Human Capital, Consumption and Housing Wealth in Transition

Jarko Fidrmuc,
Matus Senaj

Human Capital, Consumption, and Housing Wealth in Transition[1]

Working paper NBS

Jarko Fidrmuc[2], Matus Senaj[3]

Abstract

This paper focuses on human capital and housing in Slovakia during the economic reforms of the last two decades. We compare households that entered the labour market before and after the economic reforms in 1990. On the one hand, we study the returns to education in different labour market cohorts using household consumption surveys. On the other hand, we analyse the determinants of housing wealth and its impact on consumption. We show that old cohorts are characterised by lower returns to human capital and consumption levels, but higher housing wealth. Thus, we do not identify a clear pattern of winners and losers from transition.

JEL classification: C31, D12, J24
Key words: consumption function, housing wealth effect, human capital, survey data

---

[2] Zeppelin University Friedrichshafen, CESifo Munich, Institute for Eastern European Studies, Regensburg, Comenius University Bratislava, and Mendel University in Brno. E-mail: jarko.fidrmuc@zeppelin-university.de.
[3] National Bank of Slovakia, Research Department and Comenius University, Bratislava. Postal address: Imricha Karvasa 1, Bratislava 813 25, Slovak Republic. Phone no. : +421 2 5787 2935. Email: matus.senaj@nbs.sk.

1 INTRODUCTION

Human capital and physical capital accumulation are among the most important determinants of growth (Barro, 1991, Levine and Renelt, 1992). The importance of the latter factor was stressed in the past also by central-planning countries in Eastern Europe. By contrast, central planning had an ambiguous relationship to the importance of human capital. On the one hand, eastern European countries focused on basic and technical education (Fischer et al., 1997), while, on the other hand, human and social sciences were underdeveloped, in some cases even prohibited and persecuted. Similarly, high-quality research was often concentrated on top-priority secret military projects with low spillovers to other sectors.

The early literature on restructuring often stressed the misallocation of resources in central-planning economies. In general, industry and especially heavy and military industry received too much weight while services were underdeveloped. As a result, the first years of transition were characterised by shrinkages of industrial production and rapid expansion of the service sector. Less attention was paid to the structure of human capital and the implications of past education policies for households in eastern Europe. We attempt to fill this gap in the literature. In particular, we compare human capital equipment and especially the returns to education for cohorts that finished their education before and after 1989.

Moreover, we look also at other characteristics of household wealth. While people faced restrictions in their accumulation of human capital before the changes of the 1990s, the socialist system with intensive social subsidies provided some important benefits to the population as well. Although the majority of these benefits were short run, they included easy and cheap access to social housing. By contrast, residential construction decreased during the first years of reforms. More recently, supply declines caused excess demand, which resulted in a housing bubble in several countries (Hlaváček and Komárek, 2009).

Different past conditions in the education sector and housing market caused persistent differences between households in Eastern Europe. In general, old households are characterised by restricted access to higher education but by a higher endowment of housing stocks. In contrast, the young generation enjoys better access to competitive education, but

the supply of housing to young households is constrained by imperfect housing markets. We use this time variation in access to education and housing in order to estimate their effects on private consumption, which stands as a proxy for welfare.

Overall, we can see a tradeoff similar to that observed for firms in the first stage of economic reforms. High investment of old households is associated with insufficient and low-quality human capital equipment, while young households have higher human capital equipment but low access to physical capital (housing). These features may have two long-term implications for Eastern European countries. First, it is more difficult to change the capital structure of households than to support restructuring of firms. People often do not re-qualify until they are forced to do so by extreme events, including for example long-term unemployment. Often people even lose their previous qualification and move to less skilled and worse paid occupations.[4] Moreover, it is hard to acquire specific skills in older age. Fidrmuc and Fidrmuc (2009), for example, demonstrate that there is still a strong dividing line in language skills between Western and Eastern European countries, with populations in the latter region being less able to communicate in all foreign languages (with the exception of Russian).

Second, different factor equipment has important implications for political economy and political stability in Eastern European countries. Economic reforms have introduced welfare gains but also losses. Households have been diversely affected by these changes, which are often reflected in their political behaviour (Fidrmuc, 2000). Denisova, Eller and Zhuravskaya (2010) show that attitudes in Russia towards transition and the role of the state vary according to the age and education of respondents. Older and less educated respondents are more likely to view critically the economic reforms and favour a more important role for the state in the economy. Therefore, it is important that no population groups are excluded from growth and welfare improvements.

The economic reforms in Central and Eastern Europe bring benefits mainly to young and highly qualified people. Young cohorts receive access to education without the former political restrictions, open career opportunities in growing economies, and the opportunity to travel and work abroad. In contrast, old households had to bear the welfare costs of

---

[4] Campos and Dabušinkas (2009) show that the majority of occupational changes in Estonia between 1990 and 1994 was towards sectors with lower wage levels.

economic reforms. Since restructuring was associated with the destruction of non-efficient jobs, these people often experienced unemployment over shorter or longer periods. Furthermore, their skills and work experience acquired in large state enterprises were often less demanded in the market economy. We argue, however, that the early cohorts are not necessarily worse off after the reforms, and we identify physical capital equipment (housing) as an important source of their wealth. Since the housing sector was heavily subsidised during the former regime, older households are more likely than younger households to own apartments and houses. Several economic reform measures have aimed to improve the economic situation of incumbent households at the expense of future developments. This includes the sale of housing at low prices to the resident population, but also the voucher privatisation schemes introduced in several Eastern European countries. Our results indicate that this was actually important for equalising the welfare effects of economic reforms on different cohorts.

We concentrate on Slovakia, because this country is an example of a fragile liberal democracy. Among the new Member States, Slovakia pursued a pathbreaking economic policy,[5] but its political developments faced regular populist and nationalist trends as well as backsliding (Malová and Miháliková, 2002). Correspondingly, specific redistributive policies (e.g. voucher privatisation and sales of public apartments to tenants) were actively targeted, especially by liberal parties. We view these policies as a part of compensation policies which target the political economy equilibrium in the country.[6]

Using a detailed dataset on households in Slovakia, we show that the returns to education are significantly different between cohorts with human capital acquired before and after the reforms. We use household income survey data, which since they cover all sources of income are more appropriate than wage data used in other papers. This may be important especially in countries with a high-share informal economy. Moreover, we can illustrate significant differences between the housing wealth of both cohorts which were not addressed in the earlier literature. We use information on the quality and state of housing to impute the value of real estate owned by households. We show that housing quality

---

[5] Slovakia introduced a major taxation reform, including a flat tax, in 2004 (Moore, 2005). It joined the European Union in 2004 and the euro area in 2009.

[6] Similar arguments in favour of voucher privatisation are presented by Roland and Verdier (1994).

compensates old households at least partially for income losses due to their low returns on education. Overall, it is difficult to identify winners and losers from economic reforms, because they cannot be attributed to demographic groups. We argue that this has been a factor in the stabilisation of the political system in Slovakia and has supported significant progress in reforms.

The paper is structured as follows. The next section reviews the previous literature on returns to education and housing wealth in Eastern Europe. Section 3 describes our data sets on consumption expenditures and housing wealth in Slovakia. Section 4 provides a descriptive analysis of households' income, housing and consumption. Empirical results are discussed in section 5. Section 6 concludes and generalises our results from Slovakia for other countries in Eastern Europe.

2 LITERATURE OVERVIEW

In general, central planning countries tried to reduce all sources of inequality (Orazem and Vodpivec, 1995, Campos and Coricelli, 2002). Correspondingly, there was a tendency to equalize wages for all jobs, possibly excluding several priority areas, such as the heavy industry.[7] As a result, returns to education were negligible in all central planning countries. Münich, Svejnar, and Terrell (2005) present an in-depth comparison of returns to human capital under the communist regime and during the transition to the market economy. They find that the returns to education were extremely low before 1989, but increased already during the first years of transition. These results are largely similar to earlier estimations for the Czech Republic and in Slovakia presented by Chase (1998), for Romania by Andrén, Earle and Sapatoru (2005), or for Slovenia (Orazem and Vodpivec, 1995). More recently, higher returns to education were reported by Newell and Socha (2007) for Poland. These results are confirmed by Fleisher, Sabirianova and Wang (2005), who document in a meta analysis that the average returns to schooling doubled between 1990 and 2002 in transition economies (including China). Orlowski and Riphahn (2009) contribute to the literature by studying the returns to tenure and skills in East and West Germany. They find that the

---

[7] Münich, Svejnar, and Terrell (2005) present the wage grid applied in the Czech Republic for industry, heavy industry and public sector.

returns to skills are lower in East Germany, which is probably the result of economic transition when the skills of some workers become obsolete.

Several authors address the suitability of human capital achieved by communist education system. In particular, previous authors discuss several ways of how education completed before economic reforms may be less valued in a market economy. First, it is often argued that education was concentrated to areas (e.g. rocket science), which are less in demand by market economies (Campos and Dabušinkas, 2009). Second, important soft skills in marketing and management may be missing (Campos and Coricelli, 2002). Third, however, the quality of education could be worse because of external shocks, which were not related to economic transition. Card and DiNardo (2002) show that low computer skills cause a negative wage premium in the US. Finally, low education premium for tenured employees may be perpetuated in their later wage profile if wage setting practices are using former income as a negotiation base for later wages (Andrén, Earle and Sapatoru, 2005).

Several authors test whether the returns to education completed before economic reforms are lower than returns to market-type education. Contrary to the initial expectations, the previous analysis show statistically insignificant difference between the returns to education completed before and after 1990. Münich, Svejnar, and Terrell (2005) compare the marginal returns of a year of education completed either before or after 1990. Somewhat surprisingly, they found lower returns to education completed during the economic reforms. Andrén, Earle and Sapatoru (2005) also find no statistical difference between education acquired before and after economic reforms.

However, these results may be influenced by a low number of observations with post-communist education (about 14% of sample used by Münich, Svejnar, and Terrell (2005), which represents around 320 employees). It may be influenced also by adverse labour market developments during the first year of transition (reduction of employment and increase of youth unemployment). Moreover, the quality of education could decline during the reforms in Romania as argued by Andrén, Earle and Sapatoru (2005). Campos and Coricelli (2002) note that human capital indicators (e.g. enrolment rates) declined in all transition economies including also Central Europe. Finally, the previous authors consider the wage premium of an additional year of education, while the impact may be different on employees with basic, secondary or higher education.

There are only a few analysis of housing wealth in Eastern Europe. Early studies pointed at the importance of housing as a part of non-wage benefits. In the planned economies, municipalities and firms were often made responsible for providing social services to employees and the general population (Tsenkova and Turner, 2004, Juurikkala and Lazareva, 2006). State enterprises used the non-wage benefits to attract employees. Thus, the enforced equalization of income was at least partially compensated by non-wage benefits, and housing played a key role in this respect. Berger, Blomquist and Sabirianova Peter (2008) show that Russian employees were compensated for differences in regional living quality through better access to housing.

Unlike other areas, economic reforms did not target the distortions in the housing market. Low supply resulted in soaring housing prices. Égert and Mihaljek (2007) show that housing price grew similarly to income. By contrast, Hlaváček and Komárek (2009) find several periods of housing bubbles (in particular, in 2002-2003 and 2007-2008) in the Czech Republic. The different development of housing markets before and after 1990 implies that households have largely different stocks of housing wealth.

For developed economies, numerous papers estimate the housing wealth effect on consumption based either on household level data, as well as on aggregate data. They usually report that marginal propensity to consume with respect to wealth change is up to 0.10. This means that exogenous increase in the value of the house of 1 percent leads to an increase of household consumption by 0.10 percentage points. Farinha (2009) uses micro-level data collected in Portugal in 2006 and 2007. This survey confirms that housing wealth represents the most important asset in the household portfolio. She estimates the elasticity of consumption with respect to wealth between 0.04 and 0.05 for households. For Italy, Grant and Peltonen (2008) report marginal propensity to consume above 0.08 percent of housing wealth. They also find that the marginal propensity to consume is higher for old households (0.15), whereas it is statistically insignificant for young households. In Spain, Bover (2005) finds that the marginal propensity to consume is 0.02 percent of housing wealth of the main residence. For aggregate consumption, Carrol, Otszuka and Slacalek (2011) report the wealth effect between 4 and 10 cents per $1 change in housing wealth in U.S. data. Using a simple life-cycle model, Attanasio, Leicester and Wakefield (2011) prove that house price shock should have larger effect on the consumption of older households.

Moreover, they conclude that the consumption of younger households tends to respond more to income shocks. Contrasting to the previous findings, Calomiris, Longhofer and Miles (2009) claim that housing wealth has a small and insignificant effect on consumption in the US, if the control for the endogeneity bias caused by correlation between housing wealth and permanent income. So far, however, there are no comparable studies for new EU member states.

3 DATA DESCRIPTION

In our repeated cross-sectional analysis we merge two different data sources for households in Slovakia. First, we use data on household income and consumption from the household expenditure survey (HES), which is conducted annually by the Statistical Office of the Slovak Republic. Second, we use data on house prices, which is published quarterly by the National Bank of Slovakia. Both datasets are available for the period from 2004 to 2009. Thus our data is not influenced by the flat tax reform in 2004 (Moore, 2005). The data sets may be influenced only marginally by the accession to the European Union, which took place in May 2004. We do not deflate the nominal data; instead we include time effects in the estimated equations.

The HES is collected since late 1950s. However, due to several important methodological changes implemented in the household survey in 2004, we cannot use the previous household surveys for the analysis.[8] The survey provides data on structure of income and expenditures of Slovak households. The sample size of the HES is approximately 4,700 households every year. Since 2004, the Statistical Office of the Slovak Republic uses random sampling. The selected sample is representative not only on a country level but also at the regional level. The basic sampling unit is a private household[9] created by one or more persons who (i) live together in the same dwelling and (ii) share the living costs.

---

[8] Before the 2004 wave, the HES used to have smaller sample size (only about 1600 households) and significant part of Slovak households were not surveyed. Particularly those households with unemployed or disabled person or single mother as a head of the household.

[9] Collective households (for example hospitals, cloisters, and prisons) are excluded from the survey.

Given the data quality, the household expenditure surveys are used commonly for regular analysis of household expenditures, the computation of general population weights, calculation of consumer price indices, and as a main source for final private consumption entering the National Account System (Byfuglien, 2006). The methodological changes in 2004 improved significantly representativeness of the surveys. Nevertheless, the sample may not include very rich and very poor households (Deaton, 2005, Carraro, 2006). Another restriction is the lack of time dimension, which means that we can not trace a behaviour of a specific household over the sampling period.[10]

The household expenditure survey provides detailed information on housing quality, but it does not include the market value of the housing facilities. In order to impute the housing wealth, we use our second dataset, which comes from the survey of residential property prices[11] conducted jointly by the National Bank of Slovakia and the National Association of Real Estate Agencies. We consider the housing wealth equals the market value of the house because we do not have the information on mortgage[12]. Based on the region, location and the number of rooms of the property, we distinguish between 120 different types of a flat or a house. From the household expenditure survey, we know the type of property the household occupies. Moreover, from the survey of residential property prices we draw the prices for every group of dwelling out of 120 mentioned earlier[13]. In particular, we use square meter prices of the property with given characteristics from this database. We impute the value of housing wealth by multiplying the size of the flat or house by the corresponding square meter price. This imputation adds the information on housing wealth to the original HES database.

---

[10] An alternative household survey, EU SILC, includes aslo a panel component. However, the EU SILC survey does not cover information on household consumption.

[11] Detailed information on the survey can be found in Cár (2006).

[12] The share of households with mortgage is about 10 per cent in Slovakia.

[13] For example, prices range from 418 euro to 5,130 euro per square meter in 2009.

4 DESCRIPTIVE STATISTICS

A first look into the database reveals several interesting features of household's disposable income. As can be seen in the figure 1, age-income profile has a nonlinear shape. It increases to the age of 50 of the household head (HH). The income of older families sharply decreases. Moreover, the variability reaches its highest levels between the ages of 50 and 60. Based on the level of education of the principal earner, we distinguish three different age-income profiles. All three groups (primary, secondary and tertiary) share common pattern of the age income profile. The profiles of families older than 60 years converge mainly due to the low inequality of old age pensions in Slovakia. Moreover, the income pattern of an average household coincides with the pattern of the household with secondary education. The income profiles correspond with those of consumption. However, the age-consumption profile decreases faster than income. This means that older households are more focused on saving.

Since the housing wealth is the most important component of private capital we focus our attention on housing. Contrary to the previous findings, older households own more housing wealth. In general, former communist countries are known as countries with very high home-ownership rate due to the mass privatization of former state rental housing (Lux 2004, Edgar, Filipovic and Dandolova, 2007). This is also the case of Slovakia. Figure 1 depicts also the pattern of ownership rate in our sample and displays the snapshot of dependency between the age and home ownership. The ownership rate starts at 50 percent for the youngest households. Then it grows to the values higher than 95 percent. More than 95 percent of households older than 50 years own their residence.

Very similar pattern can be found in age - housing wealth profile. Housing wealth rises over the life cycle. However, it is slightly declining for the oldest households. This is a natural feature. We can expect that older households usually occupy smaller flats. What can be surprising is the average house price per square meter for different age groups. Although, properties of older households are smaller, they are more valuable mainly due to better location of their apartments and houses. The last graph shows the histogram of housing wealth in Slovakia. In our sample, we have about 6 per cent of households that do not own any real property - they are included in the first bin.

Figure 1 Descriptive statistics by age cohorts
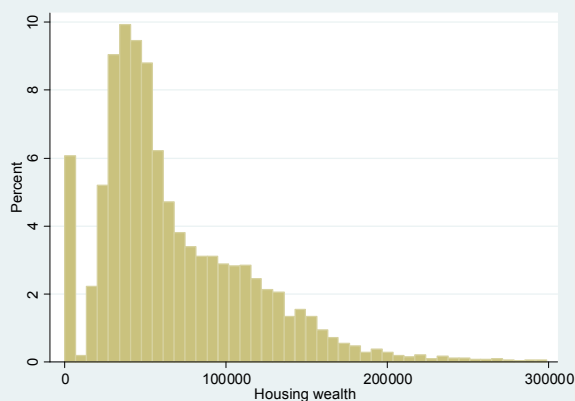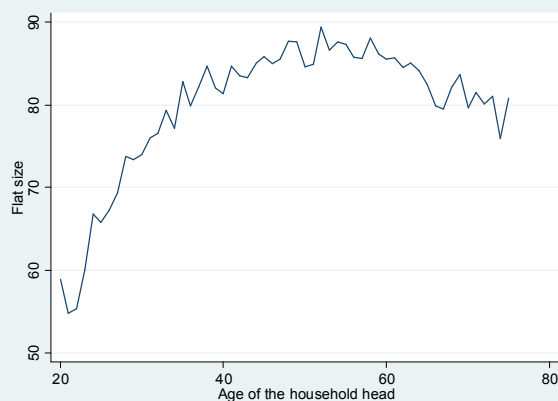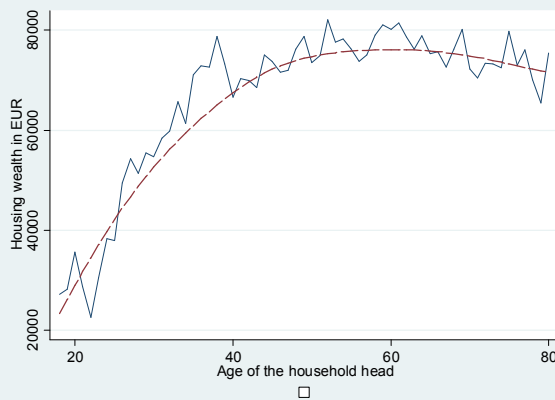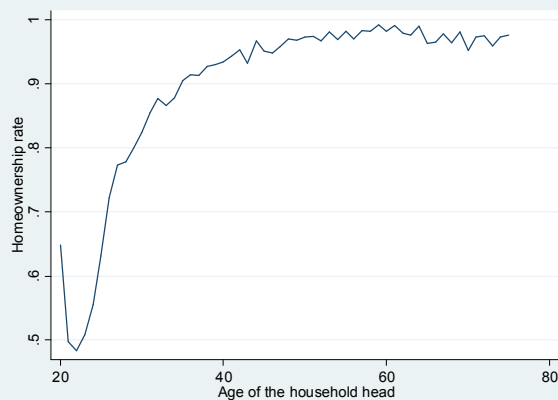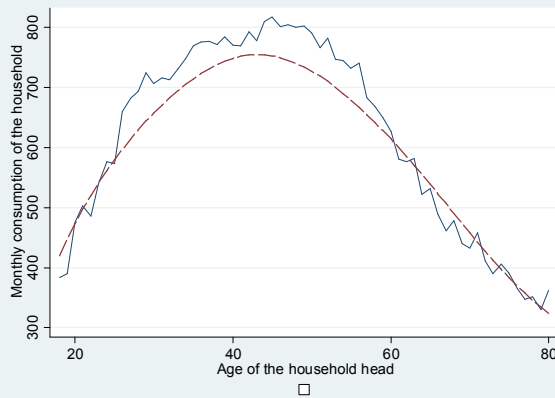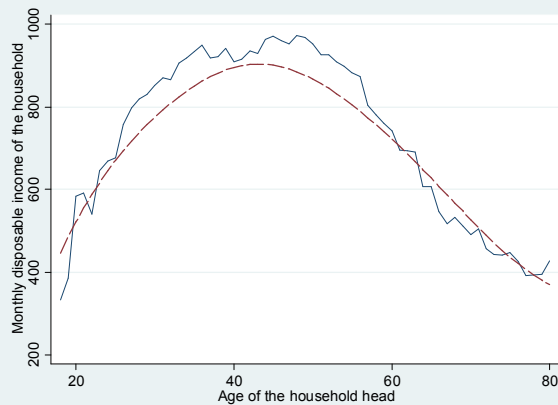
Source: authors' calculation.
Note: Consumption, income and housing wealth are deflated (in 2005 prices).

5 EMPIRICAL ANALYSIS

In this section we proceed in three steps. Firstly, we start our analysis with a focus on human capital of the households and its impact on the disposable income. In the second step, we turn our attention to housing wealth and look for the determinants of the residential property prices. Finally, we use both indicators (disposable income and housing wealth) as determinants of the consumption function.

5.1 INCOME DETERMINANTS

We start with the estimation of the income equation. The depended variable is defined as monthly household income (in logs), although the traditional Mincer model of earnings (Mincer, 1974) analyzes individual income instead of a household of several persons. This reflects that the next sections analyze housing wealth and consumption of households.

Table 1 presents estimations of household income determinants. The first specification (labelled Income 1) includes standard demographic indicators as gender, age, education, which are defined for the principal earner (household head). Since, the age-income profile has nonlinear shape, we include two age variables in the regression. Variable age is defined as age of the household head divided by 10 and age2 stands for age^2/100. Moreover, we control if the household head is widow, widower, divorced or single (we call this group as single parent). Furthermore, the number of household members and number of children are included in order to capture the size of the households. All variables are highly significant and they have the expected attributes. The households with highest education have higher income by 18.5 percent when compared to secondary education (omitted category). Households with female principal earner have income lower by about 4.8 percent, but single households with children have even lower income by 23.1 percent. We include also the level of partner's education. Similarly to negative gender effects, we find that the partner's education yields significantly lower returns to human capital. For example, the households with university educated household head have income higher by 18.5 percent, however, the household with the same level of education of his/her partner earn more by 13.7 percent. The negative differential of the secondary earner is visible also for primary education, where it amounts to 0.9 percent.

Table 1 OLS estimates of disposable income equation

	Income 1	Income 2	Income 3	Income 4	Income 5	Income 6
Age	0.095***	0.161***	0.163***			
Age2	-0.016***	-0.020***	-0.021***			
Number of adult	0.271***	0.276***	0.275***	0.244***	0.292***	0.275***
Number of children	0.058***	0.052***	0.053***	0.030***	0.064***	0.049***
Female	-0.048***	-0.048***	-0.049***	-0.076***	-0.019	-0.039***
Single parent	-0.230***	-0.226***	-0.227***	0.090	0.119***	-0.227***
Education primary	-0.122***	-0.122***	-0.328***			
Education tertiary	0.185***	0.185***	0.187***			
Partner's education	-0.131***	-0.131***	-0.128***			
Partner's education	0.137***	0.136***	0.135***			
Cohort 90		-0.071***				
Cohort 90 x primary education			0.148***			
Cohort 90 x secondary education			-0.074***			
Cohort 90 x tertiary education			-0.076***			
Years of education				0.488***	0.265***	
Years of partner's education				0.261***	0.304***	
Potential work experience_1				0.377***	-0.242**	
Potential work experience_2				-0.103***	-0.050	
Years of education before 1990						0.415***
Years of education after 1990						0.494***
Potential work experience before						-0.173***
Potential work experience after						0.096***
Potential work experience before						0.041***
Potential work experience after						0.036***
Constant	9.115***	8.958***	8.961***	8.135***	8.197***	8.604***
Sample	All households	All households	All households	Cohort of younger h.	Cohort of older h.	All households
No. of obs.	27,650	27,650	27,650	8,674	19,288	27,962
R^2	0.641	0.642	0.643	0.464	0.665	0.637

Note: */**/*** depicts statistical significance of the coefficients at 10/5/1 % level of significance respectively. Regional and time effects are not reported. Source: authors' calculation.

The next specification (Income 2) extends the analysis by a cohort differential in age-income profile of the Slovak households. In particular, this specification includes also Cohort90, which is a dummy variable that equals to one if the principal earner entered the labour market before 1990 (in other words, if his or her age was more than 25 years in 1989).[14]

---

[14] This threshold was confirmed in a version of Chow structural break test for the household's age between 20 and 30 in 1990. The age of 25 years in 1990 was associated with the highest t-statistics.

These households received their complete education before economic reforms. Such specification shows that income of households belonging to the Cohort 90 is lower by 7.1 percent compared to the younger households.

However, cohort differentials may correspond to several factors including previous earning profile (see discussion in section 2). Therefore, we compare the returns to human capital for different levels of education in the last specification. In comparison with secondary education completed after 1990, which was selected as a base category, employees with university degree receive lower incomes if they entered the labour market before 1990, while income for respondents with basic education is actually higher for those, who entered the labour market before 1990. This contradicts alternative explanations of income differentials (e.g. wage persistence).

These results are highly robust to various sensitivity tests. Following Chase (1998) we include years of education and years of work experience in the disposable income equation. Given expected length of education for various levels, we define years of education as

$$years\ of\ education = (basic*8 + secondary*4 + university*5)/10\,.$$

Additionally, we define the potential work experience indicator, which represents an additional characteristic of human capital. The variable work experience is defined, as it is common in the literature:

$$potential\ experience\_1 = (age - years\ of\ education - 6)/10$$

$$potential\ experience\_2 = (age - years\ of\ education - 6)^2/100$$

We split the sample for both cohorts according to the age of the principal earner. Two columns (Income 4 and Income 5) in table 1 present regression of household incomes on years of education, years of potential experience, experience squared and other variables capturing households' characteristics. Similarly to the previous results, the estimated coefficient on years of education is significantly lower among the older households, which confirms our previous findings. Moreover, the effect of work experience is also lower in the older cohort group.

Finally, we compute years of education and years of potential work experience achieved before and after 1990 for every household. The last column of table 1 summarizes the estimated coefficients. Not surprisingly, it turns out that the education completed after 1990 is significantly better rewarded compared to the education from transformed schooling system after 1990. Thus, our sensitivity analysis confirms that human capital obtained before economic reforms yields lower returns than human capital attained more recently.

5.2 DETERMINANTS OF HOUSING WEALTH

Under central planning, housing was under tight state control. Majority of dwellings [15] were owned directly by the state or by state enterprises. Lux (2004) classifies the following four types of housing: state rental flats, rental flats owned by state enterprises, cooperative rental flats and privately owned family houses. The mass privatization of former state rental housing began in the early 1990s. Due to privatization, a lot of families became owners of flats they had occupied. Moreover, they had to pay far less than the market price for such flats. Thus, older families acquired their housing wealth relatively cheaply and they are often equipped with a higher physical capital.

The estimation of determinants of housing wealth has to reflect that the sample includes households with zero reported housing wealth. In this case, the OLS approach will not yield consistent estimates mainly because the censored sample is not representative of the population (Cameron and Trivedi, 2009). Therefore, we apply two alternative approaches. The Tobit model proposed by Tobin (1958) reflects the truncation of the data sample. However, it does not consider that households with housing wealth are likely to be different from the remaining households. The Heckman selection model reflects also the selection bias in the housing wealth equation.

The Tobit model is used when the depended variable is not always observed but the vector of covariates is fully observed. This is also our case because housing wealth is observed only if the household owns the dwelling. Therefore, we try to apply the Tobit model on housing wealth. The model is specified for unobserved (latent) variable model:

---

[15] Due to data limitation, we assume only dwellings the families live in. So we do not consider another properties owned by the family.

$$y^* = x\,\beta + u$$

Where, housing wealth is proxied as

$$housing\ wealth = \begin{cases} y^* & if\ \ y^* > L \\ L & otherwise \end{cases}.$$

The variable x stands for vector of covariates and L is a censoring point. The model is left censored.

Explanatory variables include disposable income, number of family members, dummy

variable for single parent households and also dummy for households belonging to Cohort 90. The estimated coefficients for all variables are in line with standard expectations. Moreover, the coefficient on Cohort 90 is also positive and highly significant. The impact is actually high also in economic terms. Older households, who received housing under the central planning, own property valued nearly 50% higher than younger households.

As many authors point out, the Tobit model is very sensitive to proper specification. The estimates are inconsistent if the errors are not normally distributed or if they are not homoscedastic. Therefore, we use a selection model, which might be more appropriate approach for the estimation of the housing wealth. The Heckman selection model offers a more general modelling approach than the Tobit model. It represents a bivariate sample selection model. In general, the model includes a selection equation for home ownership, (ho):

$$ho = \begin{cases} 1\ \ if\ \ z\gamma + u_2 > 0 \\ 0\ \ if\ \ z\gamma + u_2 \le 0 \end{cases}.$$

The outcome or regression equation for housing wealth has linear form. The dependent variable housing wealth (hw) is observed only if ho equals to one. Thus

$$hw = \begin{cases} x\beta + u_1 & if\ \ z\gamma + u_2 > 0 \\ - & otherwise \end{cases},$$

where *x* stands for vector of covariates for outcome equation, *z* represents vector of covariates for selection equations. The Heckman selection model can be estimated by two different methods. First, a two-step estimation approach estimates the outcome and selection equation in two steps. Second, both equations can be estimated simultaneously by a maximum likelihood, which is generally considered to be more efficient and robust. Table 2 presents results of both methods which supports the robustness of our results.

We include the same set of explanatory variables as in the previous Tobit estimation. Moreover, the selection equation includes age and age squared of the principal earner, which are used as the exclusion restriction[16]. This reflects the assumption that households are more likely to become home owners as they age. Once acquired, households stay in the same housing for a relatively long period of time. Therefore, the value of housing does not change again with age (it is actually insignificant if included in outcome equation). Nearly all variables keep expected signs in the selection equation and age variables are highly significant. By contrast, number of members of the family, as well as the dummy variable for Cohort 90, is insignificant and does not have any effect on home ownership.

The outcome equation contains the disposable income, which as expected has a positive sign. Families with higher income live in properties that are more valuable. The coefficient on number of family members has also positive sign indicating that larger families own dwellings that are larger and thus more valuable. All specifications confirm that households belonging to the Cohort 90 own more valuable housing wealth compared to younger households. Year dummies capture the development of house prices compared to the omitted year 2004. We include also regional dummies to control for different regional prices of properties, which keep expected results. For example, households in the capital city, Bratislava, are less likely to own their housing, but if so, it is more expensive than in other regions.

---

[16] Because of the identification condition, we use age in the selection equation only. Therefore, it does not appear in the regression equation.

Table 2 Tobit and Heckman selection model estimates of housing wealth

	Housing 1 Tobit model	Housing 2 Tobit model	Housing 3 Heckman model – ML	Housing 4 Heckman model -2STEP	Housing 5 Heckman model - ML	Housing 6 Heckman model -2STEP
Disposable income	0.159***	0.145***	0.061***	0.043***	0.061***	0.054***
Number of family members	0.031***	0.078***	0.050***	0.056***	0.063***	0.062***
Single-parent	-0.149***	-0.137***	-0.058***	-0.045***	-0.060***	-0.058***
Cohort 90		0.448***			0.133***	0.093***
Constant			13.434***	13.619***	13.286***	13.395***
			Homeownership – selection model			
Disposable income			0.370***	0.336***	0.360***	0.336***
Single parent			-0.199***	-0.238***	-0.206***	-0.238***
Number of family members			0.042	0.019	0.034	0.019
Age			1.023***	1.093***	1.058***	1.093***
Age2			-0.067***	-0.076***	-0.071***	-0.076***
Cohort 90			0.041	-0.000	-0.031	-0.000
Constant			-5.301***	-4.931***	-5.178***	-4.931***
No. of observations	26,300	26,300	27,965	27,965	27, 965	27,965
No. of censored obs.	1,674	1,674	1,674	1,674	1,674	1,674
rho			-0.447	-1.000	-0.275	-0.701

*Note: */**/*** depicts statistical significance of the coefficients at 10/5/1 % level of significance respectively. Regional and time effects are not reported.*

Source: authors' calculation.

5.3 CONSUMPTION FUNCTION

So far, we have shown on the one hand that families, which entered the labour market before the transition have significantly lower disposable income. On the other hand, those families own higher housing wealth. However, neither income nor housing wealth individually describes welfare sufficiently. Therefore, we merge both channels in an estimation of household consumption, which may be taken as a better proxy of households' welfare [17]. In particular, we study the impact of income and housing wealth on consumption. By and large, the household consumption forms more than 50 per cent of output. Such importance is another reason to study the impact of wealth on consumption.

---

[17] In order to keep our analysis simple, we do not discuss the possible implications of future income streams and time preferences between the households.

Using the Durbin-Wu-Hausman test, we strongly reject the hypothesis that disposable income is exogenous variable in the consumption function. Since the OLS estimation would be biased in this case, we prefer an instrumental variable approach to estimate the consumption function. In order to present robust estimates, we perform two-stage OLS together with GMM estimation. The crucial point here is the selection of proper set of instruments. We test the exogeneity of instruments by Hansen J-statistics. Given its results, we choose two variables as proper instruments, namely a dummy for households with female principal earner and households living in a town. These instruments describe the background of the household. We use gender income differences (lower income for female principal earner) which are well documented in the literature (e.g. Weichselbaumer and Winter-Ebmer, 2005 and 2007) and confirmed by previous estimations. Moreover, we suppose that income in towns is higher, which reflects better earning opportunities in urban centres.[18] We do not include cohort dummy variable in the instruments due to possible endogeneity. The reported Hansen J-statistics confirms that our instruments are valid (see table 3). The same group of instruments is used in two-stage OLS and also in GMM estimation.

In order to present robust results we have utilized two stage OLS and Generalized methods of moments approach. Using both methods, we have estimated two types of consumption function. They both include disposable income, housing wealth and dummy for primary and tertiary education. The only difference is that the second and fourth specifications are supplemented with the variable Cohort 90. Therefore, in table 3 we present four columns. In all cases, the estimated coefficients of disposable income are more or less the same. The marginal propensity to consume is around 0.87. It turns out that housing wealth effect on consumption is insignificant. Actually, this result may reflect a low degree of development of credit markets in Slovakia. Thus it is generally impossible to use mortgage equity withdrawals.

---

[18] Both instrumental variables are correctly signed and highly significant in the fist state equation. F-Statistics of excluded instruments is with values of 820 and 885, well above the recommended threshold of 10.

Table 3 IV estimates of consumption function

	Consumption 1 2SLS	Consumption 2 2SLS	Consumption 3 GMM	Consumption 4 GMM
Disposable income	0.874***	0.862***	0.872***	0.860***
Housing wealth	-0.001	0.001	-0.001	0.001
Primary education	-0.113***	-0.106***	-0.114***	-0.107***
Tertiary education	0.015*	0.017**	0.014*	0.016**
Constant	1.149***	1.280***	1.170***	1.296***
Cohort 90		-0.047***		-0.046***
Number of observations	27 965	27 965	27 965	27 965
Centered R^2	0.620	0.623	0.620	0.624
Hansen J statistic	0.164	0.157	0.164	0.157
Hansen p-value	0.686	0.692	0.686	0.692

Note: */**/*** depicts statistical significance of the coefficients at 10/5/1 % level of significance respectively. Time effects are not reported. Disposable income is instrumented by dummies for female principal earner and for location in urban centres.

Source: authors' calculation.

We can see that early labour market cohorts have a lower consumption level than younger cohorts by almost 5 percent. Nevertheless, consumption of older households would be higher if rents for better housing were properly imputed. In the following example, we try to evaluate the size and the impact of imputed rents. In Table 2, we estimate that value of housing of older households is higher by 9 to 13 percent. Given the annual rent to price ratio of 5.5 percent (Global Property Guide, 2012) and the average consumption and house price, it implies that imputed rent for older households increases their consumption by 5 to 7 percent. Therefore, the differences in consumption levels between the cohorts are rather negligible if rent imputation is considered. Thus we can conclude that the negative income level is largely compensated at the level of consumption.

Table 4 shows the estimates of consumption function for different levels of education and for different age groups. Both characteristics apply to principal earner. The main difference between the three groups of estimates is the coefficient on disposable income. Low educated families have the highest marginal propensity to consume. As before, the housing wealth effect is insignificant across all three groups.

Finally, we present the estimated coefficients for four age categories. First group includes younger families, where the principal earners are younger than 30 years old. Principal

earners between 30 and 40 and between 40 and 50 comprise the second and third column, respectively. The last column represents families older than 50 years. In general, the estimates are more or less comparable across all age groups. The marginal propensity to consume is somewhat lower in the second and third age group. However, it is higher among the youngest and the oldest households. The coefficient on housing wealth is insignificant in first three groups. Although it is significant among the oldest families, the value of the coefficient is almost zero.

Table 4 Consumption function by education and age categories							
	Primary education	Secondary education	Tertiary education	Age<=30	30<Age<=40	40<=Age<50	Age>50
Disposable income	0.938***	0.849***	0.847***	0.865***	0.834***	0.839***	0.889***
Housing wealth	0.000	0.001	-0.000	0.002	0.001	-0.001	0.003**
Cohort 90	-0.090**	-0.049***	-0.029**				
Constant	0.550**	1.403***	1.463***	1.223***	1.548***	1.513***	0.935***
No. of observations	3324	20839	3802	1907	5179	6572	14307
Centered R^2	0.579	0.580	0.512	0.426	0.457	0.504	0.644
Hansen J statistic	0.895	0.060	0.220	0.055	0.021	1.105	3.518
Hansen p-value	0.344	0.806	0.639	0.814	0.885	0.293	0.061

Note: */**/*** depicts statistical significance of the coefficients at 10/5/1 % level of significance respectively. Time effects are not reported. GMM estimator is used.
Source: authors' calculation.

6 CONCLUSIONS

Central planning in Eastern Europe put a large weight on material production and investment. Behind specialization of these countries on heavy industry, we show that these preferences were strongly entrenched also in the provision of human capital and physical goods to population. Access to education was heavily controlled and education was focused on areas enjoying preferences by central planning. By contrast, the countries made a significant effort to satisfy basic needs of population, including also affordable housing for everybody.

Also nearly 25 years after the beginning of economic reforms and transition in Eastern Europe, the former preferences are clearly visible in the endowment of population by human

capital and physical capital. Using household expenditure surveys in Slovakia, we demonstrate significant differences between cohorts entering the labour market before and after 1990. On the one hand, returns to human capital are lower for education obtained before market reforms. On the other hand, the early labour market cohorts enjoyed also easier access to housing. We find that both effects seem to counteract each other to a significant degree. Older employees face lower returns on human capital, which lowers their disposable income. Keeping other effects unchanged, this would result in negative implications on their wealth. However, older households enjoyed also a preferential access to housing. Although the effects are difficult to quantify exactly, the magnitude of both effects, and their expected variability among individuals, lead to a conclusion that it is difficult to identify winners and losers of transition, at least in the example of Slovakia. The importance of both effects describes how fragile is the political support for economic reforms in Eastern Europe. We argue that mass privatization programs (voucher privatization, but even more privatization of housing to incumbent tenants) played an important role in ensuring political support during economic reforms.

Behind political economy considerations, we provide several findings with regard to income, wealth and consumption determinants at the household level. Household income reflects education level of its members. However, we find also significant gender and regional differences. Disposable income is an important determinant of housing ownership, as well as its value. Finally, household consumption is determined by available income. Instrumental estimations of income effects imply marginal propensity to consume, which is below 1 and it varies strongly between household categories. Finally, housing wealth is not entering directly the consumption function, which reflects low availability of financial instruments in Eastern European countries.

REFERENCES

Andrén, D., Earle, J. S., and Sapatoru, D. (2005) The wage effects of schooling under socialism and in transition: Evidence from Romania, 1950-2000, *Journal of Comparative Economics* 33(2), 300-323.

Attanasio, O., Leicester, A. and Wakefield, M. (2011), Do House Prices Drive Consumption Growth? The Coincident Cycles of House Prices and Consumption in the UK. *Journal of the European Economic Association*, 9(3), 399–435.

Berger, M. C., Blomquist, G. C., and Sabirianova Peter, K., (2008) Compensating differentials in emerging labor and housing markets: Estimates of quality of life in Russian cities, Journal of Urban Economics 63(1), 25-55.

Bover, O. (2005) Wealth effects on consumption: microeconometric estimates from the Spanish survey of household finances." *Banco de España Working Papers 0522*, Banco de España.

Byfuglien, J. (2006) Statistical Capacity Master Plan for the Slovak Republic.

Calomiris, Ch., Longhofer, S. D. and Miles W. (2009) The (Mythical?) Housing Wealth Effect ,NBER Working Papers 15075, National Bureau of Economic Research, Inc.

Cár, M. (2006) Monitoring residential property prices in Slovakia. *Biatec* 14(1), 9-15.

Card, D., and DiNardo, J. E., (2002) Skill-biased technological change and rising wage inequality: Some problems and puzzles, *Journal of Labor Economics* 20(4), 733–783.

Carraro, L. (2006) Calculation and use of an absolute poverty line. Report for the Ministry of Labor, Social Affairs and Family of the Slovak Republic. Oxford Policy Management.

Carroll, Ch. D., Otsuka, M. and Slacalek, J. (2011). How Large Are Housing and Financial Wealth Effects? A New Approach. *Journal of Money, Credit and Banking*, vol. 43(1), 55-79.

Cameron, A. C. and Trivedi P. K. (2009). Microeconometrics Using Stata. A Stata Press Publication.

Campos, N. F., and Coricelli, F. (2002). Growth in Transition: What We Know, What We Don't, and What We Should, J*ournal of Economic Literature* 40(3), 793-836.

Campos, N. F., and A. Dabušinskas, (2009) So many rocket scientists, so few marketing clerks: Estimating the effects of economic reform on occupational mobility in Estonia, *European Journal of Political Economy* 25(2), 261-275

Deaton, A., (2005). Measuring Poverty in a Growing World (or Measuring Growth in a Poor World), *Review of Economics and Statistics*, MIT Press 87(1), 1-19.

Denisova, I., Eller, M. and Zhuravskaya, E. (2010) What do Russians think about transition?, *Economics of Transition* 18(2), 249-280.

Grant, Ch and Peltonen, T. A. (2008) Housing and equity wealth effects of Italian households. *Working Paper Series 857*, European Central Bank.

Chase , R. S. (1998) Markets for Communist Human Capital: Returns to Education and Experience in the Czech Republic and Slovakia . *Industrial and Labor Relations Review.* Vol. 51, number 3, pages 401-423.

Denisova, I., Eller, M., and Zhuravskaya, E. (2010) What do Russians think about transition? Economics of Transition 18(2), 249–280

Edgar, B., Filipovic, M. and Dandolova, I., (2007) Home Ownership and Marginalisation. European Journal of Homelessness, Vol. 1..

Égert, B. and Mihaljek, D. (2008) Determinants of House Prices in Central and Eastern Europe, Working Papers No. 1, Czech National Bank, Prague.

Farinha, L. (2008) Wealth effects on consumption in Portugal: a microeconometric approach. *Economic Bulletin and Financial Stability Report Articles*.

Fidrmuc, Jan, (2000) Political support for reforms: Economics of voting in transition countries, *European Economic Review* 44(8), 1491-1513.

Fidrmuc, Jan, Fidrmuc, Jarko, (2009) Foreign Languages and Trade. Discussion Papers No. 7228, CEPR London.

Fischer, S.; Sahay R. and Végh, C. (1997) From Transition to Market: Evidence and Growth Prospects, in Zecchini, S. (ed.) Lessons from the Economic Transition: Central and Eastern Europe in the 1990s. Kluwer Dordrecht, 79–101.

Fleisher, B. M., Sabirianova, K. and Wang, X. (2005) Returns to skills and the speed of reforms: Evidence from Central and Eastern Europe, China, and Russia, *Journal of Comparative Economics* 33(2), 351–370.

Global Property Guide (2012) Europe: Price/Rent Ratio - Rent Years to Buy 120 Sq.M. Property, http://www.globalpropertyguide.com/Europe/price-rent-ratio/ (viewed January 12, 2012).

Hlaváček, M. and Komárek, L. (2009) Housing Price Bubbles and their Determinants in the Czech Republic and its Regions, Working Papers No. 12, Czech National Bank, Prague.

Juurikkala, T. and Lazareva, O. (2006) Non-wage benefits, costs of turnover, and labor attachment: Evidence from Russian firms, BOFIT Discussion Papers 4/2006, Bank of Finland, Institute for Economies in Transition.

Karmažin, B. Vplyv zavedenia eura na vývoj spotrebiteľských cien (Euro changeover effects on consumer prices). *Biatec* 19 (8), 4-14.

Lux, M. 2004. Housing the Poor in the Czech Republic: Prague, Brno and Ostrava. In: Too poor to move, too poor to stay. LGI Fellowship Series.

Malová, D. and Miháliková, S. (2002) Political Science – Slovakia, http://www.gesis.org/knowledgebase/archive/politicalscience/slovakia/report1.html

Mincer, J. (1974) Schooling, Experience and Earnings NBER Press, New York.

Moore, D. (2005) Slovakia's 2004 Tax and Welfare Reforms, Working Paper No 05/133, IMF, Washington.

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

Newell, A., and Socha, M. W. (2007) The Polish wage inequality explosion, Economics of Transition 15(4), 733–758.

Orazem, P. F., and Vodopivec, M. (1995) Winners and Losers in Transition: Returns to Education, Experience, and Gender in Slovenia, *World Bank Economic Review* 9(2), 201-30.

Orlowski, R. and Riphahn, R. T. (2009) The East German wage structure after transition. *Economics of Transition*. Volume 17(4), pages 629-659.

Roland, G., and Verdier, T. (1994) Privatization in Eastern Europe: Irreversibility and critical mass effects, *Journal of Public Economics* 54(2), 161-183.

Senaj, M. (2008) Consumption Function Estimate and Consumption Forecast. *Ekonomicky casopis (Journal of Economics),* 56(1), 3-21.

Tobin, J. (1958) Estimation of relationships for limited dependent variables. *Econometrica* 26 (1), pages: 24–36.

Weichselbaumer, D. and Winter-Ebmer, R. (2005) A Meta-Analysis of the International Gender Wage Gap. *Journal of Economic Surveys* 19(3), 479-511.

Weichselbaumer, D. and Winter-Ebmer, R. (2007) The effects of competition and equal treatment laws on gender wage differentials. Economic Policy 22, 235-287.

Van Ours, J.C. and Stoeldraijer, L. (2010) Age, Wage and Productivity. IZA Discussion Paper No. 4765. Bonn.

APPENDIX

Table 5 Summary statistics

	No. of observations	Mean	Std. Dev.	Min	Max
all households					
Household consumption	27,377	672	378	44	3,272
Disposable income	27,377	796	438	13	4,035
Housing wealth	27,377	71,484	61,738	0	1,325,641
younger households					
Household consumption	8,678	743	357	78	3,110
Disposable income	8,678	894	407	101	3,731
Housing wealth	8,678	65,379	63,399	0	1,128,155
cohort 90 households					
Household consumption	18,699	640	383	44	3,272
Disposable income	18,699	750	445	13	4,035
Housing wealth	18,699	74,318	60,745	0	1,325,641

Table 6 first stage estimates of consumption function

	Consumption 1	Consumption 2	Consumption 3	Consumption 4
Dependent variable: disposable income				
Housing wealth	0.01***	0.02***	0.01***	0.02***
Primary education	-0.36***	-0.34***	-0.36***	-0.34***
Tertiary education	0.20***	0.20***	0.20***	0.20***
Cohort 90		-0.09***		-0.09***
Female household head	0.05***	0.05***	0.14***	0.05***
Type of town	0.14***	0.14***	0.22***	0.14***
Constant	0.22***	0.21***	0.32***	0.21***
Number of observations	27,962	27,962	27,962	27,962
Prob > F	0.00	0.00	0.00	0.00
Partial R2	0.17	0.17	0.17	0.17

*Note: */**/*** depicts statistical significance of the coefficients at 10/5/1 % level of significance respectively. Time effects are not reported. Disposable income is instrumented by dummies for female principal earner and for location in urban centres.*

Source: authors' calculation.