex insofar as both Slovakia and the Czech Republic lost some scale and gained some homogeneity to overcome the complexities of public decision making in multinational environments (Alesina and Spolaore, 1997, 2003). However, given that transition implied a whole institutional build-up (Milanovic, 1998), the costs of break up at that transition point might have been mitigated.

effects (Bobak & Feachem, 1992; Cornia & Panicià, 2000; Ginter, Simko, & Wsolova, 2009; Lawson & Nemeč, 2003; Stillman, 2006).

The next section contains the background on the specific case study. Section three reports the data and methods. Section four contains the results, section five the robustness checks and a final discussion section concludes the paper.

2. Institutional Setting

After World War II, in 1948 Czechoslovakia became under the Soviet influence. A ban on civil and political liberties alongside media censorship and economic dirigisme followed with the implementation of production plans and quotas. To enforce these measures, penalties included forced labour camps and possibly execution for extreme cases (Janik, 2010). The regime lasted forty years until 1989 (inclusive) with only the short Prague spring⁴ when reform was attempted. The degree of decentralization in Czechoslovakia was limited (Bookman, 1992). Although it became a federation in 1969, in 1971 a new re-centralization process emerged and continued until 1990 when regional decentralization was enacted too late just before the break up in 1992. Initially the steps taken in the two federations of Czechoslovakia were similar, but in 1992 a peaceful secession process was designed by the two main community leaders to create two separate countries in 1993. After secession reforms gradually began to differ. Czech Republic initially implemented aggressive economic reforms in combination with socio-economic entitlements and democracy. In contrast, in Slovakia the first years after the break-up were characterized by a

⁴ In 1968 the “Prague Spring” marked a short-lived period of liberalization and democratization with reforms but quickly ended with the Warsaw Pact troops’ invasion; any attempts for reforms were crushed and oppression under Soviet Communism continued for the next 20 years (Janik 2010).

continuation of authoritarian rule which left the country economically and politically isolated (Inglot, 2009; Meszaros, 1999).

Slovakia was severely disadvantaged throughout the 1990s in terms of policy leadership and necessary social expertise, coupled with rapid institutional changes departing from those of Czechoslovakia's past and in search of its new social welfare model (Inglot, 2009; Potucek & Radicova, 1997). Nonetheless, by 1998 the rapid economic growth in Czech Republic slowed down and the reverse happened in Slovakia. The Czech Republic was ready to join the EU while Slovakia's chances appeared slim. The period between 1989 and 2004 is characterized by some as the 'transformation shock' (Inglot, 2009). However, both countries reached an externally required level of political and economic transition and joined the European Union in 2004.

Already during the communist period, Czech Republic and Slovakia differed in their level of economic and social development. Life expectancy and mortality rate suggest that, despite both countries exhibiting improvements, Czechs continue to outperform the Slovaks even after the transition (Ginter, et al., 2009). The same is suggested by the Human Development Index (HDI) which also includes income and education in addition to life expectancy, and ranks Slovakia closely behind the Czech Republic (United Nations Development Programme).⁵ Overall, evidence suggests that the Czech Republic has been performing better during communism and has continued to outperform Slovakia in many

⁵ Indicators such as avoidable mortality that attempt to capture the changes in the quality and performance of the health care system suggest that before 1989 Czech Republic was doing better than Slovakia, but since the transition and independence, both countries' performance has improved; in a number of areas Slovakia has exceeded Czech Republic (Kossarova et al, 2012).

wellbeing indicators. However, the initial years after the transition in both countries were painful and reflected in a decline of overall welfare (Cox & Mason, 1999; Milanovic, 1998)⁶.

3. Data and Empirical Strategy

3.1 Data

This study uses as a primary data the 2003 World Health Survey (WHS) which is the baseline household survey for health status of populations and outcomes related to investments and functioning of health systems. Other alternative datasets were deemed unsuitable for the project mainly because they lack data on heights. The exception was the Eurobarometer survey 64.3 which we employ in the robustness checks. The WHS samples all the adult population over age 18 years old using a probability sampling design either with single or multi-stage random cluster sampling. Individual probability sampling weights were available to adjust for the probability of selection into the sample (World Health Organization, 2003). According to the WHS individual country reports provided by the WHO, the number of interviewed households was 935 in the Czech Republic and 1811. According to the official WHS country report of the Czech Republic, prepared by the Institute of Health Information and Statistics of the Czech Republic (Institute of Health Information and Statistics of the Czech Republic, 2004), the sample is representative of the population and follows the same procedure as the Slovak sample (see Appendix 1). We identified some potential selection bias driven primarily by low response rate of Czechs. When we examine age groups we find that the Czech sample is more uniformly distributed

⁶ Change in inequality between 1987-1988 and 1993-95 measured by the GINI coefficient showed that inequality increased in the Czech Republic but did not change in Slovakia. The shape of the change also differed: in Slovakia no income quintile gained or lost more than 1 percentage point; in the Czech Republic, the loss of 1-2 percentage points was concentrated in the bottom three quintiles, the fourth quintile experiencing a very small loss and the top quintile was the one benefiting. However, it has to be noted that given the overall income decline in both countries, the losers were losing more severely and the winners were not necessarily gaining in real income.

across age groups. Hence, we will come address this question in the robustness checks where we carry on the same analysis with a sample from another survey that employs stratified random sampling and have barely non missing observations for height. Other two potential sources of concern refer to differential migration between countries and different trends in mortality across countries. However, other studies do not find evidence consistent with such an effect (Kossarova et al, 2012).

The survey includes information individual's height (in cm) as well as information on other important variables that are controlled for including education, income, rural or urban location, employment and others. The control variables are based on the conceptual framework of determinants of height defined by Steckel (1995). Table 1 below summarizes the descriptive statistics for all the variables used in the analysis.

Table 1. Variable description

<i>Variable</i>	<i>Variable description</i>	<i>Obs</i>
height	Adult height in cm	2726
gend	=1 if male; 0 if female	2726
co	=1 if Czech Republic; 0 if Slovakia	2726
popul_cz	= number of Czechs	920
popul_sk	= number of Slovaks	1806
age70_98	=1 if the individual was born between 1910-1933; 0 otherwise	2726
age60_69	=1 if the individual was born between 1934-1943; 0 otherwise	2726
age50_59	=1 if the individual was born between 1944-1953; 0 otherwise	2726
age40_49	=1 if the individual was born between 1954-1963; 0 otherwise	2726
age30_39	=1 if the individual was born between 1964-1973; 0 otherwise	2726
age18_29	=1 if the individual was born between 1974-1985; 0 otherwise	2726
educ1	=1 if individual has primary education or less; 0 otherwise	2724

educ2	=1 if individual completed secondary education; 0 otherwise	2724
educ3	=1 if individual completed high school/equivalent education; 0 otherwise	2724
educ4	=1 if individual completed college or higher level education; 0 otherwise	2724
job1	=1 if individual is working; 0 otherwise	2702
income	estimated permanent income of individual	2596
qincome1	bottom income tercile	2596
qincome2	middle income tercile	2596
qincome3	top income tercile	2596
demage	Years spent under democracy before the age of 20	2726
indage	Years spent under independence before the age of 20	2726
demd	=1 if individual was raised at least 1 year under democracy before age 20; 0 otherwise	2726
indd	=1 if individual was raised at least 1 year in independent country before age 20; 0 otherwise	2726
dempolity	Years spent under democracy from 1993-2003, adjusted for the "quality of democracy" with the Polity IV democracy score	2726
language	=1 if individual reported a language; 0 otherwise	2726

Source: World Health Survey, 2003.

Given that the dataset contained no income or wealth data, we defined a variable as predicted permanent income (*income*) which acts as a proxy data reduction technique from a series of questions on the ownership of particular household objects (e.g. number of cars, TVs, rooms, ownership of phone, video camera, computer and access to internet)⁷. (Filmer & Pritchett, 1999; Komlos & Baur, 2004; Persico, et al., 2004). Polychoric correlation was first carried out as the variables are constructed as counts or dummies followed by factor analysis to reduce the several correlated variables into one variable. The predicted income variable was then standardized and converted into three income terciles which we expect will capture

⁷ One of the advantage of the employed measures of socio-economic status lies in that under high inflation rates, income might not be precisely measured anyway.

some of the heterogeneity in the anthropometric effects to be estimated⁸. The literature suggests that there are diminishing returns to nutrient intake suggesting that the height of the rich is expected to increase by less than is the decline in the height of the poor (Komlos, 2009).

An important control to include in the regression analysis is education (*educ*) data which we measure as a proxy of individual abilities and a predictor of an individual's efficiency in health production (Costa-Font & Gil, 2008; D.S. Kenkel, 1991). It is presented in four categories from those with less than primary education completed all the way to those with a post-graduate degree completed. In addition, we control for urban and rural differences in height as those in urban areas are more likely to have easy access to resources (Costa-Font & Gil, 2008). The variable *job* captures the employment status and a dummy variable was included to capture the country effect (*co*) – Slovakia and Czech Republic. We use six age categories represent the effect of the different birth cohorts, where the 1974-1985 birth cohort was selected as the reference category. Finally, although ethnicity as such as not available, we employed a dummy variable *language* which highly correlated with ethnicity, and may be capturing individuals belonging to one of the important ethnic minorities in Czech Republic and Slovakia (e.g. Roma, Hungarians).

The key explanatory variables are represented by the number of years a person has lived under democracy (*damage*) and independence (*indage*) before they reach 20 years of age⁹. For democracy (after 1989, starting at 1990), these are individuals aged 18 to 33 year

⁸ Given that nutrition is a function of income, a positive association between height and income is expected; however, it should also be noted that the height-income relationship is not stable in the face of epidemiological conditions; at a given income, improvements in public health, personal life style and childcare practices, the prevalence of disease may be reduced and physical growth enhanced (Peracchi, 2008; Steckel, 2009).

⁹ We have tested the effect of reducing the cut-off point by one year to capture individuals up until they reach the age of 18. The results for the overall sample were not significantly different.

in year 2003 (birth cohorts 1970 - 1985) who lived their first 20 years between 14 to 1 year under democracy (4 to 19 years under communism). All the older individuals lived all the years before they reach 20 years of age under communism. Similarly, for independence (1993), individuals aged 18 to 30 in year 2003 (birth cohorts 1973-1985) lived their first 20 years between 11 to 1 year as part of an independent country (or 7 to 19 years as part of Czechoslovakia). These variables were first tested employing for construction purposes a crude measure of democracy using a dummy variable with a value of 0 for those who were raised zero years under democracy (*demd*) independent (*indd*) country and 1 otherwise. The purpose is to see whether being raised for any number of years under a democracy/independence as opposed to none matters or whether it is rather the increasing number of years that has an impact.

Given that measuring the effect of a democracy with a dummy variable is too crude assumption, we then controlled for the “quality” of the democratic years by means of adding the most well accepted index of democracy, the so-called the Polity IV institutionalized democracy variable (*dempolity*) after 1993 for independent Slovakia and Czech Republic¹⁰. In other words, whether someone was a child during the 1993-1997 democratic years may not be the same as growing up under the 2000-2003 democratic years and later (see Appendix 2 for details). For both types of democracy variables and independence variable a positive association with height was expected. However, as the independence and democracy variables are likely to be confounded and the changes that occurred as a result of one or the other transition cannot be appropriately controlled for, these are included in separate regressions.

¹⁰ The goal of the Polity IV project is to code the authority characteristics of states in the world system for purposes of comparative, quantitative analysis. It has become the most widely used resource for monitoring regime change and studying the effects of regime authority (Center for Systemic Peace).

Finally, the following interaction terms are also included: two-way interaction variables between country and years under democracy/independence, income and years under democracy/independence, income and country, as well as a three-way interaction between income terciles, years under democracy/independence. The goal is to see whether the effect of democracy was country or income group dependent, especially given the fact the Czech Republic was initially performing significantly better on many grounds than Slovakia. As the direct interpretation of three-way interactions is complicated, where the term is significant, additional visual analysis is carried out. This was done by graphing the slopes of height by one of the continuous variables, while allowing for the other two categorical variables to differ. Then the slopes were calculated followed by a test of differences in slopes (Institute of Research and Digital Education, 2013).

3.2 Empirical Strategy

Although the samples of the countries considered could be conceived in terms of a causal analysis employing regression discontinuity designs or a synthetic control, this paper primarily attempts identify whether there is an effect on the first place, and whether the effect is robust. Hence, a classical ordinary least squares (OLS) regression model is employed to examine the effect of democracy and independence on the mean height of the population, as well as the other control variables on height. The advantage of OLS is that the coefficients are easy to interpret and pose few restrictions compared to alternative modeling options. The latter is particularly the case in the presence of dummy variables. Furthermore, the continuous nature of height data on centimeters makes OLS more suitable, even though the

censored nature of height at zero and around 200-220cm. The model for the effect of democracy is as follows:

$$H = f(\text{democracy}, \text{gender}, \text{country}, \text{age}, \text{education}, \text{job}, \text{income}, \text{language})$$

More specifically, the models can be expressed as:

$$\begin{aligned} \text{Height}_i = & \beta_0 + \beta_1 \text{democracy}_i + \beta_2 \text{gend}_i + \beta_3 \text{age}_i + \beta_4 \text{educ}_i + \beta_5 \text{job}_i + \\ & + \beta_6 \text{income}_i + \beta_7 \text{co}_i + \beta_8 \text{language}_i + \varepsilon_i \end{aligned} \quad (1)$$

for observations $i = 1 \dots n$, where democracy is mainly a continuous variable (*demage* or *indage*) measuring the number of years under a democratic regime, ε_{it} is the unobserved random error which captures random factors that may affect height. Given the potential sample selection problem, in addition to employing a second dataset, we estimated a propensity score matching (PSM) specification on health as an observable, but no evidence of selection was found. Hence, we continue employing a convenient OLS model.

4. Results

4.1 Preliminary evidence

Table 2 displays a height difference between males and females as well as between the Slovak and the Czech population by age groups¹¹. As expected in all populations, we find an increasing height trend across the age cohorts, where older generations are shorter than the younger ones. The range for Slovak males between the oldest and the youngest age groups is as much as 8.79cm, followed by Czech males (8.41cm), Slovak females (6.99cm) and Czech

¹¹ This is important given that the most important effect of height can be observed among individuals under 50 due to the existence of height shrinkage after that age.

females (5.97cm). We find large relevant height difference between the two countries for males aged 30-39 (born 1964-1973) and females aged 40-49 (born between 1954-1963). Overall, the difference over age cohorts appears to be more important than the difference between the two countries.

Table 2. Mean height by gender and country, 2003

	<i>SLOVAKIA</i>		<i>CZECH</i>	
	Mean height	Std. Dev.	Mean height	Std. Dev.
WOMEN				
18_29	167.69	5.68	168.55	6.53
30_39	166.32	5.66	166.17	6.38
40_49	164.63	5.98	166.39	7.28
50_59	164.09	5.74	164.35	5.35
60_69	161.83	5.80	162.70	5.53
70_98	160.70	5.30	162.58	5.81
MEN				
18_29	180.79	7.44	180.24	7.46
30_39	178.88	7.27	180.84	6.95
40_49	178.61	6.85	178.52	7.45
50_59	175.82	5.67	176.09	6.51
60_69	171.67	6.67	174.92	6.16
70_98	172.00	6.91	171.83	6.14

Note: No adjustment with weights was carried out

Source: World Health Survey. WHO, 2003.

As expected, the heights distribution is heterogeneous across income terciles within and across countries (Table 3 and Figure 1). The average height of the Slovak females in the lowest tercile is only 164.6cm, increasing to 166.1cm in the mid and top terciles. Slovak males' height gradually increases across tercile from 176.8cm to 178.6cm and 180.3cm respectively. Czech females are 164.4cm in the lowest tercile, 164.8cm in the mid and increases to 167.1cm in the top group. Finally, the poorest Czech males are 175.3cm, increasing to 177cm and 180.2cm in the mid and highest income terciles respectively.

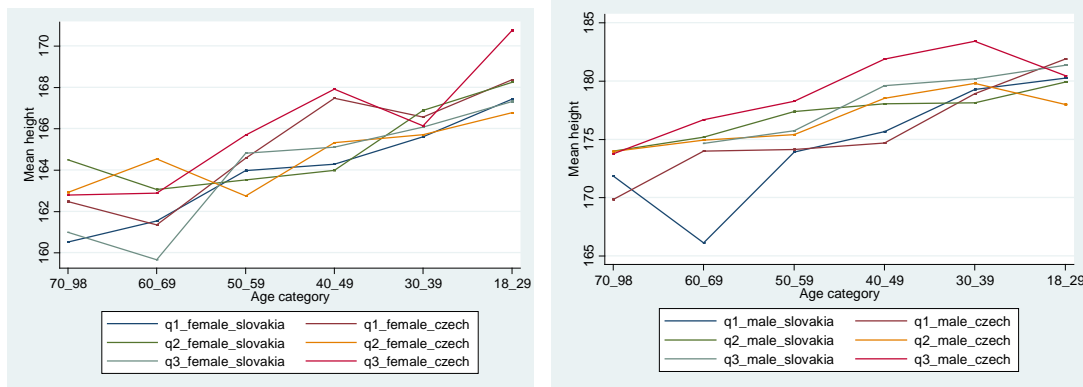
Table 3. Average height by terciles, gender and country

<i>Variable</i>	<i>Obs</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
q1_female_SK	408	164.62	2.24	160.512	167.43
q1_male_SK	143	176.78	3.97	166.12	180.24
q1_female_CZ	190	164.42	2.49	161.34	168.36
q1_male_CZ	133	175.26	4.06	169.83	181.9
q2_female_SK	352	166.12	2.04	163.07	168.24
q2_male_SK	202	178.60	1.37	173	179.93
q2_female_CZ	185	164.82	1.47	162.76	166.78
q2_male_CZ	140	177.01	2.22	173.96	179.82
q3_female_SK	380	166.07	1.22	159.67	167.67
q3_male_SK	234	180.31	1.73	174.67	181.36
q3_female_CZ	123	167.08	2.44	162.8	170.75
q3_male_CZ	130	180.21	2.76	173.77	183.43

Note: No adjustment with weights was carried out

Figure 1 plots the height difference across terciles by age cohorts exhibiting that regardless of the income tercile, height increases from the oldest to the youngest generations. As expected, Figure 1 also suggest some variation in the mean height for males and females across the age cohorts and income terciles, with the richest Czechs being the tallest across cohorts.

Figure 1. Height by income tercile, age group, gender and country, 2003. Poorest (q1), middle (q2), top (q3)



4.2 Regression Results

After the descriptive estimates suggest evidence of height changes by cohort, age and country beyond the existence of secular trends we then move on to regression analysis. We start reporting first the regression results where the key independent variable democracy is included in the analysis as a dummy variable (taking the value of one for those who spent at least 1 year growing up under democracy and zero otherwise) are presented (Table A1 in the Appendix 3)¹².

The complete sets of regressions where democracy is included as a continuous variable are summarized in Table 4. The results show that an additional year spent under democracy while growing up yields a small significant and positive effect on height, contrary to the findings above where democracy was included as a dummy variable. The effect of the

¹² It can be seen that the sign and the significance of the variable changes depending on the model specification which is mainly the results of lower power estimates under smaller sample sizes, but for the most complete estimates (in specification 3 and 7), we find evidence of positively significant effect, similarly to the country effect. However, the measurement of democracy as a dummy offers an incomplete interpretation.

other variables (education, gender, income) is still significant in the same direction even though the size of the coefficients differs somewhat. However, age cohort is only significantly negatively associated with the height of the youngest age cohort for individuals born before 1953. In other words, there is no significant difference in height between the three youngest cohorts, all of which grew up predominantly under communism. Although the country effect is not consistently significant across the models, the results suggest a significant effect by income terciles (specification 3) where the bottom and middle tercile are shorter than the top tercile. Also, there is a significant effect of job status where those employed are significantly taller than the unemployed, and a significant education effect. Interactions are again included in specifications 3, 4 and 5 and only the interaction between country and democracy is significant (specification 3). Now democracy is a continuous variable so the interpretation is slightly different from before. With an additional year spent under democracy while growing up, height increases by 0.286cm for Slovaks and 0.148cm for Czechs. *In other words, height gap between Czechs than Slovaks is 1.141cm if a person spent zero years under democracy and this difference in height becomes smaller for each additional year under democracy ($1.141 - 0.138 * \text{demage}$).* Similarly, as before, results indicate that democracy seems to be benefiting the Slovaks more than the Czechs. In specification 7 the three-way interaction is significant and the model is also preferred to the model with income only, based on the results of the likelihood ratio test.

Table 4. OLS regressions of years lived under democracy as a continuous variable on height with different controls

VARIABLES	(1) Eq.1	(2) Eq.2	(3) Eq.3	(4) Eq.4	(5) Eq.5	(6) Eq.6	(7) Eq.7
demage	0.264*** (0.0714)	0.217*** (0.0735)	0.286*** (0.0783)	0.221*** (0.0754)	0.222*** (0.0737)	0.202*** (0.0734)	0.432*** (0.110)
1.co#c.demage							-0.251** (0.105)
2.qincome							0.643 (0.840)
3.qincome							1.353 (0.843)
1o.co#1b.qincome							0 (0)
1.co#2.qincome							-0.135 (0.920)
1.co#3.qincome							0.358 (0.933)
2.qincome#c.demage							-0.291*** (0.112)
3.qincome#c.demage							-0.286** (0.111)
1o.co#1b.qincome#co.demage							0 (0)
1.co#2.qincome#c.demage							0.0340 (0.140)
1.co#3.qincome#c.demage							0.379*** (0.137)
gend	13.12*** (0.249)	12.99*** (0.254)	12.97*** (0.254)	13.00*** (0.255)	12.98*** (0.255)	12.98*** (0.254)	12.49*** (0.251)
language							1.065 (4.279)
geog							0.196 (0.322)
age30_39	0.933 (0.739)	0.662 (0.758)	0.521 (0.759)	0.668 (0.759)	0.685 (0.758)	0.390 (0.758)	-0.226 (0.756)
age40_49	0.822 (0.834)	0.535 (0.856)	0.394 (0.857)	0.542 (0.857)	0.572 (0.857)	0.357 (0.854)	-0.149 (0.855)
age50_59	-2.752*** (0.848)	-2.950*** (0.868)	-3.191*** (0.872)	-2.934*** (0.871)	-2.901*** (0.869)	-3.154*** (0.867)	-3.625*** (0.874)
age60_69	-3.145*** (0.882)	-3.036*** (0.902)	-3.330*** (0.909)	-3.013*** (0.906)	-2.974*** (0.904)	-3.324*** (0.901)	-3.417*** (0.945)
age70_98	-5.017*** (0.853)	-4.648*** (0.874)	-4.958*** (0.882)	-4.623*** (0.880)	-4.577*** (0.876)	-4.986*** (0.873)	-4.715*** (0.929)
educ2							1.505*** (0.405)
educ3							1.409*** (0.397)
educ4							2.063*** (0.528)
job1							0.630** (0.318)
dem_co			-0.138** (0.0543)				
co	0.458 (0.290)	0.458 (0.296)	1.141*** (0.400)	0.454 (0.297)	0.342 (0.313)	0.542* (0.296)	1.335** (0.637)
income		0.909*** (0.145)	0.894*** (0.145)	0.937*** (0.179)	0.679*** (0.248)		
dem_inc				-0.00755 (0.0284)			
inc_co					0.340		

					(0.298)		
qincome1						-1.924***	
						(0.326)	
qincome2						-2.184***	
						(0.305)	
Constant	165.0***	165.0***	164.7***	165.0***	165.1***	166.9***	161.8***
	(0.801)	(0.825)	(0.834)	(0.827)	(0.826)	(0.853)	(4.439)
Observations	2,726	2,596	2,596	2,596	2,596	2,596	2,572
R-squared	0.569	0.576	0.577	0.576	0.577	0.579	0.583

When the regression is decomposed by gender, the effects are quite different for men and women (Table 5 and 6) consistently with previous studies on German reunification. The interaction terms were excluded for the purpose of simplicity. For males, years under democracy is significantly associated with a height increase in all the specifications. The country effect shows that the Czech males are shorter than Slovak males. A large positive significant income effect both as a continuous variable and when included in income terciles can be noted, and there is significant positive education effect as years of completed education increase. However, the results for the birth cohorts show an important difference where actually the birth cohorts 1954-1963 and 1964-1973 are significantly taller than the youngest birth cohort 1974-1985; the oldest birth cohort is significantly shorter than the youngest birth cohort. *In other words, there appears to be height gain between the youngest age cohort growing up under democracy and the previous generation.*

For women (Table 6), and consistently with Komlos and Snowden (2005) study, we find that *years spent under democracy while growing up is not significantly associated with a height increase among women.* Again there is a significant country effect; however, it is the Czech women who are taller than the Slovak women. Education also has a significant effect on height but whether or not women are employed does not seem to affect height. Here income is not significantly associated with an increase in height and when included in income

terciles, it is only the middle tercile that is significantly shorter than the top tercile. All the cohorts of women born before 1953 are significantly shorter than the youngest cohort but there is no significant difference between the youngest cohort and the next two older cohorts. *So to summaries the gender specific results, it is democracy, income and job that matters for men while for women there is no income or democracy effect, but a strong country effect.*

Table 5. OLS regressions of years lived under democracy on height with different controls – male

VARIABLES	(1) Eq.1	(2) Eq.2	(3) Eq.3	(4) Eq.4
Demage	0.428*** (0.125)	0.317** (0.127)	0.301** (0.127)	0.273** (0.134)
Co	-1.538*** (0.539)	-1.729*** (0.537)	-1.592*** (0.531)	-0.785 (0.542)
Income		1.968*** (0.251)		1.742*** (0.251)
Geog				0.632 (0.597)
Language				6.520 (7.379)
age30_39	3.473** (1.350)	3.238** (1.365)	3.039** (1.354)	2.253* (1.356)
age40_49	3.876*** (1.501)	2.989** (1.518)	2.727* (1.504)	2.584* (1.531)
age50_59	-1.816 (1.538)	-2.268 (1.552)	-2.452 (1.550)	-2.788* (1.584)
age60_69	-1.386 (1.637)	-1.384 (1.653)	-1.833 (1.644)	-1.485 (1.754)
age70_98	-4.168*** (1.520)	-3.565** (1.535)	-3.895** (1.525)	-3.087* (1.682)
educ2				2.277*** (0.753)
educ3				1.383* (0.720)
educ4				2.559*** (0.905)
job1				1.109* (0.573)
qincome1			-4.743*** (0.553)	
qincome2			-3.716*** (0.510)	
Constant	177.7***	177.8***	181.3***	168.1***

	(1.446)	(1.475)	(1.513)	(7.592)
Observations	1,025	976	976	967
R-squared	0.222	0.266	0.284	0.261

Finally, the complete sets of regressions where democracy is included as a continuous variable adjusted with the Polity IV score are presented in the Appendix 4. The results are very similar to those presented earlier without the adjustment. The significance of the coefficients does not change, only somewhat the magnitude depending on the Model.

Table 6. OLS regressions of years lived under democracy on height with different controls – female

VARIABLES	(1) Eq.1	(2) Eq.2	(3) Eq.3	(4) Eq.4
demage	0.0967 (0.0824)	0.0851 (0.0849)	0.0971 (0.0847)	0.107 (0.0883)
co	1.725*** (0.319)	1.811*** (0.329)	1.894*** (0.329)	2.107*** (0.342)
income		0.0962 (0.167)		0.00384 (0.170)
geog				0.0157 (0.360)
language				-1.899 (5.031)
age30_39	-1.018 (0.820)	-1.123 (0.843)	-1.185 (0.842)	-1.066 (0.864)
age40_49	-1.493 (0.937)	-1.494 (0.962)	-1.357 (0.960)	-1.205 (0.990)
age50_59	-3.742*** (0.946)	-3.950*** (0.970)	-3.935*** (0.966)	-3.620*** (0.995)
age60_69	-4.861*** (0.973)	-4.915*** (0.997)	-5.062*** (0.993)	-4.543*** (1.063)
age70_98	-5.563*** (0.963)	-5.580*** (0.990)	-5.843*** (0.986)	-4.960*** (1.062)
educ2				0.884* (0.452)
educ3				1.710*** (0.438)
educ4				1.885*** (0.631)
job1				-0.153 (0.370)
qincome1			0.422 (0.381)	
qincome2			-0.775** (0.364)	
Constant	165.8*** (0.895)	165.8*** (0.921)	165.9*** (0.951)	166.1*** (5.185)

Observations	1,701	1,620	1,620	1,605
R-squared	0.131	0.133	0.140	0.141

The complete sets of regressions that look at the effect of years lived under independence are summarized in Table 7. As before we now focus on the effect of years spend under democracy, the results show that all the generations born before 1973 are significantly shorter than the youngest generation. With increased education, there is a significant positive effect on height, while job is not significant. There is a positive overall income effect on height as well as by income terciles where those in the bottom and mid terciles are significantly shorter than people in the top tercile. Results show that an additional year spent in independent Slovakia or Czech Republic while growing up there is a significant positive effect on height. These results resemble the results for democracy. The effect of the other variables (education, gender, income, income terciles) is still significant in the same direction even though the size of the coefficients differs somewhat. Here again age cohort is only significantly negatively associated with the height of the youngest age cohort for those born before 1953. In other words, there is again no significant difference in height between the youngest generation growing up almost entirely in an independent country and those growing up under Czechoslovakia. The only interactions that are significant are the ones in Models 3 and the three-way interaction in specification 7. The interaction between independence and country in specification 3 indicate that an additional year spent in independent countries while growing up, height increases by 0.4cm for Slovaks and 0.2cm for Czechs. In other words, *height is 1cm more for Czechs than Slovaks if a person spent zero years under independence and this difference in height becomes smaller by 0.153 for each additional year under independence ($1 - 0.153 * \text{indage}$).* In specification 7 the three-way

interaction is significant and the model is also preferred to the model with income only, based on the results of the likelihood ratio test.

Table 7. OLS regressions of years lived under independence as a continuous variable on height with different controls

VARIABLES	(1) Eq.1	(2) Eq.2	(3) Eq.3	(4) Eq.4	(5) Eq.5	(6) Eq.6	(7) Eq.7
indage	0.318*** (0.0790)	0.269*** (0.0809)	0.345*** (0.0882)	0.262*** (0.0836)	0.274*** (0.0810)	0.257*** (0.0807)	0.534*** (0.137)
1.co#c.indage							-0.314** (0.140)
2.qincome							0.439 (0.805)
3.qincome							1.262 (0.802)
1o.co#1b.qincome							0 (0)
1.co#2.qincome							-0.00719 (0.884)
1.co#3.qincome							0.366 (0.891)
2.qincome#c.indage							-0.352** (0.147)
3.qincome#c.indage							-0.368** (0.145)
1o.co#1b.qincome#co.indage							0 (0)
1.co#2.qincome#c.indage							0.0109 (0.186)
1.co#3.qincome#c.indage							0.567*** (0.180)
gend	13.10*** (0.249)	12.98*** (0.255)	12.96*** (0.254)	12.98*** (0.255)	12.97*** (0.255)	12.97*** (0.254)	12.44*** (0.251)
geog							0.231 (0.322)
language							1.169 (4.274)
age30_39	0.848 (0.677)	0.645 (0.691)	0.509 (0.694)	0.639 (0.692)	0.660 (0.691)	0.426 (0.691)	-0.150 (0.690)
age40_49	0.429 (0.699)	0.267 (0.712)	0.165 (0.713)	0.262 (0.712)	0.291 (0.712)	0.162 (0.710)	-0.252 (0.709)
age50_59	-3.149*** (0.714)	-3.223*** (0.728)	-3.400*** (0.732)	-3.238*** (0.730)	-3.187*** (0.729)	-3.352*** (0.727)	-3.727*** (0.731)
age60_69	-3.545*** (0.755)	-3.312*** (0.769)	-3.530*** (0.775)	-3.332*** (0.772)	-3.263*** (0.770)	-3.525*** (0.768)	-3.503*** (0.807)
age70_98	-5.415*** (0.720)	-4.922*** (0.736)	-5.152*** (0.743)	-4.945*** (0.740)	-4.864*** (0.738)	-5.185*** (0.735)	-4.800*** (0.787)

educ2							1.535*** (0.405)
educ3							1.396*** (0.395)
educ4							2.095*** (0.528)
job1							0.655** (0.317)
ind_co			-0.153** (0.0711)				
co	0.483* (0.290)	0.481 (0.297)	1.001*** (0.382)	0.485 (0.297)	0.364 (0.314)	0.565* (0.296)	1.157* (0.617)
income		0.908*** (0.145)	0.895*** (0.145)	0.880*** (0.172)	0.675*** (0.248)		
ind_inc				0.0109 (0.0375)			
inc_co					0.343 (0.298)		
qincome1						-1.930*** (0.326)	
qincome2						-2.182*** (0.304)	
Constant	165.4*** (0.659)	165.3*** (0.675)	165.0*** (0.685)	165.3*** (0.677)	165.4*** (0.678)	167.0*** (0.704)	162.0*** (4.398)
Observations	2,726	2,596	2,596	2,596	2,596	2,596	2,572
R-squared	0.570	0.577	0.578	0.577	0.577	0.580	0.584

When the regression is decomposed by sex, similarly to the case of democracy, the effects were quite different for men and women (see Appendix 5). For males, years under independence is found to significantly be associated with a height increase in all the models. In contrast, for women, years spent under independence is not significantly associated with a height increase in any of the models while a significant positive country effect with Czech women being taller than Slovak women in all models can be observed. There is again a significant education effect while job is not significant for females. Income is not significantly associated with height only when it is included as income terciles where the women in the middle tercile are significantly shorter than the top tercile. The effect of the birth cohort is the same as in the aggregate model where all the cohorts are significantly shorter than the youngest cohort.

4.3 Robustness checks

Two main robustness checks are carried out. First, a reduced sample excluding individuals who are over the age of 50 was analyzed as at older ages people's height begins to shrink. As a result, the coefficients obtained may have been overestimated. The older individuals are also those who grew up their entire childhood and youth under communism. This double effect may have been biasing the results. The results show that with every additional year growing up under democracy, there is between a 0.17 and 0.37cm height increase. As expected, the coefficients are somewhat lower in this analysis but overall exhibit the same sign and interpretation.

Second, to address potential sample selection concerns we use data from the 2005 Eurobarometer survey (Eurobarometer 64.3: Foreign Languages, Biotechnology, Organized Crime, and Health Items, November - December, 2005). The Eurobarometer (EB) survey is a series of cross-national and cross-temporal comparative social science research that started in the early seventies. The sample size is of 1000 respondents per country. Representative national samples are interviewed in the European Union member states twice a year. The goal of the EB is to provide data for monitoring of public social and political attitudes in the European Union¹³ (Economic and Social Data Service, 2005). This round of the EB survey asked respondents on foreign languages, biotechnology, organised crime and corruption, health consciousness, smoking, AIDS prevention, medical errors, and consumer rights. For the purpose of the analysis, the relevant data came from the demographic and other background information section, including the respondents' height, age, gender, occupation and urban/rural residence. The variables included are similar to the variables used in the

¹³ For more information see the Leibniz Institute for the Social Sciences, Data Archive for the Social Sciences (GESIS) Eurobarometer Survey Series web pages.

analysis; however there was no data that would allow for a better proxy of income or wealth of the individuals. As a result, only the results from the basic model will be compared. Below the main results are summarized in Table 8.

Table 1. OLS regressions of years lived under democracy as a continuous variable on height with different controls – individuals aged 50 and less

VARIABLES	(1) Eq.1	(2) Eq.2	(3) Eq.3	(4) Eq.4	(5) Eq.5	(6) Eq.6	(7) Eq.7
demage	0.171*** (0.0294)	0.199*** (0.0762)	0.285*** (0.0828)	0.207*** (0.0781)	0.204*** (0.0762)	0.174** (0.0757)	0.356*** (0.123)
1.co#c.demage							-0.295** (0.125)
2.qincome							-0.497 (1.065)
3.qincome							0.822 (1.023)
1o.co#1b.qincome							0 (0)
1.co#2.qincome							-0.446 (1.255)
1.co#3.qincome							0.0390 (1.218)
2.qincome#c.demage							-0.188 (0.127)
3.qincome#c.demage							-0.233* (0.123)
1o.co#1b.qincome#co.demage							0 (0)
1.co#2.qincome#c.demage							0.0854 (0.163)
1.co#3.qincome#c.demage							0.397** (0.156)
gend	14.20*** (0.307)	14.09*** (0.315)	14.04*** (0.315)	14.10*** (0.315)	14.08*** (0.315)	14.13*** (0.312)	13.53*** (0.311)
language							1.019 (4.268)
geog							0.580 (0.406)
age30_39		0.717 (0.780)	0.563 (0.781)	0.727 (0.781)	0.744 (0.780)	0.294 (0.778)	-0.283 (0.780)
age40_49		0.478 (0.883)	0.348 (0.882)	0.488 (0.883)	0.517 (0.882)	0.257 (0.877)	-0.236 (0.886)
educ2							1.097* (0.614)
educ3							1.033* (0.601)
educ4							1.323* (0.764)

job1							0.578 (0.373)
dem_co			-0.160*** (0.0608)				
co	0.266 (0.323)	0.298 (0.333)	1.282** (0.500)	0.291 (0.333)	0.0177 (0.370)	0.385 (0.330)	1.657* (0.946)
income		0.884*** (0.171)	0.872*** (0.171)	0.964*** (0.237)	0.521* (0.272)		
dem_inc				-0.0156 (0.0320)			
inc_co					0.599* (0.349)		
qincome1						-1.203*** (0.400)	
qincome2						-2.641*** (0.350)	
Constant	165.6*** (0.333)	164.7*** (0.862)	164.2*** (0.884)	164.7*** (0.866)	164.9*** (0.866)	166.6*** (0.892)	162.2*** (4.504)
Observations	1,917	1,816	1,816	1,816	1,816	1,816	1,805
R-squared	0.551	0.556	0.558	0.556	0.557	0.563	0.564

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

When democracy is included as a continuous variable, there is again a positive significant association with height for every additional year lived under democracy. Confirming the main results, the age cohort effect is again only significant for the older generations starting for individuals born before 1955. Results were different in the analysis by gender where a significant height increase can be observed for women rather than men. When independence is examined, results follow the same pattern as for democracy with respect to the WHS results. Overall, the minor difference, especially the gender and the country effect, is likely to be explained by the difference in samples resulting from a different sampling method used by the EB survey where either multi-stage national probability samples or national stratified quota samples are implemented, as opposed to stratified random sampling in the WHS.

5. Discussion

This paper has examined whether changes in human height in the Czech Republic and Slovakia can be attributed to the transition to a liberal economy and democracy, alongside the breakup from Czechoslovakian federation. Overall, the following results emerge. First, there has been a significant height increase for every additional year spent under democracy (0.2-0.4cm; 0.18-0.36cm for sample younger than 50 (to account for shrinkage) or as independent countries, and part of this effect can be attributed to the transition. Second, political and economic liberalization appears to have exerted beneficial effects on heights that compare to those of other studies in East and West Germany, and Spain among others (Costa-Font & Gil, 2008; Hiermeyer, 2008; Komlos & Kriwy, 2002; Komlos & Snowden, 2005). Our results suggest that the transition period did not have a detrimental effect on health and standard of living as heights have continued to increase in both countries¹⁴. Finally, the results were largely heterogeneous. Indeed, when examining the results by income terciles we find that height increases from the poorest to the richest tercile, for both men and women, implying that similarly to Germany (Komlos & Kriwy, 2003), social differences in height exist in both the Czech Republic and Slovakia. Changes in height by gender groups were also examined and robustness was tested by employing a second dataset. Our findings hold even when democracy is adjusted with the Polity IV index or the analysis is carried out with a different data set.

These findings are also consistent with the extensive evidence suggesting that inequalities were present already under communism and continued to widen in both countries after 1989 (Cox & Mason, 1999; Milanovic, 1998; Simai, 2006; Szamuely, 1996). There is

¹⁴ Indeed, despite the existing evidence of an initial deterioration in the standard of living in the transition countries (Leff, 1996; Milanovic, 1998), our results demonstrate that starting from 1990 there continues to be a small positive effect on well-being as measured by an increase in height.

also a significant education and gender effect. The level of education achieved is an important determinant of the individual's height. It is important to note that most of the height literature focuses on parental education as a key determinant (Christiaensen & Alderman, 2004; Fedorov & Sahn, 2005) so the education of the individual in this context was a proxy for the individual's capabilities and the importance of schooling on health behaviour (Costa-Font & Gil, 2008; Donald S. Kenkel, 1991). There is no consistent country effect across the models.

The statistically significant interaction between country and years spent under democracy implies that the democracy effect was not the same in the two countries. While the Czechs are on average taller, the Slovaks seemed to have benefited more from the transition to democracy. This result confirms the general hypothesis that the one performing worse has a bigger capacity to benefit. Slovakia was the poorer federation during communism and also had a rougher transition in the initial years under authoritarian rule (Meszaros, 1999). Nevertheless, the Slovaks seem to have benefited from this transition more than the Czechs, which over years has brought an increase in their well-being and standard of living as measured by height.

When comparing across countries by income distribution, the Slovaks benefited more than the Czechs in the bottom and mid tercile with no difference in the top group. Furthermore, with increasing number of years under democracy the poorest in Slovakia benefited more in height than both the mid and top tercile. In the Czech Republic, the bottom tercile benefited more than the middle, and the middle less than the top tercile. As noted above, evidence of inequalities and poverty since transition has been documented. The transition brought along significant social changes where particular groups benefited –

especially those who were benefiting under the previous regime – while others such as pensioners, workers, ethnic groups or women were able to benefit much less; the cost of transition weighed most heavily on ordinary citizens who felt that they had too little influence on the political decisions that affected them (Leff, 1996; Simai, 2006).

The analysis revealed heterogeneous findings when carried out separately for women and men. For men, the years spent growing up under democracy are significantly positively associated with height, even after controlling for a number of controls. In contrast, no effect is found for women consistently with Komlos and Sowden (2005). The lack of a significant democracy effect for women actually suggests that the institutional and environmental effects during the transition did not bring substantial improvements for women compared to their position in the society under communism; the latter is the case even when we control for employment status and socio-economic position (Leff, 1996). Given that the effect is measured on height, which is fixed at age 20, changes after than age would not be expected to have exerted an influence. Finally, education was an important determinant for both males and females, while income and employment are only significant for men.

There are several limitations to this study. First, the low response rate in the WHS data used for the Czech population may have introduced bias in the results, as non-response bias where responders may be significantly different from non-responders, is difficult to account for. However, when the same analysis was carried out with 2005 Eurobarometer 64.3 the overall picture remained. Second, survey data on heights tends to contain self-reporting bias, which limits the precision of the magnitude of our estimates, however, similarly as in studies measuring self-reported health they tend to be widely employed and validated. In addition, we expect such a bias to be present across country and age by a comparable magnitude, hence

although it would bias the absolute height estimate it is unlikely to affect relative estimates. However, this is indeed one of the main limitation of studies relying on self reported data which we must acknowledge. Thirdly, as has already been mentioned, it was not possible to disentangle the effects of the 1989 transition to democracy and the 1993 disintegration of Czechoslovakia, even though both appeared to have a positive effect on stature as no acceptable control group could be identified. Finally, it can be argued that height does not depend monotonically on health and wellbeing during the first 20 years of one's life, and that some specific years were more important than other. Hence, again the magnitude of the effect might be age specific rather than cohort specific.

The interpretation of our results can be subject to discussion. Our preferred interpretation is that democracy and break-up brought new institutions that exerted effects on wellbeing such as avoidance of heavy works during childhood and adolescence, better access to quality medical care during pregnancy which exert effects in less than two decades (Fogel, 2004), and which we identify, at least partially in our data. However, using newer data would allow better precision at capturing such effects. Similarly, our finding suggesting an increasing convergence in heights between Slovaks and Czechs after the breakup can be attributed to the distinctive policies of both countries, but might well capture at least partially the fact that Slovaks, the poorer of the two had a higher capacity to benefit from independence.

6. Conclusion

We have examined at the changes in stature of the Czech and Slovak population after democracy and economic liberalization, namely the 1989 transition from the communist

regime to democracy. The contribution of this study lies in examining the effect on human heights of the political and economic liberalization and disintegration of Czechoslovakia in 1993 into two independent countries which allows to control for the institutions immediately before liberalization and examine its effects afterwards. Our findings confirm that as in other studies, there is a height gain associated with democracy which is primarily driven by male heights and no significant effects are found among women, and height improvements of individuals in the middle and lower income groups. Second, democracy and independence reduced the height gap between Czech Republic and Slovakia. In any event, the causal interpretation of these results need to be taken with some caution.

References

- A'hearn, B., Peracchi, F., & Vecchi, G. (2009). Height and the normal distribution: evidence from Italian military data. *Demography*, 46(1), 1-25.
- Adeyi, O., Chellaraj, G., Goldstein, E., Preker, A., & Ringold, D. (1997). Health Status during the Transition in Central and Eastern Europe: Development in Reverse? *Health Policy and Planning*, 12(2), 132-145.
- Alesina, A. and E. Spolaore (1997). On the Number and Size of Nations, *Quarterly Journal of Economics*, 112, pp. 1027–1056
- Alesina, A. and E. Spolaore (2003). *The Size of Nations*. Cambridge, Massachusetts: MIT Press.
- Arcaleni, E. (2006). Secular trend and regional differences in the stature of Italians, 1854–1980. *Economics & Human Biology*, 4(1), 24-38.
- Akresh, Richard, Sonia Bhalotra, Marinella Leone, and Una Okonkwo Osili. 2012. "War and Stature: Growing Up during the Nigerian Civil War." *American Economic Review*, 102(3): 273-77
- Bartosova, J., & Zelinsky, T. (2013). The extent of poverty in the Czech and Slovak Republics 15 years after the split. *Post-Communist Studies*, 25(1), 119-131.
- Baten, J., & Blum, M. (2012). Growing Tall but Unequal: New Findings and New Background Evidence on Anthropometric Welfare in 156 Countries, 1810–1989. *Economic History of Developing Regions*, 27(sup1), S66-S85.
- Blinder, A. S. (1973). Wage discrimination: Reduced form and structural estimates. *Journal of Human Resources*, 8, 436-455.
- Bobak, M., & Feachem, R. (1992). Health status in the Czech and Slovak Federal Republic. *Health Policy and Planning*, 7(3), 234-242.
- Bogin, B. (2001). *The Growth of Humanity*. New York: Wiley-Liss.
- Bookman, M. Z. (1992). *The Economics of Secession*. New York: St. Martin's Press.
- Bolton, P., Roland, G. and E. Spolaore (1996), *Economic Theories of the Breakup and Integration of Nations*, *European Economic Review* 40, 697-706.
- Bozzoli, C., Deaton, A., & Quintana-Domeque, C. (2009). Adult height and childhood disease. *Demography*, 46(4), 647-669.
- Cavelaars, A. E. J. M., Kunst, A. E., Geurts, J. J. M., Crialesi, R., Grötvedt, L., Helmert, U., et al. (2000). Persistent variations in average height between countries and between socio-economic groups: an overview of 10 European countries. *Annals of Human Biology*, 27(4), 407-421.
- Center for Systemic Peace. *Polity IV Annual Time Series 1800-2011*. Integrated Network for Societal Conflict Research Data Page Retrieved February, 2013, from <http://www.systemicpeace.org/polity/polity4.htm>; <http://www.systemicpeace.org/inscr/inscr.htm>
- Chanda, A., Craig, L., & Treme, J. (2008). Convergence (and divergence) in the biological standard of living in the USA, 1820–1900. *Cliometrica*, 2(1), 19-48.

- Christiaensen, L., & Alderman, H. (2004). Child Malnutrition in Ethiopia: Can Maternal Knowledge Augment the Role of Income? *Economic Development and Cultural Change*, 52(2), 287-312.
- Cizmecioglu, F., Doherty, A., Paterson, W. F., Young, D., & Donaldson, M. D. C. (2005). Measured versus reported parental height. *Archives of Disease in Childhood*, 90(9), 941-942.
- Collins, S M. and Rodrik, D (1991), *Eastern Europe and the Soviet Union in the World Economy*, Washington, DC: Institute for International Economics
- Cornia, G. A., & Panicià, R. (2000). *The Mortality Crisis in Transitional Economies*. Oxford: Oxford University Press.
- Costa-Font, J., & Gil, J. (2008). Generational effects and gender height dimorphism in contemporary Spain. *Economics & Human Biology*, 6(1), 1-18.
- Cox, T., & Mason, B. (1999). *Social and Economic Transformation in East Central Europe: Institutions, Property Relations and Social Interests*. Cheltenham: Edward Elgar Publishing Limited.
- Cvrcek, T. (2006). Seasonal anthropometric cycles in a command economy: The case of Czechoslovakia, 1946–1966. *Economics & Human Biology*, 4(3), 317-341.
- Economic and Social Data Service. (2005). SN 5526 -Eurobarometer 64.3: Foreign Languages, Biotechnology, Organized Crime, and Health Items. Retrieved February 12, 2013, from <http://www.esds.ac.uk/findingData/snDescription.asp?sn=5526>
- Eveleth, P. B., & Tanner, J. M. (1976). *Worldwide variation in human growth*: Cambridge University Press.
- Eveleth, P. B., & Tanner, J. M. (1990). *World-Wide Variation in Human Growth* (2nd ed.). Cambridge: Cambridge University Press.
- Ezzati, M., Martin, H., Skjold, S., Hoorn, S. V., & Murray, C. J. L. (2006). Trends in national and state-level obesity in the USA after correction for self-report bias: analysis of health surveys. *JRSM*, 99(5), 250-257.
- Fedorov, L., & Sahn, D. E. (2005). Socioeconomic Determinants of Children's Health in Russia: A Longitudinal Study. *Economic Development and Cultural Change*, 53(2), 479-500.
- Filmer, D., & Pritchett, L. (1999). The impact of public spending on health: does money matter? *Social Science & Medicine*, 49, 1309-1323.
- Friedman, D. (1977) , A Theory of the Size and Shape of Nations, *Journal of Political Economy* 85, 59-77.
- Fogel R. W (2004) *The escape from hunger and premature death*, New York
- Garner, T. I., & Terrell, K. (1998). A Gini decomposition analysis of inequality in the Czech and Slovak Republics during the transition1. *Economics of Transition*, 6(1), 23-46.
- Giles, E., & Hutchinson, D. L. (1991). Stature- and age-related bias in self-reported stature. *Journal of Forensic Sciences*, 36(3), 765-780.
- Ginter, E., Simko, V., & Wsolova, L. (2009). Fall of the iron curtain: male life expectancy in Slovakia, in the Czech Republic and in Europe. *Central European Journal of Public Health*, 17(4), 171-174.

- Guntupalli, A., & Baten, J. (2009). Measuring Gender Well-Being with Biological Welfare Indicators. In B. Harris, L. Galvez & H. Machado (Eds.), *Gender and Well-Being in Europe: Historical and Contemporary Perspectives*. Farnham: Ashgate Publishing Limited.
- Hausner, J., Jessop, B., & Nielsen, K. (Eds.). (1995). *Strategic choice and path-dependency in post-socialism: institutional dynamics in the transformation process*. Brookfield: E.Elgar.
- Heineck, G. (2006). Height and weight in Germany, evidence from the German Socio-Economic Panel, 2002. *Economics & Human Biology*, 4(3), 359-382.
- Heyns, B (2005). Emerging Inequalities in Central and Eastern Europe. *Annual Review of Sociology*, 31, (2005), pp. 163-197
- Hiermeyer, M. (2008). The trade-off between a high and an equal biological standard of living—Evidence from Germany. *Economics & Human Biology*, 6(3), 431-445.
- Hill, A., & Roberts, J. (1998). Body mass index: a comparison between self-reported and measured height and weight. *Journal of Public Health*, 20(2), 206-210.
- Inglot, T. (2008). *Welfare states in East Central Europe, 1919-2004*. Cambridge; New York: Cambridge University Press.
- Inglot, T. (2009). Czech Republic, Hungary, Poland and Slovakia: Adaptation and Reform of the Post-Communist 'Emergency Welfare States'. In A. Cerami & P. Vanhuysse (Eds.), *Post-communist welfare pathways : theorizing social policy transformations in Central and Eastern Europe* Basingstoke: Palgrave Macmillan.
- Innes, A. (2001). *Czechoslovakia: the Short Good-bye*. New Haven: Yale University Press.
- Institute of Health Information and Statistics of the Czech Republic (2004). <http://www.uzis.cz/en>
- Janik, Z. (2010). Twenty Years after the Iron Curtain: The Czech Republic in Transition. *Juniata voices* 10(2010).
- Jann, B. (2008). The Blinder–Oaxaca decomposition for linear regression models. *The Stata Journal*, 8(4), 453-479.
- Kirschbaum, S. J. (1993). Czechoslovakia: The creation, federalization and dissolution of a nation-state. *Regional Politics and Policy*, 3(1), 69-95.
- Komlos, J. (2009). Anthropometric history: an overview of a quarter century of research. *Anthropol Anz.*, 67(4), 341-356.
- Komlos, J., & Baten, J. (Eds.). (1998). *The Biological Standard of Living in Comparative Perspective*. Stuttgart: Franz Steiner Verlag.
- Komlos, J., & Baur, M. (2004). From the tallest to (one of) the fattest: the enigmatic fate of the American population in the 20th century. *Economics & Human Biology*, 2(1), 57-74.
- Komlos, J., & Kriwy, P. (2002). Social status and adult heights in the two Germanies. *Annals of Human Biology*, 29(6), 641-648.
- Komlos, J., & Kriwy, P. (2003). The Biological Standard of Living in the Two Germanies. *German Economic Review*, 4(4), 459-473.
- Komlos, J., & Snowdon, B. (2005). Measures of Progress and Other Tall Stories. *World Economics*, 6(2), 87-135.

- Kostecki, W., Zukrowska, K., & Goralczyk, B. J. (Eds.). (2000). *Transformations of post-communist states*. London: Macmillan.
- Lawson, C., & Nemeč, J. (2003). The political economy of Slovak and Czech Health Policy: 1989-2000. *International Political Science Review*, 24(2), 219-235.
- Leff, C. S. (1996). *The Czech and Slovak Republics: Nation Versus State*. Boulder: Westview Press.
- Masseria, C., Allin, S., Sorenson, C., Papanicolas, I., & Mossialos, E. (2007). What are the methodological issues related to measuring health and drawing comparisons across countries? Research Note,
- Meisel, A., & Vega, M. (2007). The biological standard of living (and its convergence) in Colombia, 1870–2003: A tropical success story. *Economics & Human Biology*, 5(1), 100-122.
- Meszaros, A. I. (1999). Divergent neighbors: The Czech Republic and Slovakia since independence. *Harvard International Review*, 21(2), 30-33.
- Milanovic, B. (1998). *Income, Inequality, and Poverty during the Transition from Planned to Market Economy*. Washington, D.C.: World Bank.
- Murray, C. J., Salomon, J. A., & Mathers, C. (2000). A critical examination of summary measures of population health. *Bull World Health Organ*, 78(8), 981-994.
- Nobles, J., Brown, R., & Catalano, R. (2010). National independence, women's political participation, and life expectancy in Norway. *Social Science & Medicine*, 70(9), 1350-1357.
- North, D. C. (1991). Institutions. *The Journal of Economic Perspectives*, 5(1), 97-112.
- Olson, D. (1993). Dissolution of the state: political parties and the 1992 election in Czechoslovakia. *Post-Communist Studies*, 26, 310-314.
- Pavlínek, P. (1995). Regional development and the disintegration of Czechoslovakia. *Geoforum*, 26(4), 351-372.
- Peracchi, F. (2008). Height and Economic Development in Italy, 1730-1980. *American Economic Review*, 98(2), 475-481.
- Persico, N., Postlewaite, A., & Silverman, D. (2004). The Effect of Adolescent Experience on Labor Market Outcomes: The Case of Height. National Bureau of Economic Research Working Paper Series, No. 10522.
- Potucek, M., & Radicova, I. (1997). Splitting the welfare state: the Czech and Slovak cases. *Social Research*, 64(4), 1449-1587.
- Przeworski (1991). *Democracy and the Market; Political and Economic Reforms in Eastern Europe and Latin America*. New York: Cambridge University Press
- Salvatore, R. D. (2004). Stature, Nutrition, and Regional Convergence: The Argentine Northwest in the First Half of the Twentieth Century. *Social Science History*, 28(2), 297-324.
- Sen, A. K. (1999). Democracy as a universal value. *Journal of democracy*, 10(3).
- Silventoinen, K. (2003). Determinants of variation in adult height. *Journal of Biosocial Science*, 35, 263-285.

- Silventoinen, K., Kaprio, J., Lahelma, E., & Koskenvuo, M. (2000). Relative effect of genetic and environmental factors on body height: differences across birth cohorts among Finnish men and women. *American Journal of Public Health*, 90(4), 627-630.
- Simai, M. (2006). *Poverty and Inequality in Eastern Europe and the CIS Transition Economies*. Working Papers, United Nations, Department of Economics and Social Affairs,
- Steckel, R. H. (1995). Stature and the Standard of Living. *Journal of Economic Literature*, 33(4), 1903-1940.
- Steckel, R. H. (2009). Heights and human welfare: Recent developments and new directions. *Explorations in Economic History*, 46(1), 1-23.
- Stillman, S. (2006). Health and nutrition in Eastern Europe and the former Soviet Union during the decade of transition: A review of the literature. *Economics & Human Biology*, 4(1), 104-146.
- Stunkard, A. J., Foch, T. T., & Hrubec, Z. (1986). A twin study of human obesity. *Journal of American Medical Association (JAMA)*, 256, 51-54.
- Sunder, M. (2003). The making of giants in a welfare state: the Norwegian experience in the 20th century. *Economics & Human Biology*, 1(2), 267-276.
- Svejnar, J. (2002). *Transition Economies: Performance and Challenges*. *The Journal of Economic Perspectives*, 16(1), 3-28.
- Szamuely, L. (1996). The Social Costs of Transformation in Central and Eastern Europe. *The Hungarian Quarterly*, 37(144).
- Tavares, J., & Wacziarg, R. (2001). How democracy affects growth. *European Economic Review*, 45, 1341-1378.
- United Nations Development Programme. *International Human Development Indicators*. Retrieved February 14, 2013, from <http://hdrstats.undp.org/en/tables/>
- Vignerová, J., Brabec, M., & Bláha, P. (2006). Two centuries of growth among Czech children and youth. *Economics & Human Biology*, 4(2), 237-252.
- Whitefield, S. (Ed.). (1993). *The New Institutional Architecture of Eastern Europe*. Basingstoke: Macmillan.
- Winiecki, J., & Kondratowicz, A. (Eds.). (1993). *The macroeconomics of transition: developments in East-Central Europe*. London; New York: Routledge.
- Wittman, D. (1991), "Nations and States: Mergers and Acquisitions, Dissolution and Divorce", *American Economic Review, Papers and Proceedings*, 81, 126-129.
- Wolchik, S. (1991). *Czechoslovakia in Transition: Politics, Economics and Society*. London: Pinter.
- World Health Organization. (2003). *World Health Survey*.

Appendix 1. Sample Response

The same report states that while the structure of the respondents differs in some characteristics from the structure of the adult Czech population, it confirms previous findings and none of the important population groups were significantly under or overestimated. The following differences were identified when compared to the overall Czech population. With respect to sex, there were somewhat more women and less men in the sample than the overall population (55.2% compared to 52% and 44.8% compared to 48%, respectively); with respect to age, women and men younger than 30 and men between 40-49 were somewhat underrepresented, while men over the age of 70 were somewhat overrepresented. Similarly, the report compares the WHS sample to the overall population for regional representation, ethnicity, family status, education, economic activity and employment, household composition and finds that the sample is broadly similar to the overall population.

Furthermore, the report identifies the proportions of individuals out of the total of 1918 individuals who did not respond to the survey and the underlying reasons: the individual or the household was unwilling to participate (26.5%); the individual was not at home (13.2%); the individual was unsuitable (1.2%); the individual did not live at the address (6.2%); the individual could not be contacted (1%); the individual died (1.4%); and individuals were not contacted at all (1.8%). In addition, an analysis of homogeneity between the responders and the non-responders was carried out. More women, less men, elder people and citizens of smaller towns responded to the survey. While these differences can be adjusted for by using sampling weights, it we can't still adjust for other non-observable

differences between respondents and non-respondents. For example, the healthiest or the least healthy may have been those who did not participate (Institute of Health Information and Statistics of the Czech Republic, 2004). In addition, the report notes that the complexity of the survey in terms of topics covered and time required to complete it, as well as implementation issues are potentially other relevant reasons for a 26.5% of those unwilling to participate.

Appendix 2 The construction of the Polity IV Democracy Measure

Under the Polity IV project, institutionalized democracy consists of three key elements: i) presence of institutions and procedures through which citizens can express effective preferences about alternative policies and leader; ii) the existence of institutionalized constraints on the exercise of power by the executive; iii) the guarantee of civil liberties to all citizens in their daily lives and in acts of political participation. Other aspects of plural democracy, such as the rule of law, systems of checks and balances, freedom of the press, and so on are means to, or specific manifestations of, these general principles (Center for Systemic Peace). The “Polity Score” ranges from -10 (hereditary monarchy) to 10 (consolidated democracy) in any given year and was used to weigh the years spent under democracy. Both for Slovakia and the Czech Republic the scores were positive (7 and above) for the entire period under study so the weights used were between 0.7 and 1. These weighted years were then added up to obtain an adjusted democracy variable.

Appendix 3

Table A3.1. OLS regressions of years lived under democracy as a dummy variable on height with different controls

VARIABLES	(1) Eq.1	(2) Eq.2	(3) Eq.3	(4) Eq.4	(5) Eq.5	(6) Eq.6	(7) Eq.7
demd	0.166 (0.558)	0.0363 (0.575)	1.504** (0.726)	0.268 (0.586)	0.0554 (0.575)	-0.0204 (0.573)	1.631** (0.742)
co	0.389 (0.291)	0.388 (0.296)	1.415*** (0.429)	0.356 (0.297)	0.288 (0.314)	0.481 (0.296)	1.641*** (0.433)
income		0.938*** (0.145)	0.912*** (0.145)	1.180*** (0.191)	0.744*** (0.248)		0.717* (0.388)
demd_co			-1.940*** (0.588)				-1.812*** (0.631)
demd_inc				-0.574* (0.293)			-0.831 (0.509)
inc_co					0.287 (0.298)		0.453 (0.434)
demd_inc_co							0.398 (0.619)
language							1.029 (4.310)
gend	13.19*** (0.249)	13.05*** (0.254)	13.01*** (0.254)	13.04*** (0.254)	13.04*** (0.254)	13.04*** (0.253)	12.59*** (0.251)
geog							0.232 (0.323)
age30_39	-1.364*** (0.456)	-1.266*** (0.467)	-1.039** (0.471)	-1.289*** (0.466)	-1.276*** (0.467)	-1.436*** (0.465)	-1.188** (0.471)
age40_49	-1.762*** (0.675)	-1.685** (0.692)	-1.428** (0.695)	-1.719** (0.692)	-1.678** (0.692)	-1.763** (0.691)	-1.325* (0.688)
age50_59	-5.323*** (0.697)	-5.148*** (0.716)	-5.042*** (0.715)	-5.095*** (0.716)	-5.131*** (0.716)	-5.256*** (0.712)	-4.838*** (0.704)
age60_69	-5.707*** (0.742)	-5.219*** (0.762)	-5.195*** (0.761)	-5.117*** (0.764)	-5.191*** (0.763)	-5.415*** (0.758)	-4.734*** (0.764)
age70_98	-7.588*** (0.704)	-6.836*** (0.727)	-6.833*** (0.725)	-6.707*** (0.729)	-6.800*** (0.728)	-7.083*** (0.721)	-6.015*** (0.736)
educ2							1.534*** (0.403)
educ3							1.376*** (0.391)
educ4							1.999*** (0.523)
job1							0.306 (0.313)
qincome1						-1.977*** (0.327)	
qincome2						-2.252*** (0.304)	
Constant	167.6*** (0.621)	167.3*** (0.641)	166.3*** (0.701)	167.2*** (0.641)	167.3*** (0.645)	169.0*** (0.664)	163.5*** (4.403)
Observations	2,726	2,596	2,596	2,596	2,596	2,596	2,572
R-squared	0.567	0.575	0.577	0.576	0.575	0.578	0.576

Appendix 4

Table 2. OLS regressions of years lived under democracy as a continuous variable adjusted for “quality” of democracy

VARIABLE	(1) Eq.1	(2) Eq.2	(3) Eq.3	(4) Eq.4	(5) Eq.5	(6) Eq.6	(7) Eq.7
S							
dempolity	0.280*** (0.0833)	0.230*** (0.0854)	0.425*** (0.108)	0.217** (0.0881)	0.231*** (0.0854)	0.217** (0.0852)	0.660*** (0.173)
1.co#c.de mpolity							-0.448*** (0.168)
2.qincome							0.375 (0.798)
3.qincome							1.246 (0.795)
1o.co#1b. qincome							0 (0)
1.co#2.qin come							0.0567 (0.878)
1.co#3.qin come							0.379 (0.885)
2.qincome #c.dempol ity							-0.431** (0.186)
3.qincome #c.dempol ity							-0.465** (0.184)
1o.co#1b. qincome# co.dempol ity							0 (0)
1.co#2.qin come#c.de mpolity							0.0892 (0.218)
1.co#3.qin come#c.de mpolity							0.663*** (0.213)
gend	13.12*** (0.250)	13.00*** (0.255)	12.96*** (0.254)	12.99*** (0.255)	12.99*** (0.255)	12.99*** (0.254)	12.44*** (0.251)
language							1.168 (4.275)
geog							0.231 (0.322)
age30_39	0.405 (0.661)	0.231 (0.675)	0.437 (0.678)	0.224 (0.675)	0.215 (0.675)	0.00724 (0.675)	-0.222 (0.674)
age40_49	-0.0402 (0.678)	-0.173 (0.692)	0.0888 (0.696)	-0.178 (0.692)	-0.182 (0.692)	-0.283 (0.690)	-0.326 (0.692)
age50_59	-3.585*** (0.702)	-3.632*** (0.716)	-3.475*** (0.717)	-3.658*** (0.717)	-3.630*** (0.716)	-3.767*** (0.715)	-3.799*** (0.715)
age60_69	-3.964*** (0.747)	-3.704*** (0.762)	-3.603*** (0.761)	-3.741*** (0.764)	-3.690*** (0.762)	-3.923*** (0.761)	-3.575*** (0.793)
age70_98	-5.833***	-5.311***	-5.225***	-5.354***	-5.290***	-5.581***	-4.872***

educ2	(0.712)	(0.729)	(0.729)	(0.733)	(0.730)	(0.729)	(0.773)
							1.533***
educ3							(0.405)
							1.399***
educ4							(0.395)
							2.096***
job1							(0.528)
							0.657**
dempolity _co			-0.242***				(0.317)
			(0.0827)				
co	0.256	0.287	0.982***	0.296	0.185	0.381	1.116*
	(0.293)	(0.298)	(0.381)	(0.298)	(0.315)	(0.298)	(0.615)
income		0.918***	0.895***	0.861***	0.721***		
		(0.145)	(0.145)	(0.171)	(0.248)		
dempolity _inc				0.0259			
				(0.0415)			
inc_co					0.292		
					(0.298)		
qincome1						-1.954***	
						(0.326)	
qincome2						-2.198***	
						(0.305)	
Constant	166.0***	165.9***	165.1***	165.9***	165.9***	167.6***	162.1***
	(0.599)	(0.615)	(0.661)	(0.616)	(0.620)	(0.642)	(4.394)
Observations	2,726	2,596	2,596	2,596	2,596	2,596	2,572
R-squared	0.569	0.576	0.578	0.576	0.576	0.579	0.584

Appendix 5.

Table 3. OLS regressions of years lived under independence on height with different controls – male

VARIABLES	(1) Eq.1	(2) Eq.2	(3) Eq.3	(4) Eq.4
Indage	0.550*** (0.137)	0.418*** (0.138)	0.402*** (0.137)	0.382*** (0.147)
Co	-1.489*** (0.539)	-1.694*** (0.537)	-1.558*** (0.531)	-0.773 (0.541)
Income		1.946*** (0.250)		1.721*** (0.251)
Geog				0.647 (0.597)
Language				6.571 (7.369)
age30_39	3.626*** (1.236)	3.426*** (1.237)	3.262*** (1.227)	2.517** (1.226)
age40_49	3.542*** (1.257)	2.825** (1.257)	2.614** (1.245)	2.573** (1.264)
age50_59	-2.151* (1.301)	-2.441* (1.299)	-2.565** (1.298)	-2.788** (1.321)
age60_69	-1.722 (1.417)	-1.561 (1.418)	-1.950 (1.410)	-1.427 (1.511)
age70_98	-4.506*** (1.281)	-3.747*** (1.280)	-4.018*** (1.271)	-3.011** (1.424)
educ2				2.272***

				(0.751)
educ3				1.403*
				(0.719)
educ4				2.566***
				(0.903)
job1				1.247**
				(0.576)
qincome1			-4.716***	
			(0.552)	
qincome2			-3.665***	
			(0.510)	
Constant	178.0***	177.9***	181.3***	167.9***
	(1.191)	(1.200)	(1.244)	(7.527)
Observations	1,025	976	976	967
R-squared	0.225	0.269	0.286	0.264

TableA5.2. OLS regressions of years lived under independence on height with different controls – female

VARIABLES	(1) Eq.1	(2) Eq.2	(3) Eq.3	(4) Eq.4
Indage	0.0772	0.0645	0.0767	0.0804
	(0.0919)	(0.0948)	(0.0945)	(0.0986)
Co	1.723***	1.808***	1.891***	2.101***
	(0.319)	(0.330)	(0.330)	(0.343)
Income		0.101		0.0105
		(0.167)		(0.170)
Geog				0.0277
				(0.360)
Language				-2.035
				(5.030)
age30_39	-1.323*	-1.414*	-1.497*	-1.425*
	(0.752)	(0.772)	(0.771)	(0.793)
age40_49	-1.920**	-1.893**	-1.791**	-1.693**
	(0.783)	(0.804)	(0.802)	(0.833)
age50_59	-4.169***	-4.346***	-4.364***	-4.111***
	(0.794)	(0.815)	(0.812)	(0.838)
age60_69	-5.287***	-5.310***	-5.490***	-5.052***
	(0.826)	(0.847)	(0.845)	(0.907)
age70_98	-5.989***	-5.975***	-6.269***	-5.469***
	(0.815)	(0.840)	(0.837)	(0.906)
educ2				0.892**
				(0.453)
educ3				1.707***
				(0.438)
educ4				1.850***
				(0.633)
job1				-0.183
				(0.369)
qincome1			0.403	
			(0.381)	
qincome2			-0.787**	
			(0.363)	
Constant	166.2***	166.2***	166.3***	166.8***
	(0.733)	(0.756)	(0.782)	(5.136)
Observations	1,701	1,620	1,620	1,605
R-squared	0.131	0.133	0.139	0.141