POST-RETIREMENT LABOUR SUPPLY IN TRANSITION ECONOMIES

by

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Abstract

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Population ageing is currently growing from the phenomenon observed primarily in the developed countries, to a challenge for other countries as well. It poses threats to fiscal systems, making widespread governments' policies to promote longer working lives. Such policies should be built, taking into account the incentives for the individuals to stay at the labour force, both institutional and individual.

In this work, we study the individual factors influencing the probability to work after reaching the retirement age using the data from Life in Transition Survey III by the EBRD, conducted in 2016. The results show that individuals with higher self-rated health, a higher level of education achieved, and a higher level of accumulated wealth positively affect the probability to be employed, while women, married persons and single-person households are less likely to be employed. The main variable of interest, income, turns out to be significant and positively affecting the employment probability for the full sample and having ambiguous effects for the regional subsamples.

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GLOSSARY

ICC. Interclass correlation

OR. Odds Ratio

ROC. Receiver operating characteristics

EBRD. European Bank of Reconstruction and Development

Chapter 1

INTRODUCTION

In recent years, a number of countries of the world incur the so-called population ageing phenomenon, resulting from both increasing longevity and decreasing fertility of the countries. According to the World Bank data, life expectancy at birth in the EU countries increased from 77.1 in 2000 to 81 in 2018 (4.9%)[1], the share of population ages 65 and above reaching 20.2% of the total population in 2018[2]. The phenomenon creates threats for state pension systems of countries, which have to pay an increasing amount of funds to the pensioners, as well as increases pressure on the public budgets of the countries. Thus, the question of studying and explaining the behaviour of retirees in the labour market during their older years becomes relevant.

However, a similar situation spreads not only among the developed countries. The countries, which are classified as transition economies according to the World Bank classification, experienced the growth of life expectancy from 71.2 in 2000 to 75.1 in 2016 (5.4%)[1], the share of the elderly reaching more than 10% in the bigger part of countries in transition[2]. Moreover, while the developed countries have positive net migration, which can be used as an instrument to offset the population ageing, most of the countries in transition have more emigrants than immigrants, implying a negative net migration value[3]. Due to such differences in the sources of

1 World Bank Open Data: https://data.worldbank.org/indicator/SP.DYN.LE00.IN

2 World Bank Open Data: https://data.worldbank.org/indicator/SP.POP.65UP.TO.ZS

3 World Bank Open Data: https://data.worldbank.org/indicator/SM.POP.NETM

population ageing and a smaller amount of instruments to offset the phenomena, the question of studying post-retirement labour supply in particularly transition economies becomes of special importance.

As for the existing literature, the empirical studies in the area of post-retirement labour supply focus on studying the institutional and individual factors which influence an individual's decision to continue working after the retirement age. The socio-economic factors affecting the decision, which were discussed in the literature, include health status (Kanabar 2015), job type (Wahrendorf 2017, Kanabar 2015), education level (Pettersson 2011), working conditions (Wahrendorf 2017) and others. Most of the studies come to the conclusion that a number of socio-economic variables are associated with the higher probability to retire.

In this thesis, we make an extension to the existing literature and study the effects of income factors on the decision to work after reaching the retirement age in transition economies. The study is different from the previous literature due to the special focus on the transition countries, which start to incur the population ageing phenomena, as well as on the income factors.

The focus on the transition economies is connected with the fact that these countries have a different source of ageing and a smaller amount of instruments to offset ageing. Besides, the transition economies have a different socio-economic environment, for instance, the level of the population's incomes is usually lower than the one of the developed ones. These differences in the environment might also affect the socio-economic variables associated with the higher probability to retire.

Furthermore, as the population ageing has yet to become as widespread in the transition economies, as in the developed ones, the issue is largely neglected in the

literature, which currently studies mostly the post-retirement labour supply in the developed countries. For these reasons, this study concentrates on studying the issue for the transition countries.

Moreover, the study provides an extension to the previous literature on the issue of income factors affecting retirement. One of the major reasons to study the income-related factors affecting retirement decisions is the significant policy implications that the relation can provide. This is due to the fact that the governments can use different tax instruments to influence the flow of individuals' incomes, thus influencing their probability to stay at the labour force. Another reason is that in the current framework of the literature on the issue, the accumulated during the lifetime wealth is studied to a much bigger extent than the income flows. Therefore, the question of the income effects is understudied and requires additional attention.

For the purposes of the study, we are using large microdata from Life in Transition Survey from the European Bank of Reconstruction and Development. With the data, we are able to analyse the extent to which individuals of different income levels are prone to stay at the labour force after reaching the retirement age. In particular, we choose observations for the individuals having reached the retirement age and construct a dependent dummy variable showing whether an individual continues working above this age. Then we analyse a number of socio-economic variables, explaining this choice, concentrating on testing the effect of income.

The results of the study might have important policy implications. According to the World Bank report on ageing in Europe and Central Asia (World Bank 2015), policies aiming at encouraging longer working lives might be useful in helping countries to cope with the challenges of ageing, specifically by supporting fiscal

sustainability and growth. This is especially relevant for Europe and Central Asia, where the participation rate in the labour market among the elderly is lower than in the benchmark countries in Western Europe.

Finally, our individual data allows us to understand the type of jobs, usually taken by the elderly population, as well as whether this job provides a significant part of income. This provides policy implications on the measures suitable for promoting the longer working life, which is in turn important for assuring stability of pension funds exposed to the problem of population ageing.

The study is structured in the following manner: Chapter 2 provides the literature overview, focusing on the empirical literature, which provides the analysis of both institutional and socio-economic factors associated with the retirement; Chapter 3 includes the description of the methodology used in the study, as well as the final specification of the main model; Chapter 4 provides an analysis of the data, including the sample construction and the main insights from the data on dependent and independent variables; Chapter 5 presents the main findings of the study; Chapter 6 draws conclusions from the findings, as well as provides policy discussion coming from the conclusions.

Chapter 2

LITERATURE OVERVIEW

Individual decision on working above the retirement age might be influenced by many factors. In the literature, the approaches to this question might be divided into two categories: contextual and individual characteristics. While contextual factors concentrate on studying the influence of institutional factors on retirement decision (e.g. pension system, available benefits, possible unemployment benefits), individual factors focus on different layers of socio-economic characteristics: marital status, level of education, wealth, presence of a husband or wife at the workforce, working conditions and others. Therefore, we would like to evaluate these two approaches separately.

2.1 Contextual factors

Contextual factors study the institutional differences between the countries, specifically how they affect the post-retirement labour supply, as well as early retirement among the elderly, which is a source of understanding the labour force behaviour of this group of people. Börsch-Supan (2009) use the Survey of Health, Ageing and Retirement in Europe (SHARE) in order to study so-called health-adjusted unused capacity in the labour force. The authors take into account both health factors, which turn out to be significant to explain the variation inside the country, but fail to explain the cross-country early retirement decisions, and institutional differences in welfare systems. The latter turns out to be driving the distribution and age pattern of early retirement. The authors find out that not only

the countries that provide the retirees with significant pensions and allow for an easy way to retire early have more early retirees, but also that in some countries like Denmark and Netherlands early retirement might be substituted by unemployment and disability benefits. This proves that the way the welfare and retirement system is organised, plays and important role in retirement decisions.

Earlier study of Gruber and Wise 1999 suggests that the social security provisions provide an important incentive to leave the labour force early. The authors analyse 11 industrialized economies and the individual data from them to show that there is a strong correspondence between the age when social security benefits are available and actual departure of a person from the labour force. This in turn substantially reduces the potential productive capacity of labour force. The study has important policy implications suggesting that the social security factors should be taken into account.

Later papers not only study the way how institution affect early retirement and working beyond pension age, but they also discuss policies aiming at incentivising people to work more through institutional factors. In this area, Wise (2010) discusses two ways of providing incentives to work more. On the one hand, it is possible to eliminate penalties on working at older ages, which in turn provides implicit incentives for the early retirement. On the other hand, it is also possible to correct the false assumption of "boxed economy" with regards to the labour market. According to this view, the retirement of the elderly is providing the new working places, that is the job for the younger workers. However, such relationship is not proven in the literature: in particular, Gruber and Wise 2010 use various estimation methods to check for the relationship between the employment of older people and the employment of the youth, and find out no evidence that the reduction of labour force participation among the elderly would create job

opportunities for the youth. Therefore, the assumption of the boxed economy should be released, according to the authors.

Finally, from the studies that discuss the effect of the institutional factors on working beyond the retirement age, as well as leaving the labour force early, we get a strong evidence that the state policy in this has a significant effect on the individual choices on retirement. This means that in the condition of increasing threat of aging population and its pressure on the pension system, the policy incentivising people to prolong their working lives would be efficient in changing the individual behaviour and decisions. However, such policies should also take into account individual factors, which shape decisions for different groups of people.

2.2 Individual characteristics

The literature on individual characteristics influencing the retirement decision takes into account not only the early and late retirement decisions, but also so called process of unretirement – when individual retires, but comes back to the labour force later on. Consensus in the developed countries shows us that unretirement decisions there do not depend on income shocks, as well as a number of different financial factors. It is rather dependent on a number of personal characteristics.

For instance, Kanabar (2015) studies post-retirement labour supply in England, based on the English Longitudinal Study of Ageing panel data, and focuses attention on individuals, who are initially observed in the retirement. To do this, they apply discrete time hazard model and control for a number of background characteristics. The author finds out that unretirement in England is more likely among individuals with a higher level of education, who have a spouse in the labour

market and who are in better health; furthermore, they research the nature of the jobs taken by the retirees and find out that they provide a non-trivial source of income.

Pettersson (2011) studies unretirement in another developed country – Sweden – using register data. The author estimates the retirement rate in the area covered by the study to be at the range of 6-14%, depending on which definition of unretirement is used. They come up with similar conclusions to Kanabar (2015) – people in the group of unretirement are more likely to have higher education, be early retirees, males and individuals with a spouse in the labour force. Thus, the studies show that unretirement is largely affected by lifestyle choices, so a number of socio-economic factors, and less dependent on financial shocks, which might incentivise people to come back to the labour force. The limitation of such studies is concentrated in the fact that unretirement decisions are studied with some geographical limitations, concentrating on developed countries, and leaving others beyond the analysis.

Finally, the study analysing specifically working beyond the pension age is conducted by Wahrendorf et al. (2017). They use the Survey of Health, Ageing and Retirement in Europe (SHARE) data to research characteristics of individuals working beyond the pension age. To do this, the authors use both descriptive methods, and estimation of a serious of multivariable logistic regression models with random intercept to predict the likelihood of working with individuals (level 1) nested in countries (level 2). They find out that such individuals are likely to be an employer/self-employed, to work as manager or professional, and under more favourable psychosocial working conditions.

To sum up, the studies in the area of retirement decisions conclude that they are often dependent on lifestyle choices. However, they are limited geographically, and usually do not focus on income aspects, as well as wages, to study this phenomena.

Chapter 3

METHODOLOGY

To find the empirical evidence of the effect of incomes on working after reaching the retirement age we would follow the methodology for multilevel logistic regression and compare it to conventional logistics model with dummy variables, to check the model fits. We focus on using multilevel modelling due to the nested structure of our dataset: individual respondents in the survey are nested within countries. Therefore, the assumption of the independence of observations is violated. One way to allow for this non-independence (clustering) due to omitted group-level predictors is fitting a multilevel model with group-level random effects. This would also allow us to account for the contextual factors, which differ among countries. These contextual factors include, but are not limited to different pension benefits and social security schemes, different taxation of incomes, institutional incentives of retirement and others. Thus, we are exploring both state-level variation of our data, but also individual-level measures relevant for explaining the retirement decision.

For the multilevel model, we would follow the methodology of Leckie (2010) predicting the likelihood of working after retirement age at the individual (level 1) and country (level 2). We would firstly fit in the empty multilevel model, to check the variance of the cluster-specific residuals and calculate interclass correlation, which would allow us to understand the necessity to account for the nested structure of our data.

Then we use the multilevel model with random intercept, as this methodology would allow us to account at the same time for the country characteristics, as well as individual characteristics, at which we are going to focus our attention. Thus we would have different intercepts among the countries, but the same slope for the variables. We would also include a model with the random slope for the expenditures variable, allowing us to understand whether the variable has a different effect in different countries. In the end, we would model a similar model for the regional subsamples, allowing us to check whether level-1 explanatory variables have a different effect in different regions.

The generalised version of the model for the continuous response variable is the following:

$$y_{ij} = \beta_0 + \beta_1 \cdot x_{1ij} + \cdots + \beta_p \cdot x_{pij} + u_{0j} + \varepsilon_{ij}, \quad (1)$$

where we account for *i*-individuals nested in *j*-countries. The group effects here are accounted by the u_j residuals , level 1 effects (individual ones) are reflected by ε_{ij} residuals. Both are assumed to follow normal distributions with random means. Random intercept here is defined for each group as $\beta_{0j} = \beta_0 + u_{0j}$ (Marc A. Scott 2013).

For the logit model, we are interested in the log-odds that y=1 given the explanatory variables, so the generalised equation becomes:

$$\log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \beta_0 + \beta_1 \cdot x_{1ij} + \cdots + \beta_p \cdot x_{pij} + u_{0j}, \quad (2)$$

where u_{0j} follows normal distribution with mean zero.

To check whether some percentage of variations is explained by country differences, we use a number of tests and compare the multilevel logit with random intercept to the one with random slopes and to conventional logit with country dummies. In particular, we check for the intraclass correlation, defined as the following:

$$\rho = \frac{\sigma_u^2}{\sigma_u^2 + \sigma^2} \quad (3)$$

to see the proportion of the variability between countries in the total variability, and thus to test whether we need to use the multilevel model. Besides, we also include the results of model with the random slope, test it against the one without the random slope, to check whether we need to include it to the model and whether it provides a better fit than the alternative without the random slope.

As for the variables included, the dependent variable is a self-reported employment status for the last twelve months. This includes both paid and unpaid job and as it is self-reported status, individuals might not be prone to report the jobs in the informal sector, so the variable would rather account for the official employment.

Our explanatory variable of interest is income. We approximate it with the expenditures per member of the household. To explain the reasons for using the proxy instead of the variable itself, we need to account for the three possible mechanisms of the influence of income on the employment after retirement. These are the following:

1) Income effect – as leisure is a normal good, with an increase in income, the consumption of leisure should increase as well; that is why the supply of the labour force with the higher incomes should be lower;

2) Substitution effect – as wage, which is a part of income, rises, leisure becomes more expensive, so individuals are giving up more income to get additional leisure; that is why the increase in income should cause an increase in the labour supply among the elderly;

3) Mechanical effect – this effect is specifically attributable to our data, as we do not have the information on the latest income before the retirement; given that in some countries it is allowed to both continue working and to receive pension benefits, the incomes of those who are working should be mechanically higher than of those of retired non-employed individuals.

One of the reasons to approximate income with expenditures is to eliminate the third effect. Despite working individuals in some countries mechanically receive both wages and social benefits, the expenditures pattern would be smoothed over time due to the consumption smoothing. Thus, although individuals might lose part of their income after the retirement, the consumption pattern is smoothed over time and would reflect the former income of the respondents that are not working. On the other hand, it would reflect the level of consumption without pension benefits for the working respondents, also due to consumption smoothing.

Table 1. Independent variables and their expected effects

Variable	Description	Expected effect
Expenditures	Monthly households expenditures per member of household (equivalised), current USD	Ambigious There is observed both income and substitution effect, affecting the probability to work, the total effect depends on which of the effects dominate
Married	Self-reported marriage status	- (Hospido 2015) Couples coordinate their retirement decisions, meaning that if a partner retires, this provides incentives for another partner to retire as well, that is why the probability of retirement among couples should be higher
Education	Dummy for whether individual has a higher education	+ (Kanabar 2015, Wahrendorf 2017) Persons with the higher education tend to work in the sectors more suitable for the elderly
Gender	Dummy for whether individual is identified as a female	- (Wahrendorf 2015) Women tend to have "home-maker" history of employment, retiring earlier
Urban	Dummy for whether individual lives in an urban area	+ The issue is not widely discussed in the literature, however, the rural citizens can be expected have a lower probability of working due to the presence of the non-paid "land" work in the area
Age	Age of the primary respondent	- The working productivity declines over time, incentivising retirement

TABLE 1 – Continued

Variable	Description	Expected effect
Asset index	Asset index including the dwelling characteristics, as well as the ownership of a car and a telephone	+ (Wahrendorf 2017) Wealthier individuals tend to work in advantaged occupational positions, more suitable for the elderly
Health	Dummy reflecting responses of "very good" and "good" in the question on self-rated health	+ (Wahrendorf 2017, Kanabar 2015) Individuals with accumulated health stock tend to be more productive, being more prone to be able to continue working
Single household	Dummy reflecting if an individual is living alone	Ambiguous The single persons living alone might need additional funds to afford living; also, they do not have home-making duties to substitute the main job

Additionally, individuals might underreport their true income as a response to the survey, due to different kinds of biases, or report only the taxable income. Besides, the bias is lower for reporting expenditures rather than reporting income. Thus, because this eliminates the mechanical effect and reduces the bias, we approximate income with the expenditures; this approximation also reduces the endogeneity arising from the discussed mechanical effect and the reverse causality, as the expenditures would be less affected by the current employment status.

We control for a number of socio-economic variables, which were previously directly or indirectly discussed in the literature or theoretical frameworks. Their description and expected sign are reflected in Table 1.

Finally, the specification is the following:

$$working = \beta_0 + \beta_1 \cdot expenses_{ij} + \beta_2 \cdot age_{ij} + \beta_3 \cdot educ_{ij} + \beta_4 \cdot female_{ij} + \beta_5 \cdot urban_{ij} + \beta_6 \cdot married_{ij} + \beta_7 \cdot assets_{ij} + \beta_8 \cdot singlehousehold_{ij} + \beta_9 \cdot missingexpenses_{ij} + u_{0j} + \varepsilon_{ij} \quad (4)$$

The specification also accounts for the variable of missing expenditures. It is a dummy reflecting 1 if expenditures are not reported by the respondent and 0 otherwise. This would allow us to include the observations with the missing expenditures data to the model. In the next chapter, we are providing more extended explanation on the variables used, based on our data, and provide some descriptive implications.

Chapter 4

DATA

3.1 Data Description

This study is based on the data from Life in Transition Survey III, conducted by the European Bank of Reconstruction and Development (EBRD) in collaboration with the World Bank. This is the third wave of the survey Life in Transition, carried in 2016. The version polls 51,000 households in 34 countries, most of them are transition countries in Central and Eastern Europe. For comparison, Italy and Germany, as developed countries, are also included in the survey, however, we do not use them for the purpose of this study.

3.2 Sample Construction

The observations for the current study were filtered by the countries and age of the primary respondents.

The criteria of the selection of the countries, relevant for the research, was the country being classified as a transition economy by the European Bank for Reconstruction and Development. Thus, we excluded from the analysis three countries, namely Italy, Germany and Greece, not classified as such and which were included in the Survey for the purpose of comparison. The final sample includes 31 transition countries from Europe and Central Asia region.

The age selection of the sample was based on the retirement age in the countries chosen. As the wave of the survey was conducted in 2016, we chose this year as a reference year for the purpose of defining the retirement age. For most countries, the retirement age is different for male and women, that is why we excluded the observations from the analysis based on the specific retirement age for genders. Furthermore, as the retirement age differs between the countries, as well as inside the countries, and is often different for the persons with different working stage or professions, we took the normal age at which all individuals are qualified for the old-age pension in the countries studies. Thus, for the sake of simplicity of the analysis and constraints in the data of the survey, we did not account for the early retirees. The qualified age for the both genders is clarified in the Appendix A.

We arrived at the final sample of 9,549 observations, used for constructing the model.

3.3 Data description

For the analysis, we have chosen as a dependent variable dummy for whether an individual is working and a number of independent variables, including the variable of interest – expenditures per member of a household, and socio-economic variables as controls (see Table 2).

Table 2. Descriptive statistics of the variables

Variable	Number of observations	Mean	Std. Dev.	Min	Max
Working	9,549	0.14	0.34	0	1
Age	9,549	70.65	7.42	55	95
Expenses per member	9,549	228.60	305.12	0	5652.78
Missing expenses	9,549	0.26	0.44	0	1
Female	9,549	0.64	0.48	0	1
Married	9,549	0.47	0.50	0	1
Higher education	9,549	0.19	0.39	0	1
Good health	9,549	0.22	0.41	0	1
Urban	9,549	0.41	0.49	0	1
Asset index	9,549	0.00	1.17	-12.43	6.14
Single household	9,549	0.41	0.49	0	1

3.3.1 Dependent variable

To analyse the employment after the retirement age, we have chosen the self-reported employment status reflected as a dummy with the value of one if a person has been working. The dummy reflects an answer to the question of whether a respondent has been working for the past twelve months. We have chosen this particular notion due to constraints of the survey, which does not reflect non-standard employment. That is why, the main dependent variable reflects self-reported employment, which does not include an informal one.

Out of 9,549 observations, included in the analysis, only 1,323 individuals (14% of the sample) reported to have been working for the past twelve months. The share confirms the statistics of the transition countries to have a lower percentage of the working retirees than the developed ones (World Bank 2015).

3.3.2 Independent variables

a) Expenditures

Our main variable of interest is income. As we mentioned in the previous chapter, we approximate it with the variable reflecting total households expenses per month, per member of the household. We use a proxy for two reasons: it would eliminate the discussed mechanical effect of work influence on incomes and would have a lower reporting bias. Given that we account for the accumulated wealth captured by wealth index, which would correlate with the savings part of income, we control for savings, which is part of income.

To measure expenditures of the households, we summed up self-reported monthly expenses on food, beverages and tobacco, utilities (electricity, water, gas, heating, fixed-line phone) and transportation (public transportation, fuel for car). We also added self-reported expenditures on education (including tuition, books, kindergarten expenses), health (including medicines and health insurance), clothing and footwear and durable goods (e.g. furniture, household appliances. TV, car, etc.), which are reported on the yearly basis; for the purpose of comparison, we divided them my twelve, to reflect average expenditures per month.

As all of the respondents were reporting their income, as well as their expenditures in local currencies, we transformed expenditures in current USD, with an exchange rate as of 31st of December 2016, for the year when the survey was taken.

In the end, we adjusted the monthly self-reported households' expenditures for the number of persons living in households on a permanent basis ("for the past six months" in the survey). To adjust for a number of persons in the household, we used the OECD's equivalisation technique. In particular, we used the square root scale and took the square root of the number of persons in the household for the

simplicity, but also due to the nature of the bigger part of the households, which include mostly adults, which would cause a higher level of the poverty.

Finally, to cope with the missing observations in the variable, we substituted missing observations with zeros and included dummy for missing observations (taking the value of one if the observation is missing).

From the descriptive statistics (see Figure 1), we can notice that the highest share of the working respondents for three out of four regions is observed among the ones above the 75th percentile in our observations by expenditures. Besides, also for three regions out of four, the share of working individuals is the lowest for the ones below the 25th percentile by expenditures. We can notice that the fraction tends to decline the lower is the quantile, providing reasons for the supposed positive relation between the expenditures and probability of working.

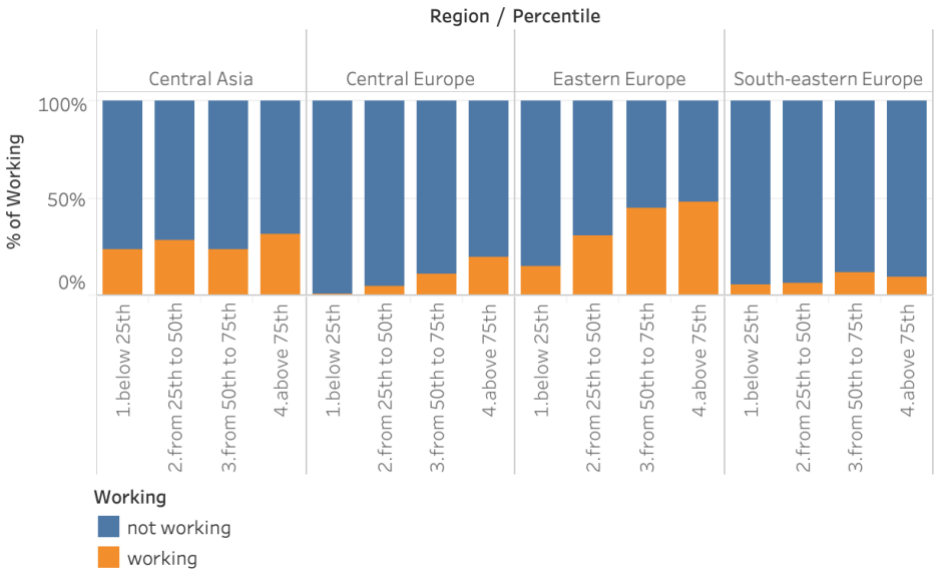

Figure 1. Percentage of working persons for different levels of expenditures

At the same time, we can notice that there is an increasing share of working persons at higher percentiles for Central and Eastern Europe, while for Central Asia and South-Eastern Europe the effect is rather ambiguous. For this reason, we need to further inspect the regional subsample in this study.

b) Age of the primary respondent

In the sample, the variable varies from 55 (the lowest retirement age among the countries) to 95 years (the biggest possible due to limitations of the survey). It is measured as self-reported age of the primary respondent. As we can see from Figure 2 the fraction of the employed among the elderly declines over time, which is consistent with the literature. The highest share is observed for individuals aged 55 years old (approximately 60%).

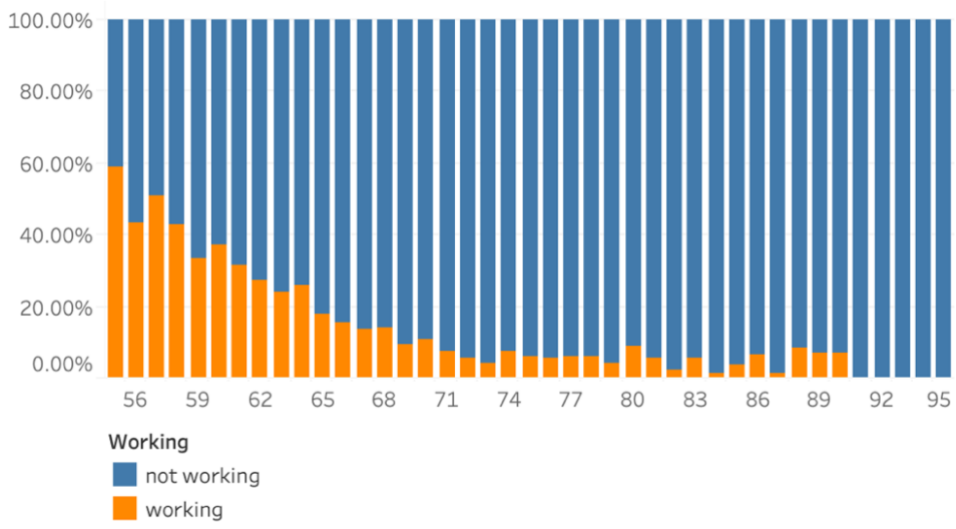

Figure 2. Share of working individuals, by age

C) Self-reported health

As the health stock declines over time and influences an individual's ability to work, this is one of the main variables influencing the employment among the elderly, according to the literature. In this survey, it is measured as self-rated health taking the values of "very good", "good", "medium", "bad" and "very bad". For the purpose of the analysis, it is included in the model as a dummy, taking the value of one if the respondent's self-assessed health status is "very good" or "good". Although this is not a formal measure of individuals' health, it is the one directly influencing the decision to remain in the labour force after reaching the retirement age, that is why we use it for the analysis.

We can see from the Figure 3 that the share of working individuals declines with the decrease of the self-rated health estimate. While 29% of individuals that assess their health as very good are working, the share for the persons with very bad self-assessed health is only 6.2%. This signifies possible positive relation of the self-rated health with the probability to work after reaching the retirement age.

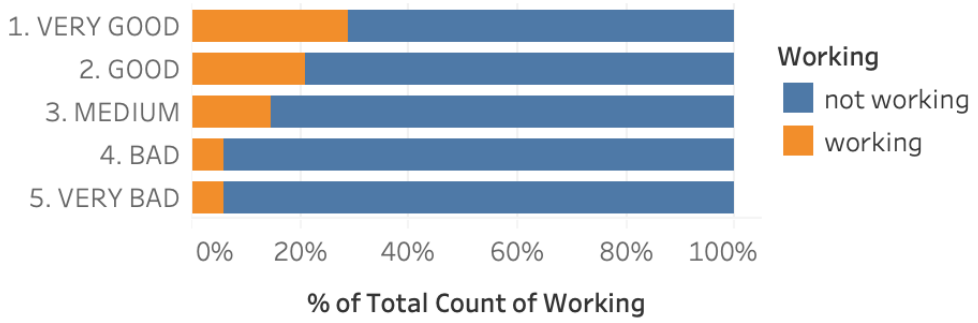

Figure 3. Share of working individuals, by self-rated health

D) Education level

According to the literature, the higher level of education obtained is associated with higher probability to continue working after retirement age. In the Life in Transition survey, the education variable is reflected as a question on the highest education level achieved, taking values of "No degree / No education", "Primary education", "Lower secondary education", "(Upper) secondary education", "Post-secondary non-tertiary education", "Tertiary education (not a university diploma)", "Post-secondary non-tertiary education", "Bachelor's degree or more", "Master's degree or PhD". We include the variable to the model as a dummy reflecting whether an individual has a higher education degree (the last three levels present). Figure 4 shows that the highest share of working individuals is observed among those who have Master's or PhD degree (28.6%) and a tertiary non-university degree (27.3%). The lowest share is observed among those having primary education (4.4%). This can be explained by the fact that the persons with higher levels of education are more likely to work at jobs suitable for the elderly not requiring usage of physical force.

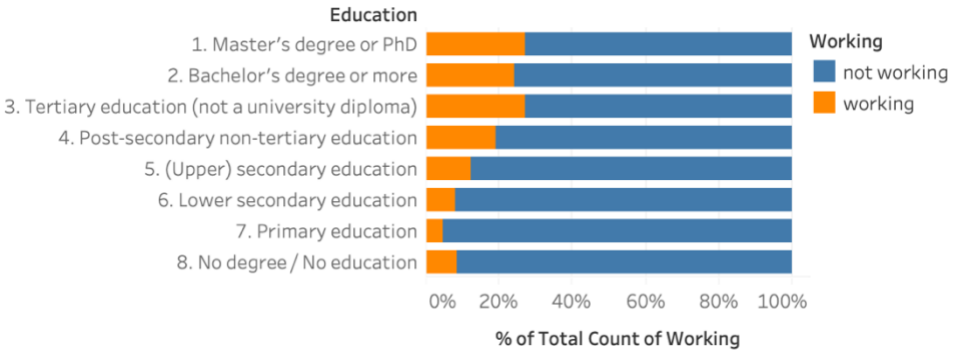

Figure 4. Number of working individuals by the level of education

e) Gender

We control for gender using a dummy taking the value of 1 if an individual is identified as a female. Although the literature shows inequalities between the share of working male and female, in the current sample the share of working male (13.62%) is almost equal to the share of working female (13.95) (see Figure 5).

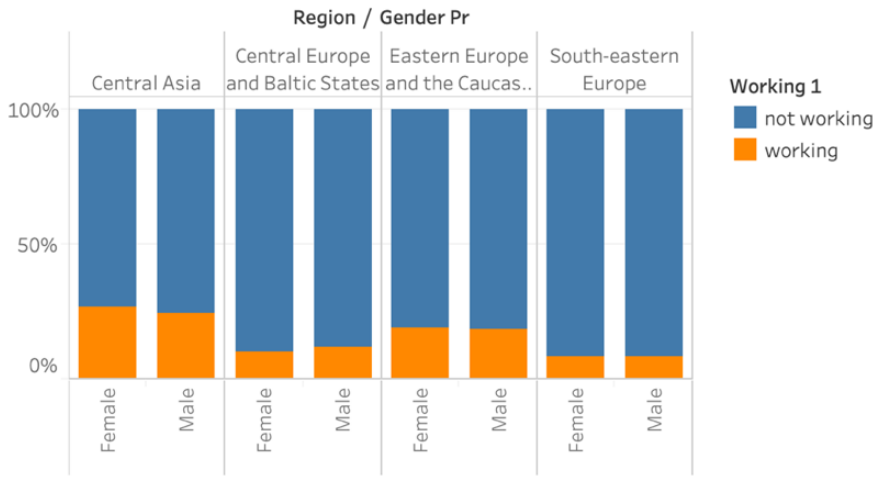

Figure 5. Number of individuals working, by gender

g) Urban residence

This is the dummy reflecting whether an individual is a resident of an urban area. The value should positively influence the probability to be employed among the retirees. This is due to the fact that rural citizens tend to have a non-standard work connected with land ownership and other factors, like housekeeping. At the same time, our dependent variable accounts for rather a formal employment, reducing the probability to work for the residents of rural areas.

e) Asset index

To include the variable which would reflect the wealth accumulated during the lifetime, we include assets index. In the index, there is included the characteristics of the dwelling (presence of water and electricity in the dwelling) and the ownership of the telephone and car by the household. To define the weights for each of the components of the index, we used the first component from the principal component analysis (PCA). The first component would serve as a synthetic indicator of the range of variability of the variables. We use the PCA for each country separately, as it would provide information on the relative wealth position of a respondent in the country. By definition, the asset index has a mean of zero, indicating that an individual has a mean position in the country comparing to other respondents. Having a negative index would mean that an individual would have the assets below the mean value in their country while having a positive one – above the mean value. In our data, this index takes values from -12.43 to 6.14 and for the bigger part of countries, its distribution is skewed to the negative side.

g) Marriage status

The variable takes the value of 1 in case the respondent is married and 0 otherwise. The studies show that the couples make a joint decision to retire, a phenomenon known as joint retirement. In particular, studies show that almost one-third of dual-earner couples in the US and in Europe coordinate their retirement decision (Hospido 2015). That is why, keeping other factors constant, the respondent who has a partner should be more likely to retire due to this coordination effect.

h) Dummy for a single person household

We construct the variable using the information on members of households, who has been living in the households for the 6 months before the survey. The variable

is reflected as a dummy taking the value of 1 if there is only one person in the household. From the sample, 16% of non-single respondents were working, while for the respondent from a single household this value was at the level of 11%, indicating a potential negative effect of the variable.

3.3.3 Regional subsamples

For the purpose of the study we divided the countries represented in the survey into four categories, according to the classification of the European Bank of Reconstruction and Development (EBRD). The classification is presented in the Table 3.

Table 3. Division of the countries to the regions

South-Eastern Europe	Central Europe and Baltic States	Eastern Europe and the Caucasus	Central Asia
Albania	Croatia	Armenia	Kazakhstan
Bosnia and Hercegovina	Czech Republic	Azerbaijan	Kyrgyz Republic
Bulgaria	Estonia	Belarus	Mongolia
Cyprus	Hungary	Georgia	Tajikistan
Kosovo	Latvia	Russia	Turkey
Montenegro	Lithuania	Moldova	Uzbekistan
North Macedonia	Poland	Ukraine	
Romania	Slovak Republic		
Serbia	Slovenia		

From the Figure 4, we can notice that some regions have a higher share of working population. Specifically, the highest one is observed in Central Asia (25%) and the lowest one – in South-Eastern Europe (8%). We can connect it to the differences in the retirement age – the average for Central Asia countries is much lower than for South-Eastern and Central Europe (see Appendix A).

At the same time, we can notice that there is some variability inside the regions themselves (see Appendix B). While the between-regions variability we can be explained by the differences in retirement ages, which tend to be similar in the specified regions, the cross-country difference inside the region is rather explained by the institutional effect and the individual differences. That is why, there is a need to analyse this phenomenon for the regional subsamples, what is done in the next chapter.

Chapter 5

RESULTS

To build a model of working after reaching the retirement age, we first run the empty multilevel model with individuals (level 1) nested in countries (level 2). This allows us to understand the variance of the cluster residual, as well as to calculate the interclass correlation (ICC), which would serve as an indicator whether we need to account for the nested structure of our data. The ICC would also serve as an indicator on to which extent the variation is explained by the contextual factors. We then run the multilevel model with a random intercept for the full sample and check the effect of expenditures on the probability to be employed. We also analyse other socio-economic variables and their effect on employment. In the second part of the chapter, we allow for the slope for expenditures to vary between the clusters (countries, in our case), to see whether the magnitude of the effect changes while allowing for the cluster residuals for this term. Then, to get an understanding on the differences in the effects of our explanatory variables, we run the multilevel logistic regression with a random intercept for the regional subsamples and make conclusions on whether the individual explanatory variables are common across the regions.

As the direct wages and job type are available only for those continuing to work after retirement, we cannot include these variables to our model. However, as the variables can provide significant insights on the types of jobs taken by the retirees, their wages and amount of time working, we provide a brief statistical analysis of these variables in the third part of this chapter.

5.1 Multilevel logit for the full sample

Firstly, we want to understand how the odds that individual is working after reaching the retirement age vary between the clusters, countries in our case. Except for providing the insights on the variance of this measure, this would serve as an indicator that we need to use a multilevel model to capture the nested structure of the data. To check this, we run an empty multilevel model with individuals nested in countries and calculate the interclass correlation coefficient. This measure shows which share of the total variation which can be explained by the variation between countries.

From the empty multilevel model, we get that the coefficient of the constant is equal to -1.87. This reflects the overall log-odds of working after the retirement age. We transform the log-odds to the average probability of working after reaching the retirement age by using the logit transformation and receive the value of 13.4%, which is the average predicted probability of working.

We also check for the variance of the level-2 residual, which shows the effect of the intercept variation. This value turns out to be 0.56, reflecting that the elderly in some countries are much more likely to work after the retirement age than in the others. The graphical inspection of the country-effects/residuals also shows that they differ for the 31 countries analysed in the study, while some countries are having significantly higher effects on the employment than others (see Appendix C).

We use the information from the constructed model, to calculate the ICC. The value turns out to be significant and shows that 15% of probability of working after the retirement age is explained by between-countries differences.

This exercise allows us to see that significant part of the variation is explained by the differences between the countries. These differences potentially include different political incentives not to retire (as higher pension benefits in the case of the later retirement), different pension benefits themselves, level of incomes and other institutional factors that vary between the countries. To account for these factors and concentrate on the individual predictors, we use a multilevel model with the random intercept and later the one with the random slope, which would account for potentially different effect of incomes in different countries.

To check for the effect of the number of social and economic variables, including our variable of interest – expenditures per member of the household, on the probability to work for all the countries, we use multilevel logit with the random intercept for the full sample. The results are presented in Table 5. We also present the random effects for the countries in Appendix D.

As we can see, most of the results are consistent with the previous literature and theoretical frameworks. In particular, the highest odds ratio and average marginal effects can be observed for the dummy of the self-rated health: the individuals having responded to have "good" and "very good" health are 2.5 times more likely to be employed. This is an expected outcome, which we can connect with the fact that health serves as a prerequisite to other activities, so poor health limits the production capabilities of individuals, affecting their productivity at work. This would influence the marginal product an individual produces, decreasing the potential wage. Thus, for individuals with a low level of health stock, the marginal benefits of working would be lower, so they are less likely to exceed the marginal costs.

Table 4. Multilevel logit with random intercept for the full sample

Variable	Odds ratio	Average marginal effects
Age	0.88***	-0.13***
	(0.005)	(0.006)
Expenditures per member	1.0005***	0.0005***
	(0.0001)	(0.0001)
Missing expenditures	0.98	-0.02
	(0.08)	(0.09)
Female	0.75***	-0.29***
	(0.05)	(0.07)
Married	0.57***	-0.56***
	(0.05)	(0.09)
Higher education	2.06***	0.73***
	(0.15)	(0.07)
Good health	2.5***	0.92***
	(0.18)	(0.08)
Urban	1.07	0.07
	(0.08)	(0.07)
Asset index	1.19***	0.17***
	(0.04)	(0.03)
Single household	0.57***	-0.56***
	(0.05)	(0.09)

Standard errors in parentheses. * if p-value < 0.1, ** if p-value < 0.05, *** p < 0.01.

For the similar reason, the coefficient on age is negative: as the productivity declines with the age, the benefits from working decline as well, that is why at the older age individuals are more likely to have the value of retirement exceed the value of continuing to work. Thus, the probability of work also declines over time.

The positive sign on the education dummy is as well consistent with the previous literature, which can be explained by higher opportunity cost of persons with higher education, as well as higher expected wages. It can also be explained by the

logic that people with higher education are expected to be more likely employed in the sectors not requiring the use of physical force. As such sectors are more attractive for the retirees due to the deteriorating health conditions, the variable might also capture the effect of the industries on the probability to be employed.

Also, the sign for the gender dummy is consistent with the literature: women are expected to have shorter employment history than men, which can be partly attributed to the higher presence of informal job – caretaking, home-making and other types of unpaid work.

Other than that, the expected sign for the married dummy is negative. This is partly consistent with the literature and shows the effect of the joint retirement, according to which the employment status of one partner affects the employment of the other one. Certainly, due to data limitations, we cannot extract the spouse's employment status. However, the estimate shows us that solely having a spouse is associated with the lower probability to be employed after reaching the retirement age. This is likely to reflect the negative effect of joint retirement decisions: if one of the spouses retires, the other one is likely to retire as well, reducing the couples' probability to be employed.

The other studied variable is whether an individual belongs to a single-person household. In our model, this negatively affects the probability to be working. This is partly inconsistent with the literature, as such individuals are expected to have less housekeeping and caretaking job, which provides incentives for the retirement. We can, however, explain this with the structure of our data by the age and health status composition of this group, which negatively affects the employment.

Our main variable of interest – expenditures per member of the household – appear to be significant and positive. This signifies that the total effect of expenditures on employment among the elderly is positive. In particular, an

additional 100 dollars of expenditures per member of the household are associated with an increase in the probability of retirement by 5%. Moreover, the marginal predicted mean is increasing with a higher level of expenditures, indicating the increasing probability to work with the higher levels of expenditures (see Figure 6).

However, we can notice that the effect is economically small. This is aggravated with the fact that the mean level of expenditures is at the level of 165 US dollars per member of household. The 99th percentile of our population has expenditures of approximately 1400 dollars per person per month. This indicates that the effect is merely observed among the population.

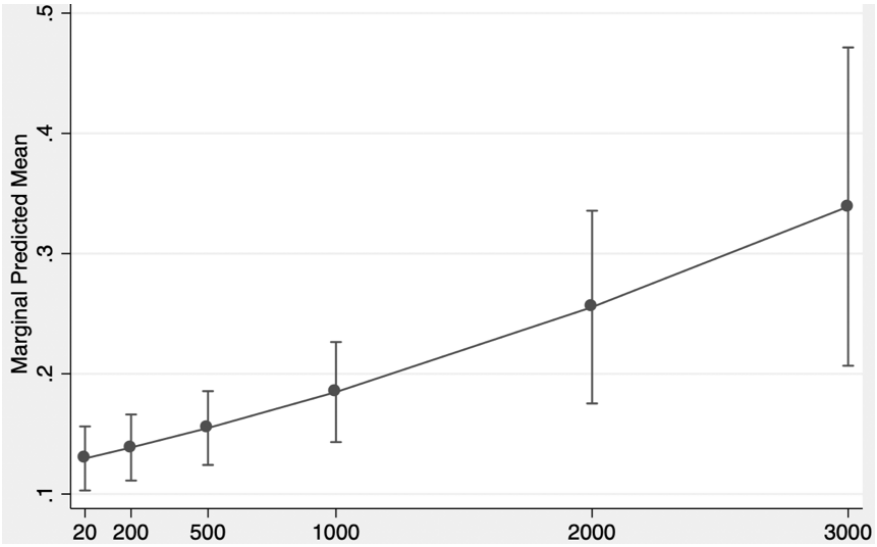

Figure 6. Marginal predicted mean for the different levels of expenditures

At the same time, the control for assets is positive and has a higher average marginal effect. By definition, zero value of the index reflects the mean position of a

household in their country by accumulated assets, which we took into account while constructing the index using PCA. Therefore, while the magnitude of the coefficient does not provide us with much of insights, we can notice that it is significant. Its effect is also much higher than the one of expenditures. This might indicate the importance of the wealth accumulated during the lifetime as opposed to the flow of income during the elderly years.

For the purposes of checking the model fit, we check whether the model classifies correctly the probability to work after the retirement age. For this purpose, we take the predictions from our model with the probability of more than 50% signifying that an individual is working. Then we construct the confusion matrix to compare the value predicted by the model with the actual one. We conclude that the accuracy of the model (share of the coinciding results to the total) is at the level of 87% of the cases present in the data. We also check the area under the ROC curve, which relies on the sensitivity and the specificity of our model, providing insights on the diagnostic ability of the model. The area turns out to be at the level of 0.81, showing a significant diagnostic ability of the model.

Likelihood ratio test against the logistic model provides the p-value of zero, signifying the need to use a multilevel model rather than the logistic one.

5.2 Multilevel logit for the regional subsamples

The next step in our analysis would be checking the effects of the socio-economic variables for the different regions from our analysis - Central Asia, Eastern Europe, Central Europe and Baltic States and South-Eastern Europe. This would allow us to understand whether they differ among the regions – by the magnitude or by the sign, which would indicate the necessity to explore the variables on the region or

country level for the purposes of the policymaking. We compare the results for the regional subsample with the model capturing the random slope for the expenditures variable. This would indicate the possibility to have different effects of expenditures in the studied countries. The results are presented in Table 6.

The main finding from the random slope model is the increase in the coefficient on expenditures per member of the household. In the model, 100 US dollars increase in this value is associated with a 15% increase in the probability to be employed. This might signify that if we take into account the differences in expenditures between clusters, then the effect of the variable on the dependent one is much higher. The model also captures the heteroskedasticity that is driven by clusters, which are countries in our case.

As for the regional subsamples, we can notice that there are variables, which are significant in all the cases, differing only by the magnitude of the coefficient, while others are significant only for certain regions.

On the one hand, the "universal" variables, significance of which is proven in the literature theoretically and empirically, remain significant over all the regions. These variables include the education level, self-rated health and the age. At the same time, it is worth noting that the average marginal effects of these variables has comparatively wide range – for instance, from 0.6 to 1 for the education variable. This might indicate the cross-country differences in the influence of these factors on the employment of the retirees. We can also include in this category the dummy on marriage status. Across the regions, the magnitude of the coefficient on the dummy is quite high, showing the significant importance of joint retirement decisions in these regions. A similar situation exists for the dummy reflecting single-person households, which is significant for all the regions, except for Central Europe.

Table 5. Average margins of multilevel model with random slope and random intercept for the full sample and only random intercept for the regional subsamples

Variable	Full sample with random slope	Central Europe and Baltic States	Eastern Europe and the Caucasus	Central Asia	South-Eastern Europe
Age	-0.13*** (0.006)	-0.14*** (0.01)	-0.12*** (0.01)	-0.1*** (0.02)	-0.11*** (0.02)
Expenditures per member	0.0015*** (0.0003)	0.0015*** (0.0002)	0.002*** (0.0007)	0.0005 (0.001)	0.00005 (0.0002)
Missing expenditures	0.23* (0.1)	0.25 (0.19)	0.24 (0.16)	-0.16 (0.3)	-0.03 (0.2)
Female	-0.28*** (0.07)	-0.33*** (0.12)	-0.23* (0.13)	-0.2 (0.2)	-0.25 (0.2)
Married	-0.57*** (0.09)	-0.68*** (0.19)	-0.34** (0.14)	-0.7*** (0.2)	-0.70*** (0.2)
Higher education	0.69*** (0.08)	0.72*** (0.13)	0.62*** (0.13)	1*** (0.2)	0.73*** (0.2)
Good health	0.92*** (0.08)	0.86*** (0.13)	0.9*** (0.16)	1*** (0.2)	1.04*** (0.2)
Urban	0.08*** (0.07)	0.13 (0.13)	0.04 (0.12)	0.3 (0.2)	-0.10 (0.2)
Asset index	0.15*** (0.03)	0.18*** (0.06)	0.17*** (0.05)	0.2* (0.09)	0.03 (0.1)
Single household	-0.53*** (0.1)	-0.27 (0.18)	-0.49*** (0.16)	-0.55* (0.09)	-1.44*** (0.3)
Number of observations	9549	3838	2382	800	2529

Standard errors in parentheses. * if p-value < 0.1, ** if p-value < 0.05, *** p < 0.01.

On the other hand, over the regions some variables might have different significance. For instance, the variable of gender is significant only for the region of Central and Eastern Europe

More importantly, expenditures and assets variable are both significant for the Central and Eastern Europe regions and lose their significance for the Central Asia and South-Eastern Europe regions(taking into account the p-value of 0.05 and less). This might be both the result of the cross-region differences in the retirees' behaviour, or the different level of bias while reporting the expenditures variable. However, as (a) these variables are insignificant together for these regions and (b) the assets variable is far less sensitive in terms of the reporting bias, as it clearly reflects what individuals possesses, the first reason seem to be more plausible. This means that we should put more attention to discovering the cross country differences in the retirees' behaviour.

5.3 Statistical results: characteristics of the post-retirement jobs

Due to the fact that we cannot extract from the data the latest employment information for the persons not working anymore, we cannot include this information to our model. However, we can make some conclusions, relying on the job information for the working individuals, which would allow us to make some important implications for the further research. In particular, we are going to look at the sectors taken by the elderly, to get the knowledge of what industries are suitable for the retirees, as well as discover the primary reasons why the retirees are not working for more hours than they are and how many months per year they are working.

Firstly, we can notice that the sectors where the retirees work do not require active physical force. The top-2 sectors include services and public administration, which are indeed characterised by not using the physical force to the extent some other sectors like manufacturing and construction do (see Figure 7).

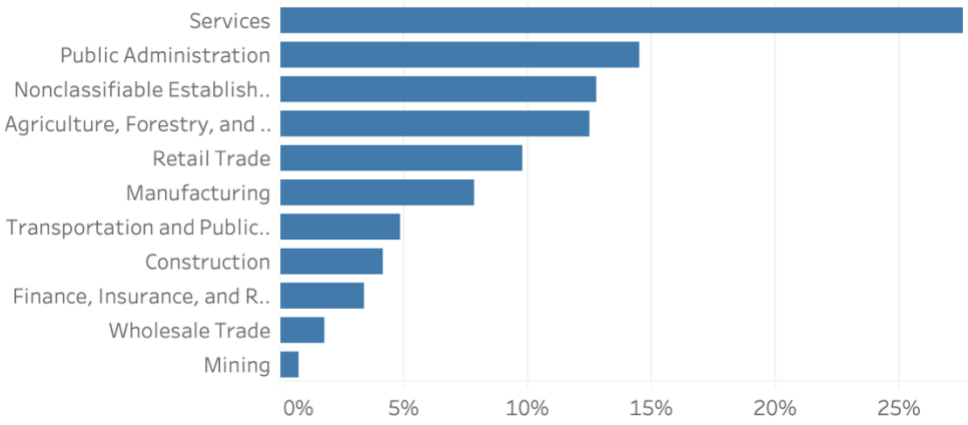

Figure 7. Sectors of the retirees' jobs
Note: the sample includes only the working retirees

Furthermore, most of the working respondents in our sample has been working for the twelve months for the year before the survey. This might indicate that the jobs taken by the retirees are expected to be the long-term stable jobs, rather than the temporary and short term ones (see Figure 8).

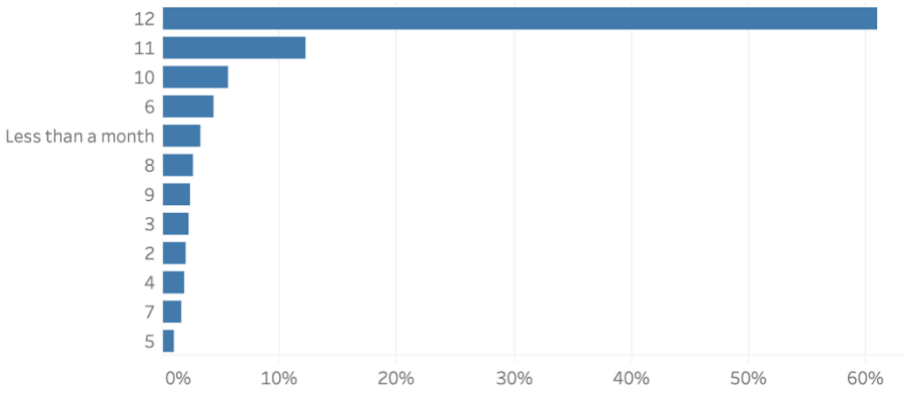

Figure 8. The share of working months during the year before the survey*
Note: the sample includes only the working retirees

Finally, some respondents in our sample prefer to work for more hours than they were working at the period of survey. They indicate among the reasons they cannot work more the inability to find another hob and the fact that they are taking care of other household members (see figure 9). The second reason might indicate the importance of taking into account informal household job (taking care of the grandchildren and other relatives) while studying the potential labour policies in the indicated countries.

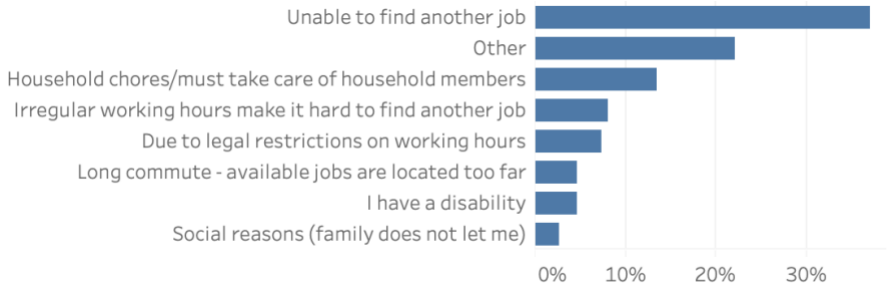

Figure 9. Reasons for not working more hours

Note: the sample includes only the working retirees wishing to work more hours

Thus, individuals who continue to work after reaching the retirement age, tend to work in some specific sectors and are expected to have certain conditions, which needs to be further studied with the data containing this information.

Chapter 6

CONCLUSIONS

In this study, we investigate the post-retirement labour supply for the countries classified as transition economies. In particular, we look at the effect of income on the probability to be employed after the retirement age. For this, we use the third wave of Life in Transition survey conducted by the EBRD and include only the observations representing the individuals who reached the normal retirement age in the countries of their residence.

Because of the nested structure of our data – individuals are nested within the countries, and the countries' effect is significant – we use multilevel logit with the random intercept for the purposes our study, which would also allow us to account for institutional (contextual) effects in our sample.

According to the study, income factors have a positive influence on the probability to be employed. As income has three possible mechanisms of influence on the probability to be employed (two regular ones – income and substitution effect, and one data specific – mechanical), we can draw a conclusion that the total effect is positive, while the particular effects need to be further studied.

As income is a highly biased variable, we approximated it with the less biased one – expenditures, which also reflect the former income of the retired respondents due to the consumption smoothing. As a result, the increase in expenditures by 100 US dollars per member of household is associated with the increase in the probability to be employed after retirement by 5% on average. The average margin also increases at the higher expenditure levels, meaning income factors have higher

effect for the persons with higher expenditures. Despite the result is positive and significant, economically it is less justifiable, as the mean expenditures per member of a household are less than 200 US dollars. Thus, the higher income is associated with the higher probability to be employed.

At the same time, the effect of income is not similar across the regions. To check this, we looked at the income variable for the four subsamples of our sample – Central Asia, Eastern Europe, South-Eastern Europe, Central Europe and Baltic states. The variable turned out to have the positive sign in all the cases, however, it appears to be significant only for two regions – Eastern Europe and Central Europe and Baltic States. For the regions of South-Eastern Europe and Central Asia not only the variable of incomes turned out to be insignificant, but also the variable of asset index, meaning the accumulated during the lifetime wealth is insignificant as well. As accumulated wealth tends to be a less biased indicator, we can draw a conclusion that the income and wealth factors are not expected to be explaining the working decision in the mentioned regions and the factors of influence there require additional attention.

A number of socio-economic variables turned out to be significant in explaining the working decision across all or almost all regions. They include education level, self-rated health, age of the respondent, marriage status and whether a person belongs to a single-person household. These results are consistent with the previous empirical evidence and can be explained by the theory of labour supply as well. The possible mechanisms of influence include increasing or decreasing productivity, which influence the marginal benefit of continuing to work rather than retiring.

At the same time, other variables – including gender – were differing in the significance among the regions. This might indicate the difference in the

importance of socio-economic factors in defining the stay at the labour force among the elderly in different countries.

Except for the estimation results, we can draw important conclusions from the data on the working retirees. In particular, the persons working after the retirement age tend to work in the sectors, not requiring the physical force, with the services sector employing most of the working retirees in our sample. Furthermore, most of the working retirees were working during the whole year before the survey, meaning the jobs taken by the retirees are not usually temporary and short term. Thus, the working conditions and the possible areas for employment require future estimations.

As for the policy implications, the results of the study might be useful while developing the policy of extending the retirement age or providing individuals with the incentives to stay at the labour force. The success of such policies depends on the responsiveness of individuals to the proposed changes, which can be analysed with the help of the results of the study. In particular, the study shows that for the transition countries the variables like health status and education are significant and have a positive effect, both statistically and economically, also having a high magnitude of the coefficients. Thus, these variables should be perceived as the prerequisites for the potential extension of the retirement age on the one hand and for different political incentives on the other hand.

Among the possible extensions of the thesis, it is desirable to estimate the income effects using the data with the former wages of the current retirees. This would provide valuable insights on the influence of the income factors prior to the retirement on the decision to retire. Besides, the difference in the significance of the socio-economic factors among different countries should be studied as well – despite, in our study we see such a difference among the four regions, it would be

useful to compare more diverse regions, for instance, developed countries and transition ones.

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APPENDIX A

RETIREMENT AGE IN THE STUDIED COUNTRIES

Table 6. Retirement age for the sample countries in 2016[4]

Country	Retirement age for female	Retirement age for male
Albania	60.3	65.0
Armenia	63.0	63.0
Azerbaijan	60.0	63.0
Belarus	55.0	60.0
Bosnia and Herz.	58.0	60.0
Bulgaria	60.8	63.8
Croatia	61.5	65.0
Cyprus	65.0	65.0
Czech Rep.	62.3	63.0
Estonia	63.0	63.0
FYR Macedonia	62.0	64.0
Georgia	60.0	65.0
Hungary	62.0	63.5
Kazakhstan	58.0	63.0
Kosovo	65.0	65.0
Kyrgyz Rep.	58.0	63.0

Country	Retirement age for female	Retirement age for male
Latvia	62.8	62.8
Lithuania	61.7	63.3
Moldova	57.0	62.0
Mongolia	55.0	60.0
Montenegro	60.0	65.0
Poland	60.0	65.0
Romania	60.3	65.0
Russia	55.0	60.0
Serbia	61.0	65.0
Slovak Rep.	62.0	62.0
Slovenia	65.0	65.0
Tajikistan	58.0	63.0
Turkey	58.0	60.0
Ukraine	57.5	60.0
Uzbekistan	55.0	60.0

[4] US Social Security Administration: https://www.ssa.gov/policy/docs/progdesc/ssptw/

APPENDIX B

SHARE OF WORKING INDIVIDUALS IN THE SPECIFIED REGIONS

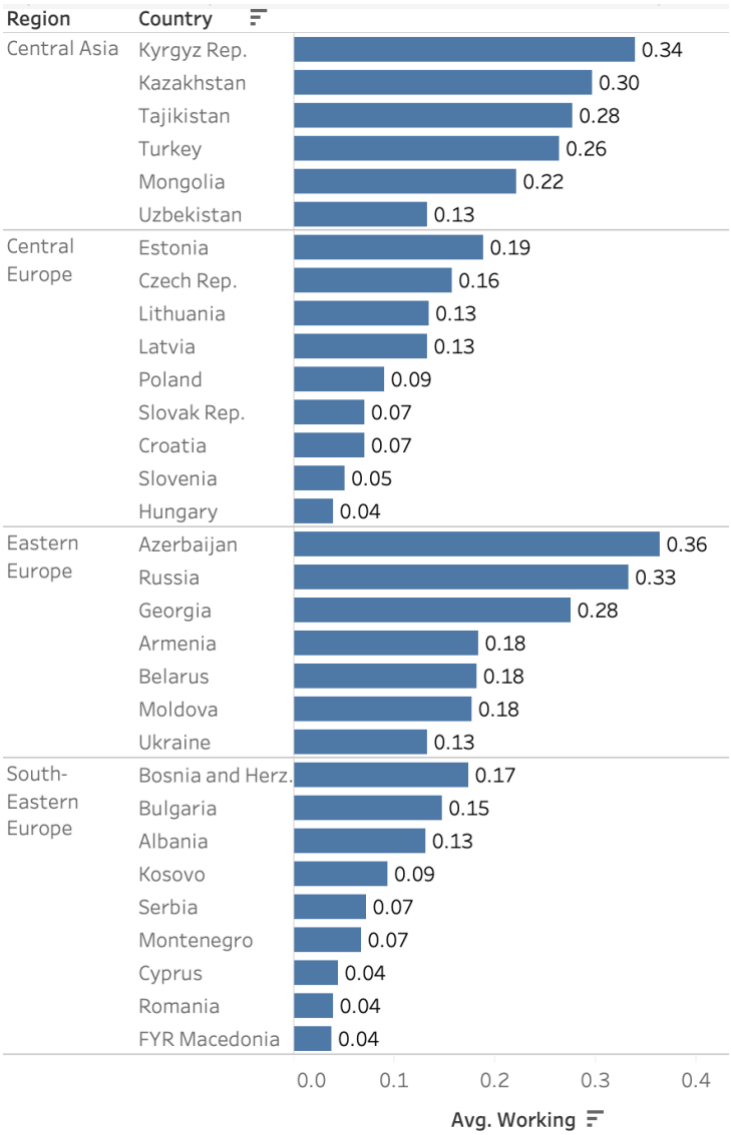

Figure 10. Share of working respondents by country and region

APPENDIX C

RANDOM EFFECTS FOR THE COUNTRIES

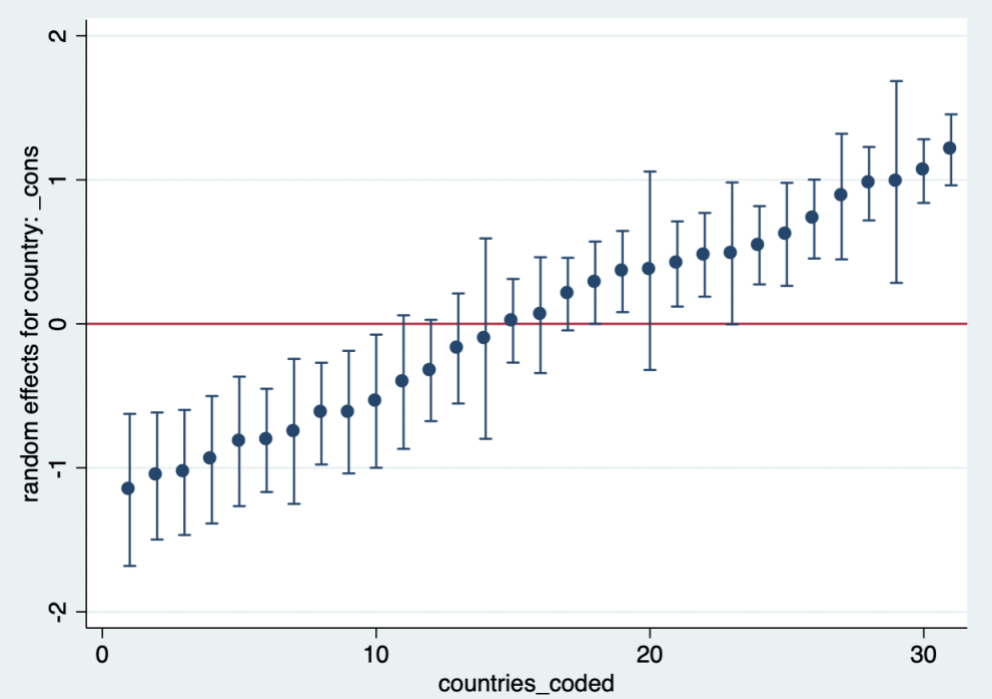

Figure 11. Average country effects and 95% confidence interval

APPENDIX D

RANDOM EFFECTS FOR THE COUNTRIES

Country	Random effect
Albania	-0.61
Armenia	0.72
Azerbaijan	0.99
Belarus	0.20
Bosnia and Herz.	-0.17
Bulgaria	0.36
Croatia	-0.54
Cyprus	-1.03
Czech Rep.	0.28
Estonia	1.06
FYR Macedonia	-1.15
Georgia	1.20
Hungary	-0.94
Kazakhstan	0.62
Kosovo	-0.10
Kyrgyz Rep.	0.88

Country	Retirement age for female
Latvia	0.54
Lithuania	0.41
Moldova	0.48
Mongolia	0.06
Montenegro	-0.75
Poland	-0.32
Romania	-1.05
Russia	0.97
Serbia	-0.40
Slovak Rep.	-0.62
Slovenia	-0.81
Tajikistan	0.49
Turkey	0.37
Ukraine	0.02
Uzbekistan	-0.8

Table 7. Random effects for the sample countries in the multilevel logit with random intercept