Mendel University in Brno
Faculty of Business and Economics

The unemployment of age category 55+ in the EU labour market

Diploma thesis

Supervisor:
Ing. Hana Stojanová, Ph.D.

Author:
Bc. Barbora Lietavcová

Brno 2017

First of all, I would like to express my sincerest gratitude to the supervisor of my diploma thesis, Ing. Hana Stojanová, Ph.D., for her kind guidance and recommendations I was offered by her. Furthermore, many thanks belong to Ing. Dennis Nchor, MSc, Ph.D., for his professional advice and assistance which helped me to elaborate this diploma thesis. Last but not least, I would like to thank my family for their love and support, not only during the time of writing the thesis but during all of my studies.

Herewith I declare that I have written my final thesis "**The unemployment of age category 55+ in the EU labour market**" by myself and all sources and data used are quoted in the list of references. I agree that my work will be published in accordance with Section 47b of Act No. 111/1998 Sb. on Higher Education as amended thereafter and in accordance with the Guidelines on the Publishing of University Student Theses.

I am aware of the fact that my thesis is subject to Act. No. 121/2000 Sb., the Copyright Act and that the Mendel University in Brno is entitled to close a licence agreement and use the results of my thesis as the "School Work" under the terms of Section 60 para. 1 of the Copyright Act. Before closing a licence agreement on the use of my thesis with another person (subject) I undertake to request for a written statement of the university that the licence agreement in question is not in conflict with the legitimate interests of the university, and undertake to pay any contribution, if eligible, to the costs associated with the creation of the thesis, up to their actual amount.

Brno, May 2017 _____

Abstract

LIETAVCOVÁ, B. *The unemployment of age category 55+ in the EU labour market.* Diploma thesis. Brno: Mendel University in Brno, 2017.

The diploma thesis is focused on the participation of older workers in the labour market of the European Union. Older people might be many times challenged by several obstacles or tougher employment conditions, compared to younger generations. The objective of the diploma thesis is to recognize the dependence of the unemployment of age category 55-64 upon selected explanatory variables. At the beginning, theoretical reviews are presented. The multiple linear regression analysis is the main method used in the thesis. The model and its parameters are estimated by the Ordinary Least Squares method, and their statistical significance is further tested. There are several statistical tests and graphical outputs that are used for testing whether the estimated model meets all seven classical assumptions.

Keywords

Unemployment, older people, age category 55-64, the European Union, regression analysis.

Abstrakt

LIETAVCOVÁ, B. *Nezaměstnanost věkové kategorie 55+ na trhu práce v EU.* Diplomová práce. Brno: Mendelova univerzita v Brně, 2017.

Diplomová práce se zabývá zapojením starších pracovníků na trh práce v Evropské Unii. Starší lidé, v porovnání s mladšími generacemi, mohou častokrát narazit na různé překážky nebo obtížnější podmínky spojené se zaměstnáním. Cílem diplomové práce je identifikace závislosti nezaměstnanosti věkové kategorie 55-64 na vybraných vysvětlujících proměnných. Začátek práce je věnován literárnímu přehledu. Hlavní metodou využitou v diplomové práci je vícenásobná lineární regrese. Model a jeho parametry jsou odhadnuty pomocí metody nejmenších čtverců a jejich statistická významnost je dále testována. Vícero statistických testů a grafických výstupů je použito na ověření, zda odhadnutý model splňuje všech sedm klasických předpokladů.

Klíčová slova

Nezaměstnanost, starší lidé, věková kategorie 55-64, Evropská Unie, regresní analýza.

Contents

1 Introduction 11

2 Objectives 12

3 Methodology 13

3.1 Econometric analysis ... 13

3.2 Classical linear regression model ... 15

3.3 Hypothesis testing ... 17

3.4 Data ... 19

3.4.1 Specification of variables ... 20

3.4.2 Model specification ... 24

4 Literature reviews 27

4.1 Unemployment ... 27

4.1.1 Unemployment rate ... 28

4.1.2 Causes of unemployment ... 28

4.1.3 Impacts of unemployment ... 30

4.2 Unemployment in the European Union ... 32

4.2.1 Development of unemployment rate within the EU ... 32

4.2.2 Unemployment rates among the EU member countries ... 34

4.3 Older people in the labour market ... 37

4.3.1 Demographic changes ... 37

4.3.2 Population ageing ... 38

4.3.3 Influence of age in employment ... 39

4.3.4 Age discrimination in employment ... 40

4.3.5 Retirement age ... 42

4.3.6 Age management ... 43

4.4 Literature reviews of other empirical studies ... 44

5 Results 50

5.1 Summary statistics of variables ... 50

5.2 Multiple X-Y scatter plots 52
5.3 Model quantification 53
5.4 Model verification 56
5.4.1 Economic verification 56
5.4.2 Statistical verification 56
5.4.3 Econometric verification 58
5.5 Actual vs. fitted plot 63

6 Discussion 65

7 Conclusion 69

8 List of references 71

9 List of figures 79

10 List of tables 80

A Used data 82

1 Introduction

José Ortega Y Gasset once said: *"An 'unemployed' existence is a worse negation of life than death itself."* The unemployment matter became one of the biggest challenges of the current market economy. Presently, the unemployment is considered to be a very serious economic and social problem. It might be seen as a global problem affecting some age categories more noticeably than others. There is no doubt that older people often feel disadvantaged at the labour market.

Older people, in general, are able to deal with changes in their lives more difficultly than younger generations. Unemployment is no exception. Older people or people in the middle age bear the loose of an employment harder because they have to adapt themselves to a new environment and conditions which potential re-employment might bring. Finding a new work position is even harder for the individuals who have been working at one profession during all of the time they actively spent at the labour market. Their requalification is nowadays much harder than it used to be in the past, mainly because of the fact that the technological requirements of the employees are stepping up almost every day.

Unemployment brings many negative impacts on people's lives. Not only the financial side of an individual is suffering, it is also a huge burden on the psychological state of the jobless person. People experiencing tough times of unemployment for long time periods usually lose their work habits as well as acquired knowledge. Harder ability to find an appropriate employment again, comes together with fading of their skills. As it was already mentioned, unemployment is bounded with some financial loss of a jobless person. Financial hardship directly decreases standards of living, and in worse case it might also lead to the social isolation of an individual. However, unemployment does not have negative impacts only on the physical and psychical health of individuals. High unemployment rate might unfavourably influence the economic growth of an affected country, as well.

At the present times, the European Union is experiencing many demographical changes. Its population is continuously ageing, as the result of lower fraternity and mortality rates, as well as higher life expectancy. Retirement age is therefore consistently growing among the EU member countries. As the phenomenon of population ageing is expected to play a very important role in the future of the European Union, it is desired to further develop measures designed for extension of working life. From the long-term perspective, the unemployment of older generation should have a decreasing tendency.

However, age discrimination is prohibited in general terms of the treaties of the European Union, the truth is that unemployment rates for the older people (55 to 64 years old) are still very high across many member states of the European Union. Even though, older people are nowadays overrepresented in the European Union, they might find it more difficult to be actively participated at the labour market. Thus, the goal of the diploma thesis is to find out which factors might influence the unemployment of age category 55+ in the EU labour market the most.

2 Objectives

The main objective of the diploma thesis is to identify the dependence of unemployment of age category 55+ upon selected explanatory variables among member countries of the European Union. With the purpose of reaching the main objective, it is necessary to study the current situation in the EU labour market. Studies of literature connected to the investigated topic, as well as current paper research focused on the unemployment of the selected age category, are essential for achieving the main objective.

In order to fulfil the main objective of the diploma thesis, other partial goals were designated, as followed:

- to recognize the total level of unemployment and the unemployment rate of age category 55+ in the member countries of the European Union,
- to evaluate the current situation concerning the age structure in the European Union,
- to summarize the empirical studies of other authors,
- wisely identify the most important variables which may affect the unemployment of age category 55+,
- research the secondary data sets,
- to run multiple linear regression analysis.

Last but not least, as the final sub-objective of the diploma thesis is to critically evaluate and interpret the results of the main objective from a statistical and economic standpoint. Within this context, it is required to compare the results with theoretical expectations. Finally, it is also suitable to consider whether there was something forgotten in the diploma thesis and whether the selected analysis was chosen correctly.

The diploma thesis should shed some light on the current situation of unemployment of older inhabitants of the European Union. The latest data available are required to be used in order to ensure the most recent reflection of the exanimated matter.

3 Methodology

The diploma thesis consists of two main parts, which are divided into individual subchapters. These two parts are theoretical part and empirical part. Theoretical part is called Literature reviews, and it is dealing with theoretical framework and literature reviews of other empirical studies connected to the explorative topic which will be crucial for the creation of empirical part.

Before forming the theoretical part it is essential to study suitable literature and to revise the knowledge acquired at the University. The first part is focused on the survey and comparison of different views and opinions of several authors on the main topic of the thesis. National and foreign books, on-line sources, current papers and articles, monographs focused mostly in the labour market of the European Union, unemployment, population ageing and age management are the subject of the literature reviews.

The term "older" people or employees are often used in the diploma thesis. Such a segment is, in the thesis, defined by chronological age. Older people or workers are regarded to be between 55 and 64 years old. Such a restriction is also useful for the secondary data collection of the European statistics.

The second part is empirical. Crucial method used in the thesis is a multiple linear regression analysis. The analysis is discovering the influence of selected independent variables on unemployment of age category 55+ in the EU labour market. In order to create the multiple linear regression analysis, secondary data research is necessary.

Secondary data are usually collected by research institutions, governments or some special agencies. They are used for reflecting freely available sources which might be used for analysing characteristics of populations or a specific hypothesis. Secondary data are different from primary data, as primary data are collected by the researcher who generally also investigates those data. The main advantage of secondary data sets might be found in the fact that they are able to provide the researcher with the reach for more information than primary data sets would be able to. (Vartanian, 2011)

3.1 Econometric analysis

The econometric analysis uses economic theory, mathematics, statistics, and informatics for researching, measuring, comparing and testing various economic and social phenomena. The econometric analysis has, in general, three steps: specification of the model, quantification of the model, and verification of the model.

Model specification

The model specification is the first and a very crucial step within the econometric analysis. It depends on personal skills and abilities to connect theoretical background with the information about the particular issue of the quantitative analysis. The model specification is constructed of three basic steps:

- Firstly, it is necessary to specify all variables included in the model, in accordance with a priori information obtained from the economic theory and the data.
- The second step consists of specification of the expected signs and values of the independent variables.
- Finally, the specification of the model equation must play a part. (Hušek, 2007)

Model quantification

The model quantification is used for the estimation of the numerical values of the model and its parameters by appropriately chosen procedures designed for econometric estimation. It starts at the collection and adjustment of adequate statistic datasets. Datasets used for the model quantification are usually non-experimental in the nature. Thus, they are not generated especially for the needs of the estimation of econometric model.

Statistical datasets might have different natures. Time-series data provides information about individual variables in consecutive terms of various lengths. Cross-sectional datasets identify observations of the variables concerning individual subjects, in the same time period. Panel datasets originate from repeating the survey with the same set of respondents in different time periods. (Hušek, 2007)

Model verification

The last part of the econometric analysis is represented by verification of the model. In case of discovering inconsistences or failures in the model, it is necessary to come back to the previous step of the econometric analysis, and to make appropriate corrections. Model verification represents verification of model validity at three stages:

- Economic verification of the estimated variables is based on a priori economic restrictions or criterions. It consists of economic interpretation of the estimated regression parameters and comparison of the signs of estimated regression parameters with the expected signs.
- Statistical verification is dealing with the statistical testing of the overall model and individual model parameters. For this purpose, testing of the statistical significance is used. F-test and T-test are commonly used for verification of statistical significance.
- Econometric verification stands for verification of the conditions, which are necessary to be met for the successful application of the econometric methods, tests and techniques used. (Hančlová, 2012)

3.2 Classical linear regression model

As mentioned, the linear regression analysis is the main method used in the diploma thesis. Software Gretl is used for the creation of the analysis.

The objective of the regression analysis is to create mathematical models which goal is to recognise the relationships that are likely to appear among variables. The simplest case of the regression analysis appears when there are only two variables, one independent (explanatory) variable and one dependent variable. (Seber, Lee, 2003)

However, the diploma thesis is dealing with the multiple linear regression model. Multiple regression models are used for investigation of statistic dependence. These models are composed of one dependent variable and multiple independent (explanatory) variables. There are, in general, three situations when it is suitable to apply the multiple regression analysis:

- For recognising the effect, which has the summary of changes affecting parameters *X1*, *X2*, …, *Xk*, on the target variable *Y*.
- For predicting the value of dependent variable *Y*, for the future values of parameters *X1*, *X2*, …, *Xk*.
- For recognising the statistical relations between dependent variable and multiple explanatory variables. (Hendl, 2015)

The classical linear regression model with *k* explanatory variables in the dataset may be expressed as followed equation:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k + \varepsilon . \quad (1)$$

Where *Y* embodies dependent variable and *X1*, *X2*, …, *Xk*, are explanatory (independent) variables, β_0 is the intercept (level constant) and β_1, β_2,..., β_k are parameters, regression coefficients. They represent the expected change in Y, corresponding to unit change of explanatory variable, as long as the other variables are constant (without any change). Although, the level constant does not have the implicit interpretation, its presence in the equation is crucial and beneficial.

According to Pecáková (2011), classical linear regression model might be also expressed in the matrix form:

$$y = X\beta + \varepsilon, \text{where} \tag{2}$$

$$Y = \begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_n \end{bmatrix}, X = \begin{bmatrix} 1 & X_{11} & X_{12} & \dots & X_{1k} \\ 1 & X_{21} & X_{22} & \dots & X_{2k} \\ 1 & \vdots & \vdots & \cdots & \vdots \\ 1 & X_{n2} & X_{n2} & \cdots & X_{nk} \end{bmatrix}, \beta = \begin{bmatrix} \beta_0 \\ \beta_1 \\ \vdots \\ \beta_k \end{bmatrix} \text{and } \varepsilon = \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_n \end{bmatrix}. \tag{3}$$

Hušek (1999) explains individual variables from the matrix as followed:
y = column vector of n observations of the dependent variable,
X = design matrix of n x k observations of the regressors,
β = column vector of k model parameters,
ε = column vector of n random errors,
k = number of regressors,
n = sample size.

By the explicit specification of explanatory variables and of the type regression function used, is the matter of correlation modelling between the variables shifted to the task of the estimation of the regression function's parameters. The most common approach used for such a purpose, is the method of Ordinary Least Squares (OLS). This method is based on the idea of finding estimates of regression parameters, which minimize the sum of squared residuals. (Pecáková, 2011)

In consideration of ensuring the OLS estimators to be the best possible, the classical assumptions must be met:

1. The classical model is linear, correctly specified, and contains the additive error term.
2. The expected value of the error term is equal to zero.
3. There is not any correlation between all of the explanatory variables and the error term.
4. Observations of the error term are not correlated with one another (there is no serial correlation).
5. The error term has a constant variance (there is homoscedasticity of the error term).
6. None of the explanatory variables is a perfect linear function of any other explanatory variables (there is no perfect multicollinearity).
7. The error term is normally distributed. (Studenmund, 2013)

Coefficient of determination (R^2)

The coefficient of determination is commonly used for expression of the level of compliance of the estimated regression model with the empirical datasets. The coefficient of determination is a part of the decomposition of variability explained

by regression model to the total variability. In other words, it reflects the quality of the model as it provides the percentage of the variability of dependent variable which was explained by the model. It is a random variable, which value is changing with the different selections.

The coefficient of determination may be expressed as the ration of the regression squares explained by the model (*RSS*) to the total sum of squares (*TSS*).

$$R^2 = \frac{RSS}{TSS} = 1 - \frac{ESS}{TSS}. \tag{4}$$

Where, *ESS* represents a part of total sum of squares, which was not explained by the model, the residual (error) sum of squares. (Hušek, 2007)

The value of the R^2 ranges within the interval: $0 \leq R^2 \leq 1$. The coefficient of determination is equal to zero if the model does not explain anything. R^2 basically reflects how much better the model is in fitting the data than the trivial model which contains only a constant term.

However, the coefficient of the determination has its weakness, as well. The value of R^2 will never decrease if some regressors are added to the model, even if they do not have any real explanatory power. By correcting the variance estimates for the degrees of freedom such a weakness might be limited. Doing so, the adjusted coefficient of correlation is obtained (R^2_{adj}).

The adjusted coefficient of correlation (R^2_{adj}) includes some punishment for adding more explanatory variables into the model, which is why its value does not necessarily increase after more variables are added to the set of regressors. On the contrary, it is usual that value of R^2_{adj} decreases with adding new regressors. (Verbeek, 2012)

The adjusted coefficient of correlation is therefore strictly smaller than the coefficient of correlation. Nevertheless, there is one exception, when $k = 1$ or $R^2 = 1$, as in such cases $R^2 = R^2_{adj}$. The adjusted coefficient of determination may even be negative, in extreme cases. Followed formula defines the adjusted coefficient of correlation:

$$R^2_{adj} = R^2 - \frac{k-1}{n-k}\left(1 - R^2\right) = 1 - \left(1 - R^2\right)\frac{n-1}{n-k}. \tag{5}$$

Where, *n* represents a sample size, and *k* stands for a number of regression parameters. (Hušek, 2007)

3.3 Hypothesis testing

Procedures for statistical testing are very often used for data analysing. Hypothesis testing might be understood as making some form of the statistical judgements, which are searching for the recommendations in form of “yes” or “no” on the for-

mulated questions. Based on the available datasets, hypothetical claims are designed, and they are further tested. The procedure of hypothesis testing is composed of following steps:

- Formulation of the research question in form of null hypothesis (H_0) and alternative hypothesis (H_1).
- Selection of the level of significance (α).
- Calculation of the test statistic.
- Recommendations of testing. (Hendl, 2015)

Formulation of hypothesis

Formulation of the hypothesis may be based on the economic question of interest. The process includes setting the null hypothesis (H_0) and the alternative hypothesis (H_1). The null hypothesis is composed of an independent parameter of a certain value. The alternative hypothesis might be understood as some kind of a negation of null hypothesis. (Erickson, 2014)

The null hypothesis (H_0) usually represents the expression of the value which, according to the researcher's opinion, is less likely to happen. On the other hand, the expression of the values which are usually expected to happen by the researcher is denoted as the alternative hypothesis (H_1). (Studenmund, 2013)

Hindls, Hronová, Seger (2004) converts presented explanatory text into mathematical formulas:
Null hypothesis is tested

$$H_0 : \beta_j = \beta_{0,j}\,, \tag{6}$$

against the alternative

$$H_1 : \beta_j \neq \beta_{0,j}\,, \text{or } H_1 : \beta_j > \beta_{0,j}\,, \text{or } H_1 : \beta_j < \beta_{0,j}\,. \tag{7}$$

Selection of the level of significance (α)

Number α represents the level of statistical test significance. The level of statistical significance (α) determines the probability of the mistaken rejection of null hypothesis, while in fact, the null hypothesis is true. Its value usually ranges from 0.001 to 0.15, in accordance with the nature of the tested matter. However, many textbooks recommend this value to be equal to 0.05, it is not the rule.

In general, two types of errors might occur within the hypothesis testing. Error of type I, stands for the rejection of the null hypothesis, while it is being correct, and on the other side, error of type II embodies not rejecting the incorrect hypothesis. (Sebera, 2014)

Calculation of the test statistic
Calculation of the test statistic (or criterion) of the secondary datasets highly depends on their nature. There might be distributions and their test criterion methods with small amounts of datasets, or only with one independent variable. On the other hand, many times the distributions and their test criterion assume huge amounts of datasets or multiple variables. In such cases, different test statistic could be used. There are multiple types of the test statistic available. (Erickson, 2014)

Recommendations of testing
Finally, the recommendations of the statistical testing might be formulated. There are two ways in formulation of testing conclusion. Within the first one, the calculated test statistic is evaluated by using, so called p-value. The p-value quantifies the probability of the occurrence of the test statistic value, while the null hypothesis is actually correct. Small p-value signalises that the null hypothesis is incorrect. The rule for the recommendation is quite simple: If the p-value is smaller, than the level of significance (α), or it is equal to the significance level, the data signalizing an impulse for rejection of the null hypothesis. If the p-value is greater than the level of significance, the null hypothesis should be further tested.

The other way of evaluating the test statistic is made by the direct comparison of the test statistic with the critical region, which is specified in accordance with the chosen level of significance (α). The critical region defines the region of rejection. If the value of the test statistic is located inside of the critical region, the null hypothesis must be rejected in favour of the alternative hypothesis.

Within this framework, it should be mentioned, that not rejecting of null hypothesis does not mean its proving. Rather, it means that there is not enough evidence for its rejection. (Hendl, 2015)

Even though researchers are typically very passionate about discovering whether the theory within the research question is proved by the datasets obtained by the real-world observations, it is very hard, if not impossible to *prove* that a given hypothesis is correct. However, it is possible to *reject* a given hypothesis at the assured level of significance. By doing so, the output of the testing says that it is very unlikely that the results of the datasets would have been noticed if the hypothesized theory were correct. (Studenmund, 2013)

3.4 Data

The diploma thesis applies the multiple linear regression analysis. The dataset used for the analysis is cross-sectional in nature. Data are collected for the reference year 2015, as these are the most recent data at the time of writing the thesis. The Eurostat and OECD database are the main sources of the secondary data used in the thesis.

The sample size is twenty-two member countries of the European Union, namely: Belgium, Bulgaria, Croatia, the Czech Republic, Estonia, France, Germany,

Greece, Hungary, Ireland, Latvia, Lithuania, Luxemburg, Malta, the Netherlands, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain, and the United Kingdom.

The sample size is selected on the grounds of data availability. However, the datasets of most variables covers all twenty-eight member states of the European Union, the data for independent variable monthly minimum wage is available only for twenty-two EU member countries, as there are six countries in the European Union, which do not set the statutory minimum wages. This indicator is, from the author's point of view, very crucial in the analysis, which is the main reason why the regression analysis contains only twenty-two EU member countries.

Secondary datasets are processed by using several graphs and tables which are followed by a verbal description. Graphical outputs are created through Microsoft Excel.

3.4.1 Specification of variables

Dependent variable

Dependent variable stands for the output or outcome whose variation is studied. The unemployment of age category 55-64 is considered to be dependent variable in the model. This age category might find it harder to be actively participated at the labour market and therefore its participants can many times feel disadvantaged. Hence, the aim of the thesis is to recognize the relationship between the dependent variable unemployment of people aged from 55 to 64, and selected independent (explanatory) variables.

The dependent variable is expressed as a percentage and it reflects the number of unemployed people from 55 to 64 years old over the active labour force in the same age class.

Independent variables

Independent variables characterize influences or causes of dependent variable. The main factors which might eventually affect or cause the unemployment of age category 55-64 are: long-term unemployment, total unemployment, social benefits for the unemployed, monthly minimum wages, average age of retirement for men, average age of retirement for women, duration of working life, productivity, technology, gross domestic product, inflation, immigration and emigration, and membership in the Euro area.

Nevertheless, datasets of some independent variables are, at the time of writing the thesis, not updated for the reference year 2015. As long as the goal of the thesis is to analyse the most current situation in the EU labour market (for the year 2015), these independent variables are not included in the model.

Independent variables which are involved in the model are as followed:

- **Long-term unemployment**

  Long-term unemployment is defined as an unemployment which lasts at least for twelve months. (Walsh, 1987) Such a definition of long-term unemployment is being used also by the Eurostat and OECD database.

  Long-term unemployment is usually composed of the structural unemployment, which reflects the discrepancy between the amount of employments available and number of unemployed individuals who are willing to work. Long-term unemployment should not be attached to the time period needed for unemployed people to find a work position, as it is not expected that searching process would last for many months. (Mankiw, 2009)

  Unit used for measuring the long-term unemployment is a percentage of active population.

- **Total unemployment**

  Total unemployment is, for the needs of the thesis, understood as the unemployment of inhabitants of the European Union aged from 15 to 64. Total unemployment is, similarly to dependent variable and independent variable long-term unemployment, expressed as a percentage.

- **Monthly minimum wage**

  The term minimum wage relates to many legal restrictions of the lowest level to be paid by employers to employees. Statutory minimum wages are delimited by official laws and statutes. (Eurofound, 2016)

  Statistics of minimum wages published by Eurostat correspond to the monthly national wages. However, in some countries of the European Union minimum wages are not set as monthly national wages. Instead, some countries prefer to set hourly rate for the minimum wages, or minimum wages are paid on the weekly basis. In such cases, the Eurostat converts these settings into the monthly rates.

  Minimum wages are legally enforceable. In many cases, they are set after the consultations with the social partners, or they may be the result of the national intersectional agreement (for example in Belgium and Greece). National minimum wages are usually applicable to all employees, or at least to the majority of workers in the country. Minimum wages represent gross amounts, which mean that they are set before the deduction of the income tax and social security contributions. These deductions are different among the member states. (Eurostat, 2017a)

  Twenty-two countries out of all twenty-eight member states of the European Union set generally obligatory statutory minimum wages. In most of the European Union's member states, which do not set the statutory minimum wages, the minimum wages are actually set in (sectorial) collective agreement for range of specific sectors. These agreements can be converted to general bindings. The countries of the European Union, where the statutory minimum wages are not set are: Austria, Denmark, Finland, Italy, Sweden and Cyprus.

(Eurofound, 2016) These are the countries, which are not included in the model of the thesis.

Monthly minimum wages are measured in euros. It should be mentioned that for those member states of the European Union which do not participate in the Euro area, the levels and ranking of statutory minimum wages represented in euro terms are influenced by exchange rates. (Eurostat, 2017b).

- **Average age of retirement for men and for women**

  The average age of retirement is the average effective age at which older workers exit from the labour market and are able to receive retirement benefits from the government. As it is still decided at the national level, the average age of retirement differs among the European Union's member states. The average age of retirement is, in many countries, defined differently for men and for women. In such cases, women withdraw from the labour marker earlier than men, in general. This independent variable is measured in years.

- **Duration of working life**

  Duration of the working life indicator is used for measuring the number of years, during which a person aged 15 should be actively participated in the labour market during his or her lifetime. This indicator is calculated by using a probabilistic model in combination with demographic data (using mortality tables, the survival functions are calculated) and labour market data (Labour Force Survey rates by particular age group). Variable duration of working life is measured in years. (Eurostat, 2017c)

- **Productivity**

  Productivity reflects how much the economy produces or provides per given resources. Put differently, productivity reflects some kind of a relationship between what is produced and the resources which are used for the production. It might be mirrored in a simple equation output per input. Anyway, the productivity of employees is usually not the same. It depends on various factors, such as their effort or enthusiasm, available technology, the overall organization at the workplace, and many more. (Bernolak, 2009)

  Productivity may be expressed in many ways. Real labour productivity per person is used in the thesis. The unit of measure for this independent variable is the index 2010=100. The index is resulting from downstream delaying the development of the previous year, the price is for 100 in the reference year. The level of growth in volume is equal to the level of increase in series of levels stand above. The index is predetermined only for the year 2010, because it is easy to re-reference it (reference year = 100) for another year. (Eurostat, 2017d)

- **Gross domestic product**

  Gross domestic product (GDP) is probably the best indicator which might be used for needs of summarizing nation's whole economy in a single statistic.

GDP is a monetary value which includes goods and services produced in a country in a given period of time. This time period is usually one year. In other words, it includes everything which was bought for money during one year. (Brezina, 2012)

Living standards among the individual countries can be compared by measuring the price of variety of goods and services in each country in the relation to income, by using common national currency. This common national currency is called purchasing power standard (PPS). An overlook of life quality of the inhabitants of each member country of the European Union can be obtained by illustrating GDP per inhabitant in PPS. (European Union, 2016) Express differently, according to Eurostat (2017e) GDP per capita in PPS is used for reducing the price level differentials across the EU member states.

Purchasing power standards (PPS) are, in general, used for cross-country comparisons. The volume indicator of GDP per capita in Purchasing Power Standards is defined in dependence on the European Union average set to equal 100. If a country has this indicator higher than 100, its level of GDP per head is greater than the average in the European Union, and vice versa. Simple figures are articulated in PPS, which means that common currency which reduces the differences in price levels among individual countries let the meaningful volume comparisons of GDP among states. (Eurostat, 2017e)

- **Inflation**

Frisch (1983) defines inflation as a phenomenon connected to continuously increasing prices of goods and services. When the inflation is present in the country, falling value of money must take a part, as well. Consumers' purchasing power decreases, because for the same quantity of money they can no longer buy the same amount of goods and services.

The main objective of the European Central Bank is to maintain price stability. Its goal is to keep the level of inflation among individual member countries of the European Union below, but close to 2%. This goal is defined over the medium run. (European Central Bank, 2016)

Consumer price inflation is internationally compared by Harmonized Indices of Consumer Prices (HICP). They are economic indicators used for measuring of the changes in prices of consumer goods and services which households obtained. More detailed, HICP offer the authorized measure of consumer price inflation in the Euro area for the objectives of monetary policy. They are also used for evaluating the inflation convergence criterion for accession to the Euro area. (Eurostat, 2017f)

- **Membership in the Euro area**

The Euro area represents monetary union within the European Union. Maastricht Treaty, besides many other affairs, introduced the monetary unification in Europe. According to the Treaty, countries which form the monetary union abandon their national currencies and start to use one common currency – the euro. (Grauve, 2012)

The last enlargement of the Euro area was in 2015. At the moment, the Euro area has nineteen members. Countries using euro currency are: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia, and Spain. (European Central Bank, 2017)

Explanatory variable membership in the Euro area in the model represents a dummy variable. The dummy variable symbolizes a dichotomous variable, which is created from variables which had originally qualitative character. (Hardy, 1993) Regarding the dummy variable membership in the Euro area, 0 represents non-membership in the Euro area, and 1 stands for country's membership in the Euro area.

3.4.2 Model specification

The variable long-term unemployment is present in the model because it might significantly influence the dependent variable. The loss of employment is challenging for older people. Once older people lose their employment, they are more likely to become ultimately dependent on the social security systems than other age categories. The main reasons are the obstacles in form of technological progress, health issues, or language barriers. It is also harder for older people to adapt to new work environment. All above mentioned can culminate into the situation when older participants of the labour market lose their employment, they are likely to become unemployed for long-term periods. When countries experience huge long-term unemployment rates, it is expected that unemployment rates of age category 55-64 will be large, as well. Thus, the expected sign of the independent variable long-term unemployment is positive.

Total unemployment may also influence the unemployment of age category 55-64. It is expected that countries with greater total unemployment rates will reflect higher unemployment rates of age category 55-64. Positive correlation is therefore expected.

However, minimum wage setting does not affect all the inhabitants of the member countries of the European Union, it could influence certain age classes more than the others. Low skilled people, as well as people with some health issues can easily be affected by the minimum wage level settings. When the minimum wages are set at very low levels, the unemployment of age category 55-64 is expected to increase. People may just not be willing to work for the wage levels they are offered at the labour market. A negative sign of this explanatory variable is therefore expected.

Although, some member countries of the European Union still prefer to set the average age for women lower than for men, the influence of these independent variables on the dependent variable is expected to be the same. The countries which prefer to let workforce withdrawal from the labour market earlier are expected to report lower unemployment rates of the age category 55-64. Positive correlations between the unemployment of age category 55-64 and the average age of retirement for men as well as for women are expected.

Duration of working life directly affects the unemployment of age category 55-64. The longer people work during their lifetime, the longer they are participated at the labour market, thus, the lower the unemployment of age category 55-64 should be. The expected sign of this independent variable is, thanks to the expected indirect proportion, negative.

Productivity growth means the growth of the overall performance of the economy. Economy's performance might, in turn, be mirrored in the employment rates. The productivity growth is therefore expected to reduce the level of unemployment of age category 55-64. The expectation about the sign of this variable is negative.

Gross domestic product, again, represents the overall performance of the economy. Okun's law suggests a negative relationship between unemployment rate and gross domestic product. More economically developed countries are expected to experience lower unemployment rates of age category 55-64 than the countries which are economically less developed. Thus, negative correlation between GDP and the dependent variable is expected.

Phillips curve defines that inflation and unemployment are recognized by a stable and inverse relationship. Hence the expectations, based on this economic concept, are that the increasing inflation rates go hand in hand with decreasing levels of unemployment of age category 55-64. The expected sign of explanatory variable inflation is therefore negative.

Membership in the Euro area is the dummy variable used for the model estimation. The study postulates a negative relationship between the unemployment of age category 55-64 and membership in the Euro area.

The expected signs of all independent variables are, for the better transparency presented in a form of table.

Tab. 1 Expected signs of independent variables

Independent variable	Expected sign
Long-term unemployment	+
Unemployment total	+
Monthly minimum wage	-
Average age of retirement Men	+
Average age of retirement Women	+
Duration of working life	-
Productivity	-
GDP	-
Inflation	-
Membership in the Euro area	-

Given

- Y – Unemployment of age category 55-64 (%),
- X_1 - Long-term unemployment (%),

- X_2 – Total unemployment (%),
- X_3 – Monthly minimum wage (€),
- X_4 – Average age of retirement for men (years),
- X_5 – Average age of retirement for women (years),
- X_6 – Duration of working life (years),
- X_7 – Productivity (index, 2010=100%),
- X_8 – GDP (PPS),
- X_9 – Inflation (HICP),
- X_{10} – Membership in the Euro area.

The equation of the model is specified as seen bellow:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} . \quad (8)$$

4 Literature reviews

This section of the thesis consists of the theoretical framework, which is related to unemployment and participation of older employees in the labour market, and the literature reviews of empirical studies of other authors.

4.1 Unemployment

Nowadays, people live in times of dynamic changes within the fields of science and engineering. This recalls for fundamental changes in all of the areas of human life. Within this context, the irreplaceable and continuously increasing phenomena are the changes in the labour market.

Complicated technological environment as well as new requirements for the production and distribution, invoke higher demand for extremely flexible, qualified employees who are able to quickly adapt to changes and requirements of the labour market. The entrance to the labour market is therefore, besides many other factors, affected by low qualified workers and frequently changing market conditions.

Labour market conditions are presently more modified by the globalization processes. Very important is the creation of the European Labour Market, which is based mainly on the fundamental freedoms of the European Union. (Šafránek, 2011)

Plenty of individuals are unemployed in almost every economy, each time period. This means that there are a lot of people who are jobless, but at the same time they want to be employed in employments like those held by people familiar to them, at the wages those people are earning. (Romer, 2012) According to Taylor, Weerapana (2012), to be regarded as unemployed, a person must be actively searching for a job but have to be jobless, at the same time. An unemployed individual according to the International Labour Organization must fulfil following criteria:

- is aged from 15 to 74 (in Italy, Spain, the United Kingdom, Iceland and Norway from 16 to 74),
- does not have any employment during the reference week,
- is able to join the working process within the following two weeks (eventually a person who has already found some employment, must be employed within the following three months),
- has been actively searching for an employment at some time during last month. (Eurostat, 2017g)

Winkler, Wildmannová (1999) define the term unemployed person in accordance with some kind of the freedom and dependence. Only those who are employed (for which they obtain remuneration in form of salary or wage) and those who can

freely quit their jobs from their own initiative, as well as from the initiative of someone else, can eventually become to be unemployed.

4.1.1 Unemployment rate

Unemployment is measured by unemployment rate. Mankiw (2009) explains the unemployment rate as a statistic, which is used for measuring the percentage of jobless people who are able to work. In other words, it is the unemployed fraction of the population in the labour force. Stanlake, Grant (1997) agrees and expresses the unemployment rate by given mathematical equation:

$$u = \frac{U}{L} * 100(\%), \tag{9}$$

where:

- u = unemployment rate,
- U = registered unemployed,
- L = labour force.

Labour force includes all individuals who are economically active. This means that they are able and willing to work. When someone is included to the working population it does not necessarily mean that such a person must be included to the labour force, as well. The best demonstrations of this are students, people who have retired early, handicapped people or housewives. (Stanlake, Grant, 1997)

4.1.2 Causes of unemployment

According to Vlček (2016), the causes of unemployment are one of the most controversial topics in the economic theory. There are many views and opinions on the causes of unemployment. The most frequent are as followed:

- **Payments to unemployed (unemployment benefits)**
  Governments of many countries provide people with various payments during the time period they are jobless. It might result into the situation when people spend more time by searching for the suitable work position because even if they are unemployed they are still able to receive some payments. The longer people search for the employment, the higher the chances of finding better, higher-paid work positions. However, the additional time which is spent for searching increases the unemployment rate. (Hubbard, O'Brien, 2015)

  Helísek (2002) stresses the fact that too high social payments and benefits markedly decrease the motivation of the individuals to search for an employment intensively, start to work, or retrain themselves.

- **Minimum wage levels**

  Although minimum wage levels do not have significant influence on the total unemployment, they can markedly affect some groups or segments of inhabit-

ants and cause high level of unemployment among them. The reason why minimum wage settings do not affect the total unemployment so much is that most of the employees in the economy work for the wages which are higher than the minimum levels.

If the minimum wage level is set above the market wage the result is the excess of quantity of labour supplied over the quantity of labour demanded. There is a space for surplus in the labour market, which in other words, means higher unemployment. (Mankiw, 1999)

- **Existence of the labour unions**

Labour unions existence is based on bargaining for higher wages as well as for better work conditions for their members with employers. Wages are usually set above the level at which the market wage would normally be, in the industries with strong labour unions. Similarly to the case of minimum wage levels, this could lead to higher levels of unemployment. Nevertheless in this case, people who are not able to find employments in strongly unionized industries may usually find employments within some other industries. (Hubbard, O'Brien, 2015)

Layard, Nickell, Jackman (1992) go more into details when they stress that not only the existence of labour unions may affect the unemployment. The level of their centralisation is equally important, according to them.

- **Efficiency wages**

According to the theory of efficiency wages, firms do not decrease wages, because it would lead to reduction of their revenues. Firms usually pay above-market wages in order to stimulate their employees to be more productive. (Vlček, 2016)

Hubbard, O'Brien (2015) remark the fact that it is very difficult to monitor workers in various business situations. Firms therefore have to rely on their workers, and make sure that they are enthused enough to work hard. According to them, this can be achieved by paying them the over-market wages, as many other employments are paid the market equilibrium wages. Firms therefore designedly raise the costs of losing jobs for workers.

Mankiw (1999) points out the similar features with the unemployment caused by minimum wage settings and the existence of the labour unions, as in all three cases the unemployment is based on the wages levels which are set above the market level.

- **Demographic changes**

Inhabitants of countries can be divided into several groups, according to gender, age, level of education, and many more. The structure of the residents evidently affects the level of unemployment.

Generally, it can be concluded that younger people with more qualifications experience fewer problems with unemployment. In contrast, older people with low level of education (or eventually very young people who have no

qualification) may find it more difficult to participate in the labour market. (Jurečka, 2013)

- **Low flexibility in the labour supply**

  Low flexibility in the labour supply mainly limits the migration for employments. The reasons might be: low will to change the employment even if the stay in current job is not pleasant for the employee, or thigh relations with the family and social environment, and many more. (Tuleja, Nezval, Majerová, 2012)

- **Structural changes**

  Structural changes are based on the change in the economic structure. They can lead to the qualification gap and formation of structural unemployment. (Helísek, 2002)

4.1.3 Impacts of unemployment

There are several impacts which unemployment might cause on the economies of individual countries, as well as on the individual human beings involved. The thesis presents the most frequent impacts on which several authors agreed. They are as followed:

1. Economic impact

Unemployment can be denoted as the most traumatic symptom of each economic recession. When the economy is in the recession, firms usually produce less. Layoffs of employees are connected to decrease in the production. (Samuelson, Nordhaus, 2013)

According to Helísek (2002), economic impact of the unemployment is the result of the production loss. Decrease or, in worse case, the loss of the qualification can have serious impact on the economy as well, as it is an important determinant of the economic growth.

With the increasing level of unemployment, there must be an increase in governmental costs, too. The shortage of revenues causes the insufficient amounts of financial sources for development programmes, social area, culture, and also education. Unemployment creates a threat in the economic area mainly because it generates additional costs which are connected to expenditures for various unemployment supports, payments of social insurance, as well as to the loss in taxes. Income and expenditures are also affected by following trends:

- decrease in VAT,
- increase in costs connected to social and pathological phenomena and to fighting against criminality,
- increase in costs of active labour market policy, where effectiveness is clearly decreased,

- increase in costs of running the institutions which are responsible for labour market policy. (Kuchař, Vaska, 2013)

2. Social impact

The employment loss means that an individual has to accept the status of "unemployed". This status is, however, inferior and can be also connected to some unpleasant duties. Unemployed people find it more difficult to satisfy culturally defined needs by certain level of consumption. What is more, unemployed individuals have to face the consumption society. In the present consumption society, there is a moral obligation to keep the respectable level of consumption and some standards of living. Consumption of goods and services undoubtedly provides people with some ability to express their own identity and to create social relationships. This ability is limited for unemployed individuals. (Mareš, 2002)

Another social impact of unemployment could be the destruction of the ethical values. This could generate more problems connected to some pathological occurrences such as criminality, alcoholism, drug addiction, prostitution, and many more. Social problems which are invoked by unemployment can lead to radicalization of the affected groups. This can later culminate into terrible political impacts or in extreme cases into racial and xenophobic disorders. (Helísek, 2002)

3. Psychological impact

Unemployment is for sure unpleasant part of human lives. Except from the material benefits, work provides employees with the feeling of self-realization and some kind of social usefulness. The loss of the employment might be for many laid offs associated with traumatic experience. The loss of work is, in general, joined to a short-term or long-term period of stress. Unemployed people often go through several stages of physical discomfort, depression and anxiety, accompanied by lower level of self-respect and self-confidence. (Buchtová, Šmajs, Boleloucký, 2013)

However, Feather (2012) points out the importance of personal characteristics of the unemployed individuals, as well as their importance in the psychological impact of unemployment. Some people might find the periods of unemployment not to be so stressful than others. People, generally, have different abilities, skills, knowledge, attitudes, values, self-perceptions, and several other personal resources which might be helpful for them in coping with unfavourable conditions.

4. Health impact

Besides psychological problems, unemployment invokes also many somatic problems. Unemployed people can suffer from serious depressions, alcoholism, suicide attempts, domestic violence and many more. (Buchtová, Šmajs, Boleloucký, 2013)

Kuchař, Vaska (2013) expand the idea and add that health risks can be even stronger, when a person who has lost the job has no positive outlook for the future. In such a case, health conditions may be seriously worsen.

4.2 Unemployment in the European Union

The most significant increase of unemployment rates in Europe is dated to early 1970s. In the context of unemployment, Europe was experiencing more pleasant times from the second half of the 1980s until the first half of 1990s, when the unemployment rates raised steeply again. Although the following years recorded slight decline in unemployment rates, the long-term unemployment levels remain to be one of the crucial problems for Europe until the present times. (Di Domenico, Spattini, 2008)

According to Symes (2006), unemployment is the worst economic problem for the member countries of the European Union. He stresses the seriousness of the unemployment issue in the European Union, as it continues to rise despite of the excess of active labour market policies.

The labour market is, perhaps, the most evident economic field, in which the European Union is much different from other advanced economies (for example USA or Japan). The unemployment rate in the European Union is, comparing to the USA and Japan, almost twice as large. Put differently, the employment rate is reaching visibly lower values from the long-term perspective. (Abrahám, 2008)

4.2.1 Development of unemployment rate within the EU

This subchapter is dealing with the development of the total unemployment rate within the European Union, as well as with the development of the unemployment rate of inhabitants aged from 55 to 64 within the European Union. The development is illustrated for 10 years, starting in 2006 and finishing in 2015.

Development of the total unemployment rate within EU

Following graph reflects the development of the total unemployment rate within the European Union. Total EU unemployment, for the requirements of the thesis, is understood as unemployment of age class from 15 to 64 within all twenty-eight member countries of the European Union. Total EU unemployment rate is displayed for ten years. Unemployment rate mirrors unemployed EU inhabitants as a percentage of the active EU population in the same age class.

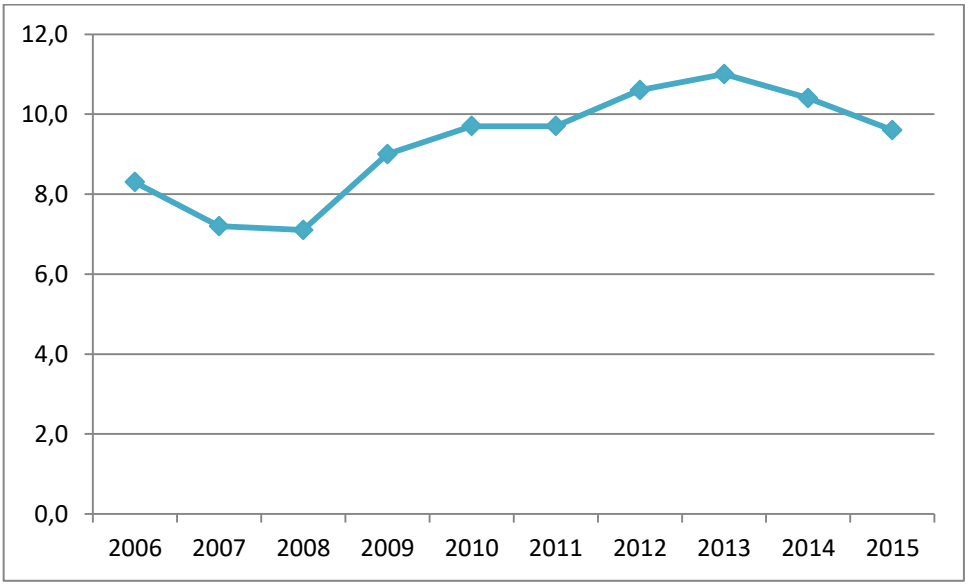

Fig. 1 Development of the total unemployment rate within the EU
Source: Eurostat (2017h), edited by author.

The development of the unemployment rate is irregular. At the beginning of the reviewed period, in 2006, the unemployment rate was equal to 8.5%. Other way round, at the end of the exanimated period (in 2015) the unemployment rate reached 9.6%. Whereas the best result (with the lowest rate of unemployment) occurred in 2008, and achieved 7.1%, the worst result was measured in 2013. The unemployment rate in 2013 was 11%.

Development of the unemployment rate of age category 55-64 within the EU

Before recognizing the development of unemployment rate of the investigated age category (people from 55 to 64 years old) within the European Union, it is useful to present the share of such an age class in the EU labour market as a whole. In 2015, older people aged from 55-64 were participated at the EU labour market by 16%. The rest, about 84%, was made up of EU inhabitants aged from 15 to 54. (Eurostat, 2017i)

The graph bellow illustrates the development of the unemployment rate of age class 55-64 within all member countries of the European Union for ten years. The unemployment rate is expressed in percentage as a share of unemployed EU inhabitants who belonged to the age category 55-64, over the active EU population of the same age class.

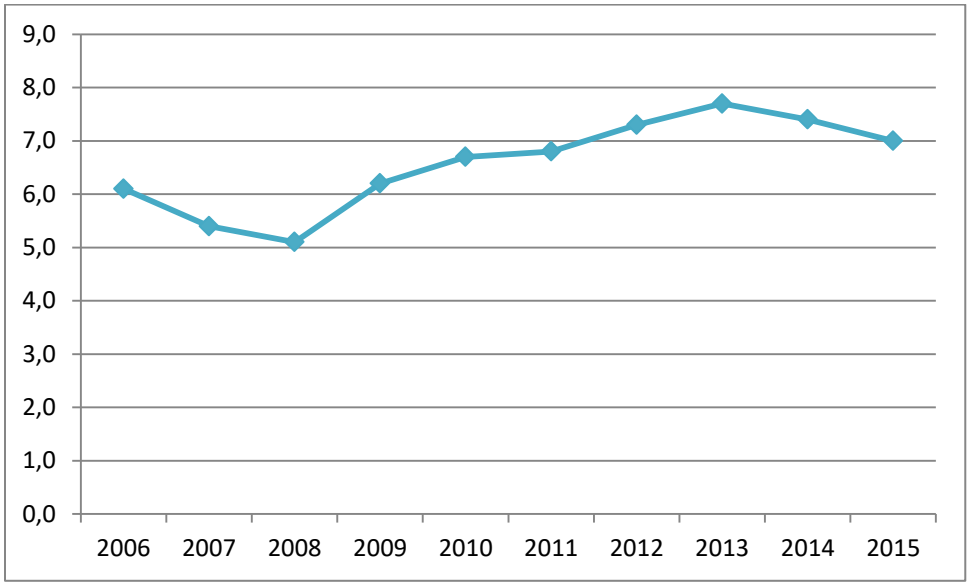

Fig. 2 Development of the unemployment rate of the age category 55-64 within the EU
Source: Eurostat (2017h), edited by author.

Development of the unemployment rate within the EU inhabitants aged from 55 to 64 is not regular. In 2006, the unemployment rate attained 6.1%. In following two years it reached the most favourable decrease, which culminated in 2008, when it hit the lowest rate of 5.1%. The following years were less fortunate. The highest unemployment rate occurred in 2013 and exhibited 7.7%. Ever since, there is observed a decreasing trend in unemployment rate, again. The latest data, from 2015, show 7.0% unemployment rate of the age class 55-64.

Comparing the development of total unemployment rate with the development of unemployment rate of age class 55-64, it might be concluded that the developments display the same trend. In both cases, the lowest unemployment rate occurred in 2008. On the other hand, both unemployment rates got their peak in 2013. The increases in unemployment rates after 2008 might be explained by the economic recession, which occurred in the European Union at that time period, and affected many economic fields.

4.2.2 Unemployment rates among the EU member countries

Nevertheless, the question of unemployment is challenging for the European Union as whole, unemployment rates may be quite different among individual member countries of the European Union. A closer look at the current situation of total levels of unemployment among the EU member countries, as well as at the present situation of the EU unemployment rates of age category 55-64, is taken. The latest data available at the time of writing the thesis, from 2015, are used.

Total unemployment rates among the EU member countries

The following graph illustrates total unemployment rates (of people aged from 15 to 64) among the European Union member states, for the year 2015. On the horizontal axis, there are presented individual member countries. On the vertical axis, the percentages of unemployment rates can be observed. Percentages are calculated as number of unemployed people (aged from 15 to 64) divided by total number of individuals of the same age category in the labour force.

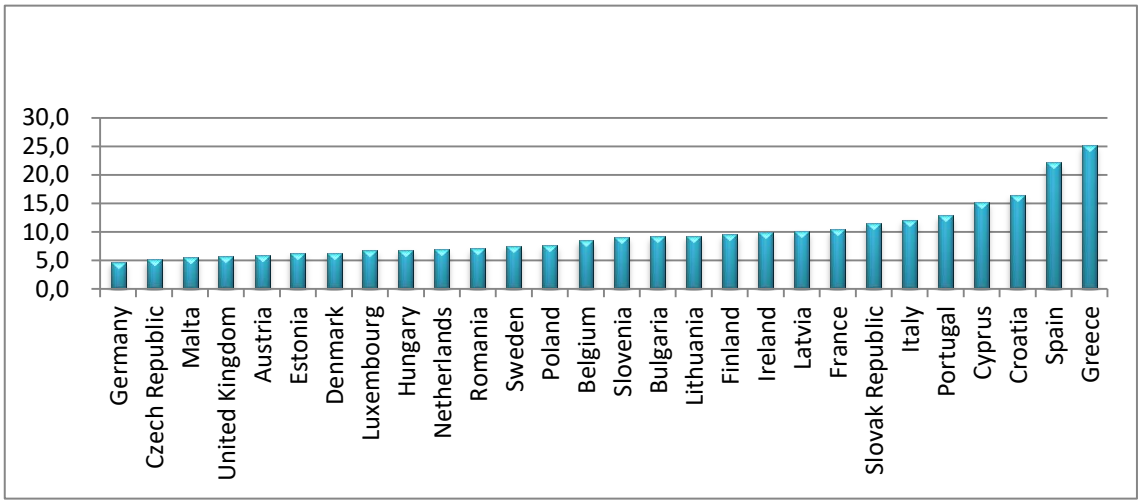

Fig. 3 Total unemployment rates among the EU member states, 2015
Source: OECD (2017), edited by author.

As it is obvious from the graph, Germany was the country with the lowest level of unemployment. The Czech Republic, Malta, the United Kingdom and Austria are the countries which reached very low levels of unemployment, as well. Unemployment rates in these countries slightly exceeded 5%. Greece was the country with the highest total unemployment rate among all of the twenty-eight EU member states (about 25%). Similar situations were recorded in Spain, Croatia and Cyprus.

Unemployment rates of age category 55-64 among the EU member countries

Next graph is very similar to the previous one. It presents the unemployment levels of people from 55 to 64 years old among the EU member states. Correspondingly, the horizontal axis shows individual EU member countries, and the vertical axis represents the percentages of unemployment rates. Percentages are calculated as the number of unemployed people aged from 55 to 64 divided by the total number of people at the same age category in the labour force.

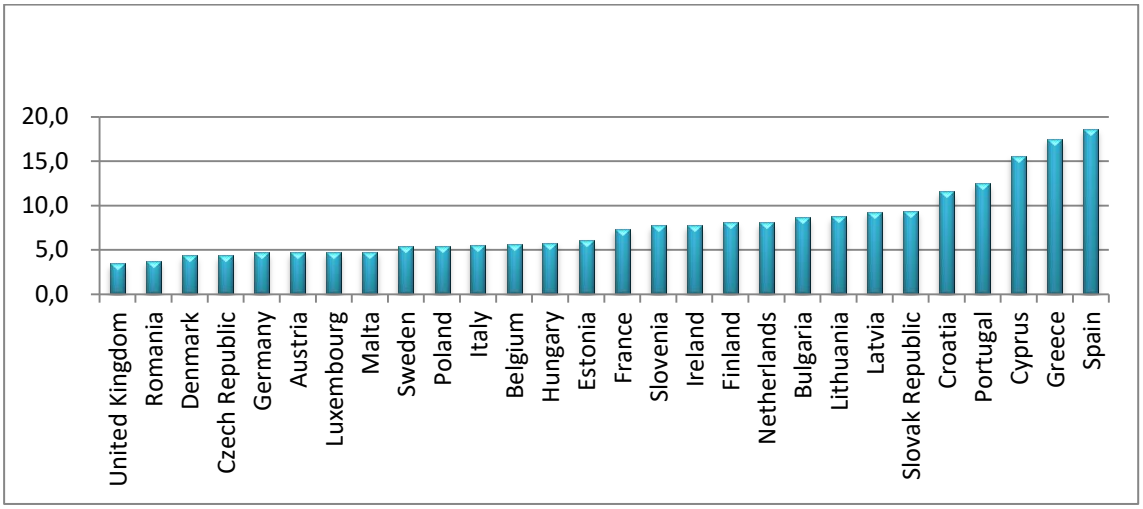

Fig. 4 Unemployment rates of the age category 55-64 among the EU member states, 2015
Source: OECD (2017), edited by author.

The lowest level of unemployment of age category 55-64, in 2015, was in the United Kingdom (3.5%). In contrast, the highest unemployment rate occurred in Spain, where it exceeded 18.6%. Relatively low unemployment rates of age category 55-64 were observed in Romania, Denmark and the Czech Republic. Greece, Cyprus and Portugal belonged to the countries with relatively high levels of unemployment. Unemployment rates of these countries exceeded 10%

Comparison of two previous graphs might be very interesting. While the lowest level of unemployment in both cases oscillated around 5%, the highest unemployment rate of age category 55-64 was almost by 10% lower, compared to total unemployment rates. Romania had almost the lowest level of unemployment of the older population, which was markedly lesser compared to total unemployment rate in this country. In general, the countries with low total unemployment rate denoted also low levels in unemployment of age category 55-64, and vice versa.

The differences among the individual countries are significant for the total EU unemployment rates as well as for the EU unemployment rates of older inhabitants. According to Palíšková (2014), the main causes for those dissimilarities might be differences in the structure and the level of economies among the member countries, differences in economic policies, and last but not least, different political decisions which affect the labour markets.

Abrahám (2008) agrees and adds that dissimilarities might not be found only among the individual member countries of the European Union. The unemployment rates differ also within the individual member states. These regional differences are usually resulting from many structural problems, or from low geographical mobility of workers, which limits the European economy, employers and employees to smoother and more effective adaptation to changing conditions.

4.3 Older people in the labour market

The diploma thesis is focused on the segment of older people and their participation in the EU labour market. It is therefore crucial to define such a group of individuals. Nevertheless, there is not a single definition, and opinions of many authors differ in explanation of such an age category. It is quite sure that older people are a very heterogeneous group to deal with. The features of older employees differ across the member countries of the European Union. The diploma thesis uses a definition of term "older employee" by chronological age. Older people are considered to be between 55 and 64 years old.

Such a definition of older people also represents the age limit of the European Commission. The European Commission understands a term "older employee" in the context of exceeding the age of 55. This also enables easier processing of the secondary data of European statistics - the range of the age group as well as the challenges it is facing.

Concerning the structure of the EU population, in 2015, older people were represented by almost 13% of total population of the European Union. Other age categories were composed of a little more than 87% of total EU inhabitants. (Eurostat, 2017j)

4.3.1 Demographic changes

There is no one in the world, able to avoid the process of ageing. The effect of ageing can differ depending on individual dispositions, as well as on many other factors, such as profession, income, lifestyle, and the overall quality of life. From the sociological and demographic point of view, the population structure can significantly be diverse among countries. These differences are not only resulting from the interaction of demographic events (such as mortality, birth-rates or migration), but also from choices of lifestyle, and quality of healthcare. (Novotný, Bosničová, Břenková, et al., 2014)

More-developed countries in the world are undergoing the processes of several demographic changes. These countries, on one side, experience the prolongation in the lives of their inhabitants, but on the other side, fewer children are born to their residents. Secondly, as the result of the increasing advanced education, young people start to be fully active in the labour market later, than the traditional ages. Thirdly, in many countries (especially those which lack retirement security), people are exiting the labour market later. These trends tend to increase the age diversity in the workplaces in more-developed countries. Above mentioned, results into the situation, in which the world's more-developed countries experience decrease in the population and their population is ageing. (Mor-Barak, 2016)

Novotný, Bosničová, Břenková, et al. (2014) further add that present structure of the Europe's population is considerably affected by a huge amount of people born in two decades after the end of the Second World War. This generation is usually called the post war baby boom generation. Boveda, Medz (2016) stress the importance of this generation, as this segment has, and is also expected to have an

important impact on the economy. The post war baby boom generation is actually about to reach the retirement age. There appear many worries related to the situation when such a huge part of the population exits the labour market. There might appear serious workforce shortages and drop in productivity. The decrease in amounts of the workforce will also cause the decrease in contribution to the economy and decreases in tax revenues to fund government programmes such as social security. The fact that there is, and is also expected to be, an increasing amount of retired people will also put some burden on the social systems of individual countries.

The presented demographical trends are often marked as a part of catastrophic scenarios about the growing number of older people in the population. Within these visions, older generations are presented as a potential threat for healthcare, social services and for the economy as a whole. It is paradoxical that even though the process of demographical ageing is the result of series of positive changes of the everyday lives, it is still considered to be a negative phenomenon. The increasing share of older people in the population is not caused by growing numbers of older people, rather by the fact that fewer children are born every day. (Sokáčová, 2014)

4.3.2 Population ageing

Population ageing (together with global climate change and global terrorism) belongs to three major global challenges of the 21st century according to The United Nations. Hoff (2011) considers that the population ageing depends on three main factors:

- **Mortality**: falling mortality causes higher numbers of population, which means increasing amounts of older people in the population.
- **Fertility**: decreasing fertility is a source of lower birth rates and therefore falling share of young people in the population. Put differently, there is a larger share of older people relative to younger people.
- **Migration**: migration can significantly affect the population ageing, too. It depends on whether the migration flows are in favour of immigration or emigration[1], weather the age structure of migration is predominantly younger or older, and last but not least it also depends on the share of migrants relative to national inhabitants.

Population ageing in the European Union

Population ageing is the world-wide phenomenon, which occurs within almost each member state of the European Union. As population ageing usually from the

[1] Immigrants are people who come to a different country than their previous residence was. On the other side, emigrants are people who leave the country of their residence and settle in another country. (Eurostat, 2017l)

long-term perspective, affects the socio-economic environment, its consequences should not be overlooked. Some of the consequences might affect the public expenditures on pensions, social security, health services etc.. This, in turn, shall increase the burden on working-age inhabitants. Weighty decrease in the working-age population might sometimes culminate into diminishing of the economy's growth rate. (Diaconu, 2015)

The long-term phenomenon of population ageing might be observed in the European Union for many years. Population ageing brings many age structure changes. There is a noticeable increasing share of older people and a decreasing share of working-age population in the whole population of the European Union.

In the very beginning of 2015 the entire population of the European Union was estimated to be around 508.5 million. There were about 15.6% young people (from 0 to 14 years old), people from 15 to 64 years old were accounted for 65.6%, and older people (65 years old and more) were represented by 18.9% of the EU population. Relating to the previous year (2014), the share of older people increased by 0.4%. Comparing the share of older people in the EU population to the statistic from 10 years ago, an increase by 2.3% was recorded. (Eurostat, 2017k)

The following graph mirrors the median age of the population within the member states of the European Union from year 2001 to 2015.

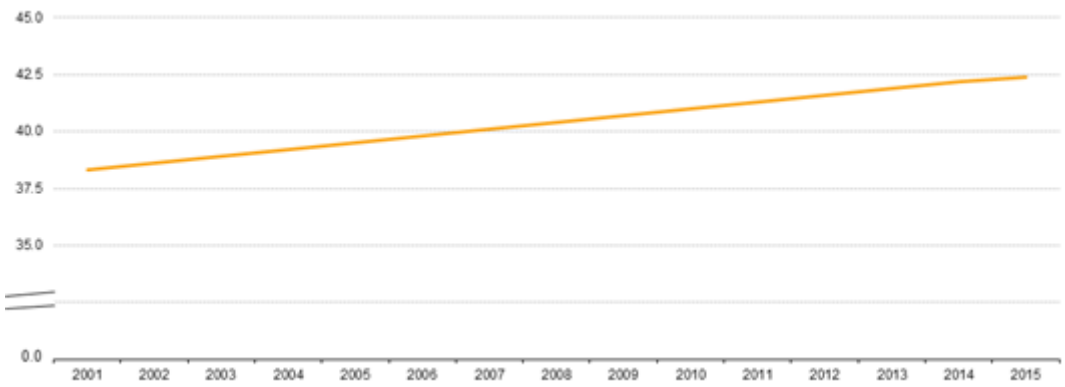

Fig. 5 Median age of the EU population
Source: Eurostat (2017k).

On 1st January 2015, the median age of the population of twenty eight member countries of the European Union was 42.4 years. Put it differently, the half of the EU population was younger than 42.4 years and the other half was older. In 2001, the median age of the EU population was around 38.3 years, which means that there was an increase by 4.1 years documented between years 2001 and 2015. (Eurostat, 2017k)

4.3.3 Influence of age in employment

Participation of older people at the labour market is presently perceived as a problem. Obviously, older people might face many obstacles in the labour market. Po-

tential loss of the employment for older individuals, can lead to ultimate dependence on the social system. People of advanced age are more often subjects of an economic and social threat, despite all the capabilities they can offer in the labour market, and in the social life. (Cimbálková, et al., 2012)

The employment is a crucial part of social identity of individuals. As people age, the gradual loss of competence, noticeable poorer performance and pessimistic prognoses in the context of the practice of their profession, might be recorded. People in such a position are always forced to accept a worse alternative than which they used to consider being their norm. Older people are largely worried about the potential loss of their employment, which is usually connected to some kind of a social degeneration. Negative perception of oneself might be even graduated because of the threat which searching for a new job position means for them. Significant portion of older population is well aware of the decrease of their social value in employments. Another component part of the social identity of ageing population is, that they value their profession competences not to be interesting for the society, as they do not satisfy all requirements, most of the time. (Vágnerová, 2000)

Thorová (2015) in her publication argues with above mentioned. She explains that people in their advanced age are continuing to be fully active workforce and, most of the time, they might find themselves at the top of their professional carriers. They are able to use all of the acquired knowledge, which is, the main reason why they usually work at higher positions, according to her.

Bočková, Hastrmanová, Havardová (2011) further appoint the most important factors (both positive and negative) influencing the employment of older people. The biggest advantage of employing the mentioned age category is definitely the long-term professional experience which is connected to gained skills, which are usually even more important than theoretical backgrounds. It is the long-term experience which enables aged people to know perfectly the system and the history of the field they are employed in. Through the many active years in the labour market, they were able to create many contacts with other offices and organizations which might be very important for their employers. Finally, the incontestable advantage of employing older people, comparing to the younger generation, is their loyalty.

On the other hand, one of the greatest disadvantages of the employment of the older generation is the technical barrier. (Bočková, Hastrmanová, Havardová, 2011) Švarcbachová (2014) agrees and adds that older people usually suffer from multiple health issues, lower level of education, unwillingness for further education, language barriers, lower physical activity and many more.

4.3.4 Age discrimination in employment

Each individual entering the labour market should be aware of the wide range of legal orders and prohibitions which goal is to effectively balance the unequal statuses among employers and employees. One of them is the prohibition of discrimination.

This prohibition is one of the means of fighting against prejudices and stereotypes faced by individuals in searching for an employment or in performances of their everyday work. The purpose of the prohibition of discrimination in employment relationships is an effort to prevent judging people in accordance with their affiliation to a particular group. Individuals may only be judged on the grounds of their personal characteristics, skills, and qualities. (Sokáčová, 2014)

Discrimination can be either direct or indirect. Indirect discrimination occurs when the conditions are set which unfavourably treat some group of people of one sex, race, religion, health issues, or older workers. On the other hand, direct discrimination can be defined as behaviour when one person is treated less favourably than other people are, or would be, treated in the comparable situation. (Armstrong, 2006)

Gregory (2001) agrees and adds to the previous that there is also huge range of time when an employer can subject an employee to acts of age discrimination in accordance with any aspects of the employment relationship at any time between hiring and laying off. Sokáčová (2014) further develops this idea and mentions the most frequent cases of age discrimination during employments, which are strictly prohibited by the EU law:

- Fair recruitment employment: Older job seekers might crash the unfavourable treatment right during job hunting. Setting the maximum age limit as one of the requirements for the job position is, with the few strict exceptions, seen as discrimination.
- Conditions of employment: Employer is obliged to ensure equal treatment of all employees. Ensuring equal treatment means should not be missed in the context of providing equal opportunities and equal remuneration for comparable job positions and caring responsibilities.
- Last but not least, firing of employees on the age grounds is another way of discrimination.

Non-discrimination on the basis of age in the EU treaties

As it was already mentioned, the age discrimination issue is one of the subjects of many EU treaties. The treaty on the functioning of the European Union, in Article 19, prohibits any discrimination based on age grounds as well as on the grounds of sex, racial or ethnic origin, religion or belief, disability, or sexual orientation. Age discrimination is further discussed in the Article 21 and the Article 25 of the Charter of fundamental rights of the European Union. Equally important is an anti-discriminatory clause in the article 14 in the European Convention on Human Rights. (Older people in Europe, 2014)

Mužáková (2014) correspondingly stresses that each country of the European Union has several applicable laws against age discrimination, which might appear at the workplace and could be hidden. She further states that although, there are many treaties and laws against any kind of discrimination, it, unfortunately, still occurs in the European Union.

4.3.5 Retirement age

The retirement age is defined as the age at which people can withdraw from the labour market, and start to receive benefits from the government. The retirement age is different among the member countries of the European Union as it is still decided at the national level. The European Union therefore does not mandate or restrict the EU member states in setting the retirement ages. However, the intention of the European Union is to ease the differences associated with the retirement ages among member states. (Štorová, Fukan, 2012)

In the past, as the result of weak economic growth and huge deindustrialization, there was a trend of encouraging an early retirement policy in Europe. Back then, it was considered to be the best way how to facilitate the economic restructuring, aimed at promoting the labour market activity of younger generation and continually low unemployment rates. However, this trend was connected to the increasing volume of non-labour costs in the social security systems. (Eichhorst, 2011)

Nowadays, the situation of retirement age in the European Union is clearly mirroring the continuous trend of increasing life expectancy associated with population ageing. This, together with the enormous rising costs of public pensions culminated into necessary raise of the retirement age. The retirement age has been increasing in almost each European country. However, this decision was necessary, it is also politically controversial as it includes a huge share of inhabitants of the European Union, and many individuals might find it disruptive as they can be concerned about their future standards of living. (Åslund, Djankov, 2016)

Rising of the retirement age is never popular, and will always be accompanied with serious resistance and anger of inhabitants. Some countries, well aware of this, try to sidestep the implementation of unpopular legislative changes by encouraging workers to carry on their employments even after mandatory retirement.

Setting of the retirement age used to be lower for women, mostly in the former countries of the European Union. The truth is that women who live in the European Union presently have longer life expectancy (by four years) than men. That is one of the reasons why there might be seen some attempts to abolish from the gender differentiation in terms of exiting the labour market, in many EU countries. (Åslund, Djankov, 2016)

White papers of the European Union

Documents reflecting the proposals for the European Union to take part in a certain area are called White Papers. The White Papers are published by the European Commission. *"The purpose of a White Paper is to launch a debate with the public, stakeholders, the European Parliament and the Council in order to facilitate a political consensus."*

'An agenda for adequate, safe and sustainable pensions' from the year 2012 is one of the recent White Papers. (EUR-lex, 2017) There are four biggest challenges of this agenda associated to current pensions, and they are as followed:

- To secure the financial sustainability of the pension systems.
- To remain the adequate pension benefits.
- To increase the participation of women and older workers at the labour market.
- The role of the member states and the EU in designing pensions.

The White Paper also stresses the need for several reforms in pensions. The time spent at employment should be appropriately balanced with the time spent in retirement. Related to this, member countries of the European Union should link the retirement age with the increasing life expectancy. Several obstacles of early retirement should take place, longer participation at the labour market may be supported, and finally, the abolishment of the pensions' gap between men and women is necessary. Supplementary retirement savings must have greater influence in safeguarding the future adequacy of pensions. The White Paper is also explaining certain ways of reaching the reforms. (EUR-lex, 2012)

4.3.6 Age management

Age management represents the creation of conditions which take into account age, at the political and organizational stages as well as in the management of work processes in the physical and social environment. Population ageing is strong motivation for both, the employers and the state. Employers have to be involved in age management because it is quite sure that they will be forced to employ older people in the future with the intentions of keeping labour productivity unchanged. (Cimbálková, et al., 2012) Naegele and Walker (2006) agree with the massive economic imperatives for age management at the labour market. The employers will soon not be able to find sufficient amounts of young job seekers. They will have to face the population ageing trend and rely on the remaining ageing workers.

Nowadays, the term age management is being used mostly in the relation to several concepts such as: active ageing, diversity management or social responsibility. Age management is based on the ideas of reducing age discrimination in employment, supporting appropriate human resources management and securing suitable work conditions. The core of this concept is to enable people to be actively participated at the labour market during their entire lives. From the following, it might be concluded that age management is not concentrated on older workers only. Rather, it takes in account the age categories. (Novotný, Bosničová, Břenková, et al., 2014)

Fuertes, Egdell and McQuaid (2013) explain the term age management as a set of various techniques which are used in order to promote age diversity and/or to limit age barriers, and which motivate employees to stay in employment even though they have previously retired.

According to Štorová and Fukan (2012), age management is a subject of interest at many levels. Obviously, motivations for the interest are different. In general, it is possible to distinguish three key levels at which the main participants are in-

terested, and also involved in age management programs. The authors appointed three key levels as provided:

- **Age management measures at national level**
  Public interest in age management is to maximize the contribution of ageing workforce to the economic and social development. Connected to this interest, there is a need to find some balance between supply and demand at the labour market. It is further dealing with the matters such as employment and unemployment, harmonizing the negative impacts of the demographic development (population ageing) in fields such as health, labour productivity, and many more. The need of the government interventions in age management are based on the fact that market itself is not able to cover many aspects of this issue. (Cimbálková et al., 2011)
- **Age management measures in each organisation**
  Particular organisations are interested in age management mostly because of the need to maintain and further develop the human potential for performance. More specifically, organizations' aim is to maintain the skills and to transfer the knowledge of their labour force. Changes in working hours and organizations' work are subjects of plans designed at this level, as well. (Rašticová, et al., 2013)
- **Age management measures in individuals**

  Cimbálková et al. (2012) understand this measure as the focus of employees at the maintaining and, if necessary, fighting for the employment. It should be in the interest of an individual to keep and develop their knowledge and skills, in order to smoothly overcome the inconvenience which might be connected with a potential job change, which is huge challenge for the ageing population. It is crucial to stay focused on the professional future and growth even in the advanced age. The biggest challenge is to learn how to use all of the advantages of advanced age such as skills and experiences. There is always a space for education in the framework of the working skills.

4.4 Literature reviews of other empirical studies

After specifying the theoretical framework concerning the unemployment and participation of older people at the labour market, it is crucial to have a closer look at the recent studies and researches of other authors on the exanimated topic of the thesis.

The report called Increasing value of age in the European Union, brought following findings:

- The share of older inhabitants is increasing – population is ageing.
- Older people are less participated at the labour market.
- The retirement age of older employees is increasing.
- The share of older employees is significantly different across sectors.

- Older employees are overrepresented in small and medium-sized enterprises (SMEs).
- Older people, in general, are learning less. (Cedefop, 2015)

Rožman, Treven, Čančer (2016) analysed the differences between older and younger employees. They divided workforce into two age groups: under 50 years old and above 50 years old. In order to recognize the differences in stereotypes in workplaces between the two age groups, they used non-parametric Mann-Whitney U test. Primary data research by means of questionnaires was used. The sample included 400 employees of small, medium and large-sized Slovenian companies, in 2016. The results of the research found out that older employees, compared to the younger workers, are stereotyped as:

- less productive,
- less motivated,
- less innovative and energetic,
- less adaptable,
- more resistant to change,
- requiring more time for learning,
- requiring more time for accomplishing work tasks.

Fasebender, Wang (2017) examined the influence of negative attitudes against older people in hiring decisions. They verified various hypotheses grounded on online questionnaires and vignette study. For data analysing, they used path analysis. The sample size was 102 people employed in human resources management among different industries, in the USA. The research founded out that negative attitudes to older employees were positively associated with dodging of employing older people, which was negatively associated to the likelihood of choosing the oldest candidate.

Montego-Maranjo, Sohail (2015) noted that the recession which occurred in the USA, in 2007-2009, unfavourably affected not only the overall unemployment levels, but also the long-term unemployment rates. They monitored the developments of long-term unemployment before and after the Great Recession for several age classes. They stated that the Great Recession, in terms of increasing unemployment as well as long-term unemployment, affected the young generation (16 to 24 years old) and the old age category (55+) very much. At the beginning of 2015, the long-term unemployment of these two age classes remained to be very high. They finally stressed that it hit the older workers the most intensely as some of them were still searching for an employment (in 2015).

Bocean (2015) in his research used time-series data of the European Union, for the time period 2003-2013, and besides many others, tested the correlations between minimum wage and employment/unemployment indicators. He examined the correlation for all twenty-eight member countries of the European Union.

For detecting the correlation, the Pearson coefficient was used. The result of his paper work showed, that the Pearson coefficient did not indicate significant correlation neither between minimum wage level and employment rate nor between minimum wage settings and unemployment rate.

Mitsis (2015) studied the effects of minimum wages on total employment is Cyprus. His research was dealing with the sample period 1960-2011, and he used vector autoregression (VAR) models. According to the results of his work, rise in minimum wage levels had a negative impact on employment. He also concluded that the coverage effects of the minimum wage on the total employment were not significant.

Karaçor, Özmen , Yorgancılar (2013) examined the relationship between minimum wage, employment and inflation, for time period 1987-2010, in Turkey. Granger causality analysis was used within their study. They reported long-term relationship among variables and proposed that the direction of the relationship was from the minimum wage levels and inflation to unemployment level. They also came up with the conclusion that the minimum wage rates and inflation were Granger reason for unemployment in a short-term period.

Brochu, Green (2013) studied whether and how the minimum wage settings can affect the employment transitions in Canada. They obtained datasets from the Canadian LFS and their research was focused on the time period 1979-2008. The feasible generalised least square (FGLS) method was used in the analysis. The results of the work indicated that lower minimum wage settings were accompanied with higher hiring rates and also higher separation rates. They also found out that employments with lower minimum wage settings were less stable, but on the other side, easier to get. However, these effects were almost completely offsetting for older employees, resulting in little influence on employment level.

Lefèbvre (2012) studied the relationship between unemployment and retirement. He was focused on the panel data of the time period 1982-2003. In his analysis, he examined the OECD countries, however, some countries had to be removed because particular values were missing. The final countries were: Australia, Canada, Finland, France, Germany, the Netherlands, Norway, Portugal, Spain, Sweden, the UK, and the USA. He divided their inhabitants into two age categories, one was represented by employees from 15 to 49 years old, and the other one corresponded to workers aged from 50 to 64. The Ordinary Least Squares model and IV estimation were used in his analysis. Lefèbvre also estimated a Beverage curve. Positive and significant relationship between the social security system towards retirement and unemployment rate was discovered. It proposed that higher probability of retirement led to decrease in active participation of older employees in the labour market, which in turn negatively affected the labour outcomes of all employees. He found out that the lower the age of retirement, the higher the probability of older workers to go onto retirement. Nevertheless, the impact on younger employees was more likely to be negative. The research also discovered that the probability of retirement of older employees had negative impact not only on the

unemployment rates of the whole population, but also on the unemployment rates of the younger population.

Staubli, Zweimüller (2011) also examined how minimum retirement age setting affects the employment, eventually unemployment of older employees, in Austria. They have been focused on men from 60 to 62.2 years old and women aged from 55 to 57.2. They analysed time-series datasets (2000-2006) from Austrian Social Security Database, and used OLS estimates and robustness testing in their research. The research advocated that an increase in early retirement age significantly affected the employment. More in details, there was recorded an increase by seven percentage points in employment for men (aged 60-62.2) and ten percentage points increase in women's (aged 55-57.2) employment.

Virjan, Certu (2015) analysed the correlation between employment and productivity of the age category 55-64 years in Romania. They found out that there was not a strict correlation between labour productivity of older people and the employment rate.

Dimian, Ileanu, Aceleanu (2016) were dealing with the analysis of the population ageing and the labour productivity. The research was focused on four countries of the European Union: Germany, the Netherlands, Austria and Finland. The goal of the research was to find out how labour productivity and number of older employees affect sectorial competitiveness in the mentioned countries. The econometric analysis using dynamic OLD and ARDL models were subjects of the research. The authors used panel data of nineteen years on five economic sectors. The research discovered that economies of these countries were focused priority on manufacturing and the branches with the highest growth rates of employment were: professional, scientific and technical activities, administrative and support service activities, real estate activities, information and communication. However, these were also the sectors which experienced the lowest share of older employees. The research also indicated that the productivity of older workforce had a positive and direct impact on the overall productivity.

Gallegati, Gallegati, Ramsey and Semmler (2014) in their research, were looking for the answer to the question whether the productivity growth increases or decreases unemployment rates. They used property of wavelet analysis in order to decay economic time series to their time series components. US post-war data were used in the research. They came up with the conclusion that productivity was the source of unemployment in sort and medium runs. However, it generated employment in the long run. In other words, they discovered a strong negative relationship between productivity and unemployment in the long run.

Khan, Saboor, Mian, Anwar (2013) were curious whether there is any relationship between real GDP growth and unemployment rate. They analysed Pakistan's time series annual datasets from 1976 to 2010. In the research, the unit root test, Hodrick-Prescott filter and Ordinary Least Squares analysis were used. The empirical analysis indicated that there was a negative relationship between unemployment and GDP growth. More detailed, with one percentage point increase in

unemployment, there was recorded decrease of 0.36 percentage point of real GDP growth.

A very similar research was done by Andrei, Vasile, Adrian (2009). They also studied the correlation between unemployment and real GDP growth. Their study case was focused on the time period from 2000 to 2008, in Romania. The source of the secondary data was the National Institute of Statistics. The authors used the Ordinary Least Squares method and the concluded negative relationship between unemployment and real GDP growth. More accurate, the increase of one percentage point of unemployment was accompanied by half percentage point decrease in real GDP growth.

Khan, Rashees, Hanif (2014) used the Quantile regression analysis with the purpose of estimation of relationship between GDP and unemployment. They compared the outcomes to the parameter estimates of Ordinary Least Squares analysis. The research used time series data of the time period 1973-2010. The outcome of the Quantile regression analysis indicated that for GDP variable estimates were statistically significant only for some quantiles (5%, 10%, and 95%). Thus, there was a verified relationship between unemployment and GDP, but only within low quantiles.

Hassan, Nassar (2015) researched the relationship between unemployment rate, percent debt and GDP. In the model, they selected unemployment to be the dependent variable, and GDP and percent debt stood for explanatory variables. They used time series data (obtained from Gecodia.com) with the intention of running cross correlations tests and Granger causality test. They analysed the relationship among individual countries for different time periods. Countries of the study were: Greece (1977-2012), Italy (1981-2012), Spain (1981-2012), Portugal (1981-2012), Ireland (1981-2012), the United Kingdom (1971-2011), France (1970-2011), Germany (1970-2011), and the US (1970-2011). The result of their analysis showed a negative relationship between unemployment and GDP and a positive relationship between unemployment and percent debt. They also presented a negative relationship between GDP and perecnt debt.

Bhattarai (2016) investigated whether there is any trade-off between unemployment rate, growth rate and inflation, in OECD countries. He used quarterly data series from years 1991 to 2014, obtained from OECD database. The study used cointegration and Granger causality tests, country specific regressions, fixed and random effect panel data and panel VAR model. He found out that there was 54% positive correlation between inflation and unemployment, 68% positive correlation between growth rate and unemployment rate and 66% positive correlation between growth rate and inflation. Trade–off between unemployment and inflation was proved to be significant in 28 out of 35 OECD countries individually and in the panel of 40 advanced economies. Trade-off between unemployment and growth rate was discovered to be significant only in 13 of these countries.

Pejaković (2010) examined the correlation between inflation and unemployment in the European Union for the time period 1998-2007. He used the correlation and regression analysis. The analysis determined a relation between unem-

ployment and inflation. The author set the hypothesis that occurrence of high inflation rates were accompanied by lower unemployment rates. The hypothesis was confirmed, and the negative linear relationship was discovered by the statistical analysis.

Popović, Popović (2011) completed the research on dynamics and correlation between inflation and unemployment in the European Union for various time periods (1998-2007, 2000-2009, and 2000-2006). They obtained data from the Eurostat database and used the comparative, correlation and regression analysis. The side hypothesis tested whether there was a significant, if inverse, relationship between unemployment and inflation in the European Union. The results characterized a significant inverse relation between variables. The results also shaded some light on the differences between various time periods. The relatively stable period of 1998-2007, indicated absolutely higher negative correlation between unemployment and inflation than less stable economic period, from years 2000 to 2009.

Herman (2010) studied the relationship between unemployment and inflation in the Romanian economy during the time period from 1999 to 2009. In order to recognize the correlation, the Pearson correlation coefficient was used. The outcome of the paper work showed, that there was not a stable, statistically significant relationship between unemployment and inflation in the long run (20 years). However, she stressed that the result of the study did not necessarily mean that there was not any relationship between these two variables from the short run perspective.

Florea (2014) was also dealing with analysing the relationship between unemployment and inflation in Romania. She was focused on the young generation from 20 to 24 years old. The data (from the time period of 1996-2012) were obtained from the National Bank of Romania and the National Institute of Statistics. She concluded that during the pursued time period, there was neither a direct, nor a reserved relationship between unemployment and inflation for the age category 20-24.

5 Results

This section of the diploma thesis presents the results and main findings of the multiple linear regression analysis. Summary statistics and multiple X-Y scatter plots are reflected at the beginning of the section. Since the model was already specified in the methodology of the thesis, they are followed by model quantification, which is dealing with the estimation of the model variables by the Ordinary Least Squares method (OLS). Ones the model is quantified it should be verified. Subchapter model verification is represented by economic, statistical and econometric verifications. The actual versus fitted plot is shown at the very end of this chapter.

5.1 Summary statistics of variables

Before the model is estimated, it is helpful to have a closer look at the summary statistics. The summary statistics are obtained for the dependent variable, as well as for all independent variables with the exception of the dummy variable which symbolizes membership in the Euro area. The summary statistics reflects values for mean, median, minimum, maximum, standard deviation, coefficient of variation, skewness, and kurtosis. The summary statistics are illustrated in the table below which is followed by a verbal description of the summary statistics for dependent variable unemployment of age category 55-64.

Tab. 2 Summary statistics

Variable	Mean	Median	Minimum	Maximum	Standard deviation	Coefficient of variation	Skewness	Kurtosis
Unemployment of age category 55-64	8,00	7,60	3,50	18,60	4,06	0,51	1,33	1,19
Long-term unemployment	5,10	4,10	1,60	18,20	3,93	0,77	1,98	3,81
Unemployment total	9,87	8,85	4,70	25,10	5,27	0,53	1,71	2,25
Monthly minimum wage	795,77	636,47	184,07	1922,96	542,81	0,68	0,64	-1,08
Average age of retirement Men	64,52	65,00	62,00	67,00	1,36	0,02	-0,51	-0,62
Average age of retirement Women	63,48	63,72	60,00	67,00	2,09	0,03	-0,08	-1,39
Duration of working life	34,66	34,55	32,10	39,90	2,20	0,06	0,86	-0,17
Productivity	106,91	104,45	95,50	129,50	7,41	0,07	1,50	2,32
GDP	94,86	80,00	46,00	271,00	46,97	0,50	2,51	7,08
Inflation	-0,11	0,05	-1,10	1,20	0,57	4,98	0,07	-0,15

Source: Gretl, edited by author.

Mean value of the unemployment of the age category 55-64 in twenty-two member countries of the European Union is equal to 8%. However, the mean statistic can, in many cases, be influenced by the extreme values which might be present in the dataset. Its explanatory power is therefore considered to be worse, compared to the median.

In order to obtain median value from the dataset, numbers must be sorted from the lowest to the highest value. Median represents the middle number in the sorted list of numbers. Median value of the dependent variable is 7.6%. Put differently, the unemployment of the age category 55-64 is in fifty present of twenty-two member states of the European Union higher than 7.6%, and in fifty present of the investigated EU member countries it is lower than 7.6%.

Minimum and maximum stand for the minimum and maximum values within the dataset. Minimum value of the unemployment of age category 55-64 in twenty-two member states of the European Union is 3.5% and the maximum value is equal to 18.6%.

Standard deviation represents the dispersion of the dataset from its mean. The closer the data are to the mean, the smaller the deviation in the dataset is. In

the case of the unemployment of age category 55-64, the standard deviation is not very high, which indicates that the data are relatively close to its mean.

The coefficient of variation is also called relative standard deviation and it measures the dispersion of the data points in a data series around the mean. In other words, it is the ration of the standard deviation to the mean. The coefficient of variation for the dependent variable is slightly higher than 0.5.

Skewness, is in general, either negative or positive. If the dataset is skewed to the left, negative skewness occurs. In contrast, right-skewed dataset specifies positive skewness. The value of skewness for unemployment of age category 55-64 is positive which means that data are skewed to the right and the mean and the median of the dataset exceed the mode.

Kurtosis refers to the distribution of observed data around the mean. It compares the given probability distribution of the random variable with a normal distribution. In the case of the dependent variable, which represents unemployment of age category 55-64, the kurtosis value is positive, which confirms that the given probability distribution differs from the normal distribution. More precisely, it has a sharper peak than the normal distribution.

5.2 Multiple X-Y scatter plots

The relationship between the dependent variable and individual explanatory variables might be recognized by demonstrating multiple X-Y scatter plots.

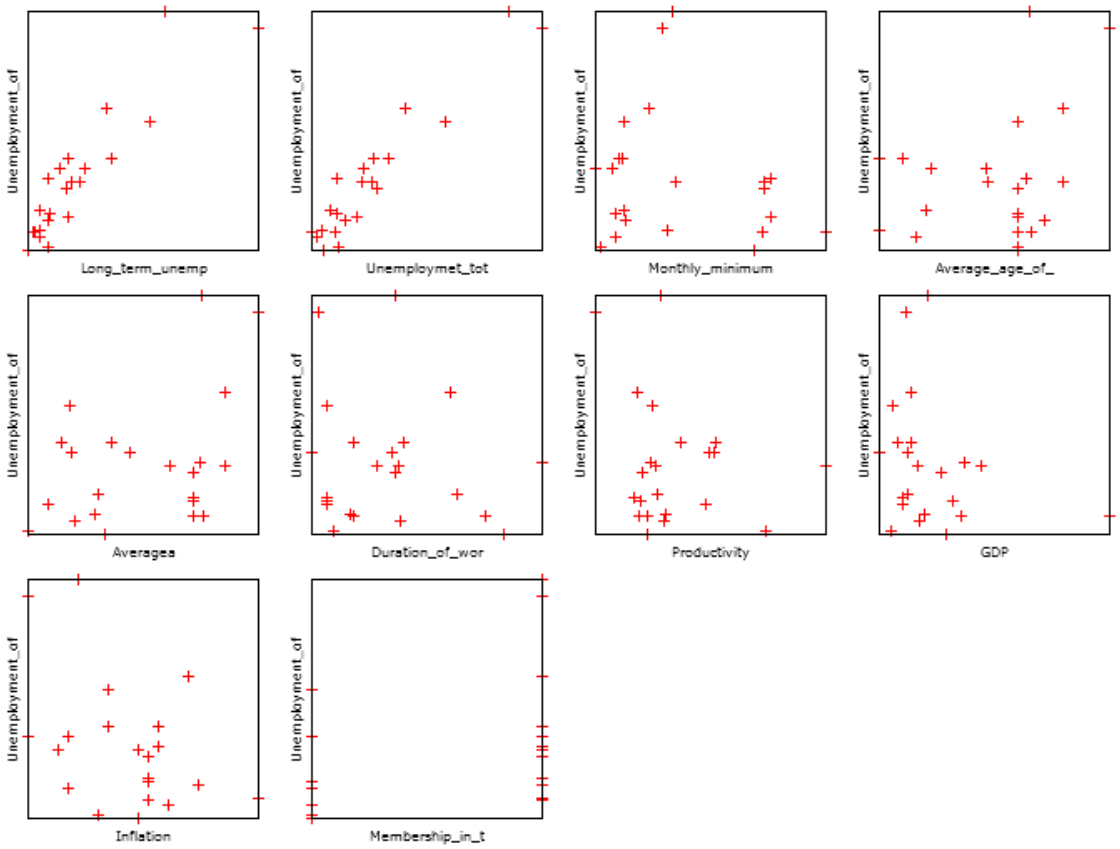

Fig. 6 Multiple X-Y scatter plots
Source: Gretl.

The scatter plots as seen in the figure show the relationships between individual independent variables and the dependent variable unemployment of age category 55-64.

Although, there is perceived positive correlation between unemployment of age category 55-64 and long-term unemployment, and the total unemployment, the other explanatory variables do not report strong positive correlation.

5.3 Model quantification

Model quantification provides the estimation of the model and its parameters. This step is crucial as it influences the overall quality of the model. The coefficients and p-values are estimated by the Ordinary Least Squares method (OLS).

The T-test is used for testing the statistical significance of the regression coefficients. The level of significance is $\alpha = 0.05$. The null hypothesis is rejected if p-value is smaller than the significance level.

At the beginning, the T-test is run for all variables, and subsequently, not significant variables are removed from the model. Thus, sequential selection method is used. Test hypotheses are as followed:

- H_0: Parameter is not statistically significant.
- H_1: Parameter is statistically significant.

Tab. 3 OLS for the original model

Variable	Coefficient	Std. Error	T-ratio	P-value
Constant	-18.904	17.266	-1.095	0.297
Long-term unemployment	-0.209	0.258	-0.808	0.436
Unemployment total	0.854	0.185	4.619	0.001 ***
Monthly minimum wage	-0.002	0.001	-1.900	0.084 *
Average age of retirement Men	-0.274	0.363	-0.753	0.467
Average age of retirement Women	0.405	0.248	1.634	0.130
Duration of working life	0.320	0.131	2.441	0.033 **
Productivity	0.012	0.036	0.327	0.750
GDP	0.005	0.010	0.475	0.644
Inflation	-0.225	0.543	-0.414	0.687
Membership in the Euro area	0.330	0.944	0.350	0.733

R-squared	0.966	Adjusted R-squared	0.935
F(10, 11)	31.224	P-value(F)	<0.001
Log-likelihood	-24.331	Akaike criterion	70.661
Schwarz criterion	82.663	Hannan-Quinn	73.489

Source: Gretl, edited by author.

The presented table indicates that only two out of ten explanatory variables are statistically significant as their p-values are smaller than the level of significance. These two variables are total unemployment and duration of working life. However, the p-value of monthly minimum wage is smaller than the level of significance $\alpha = 0.10$, the parameter is therefore significant, as well.

The adjusted coefficient of correlation is equal to 0.935, which, in other words, means that the model is explained by 93.5%. It is necessary to further modify the model in order to obtain more precise results. After gradual removing of statistically not significant variables, the following model is obtained.

Tab. 4 OLS for modified model

Variable	Coefficient	Std. Error	T-ratio	P-value
Constant	-30.889	9.484	-3.257	0.005 ***
Unemployment total	0.697	0.053	13.173	<0.001 ***
Monthly minimum wage	-0.002	0.001	-3.028	0.008 ***
Average age of retirement Women	0.339	0.158	2.145	0.047 **
Duration of working life	0.342	0.112	3.055	0.007 ***

R-squared	0.952	Adjusted R-squared	0.941
F(4, 17)	85.041	P-value(F)	<0.001
Log-likelihood	-28.022	Akaike criterion	66.044
Schwarz criterion	71.499	Hannan-Quinn	67.329

Source: Gretl, edited by author.

The final modified model is created by gradual removing of statistically not significant variables. Productivity, as the explanatory variable with the highest p-value, is removed first. It is followed by inflation, membership in the Euro area, GDP, long-term unemployment, and average age of retirement for men. The final model contains four explanatory variables which are statistically significant at the significance level $\alpha = 0.05$. For all four independent variables, the null hypothesis of the T-test is rejected in favour of the alternative hypothesis. The final modified model is explained by 94.1%.

It is interesting to take a closer look at the explanatory variables. In the original model, there are parameters which affect the unemployment of age category 55-64 directly (for instance monthly minimum wage, average age of retirement and duration of working life) and indirectly. The indirect variables are general factors and they are step by step removed from the model.

The linear function form is considered to be the most suitable for the model. The regression equation of the model is presented at the following figure:

$$Y = -30.889 + 0.697X_2 - 0.002X_3 + 0.339X_5 + 0.342X_6, \qquad (10)$$

where
Y – Unemployment of age category 55-64,
X_2 – Total unemployment,
X_3 – Monthly minimum wage,
X_5 – Average age of retirement for women,
X_6 – Duration of working life.

5.4 Model verification

The last step before the model could be applied into the practice at the macro or micro level is the model verification. Economic, statistical, and econometric verifications are subjects of this subchapter.

5.4.1 Economic verification

In this section, the expected signs of independent variables are verified with the estimated signs of the multiple regression model.

The estimated sign of explanatory variable total unemployment is consistent with an expected sign. It indicates that, if total unemployment increases by 1%, the unemployment of age category 55-64 will increase, as well, by 0.697%.

Estimated independent variable monthly minimum wage reflects the sign, which is consistent with the economic theory. If there is 1 euro increase in monthly minimum wage setting, the unemployment of age category 55-64 will decrease by 0.002%.

The estimated sign of independent variable average age of retirement for women is also the same as an expected one. If the average age of retirement for women increases by one year, the unemployment of age category 55-64 will increase by 0.339%.

However, the problem arises within the verification of independent variable duration of working life. The estimated sign is not consistent with the expectations. The estimated model indicates that, if duration of working life is prolonged by one year, the unemployment of age category 55-64 will increase by 0.342%. Nevertheless, this independent variable is according to the p-value of the T-test statistically significant. Detected inconsistency in expected and estimated signs leads author to review the theoretical assumption used for creation of the expectation. The shorter the duration of working life, the lower the probability that labour force aged from 55 to 64 will be unemployed.

5.4.2 Statistical verification

Statistical verification is used for the verification of the statistical significance of the model and its parameters. There are many statistical tests which might be used in order to statistically verify the model and its parameters. The T-test was already used within model quantification for testing the statistical significance of independent variables. Further, the F-test, the analysis of variance (ANOVA), as well as, confidence intervals are used in the thesis. Thus, the following paragraphs are dealing with the hypothesis testing. The level of significance is in the entire thesis equal to 0.05.

ANOVA and F-test

The analysis of variance (ANOVA) is used for recognizing statistical significance of the relationship among the dependent variable (unemployment of age category 55-64) and independent variables (total unemployment, monthly minimum wage,

average age of retirement for women and duration of working life). The F-test is usually included in ANOVA models.

The F-test is used for testing the overall significance of the model. The null hypothesis is rejected in favour of the alternative hypothesis if the p-value is smaller than the level of significance. F-test hypotheses are presented below:

- H_0: Model is not statistically significant.
- H_1: Model is statistically significant.

Tab. 5 Analysis of variance (ANOVA)

	Sum of squares	Degrees of freedom	Mean square	F-test
Regression	329.255	4	82.314	85.041 [<0.001]
Residual	16.455	17	0.968	
Total	345.710	21	16.462	

Source: Gretl, edited by author.

The illustrated table shows the part of the variability in unemployment of age category 55-64 explained by the regression model, which is equal to 329.255, and the part of variability in the dependent variable unexplained by the regression model which is represented by 16.455. The second part is many times called the error variability.

The test statistic of F-test is equal to 85.041, and its p-value is smaller than the significance level $\alpha = 0.05$. The null hypothesis is therefore rejected, and the model is statistically significant.

Confidence intervals

Confidence intervals are the intervals which include, with probability, a true statistical parameter. General two-sided confidence intervals are composed of the lower confidence limit and the upper confidence limit.

The significance level, for the needs of the diploma thesis is $\alpha = 0.05$. Confidence intervals for 95% are therefore constructed.

Tab. 6 Confidence intervals

Variable	Coefficient	95% confidence interval	
		Lower limit	Upper limit
Constant	-30.889	-50.898	-10.880
Unemployment total	0.697	0.585	0.808
Monthly minimum wage	-0.002	-0.003	-0.001
Average age of retirement Women	0.339	0.006	0.673
Duration of working life	0.342	0.106	0.578

Source: Gretl, edited by author.

The offered table demonstrates the coefficients of variables and the 95% confidence intervals. As it is obvious from the table, the individual coefficients belong to their confidence intervals. In other words, they lay within the area which is restricted by the lower and upper confidence limit.

5.4.3 Econometric verification

Econometric verification is used for detecting the accuracy of seven classical assumptions. It verifies whether the classical assumptions are met at the model. Econometric verification is based on proving the conditions which are necessary for the successful application of the econometric methods, tests and techniques, by using the economic criteria to assess the validity or accuracy of the statistical criteria.

If the classical assumptions are not met, the estimates lose their optimal characteristics. If there occurs a break among the classical assumptions, the appropriate remedy must play a part.

Similarly to the statistical verification, there are multiple tests used for econometric verification and many of them are used in the thesis. The level of significance is still $\alpha = 0.05$.

1st classical assumption

The first classical assumption is dealing with the correct specification of the model and containing the additive error term.

The RESET test, together with LM tests are used for the model specification testing. The null hypothesis is rejected if the p-value is smaller than significance level 0.05.

- H_0: Model is correctly specified.
- H_1: Model is not correctly specified.

Tab. 7 Specification tests

Test	Test statistic	P-value
RESET test	1.991	0.171
LM test squares	7.701	0.103
LM test logs	7.082	0.132

Source: Gretl, edited by author.

P-values from the table indicate that the null hypothesis about the correct specification is not rejected as all specification tests exhibit p-values greater than the level of significance $\alpha = 0.05$. Thus, all three tests confirm the correct specification of the model.

2nd classical assumption

The second classical assumption says that the expected value of the error term is equal to zero. The second classical assumption is not usually tested by any statistical test. Rather, it might be verified by the graphical testing.

The residual plot can be used for the verification of the second assumption. In order to prove that the expected value of the error term is equal to zero, points on the residual plot should be dispersed around zero value.

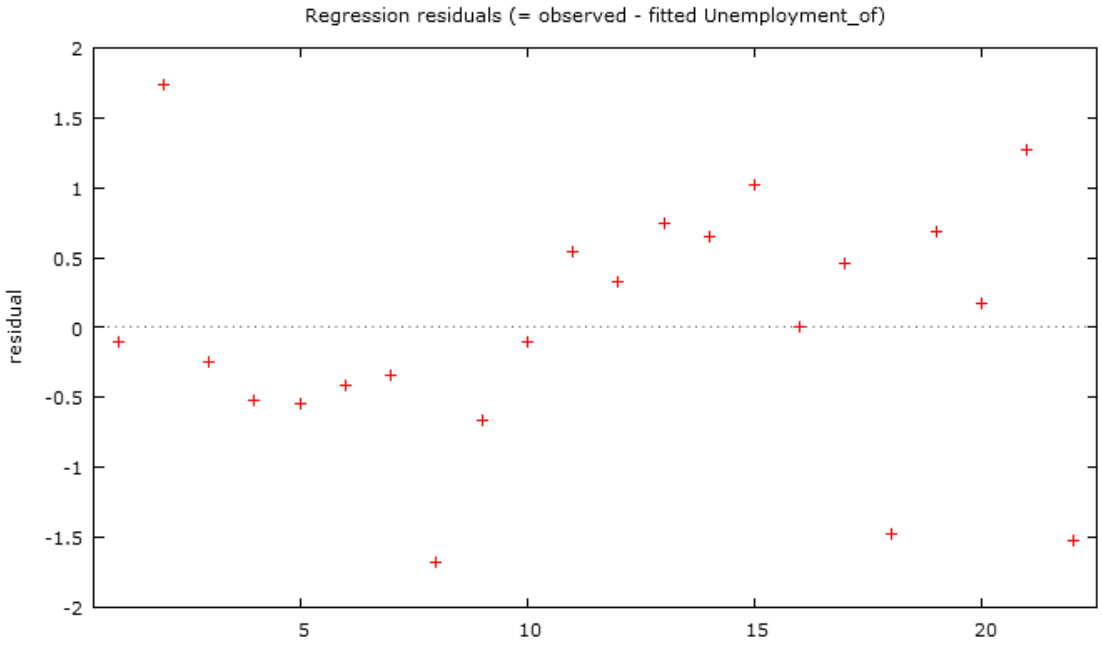

Fig. 7 Residual plot
Source: Gretl.

It can be observed from the graph that red crosses are randomly dispersed around the zero. Therefore, it can be concluded that the error term has expected the value equal to zero.

3rd classical assumption

The third classical assumption assumes that there is no correlation between all of the explanatory variables and the error term. This assumption is usually not verified by any statistical or graphical tests.

The first assumption has already confirmed the correct specification of the model. Thus, it can be stated that none of the independent variables is correlated with the error term.

4th classical assumption

The forth classical assumption states that observations of the error term are not correlated with each other. Express differently, there is not serial correlation.

Serial correlation is present mostly in time series regression models. Since the diploma thesis is dealing with the cross-sectional regression model, this assumption is not further tested. It might be resolved that there is not serial correlation in the model.

5th classical assumption

The fifth classical assumption is assuming the constant variance of the error term. Put another way, there is no heteroskedasticity of the error term. Heteroskedasticity represents some kind of the adverse phenomenon, when the variability of the error term distribution is not constant for observations.

The White's test and Breusch-Pagan test are used for detection of hereroskedasticity of the error term. If the p-value of these tests is smaller than significance level $\alpha = 0.05$, the null hypothesis is rejected in favour of the alternative hypothesis and the model is heteroskedastic.

- H_0: Homoskedasticity of the error term.
- H_1: Heteroskedasticity of the error term.

Tab. 8 Heteroskedasticity tests

Test	Test statistic	P-value
White's test	18.160	0.199
Breusch-Pagan test	2.925	0.570

Source: Gretl, edited by author.

Both tests demonstrate p-values higher than the level of significance. Thus, the null hypothesis is not rejected. The error term has constant variance, which means that it is homoskedastic.

6th classical assumption

The sixth classical assumption states that none of the explanatory variables is a perfect linear function of any other explanatory variables. In other words, there is no perfect multicollinearity.

Increase of estimated variance of regression coefficients might indicate the occurrence of multicollinearity in the model. Among many others, the method of Variance Inflation Factors (VIF) is used for multicollinearity testing. If the value of the Variance Inflation Factors is greater than number 10, the model is likely to be affected by multicollinearity.

Tab. 9 Collinearity test

Variable	VIF value
Unemployment total	1.685
Monthly minimum wage	2.080
Average age of retirement Women	2.370
Duration of working life	1.317

Source: Gretl, edited by author.

The table above reflects explanatory variables and values of Variance Inflation Factors (VIF). As all VIF values are significantly smaller than the limit of 10, it is concluded that there is not multicollinearity present in the model.

7th classical assumption

Last classical assumption is tied up with normality of the error term. It says that the error term must be normally distributed.

Statistical tests as well as graphical outputs are used for the detection of the normal distribution of the error term. For the graphical normality testing, the histogram and Residual Q-Q plot are used in the thesis.

Normality is also tested by a Chi-square test. Applying again, if the p-value is smaller than significance level $\alpha = 0.05$, the null hypothesis is rejected and the alternative hypothesis is valid.

- H_0: Error term is normally distributed.
- H_1: Error term is not normally distributed.

Tab. 10 Normality test

Test	Test statistic	P-value
Chi-square test	0.332	0.847

Source: Gretl, edited by author.

The Chi-square test confirms the normal distribution of the error term as the p-value of the test is greater than the level of significance. Thus, the null hypothesis is not rejected.

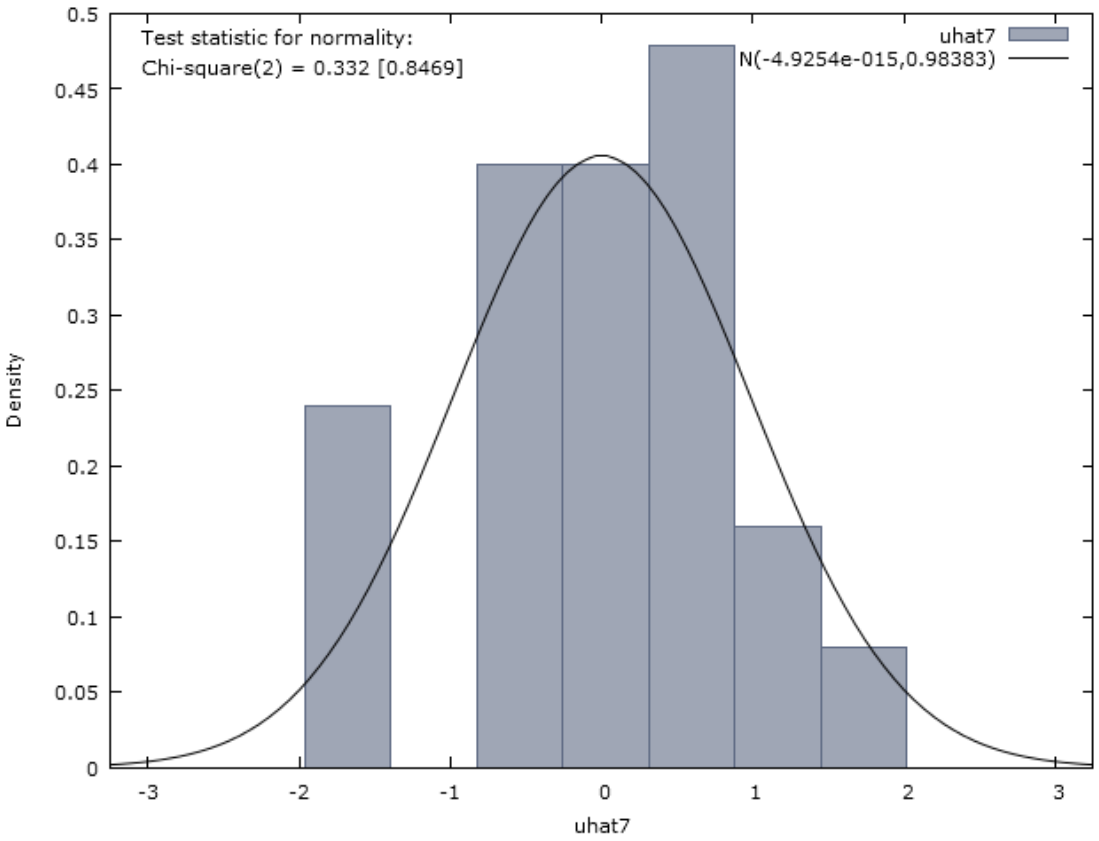

Fig. 8 Histogram
Source: Gretl.

The presented picture illustrates a histogram. The histogram embodies the graphical distribution of numerical data.

Normal distribution is characteristic for its typical bell shape. The offered picture shows that the residuals are symmetrically distributed. The histogram therefore confirmed normal distribution of the error term.

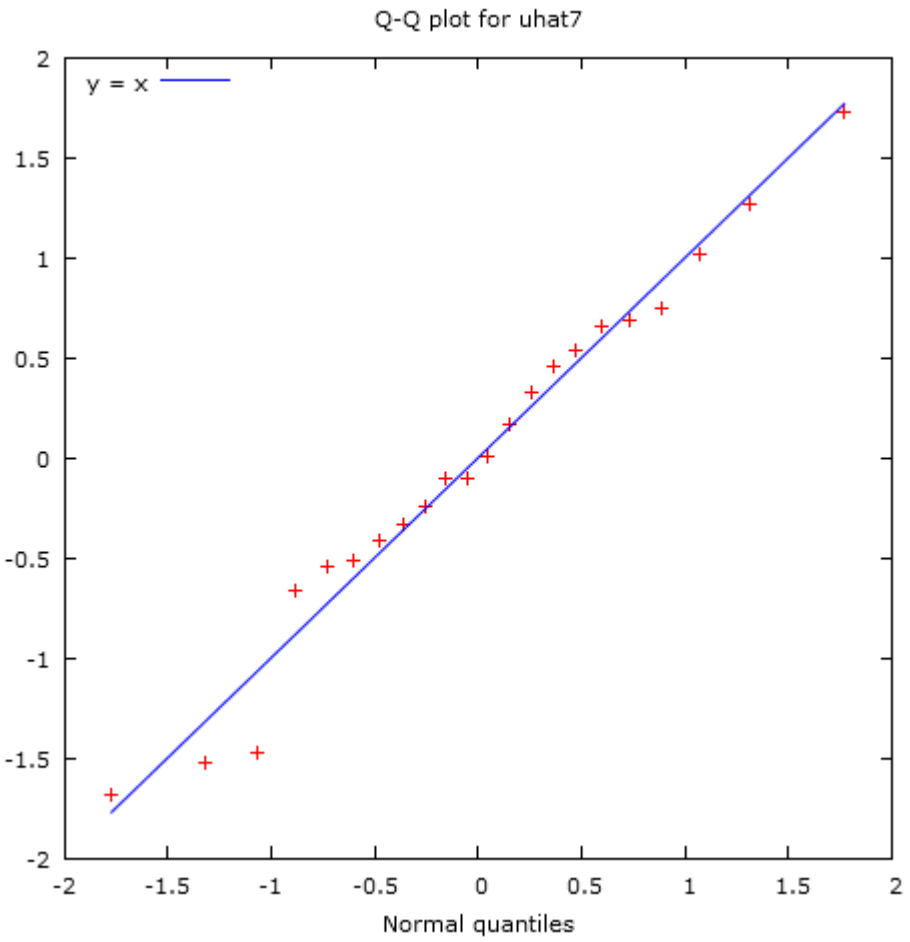

Fig. 9 Residual Q-Q plot
Source: Gretl.

Finally, the distribution of the error term is tested by the Residual Q-Q plot. The blue line represents the quantiles of the standard normal distribution and the red crosses stand for the empirical quantiles. If the residuals are normally distributed, the red crosses should fall along the blue line.

The Residual Q-Q plot mirrors that the red crosses are falling very closely to the blue line. Thus, it can be concluded that the Q-Q plot also confirms the normal distribution of the error term.

The statistical and graphical tests together approve the normality of the error term. Thus, the seventh classical assumption is fulfilled.

5.5 Actual vs. fitted plot

The actual vs. fitted plot is mirroring the actual response versus the predicted response. The diagonal line is blue X=Y line. In case of perfect fit, all red crosses

should be lying on the blue line. In case of good fit, all red crosses should be close to the blue line.

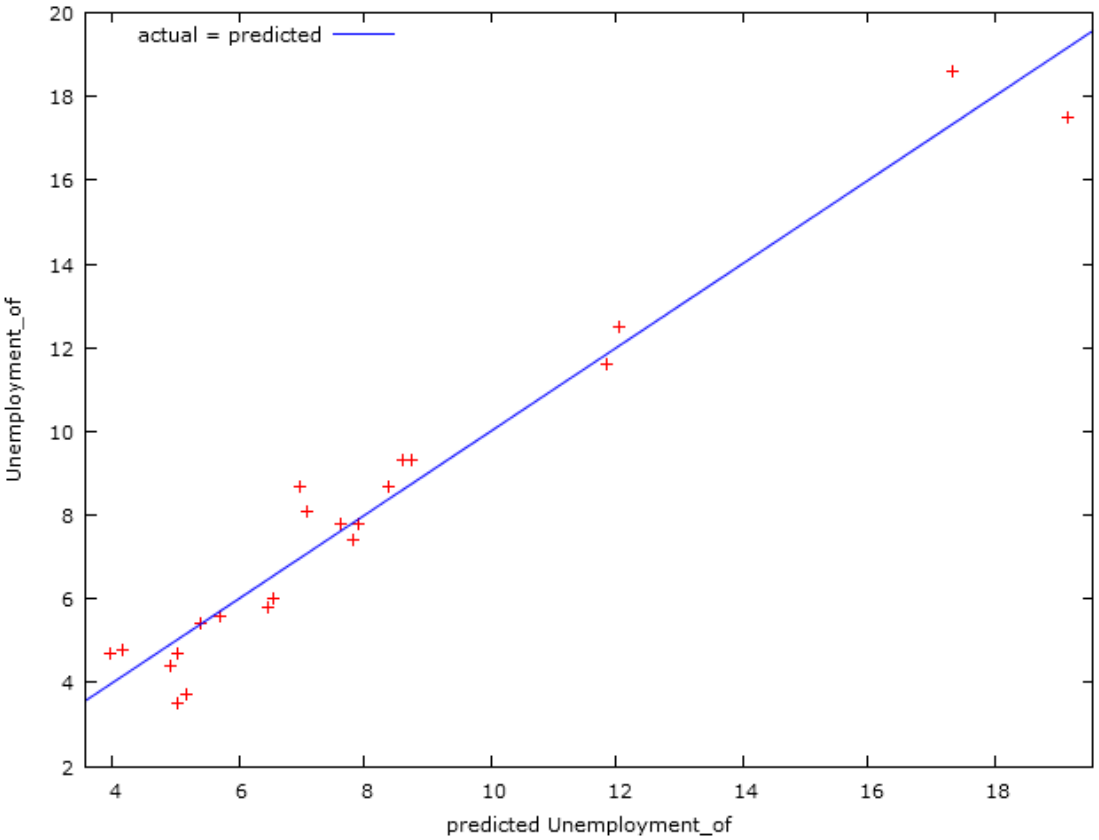

Fig. 10 Actual vs. fitted plot
Source: Gretl.

The actual data (red crosses) are located very close to the fitted data (blue line), which indicates that the estimated model is a good fit to the actual data.

6 Discussion

The main goal of the diploma thesis was to recognize the dependence of unemployment of age category 55-64 upon various explanatory variables in certain member countries of the European Union. In order to fulfil this objective, the explanatory variables were selected and the expectations of their signs were presented. Economic verification was dealing with the comparison of the estimated and expected signs of the independent variables. Estimated signs of independent variables total unemployment, monthly minimum wage, and average age of retirement for women were in accordance with the expectations. Thus, the estimated signs were consistent with the economic theory. Conversely, the estimated sign of the explanatory variable duration of working life was not consistent with the expected sign.

Within the specification of the expected signs of independent variables, negative correlation between unemployment of age category 55-64 and duration of working life was expected. It was assumed that the longer people work during their lifetime, the longer they may be actively participated at the labour market, hence, the lower the unemployment of age category 55-64 should be. However, the Ordinary Least Squares regression estimated positive dependence of unemployment of older people on duration of working life. The estimated relationship showed that if there was a one year increase in the duration of working life, the unemployment of age category 55-64 would also increase by 0.342%. Detected inconsistence led the author to re-explore the theoretical foundations of the model which culminated into a specification treatment: the shorter the duration of working life, the lower the probability that labour force aged from 55 to 64 would be unemployed, as with the shorter duration of working life, older people were expected to retire earlier, which was in turn expected to decrease the unemployment of age class 55-64.

The scatter plot of the unemployment of age category 55-64 and total unemployment clearly indicated positive correlation between these two variables. Later, a positive relationship between unemployment of age category 55-64 and total unemployment was discovered by the OLS method. It was found out that if there was an increase in total unemployment by 1%, the unemployment of age category 55-64 would increase by 0.697%. As it was many times mentioned in the thesis, older people might often find themselves to be disadvantaged or underappreciated in the labour market, compared to the other age classes. This result confirmed theoretical assumption that countries with higher total unemployment rates experience also higher unemployment rates of older people.

Bocean (2015) analysed, besides many other factors, the influence of minimum wage setting on the unemployment for all member countries of the European Union, while the thesis is dealing only with twenty-two member countries of the European Union. He was working with the time-series datasets from 2003 to 2013. The thesis used cross-sectional datasets of the year 2015. Regarding the methodology, the diploma thesis used the multiple linear regression analysis with the Or-

dinary Least Squares method, whereas Bocean preferred using the Pearson coefficient. The outcome his study indicated that there was not any significant correlation between minimum wage level and unemployment rate. The diploma thesis introduced the negative relationship between unemployment of age category 55-64 and monthly minimum wage rate. More precisely, if there was 1 euro increase in monthly minimum wage level, the unemployment of age category 55-64 would decrease by 0.002%. There might be various reasons why the results differed. First of all, the nature of the data, as well as the sample size were different. Furthermore, different methods were used for the analyses and lastly, he was focused on the total unemployment, while the thesis was dealing with the unemployment of older people.

Mitsis (2015) was dealing with the question how minimum wages affect total employment. He examined the case of Cyprus in the time period 1960-2011. Vector autoregression (VAR) models concluded that an increase in minimum wage settings brought negative impact on the employment. Put differently, the positive relationship between minimum wage and unemployment was discovered. Such a result contradicts the result of the diploma thesis. The main reason why the researches brought out diverse outcomes might be found in the fact that Cyprus represents one of the six countries of the European Union where the statutory minimum wages are not set at the national level. Instead, minimum wage levels are specified for various occupations, and they are introduced on the annual basis. The diploma thesis was examining twenty-two countries of the European Union where the statutory minimum wages are in place. Thus, Cyprus was not even involved in the analysis. However, the results can differ also because of diverse nature of the data. It would be appropriate to analyse the exanimated matter of the thesis with the time-series datasets and to find out whether the outcome would change. Discrepancy in the results might also come from the discrepancy in the methods used.

Lefèbvre (2012) examined the relationship between unemployment and retirement. He analysed the panel data of twelve OECD countries: Australia, Canada, Finland, France, Germany, the Netherlands, Norway, Portugal, Spain, Sweden, the UK, and the USA, of the time period 1982-2003. He divided the population of those countries into two age classes. The first one was composed of younger people aged from 15 to 49 years old, and the other one consisted of older people from 50 to 64 years old. In the paper work, he used the Ordinary Least Squares model, as well as IV estimation. His study presented many outcomes. Beside others, he specified that higher probability of retirement led to decrease in the active participation of older employees in the labour market. He also came up with the conclusion that if the average age of retirement was shortened, which would increase the probability of older employees to go onto retirement, it would more likely have a negative effect on younger employees. However, the diploma thesis was not focused on the same time period, and was concentrated on different countries, it used similar methodology. The positive relationship between variables unemployment of age category 55-64 and average age of retirement was detected in the thesis. If the average age

of retirement for women was prolonged by one year, the unemployment of age category 55-64 would increase by 0.339%.

The Australian research by authors Staubli, Zweimüller (2011) was also oriented on the relationship between retirement age and employment of older people. The authors analysed men aged from 60 to 62.2 and women aged from 55 to 57.2, from year 2000 to 2006. Within the analysis, they used Ordinary Least Squares estimates and found out that increase in the retirement age (by 2.2 years) was connected to 7% increase in employment of affected men and 10% increase in employment of affected women. Although, Staubli and Zweimüller were focused on employment of older people, they research was very similar to the one used in the diploma thesis. Comparable methodology was used, however, the diploma thesis research brought out a completely opposite result. While, Staubli and Zweimüller discovered that there was a positive relationship between retirement age for women, and employment of women aged from 55 to 57.2 (which basically means a negative relationship between retirement age and unemployment of women aged from 55-57.2), the diploma thesis offered a positive relationship between retirement age for women and the unemployment of age category 55-64. One of the reasons why the conclusions of the researches were so different can be linked to the awareness that Australian labour market conditions may be considerably different from the European Union's. The authors analysed the time-series data, while the thesis was focused on the cross-sectional data, it is therefore possible that the time-series analysis would come up with different outcome. Last but not least, the analysed age categories slightly differed among the researches.

Nevertheless, various limitations should be also pointed out. The original model was composed of ten independent variables. However, there are many other variables which could eventually cause, or at least influence the unemployment of age category 55-64. A very crucial independent variable is social benefits for unemployed. These and other important independent variables were not included in the model because the datasets, at the time of writing the thesis, were not updated for the reference year 2015, and the objective of the thesis was to analyse the most actual situation in the labour market of the European Union.

The sample size consisted of twenty-two member countries of the European Union. Although, most of the datasets were available for all twenty-eight member countries of the European Union, there was one independent variable which included only the mentioned twenty-two countries. The monthly minimum wage was such a variable, and the reason why is, that there are six countries of the European Union which do not apply general statutory minimum wage. This independent variable was from the author's point of view very crucial, so the whole analysis was restricted only to those countries of the European Union, where the statutory minimum wage is in place. If the author decided to analyse the current situation for all member countries of the European Union (excluded the independent variable monthly minimum wage), different results could be obtained.

According to the methodology of the thesis, software Gretl was used for the creation of the analysis. However, there are many more softwares or programmes

which could be used for the purpose of the analysis. Many of these provide users with more precise and detailed outcomes. Usage of some other software could introduce deeper point of view.

It was very hard to compare the results of the diploma thesis with studies of other authors as many of them used time-series datasets and the diploma thesis worked only with the cross-sectional data. Further research could examine the time-series datasets of the European Union, concerning the objective of the thesis. It would be suitable to process also other research, which could be focused on the analysis of panel data.

7 Conclusion

Nowadays, the European Union is experiencing unceasing trend of population ageing. On one side, Europeans are able to enjoy longer lifespans as the result of the increasing life expectancy at birth, but on the other side there is on-going trend of decreasing fertility rates in the European Union. The phenomenon of population ageing is expected to continue in next decades as the post war baby-boom generation is about to reach the retirement age. With the declining numbers of economically active inhabitants, the labour market of the European Union will be forced to face multiple challenges in the near future. The process of increasing retirement age has already started in the EU, and it is quite sure that inhabitants of the European Union will have to be actively participated at the labour market for longer time periods.

The diploma thesis was dealing with the participation of older workers in the labour market of the European Union. Older people are a very specific, heterogeneous group to deal with. Many times, they are challenged by tougher family and life conditions than younger generations. Nevertheless, they often have to face harder conditions regarding their participation in the labour market, as well.

The main objective of the diploma thesis was to recognize the relationship between unemployment of age category 55-64 and selected variables, which may cause or affect the unemployment of people aged from 55 to 64, in the European Union. In order to achieve the main objective, partial goals were also set and fulfilled.

Methodology of the thesis introduced the main steps of creating the econometric analysis, which was the inseparable part of the diploma thesis. It also presented characteristics of classical linear regression model, and shaded some light on the hypothesis testing. However, the most important part of the methodology was the specification of the model. The selection of independent variables was one of the most fundamental steps. It was based on the economic theory and the data availability. Furthermore, the expected signs of the independent variables were developed, which mirrored author's expectations about their dependence on the unemployment of age category 55-64.

The beginning of the diploma thesis was concentrated on literature reviews. In this section, theoretical background connected to the topics of unemployment and participation of older people in the labour market played part. Theoretical background was followed by literature reviews of other empirical studies of different authors, who were interested in analysing similar matter as the one examined in the thesis. Printed and electronic resources, monographs, current papers and articles were used as sources of information.

The following chapter represented the main results and findings of the analysis. Ten independent variables were included in the Ordinary Least Squares model. Cross-sectional dataset of these variables for the reference year 2015, were obtained from the Eurostat database. Further, the significance of the model parameters was tested by the T-test. The T-test indicated that six independent variables,

namely: productivity, inflation, membership in the Euro area, GDP, long-term unemployment, and average age of retirement for men, appeared not to be statistically significant. Thus, they were gradually removed from the model. The final model was obtained after six modifications of the original model, and it consisted of the model constant and four explanatory variables, such as: total unemployment, monthly minimum wage, average age of retirement for women, and duration of working life.

The specific independent variables in the original model, in general, affect the unemployment of selected age category directly (for example monthly minimum wage, average age of retirement or duration of working life), as well as indirectly (for instance productivity, GDP, inflation, membership in the Euro area). Particularly, the independent variables which affect the dependent variable indirectly were statistically not significant, and therefore removed from the model.

After removing statistically insignificant variables from the model, the adjusted coefficient of determination increased, which also confirmed the appropriateness of such a decision. The final model was explained by approximately ninety-four per cents. Put differently, there was ninety-four per cents variation explained by the long-term unemployment, monthly minimum wage, average age of retirement for women, and duration of working life, which actually affected the unemployment of age category 55-64 in the EU labour market.

Econometric verification indicated positive dependence of unemployment of age category 55-64 upon independent variables total unemployment, average age of retirement for women, as well as on duration of working life. A negative relationship was discovered between the dependent variable and monthly minimum wage.

Statistical verification confirmed the statistical significance of the model, which was further verified from the econometric point of view. Econometric verification was testing, whether seven classical assumptions were met in the estimated model. It was concluded that the estimated model met all seven classical assumptions as there was not any problem detected.

Finally, in the discussion, the results of the analysis were confronted with the outcomes of other empirical studies of different authors. This section also included critical evaluation of the results of economic verification and represented various limitations of the analysis used in the diploma thesis.

8 List of references

Printed sources

ABRHÁM, J. *Komparativní ekonomika EU: (trendy, souvislosti a implikace pro ekonomickou governance).* Praha: MAC, 2008. ISBN 978-80-86783-34-5.

ARMSTRONG, M. *A. Handbook of Human Resource Management Practice.* London: Kogan Page, 2006. ISBN 978-07-4944-105-0.

ÅSLUND, A. AND S. DJANKOV. *Europe's Growth Challenge.* Oxford: Oxford University Press, 2016. ISBN 9780190499211.

BERNOLAK, I. *Succeed with productivity and quality: how to do better with less.* Milwaukee, Wis.: ASQ Quality Press, 2009. ISBN 978-0-87389-771-6.

BOČKOVÁ, L., Š. HASTRMANOVÁ AND E. HAVRDOVÁ. *50+ aktivně: fakta, inspirace a rady do druhé poloviny života.* Praha: Respekt institut, 2011. ISBN 978-80-904153-2-4.

BREZINA, C. *Understanding the gross domestic product and the gross national product.* New York, NY: Rosen Pub., 2012. ISBN 9781448855698.

BUCHTOVÁ, B., J. ŠMAJS AND Z. BOLELOUCKÝ. *Nezaměstnanost.* 2nd ed. Praha: Grada, 2013. ISBN 978-80-247-4282-3.

CIMBÁLNÍKOVÁ, L., ET AL. *Age Management: komparativní analýza podmínek a přístupů využívaných v České republice a ve Finsku.* Praha: Asociace institucí vzdělávání dospělých ČR, 2011. ISBN 978-80-904531-2-8.

CIMBÁLNÍKOVÁ, L., ET AL. *Age Management pro práci s cílovou skupinou 50+: metodická příručka.* Praha: Asociace institucí vzdělávání dospělých ČR, 2012. ISBN 978-80-904531-5-9.

DI DOMENICO, G. AND S. SPATTINI. *New European approaches to long-term unemployment: what role for public employment services and what market for private stakeholders?.* Netherlands: Kluwer Law Internationa, 2008. ISBN 978-90-411-2614-6.

ERICKSON, K. H. *Econometrics: a simple introduction.* Lexington: [s.n.], 2014. ISBN 978-1-49601-386-6.

FEATHER, N. T. *The Psychological Impact of Unemployment.* New York: Springer Science & Business Media, 2012. ISBN 978-1-4612-7933-4.

FRISCH, H. *Theories of inflation.* New York: Cambridge University Press, 1983. ISBN 0521295122.

GRAUWE, P. *Economics of monetary union.* 9th ed. Oxford: Oxford University Press, 2012. ISBN 978-0-19-960557-6.

GREGORY, R. F. *Age discrimination in the American workplace: old at a young age.* New Brunswick, N.J.: Rutgers University Press, 2001. ISBN 0813529069.

HANČLOVÁ, J. *Ekonometrické modelování: klasické přístupy s aplikacemi.* Praha: Professional Publishing, 2012. ISBN 978-80-7431-088-1.

HARDY, M. A. *Regression with dummy variables.* Newbury Park: Sage Publications, 1993. ISBN 0-8039-5128-0.

HAŠKOVCOVÁ, H. *Fenomén stáří.* 2nd ed. Praha: Havlíček Brain Team, 2010. ISBN 978-80-87109-19-9.

HELÍSEK, M. *Makroekonomie: základní kurs.* 2nd ed. Slaný: Melandrium, 2002. ISBN 80-86175-25-1.

HENDL, J. *Přehled statistických metod: analýza a metaanalýza dat.* 5th ed. Praha: Portál, 2015. ISBN 978-80-262-0981-2.

HINDLS, R., S. HRONOVÁ AND J. SEGER. *Statistika pro ekonomy*. 5th ed. Praha: Professional Publishing, 2004. ISBN 80-86419-59-2.

HOFF, A. *Population ageing in Central and Eastern Europe: societal and policy implications.* Burlington, VT: Ashgate, 2011. ISBN 9780754696292.

HUBBARD, G. AND A. P. O'BRIEN. *Macroeconomics.* 5th ed. Harlow: Pearson Education, 2015. ISBN 978-1-292-05944-0.

HUŠEK, R. *Ekonometrická analýza: [předmět a metody : simulační modely a techniky : ekonometrické prognózování].* Praha: Ekopress, 1999. ISBN 80-86119-19-x.

HUŠEK, R. *Ekonometrická analýza.* Praha: Oeconomica, 2007. ISBN 978-80-245-1300-3.

JUREČKA, V. *Makroekonomie.* 2nd ed. Praha: Grada, 2013. ISBN 978-80-247-4386-8.

KUCHAŘ, P. AND L. VASKA. *Regional aspects of unemployment in the Czech Republic and Slovakia.* 1st ed. Ústí nad Labem: Jan Evangelista Purkyně University, 2013. ISBN 978-80-7414-674-9.

KUMAR, M. S. *Deflation: determinants, risks, and policy options.* Washington, D.C.: International Monetary Fund, 2003. Occasional paper (International Monetary Fund), no. 221. ISBN 1589062272.

LAYARD, P. R. G., S. J. NICKELL AND R. JACKMAN. *Unemployment: macroeconomic performance and the labour market.* Oxford: Oxford University Press, 1992. ISBN 0-19-828434-9.

MANKIW, N. G. *Zásady ekonomie.* Praha: Grada, 1999. ISBN 80-7169-891-1.

MANKIW, N. G. *Macroeconomics.* 7th ed. New York, NY: Worth Publishers, 2009. ISBN 1429218878.

MAREŠ, P. *Nezaměstnanost jako sociální problém.* 3rd ed. Praha: Sociologické nakladatelství, 2002. ISBN 80-86429-08-3.

MOR-BARAK, M. E. *Managing diversity: toward a globally inclusive workplace.* 4h Ed. Singapore: SAGE publications, 2016. ISBN 9781483386126.

MUŽÁKOVÁ, K. *Diversity management: jeden z klíčových faktorů určující úspěšnost manažerských činností v současném globálním a turbulentně se měnícím prostředí.* Ostrava: Key Publishing, 2014. ISBN 978-80-7418-229-7.

NAEGELE, G. AND A. WALKER. *Guide to good practice in age management.* Luxembourg: Office for Official Publications of the European Communities, 2006. ISBN 92-897-0934-0.

NOVOTNÝ, P., N. BOSNIČOVÁ, J. BŘENKOVÁ, ET AL. *Age management: jak rozumět stárnutí a jak na něj reagovat: možnosti uplatnění age managementu v České republice : průvodce pro jednotlivce, organizace a společnost.* Plzeň: Asociace institucí vzdělávání dospělých ČR, 2014. ISBN 978-80-904531-7-3.

PALÍŠKOVÁ, M. *Trh práce v Evropské unii: historický vývoj, aktuální trendy a perspektivy.* Praha: C.H. Beck, 2014. ISBN 978-80-7400-270-0.

PECÁKOVÁ, I. *Statistika v terénních průzkumech.* 2nd ed. Praha: Professional Publishing, 2011. ISBN 9788074310393.

RAŠTICOVÁ, M., ET AL. *Age management: actual challenges and promising solutions regarding the ageing European population.* Brno: Akademické nakladatelství CERM, 2013. ISBN 978-80-7204-848-9.

ROMER, D. *Advanced macroeconomics.* 4th ed. New York: McGraw-Hill, 2012. ISBN 978-0-07-351137-5.

SAMUELSON, P. A. AND W. D. NORDHAUS. *Ekonomie.* 19th ed. Praha: NS Svoboda, 2013. ISBN 978-80-205-0629-0.

SEBER, G. A. F. AND A. J. LEE. *Linear regression analysis.* 2nd ed. Hoboken, N.J.: Wiley-Interscience, 2003. ISBN 0-471-41540-5.

SEBERA, M. *Statistika - vícerozměrné metody.* Brno: Masarykova univerzita, 2014. ISBN 978-80-210-6692-2.

SOKAČOVÁ, L. *Stárnutí populace jako výzva: age management a postavení lidí 50+ ve společnosti a na trhu práce.* Praha: Alternativa 50+, 2014. ISBN 978-80-905711-0-5.

STANLAKE, G. F. AND S. J. GRANT. *Introductory economics.* 6th ed., 3rd impr. Harlow: Longman, 1997. ISBN 0-582-24614-8.

STUDENMUND, A. H. *Using Econometrics: A Practical Guide.* 6th ed. Edinburgh: Pearson, 2013. ISBN 978-1-292-02127-0.

SYMES, V. *Unemployment in Europe: problems and policies.* New York: Routledge, 2006. ISBN 9781134815395.

ŠAFRÁNEK, L. *Nezaměstnanost: jak ji neznáme a jak jí čelit.* Praha: Orego, 2011. ISBN 978-80-87528-03-7.

ŠTOROVÁ, I. AND J. FUKAN. *Zaměstnanec a věk, aneb, Age management na pracovišti.* Šumperk: JENA, 2012. ISBN 978-80-87137-35-2.

ŠVARCBACHOVÁ, J. *Využití potenciálu osob starších 50 let na trhu práce: výstupní publikace projektu.* Kolín: Prostor plus, 2014. ISBN 978-80-260-5814-4.

TAYLOR, J. B. AND A. WEERAPANA. *Macroeconomics.* 7th ed. Australia: South-Western Cengage Learning, 2012. ISBN 978-0-538-45356-1.

THOROVÁ, K. *Vývojová psychologie: proměny lidské psychiky od početí po smrt.* Praha: Portál, 2015. ISBN 978-80-262-0714-6.

TULEJA, P., P. NEZVAL AND I. MAJEROVÁ. *Základy makroekonomie.* 2nd ed. Brno: BizBooks, 2012. ISBN 978-80-265-0007-0.

VARTANIAN, T. P. *Secondary data analysis.* New York: Oxford University Press, 2011. ISBN 019538881X.

VÁGNEROVÁ, M. *Vývojová psychologie: dětství, dospělost, stáří.* Praha: Portál, 2000. ISBN 80-7178-308-0.

VERBEEK, M. *A guide to modern econometrics.* 4th ed. Chichester: Wiley, 2012. ISBN 978-1-119-95167-4.

VLČEK, J. *Ekonomie a ekonomika.* 5th ed. Praha: Wolters Kluwer, 2016. ISBN 978-80-7552-190-3.

WALSH, K. *Long-term Unemployment.* London: Macmillan press, 1987. ISBN 978-1-349-07703-8.

WINKLER, J. AND M. WILDMANNOVÁ. *Evropské pracovní trhy a průmyslové vztahy.* Praha: Computer Press, 1999. ISBN 80-7226-195-9.

Electronic sources

ANDREI, D. B., D. VASILE AND E. ADRIAN. *The correlation between unemployment and real GDP growth. A study case of Romania.*. Annals of the University of Oradea, Economic Science Series [online]. 2009, 18(2) [cit. 2017-03-26]. ISSN 15825450.

BHATTARAI, K. *Unemployment–inflation trade-offs in OECD countries*. Economic Modelling [online]. 2016, 58 [cit. 2017-03-26]. DOI: 10.1016/j.econmod.2016.05.007. ISSN 02649993.

BOCEAN, C. G. *Relationships between wages and employment indicators.* Young Economists Journal / Revista Tinerilor Economisti [online]. 2015, 12(24) [cit. 2017-03-24]. ISSN 15839982.

BOVEDA, I. AND A. J. METZ. *Predicting End-of-Career Transitions for Baby Boomers Nearing Retirement Age. Career Development Quarterly* [online]. 2016, 64(2) [cit. 2017-01-19]. DOI: 10.1002/cdq.12048. ISSN 08894019.

BROCHU, P. AND D. A. GREEN. *The Impact of Minimum Wages on Labour Market Transitions.* Economic Journal [online]. 2013, 123(573) [cit. 2017-03-25]. DOI: 10.1111/ecoj.12032. ISSN 00130133.

CEDEFOP. *Increasing the value of age: guidance in employers' age management strategies.* Luxembourg: Publications Office of the European Union [online]. 2015. Cedefop research paper; No 44 [cit. 2017-03-24]. ISSN 1831-5860

DIACONU, L. *Ageing population: Comparative analysis among European Union states.* Centre for European Studies (CES) Working Papers [online]. 2015, 7(1) [cit. 2017-03-01]. ISSN 20677693.

DIMIAN, G. C., B. V. ILEANU AND M. I. ACELEANU. *Aging and Economic Competitiveness in the Core of "North Euro-Zone".* Engineering Economics [online].

2016, 27(3) [cit. 2017-03-24]. DOI: 10.5755/j01.ee.27.3.14028. ISSN 13922785.

EICHHORST, W. *The Transition from Work to Retirement.* German Policy Studies/Politikfeldanalyse [online]. 2011, 7(1) [cit. 2017-01-18]. ISSN 15239764.

EUR-LEX. *White Paper* [online]. 2017 [cit. 2017-01-20]. Available at: http://eur-lex.europa.eu/summary/glossary/white_paper.html

EUR-LEX. *An Agenda for Adequate, Safe and Sustainable Pensions* [online]. Brussels: European Commission, 2012 [cit. 2017-01-20]. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0055:FIN:EN:PDF

EUROFOUND. *Statutory minimum wages in the EU 2016* [online]. 2016 [cit. 2016-11-19]. Available at: http://www.eurofound.europa.eu/observatories/eurwork/articles/working-conditions-industrial-relations/statutory-minimum-wages-in-the-eu-2016

EUROPEAN CENTRAL BANK. *Monetary policy* [online]. 2016 [cit. 2016-11-21]. Available at: https://www.ecb.europa.eu/mopo/html/index.en.html

EUROPEAN CENTRAL BANK. *Euro area 1999 – 2015* [online]. 2017 [cit. 2017-03-13]. Available at: https://www.ecb.europa.eu/euro/intro/html/map.en.html

EUROPEAN UNION. *Living in the EU* [online]. 2016 [cit. 2016-11-20]. Available at: https://europa.eu/european-union/about-eu/figures/living_en#tab-2-4

EUROPEAN UNION AGENCY FOR FUNDAMENTAL RIGHTS. *EU Charter of Fundamental Rights* [online]. 2016 [cit. 2017-01-17]. Available at: http://fra.europa.eu/en/charterpedia/article/34-social-security-and-social-assistance

EUROSTAT. *Minimum wages* [online]. 2017a [cit. 2017-01-16]. Available at: http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tps00155&plugin=1

EUROSTAT. *Minimum wage statistics* [online]. 2017b [cit. 2017-01-16]. Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Minimum_wage_statistics

EUROSTAT. *Duration of working life* [online]. 2017c [cit. 2017-01-16]. Available at: http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tsdde420&plugin=1

EUROSTAT. *Labour productivity and unit labour costs* [online]. 2017d [cit. 2017-03-21]. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10_lp_ulc&lang=en

EUROSTAT. *GDP per capita in PPS* [online]. 2017e [cit. 2017-01-16]. Available at: http://ec.europa.eu/eurostat/tgm/table.do?tab=table&plugin=1&language=en&pcode=tec00114

EUROSTAT. *HICP (2015 = 100) - annual data (average index and rate of change)* [online]. 2017f [cit. 2017-01-16]. Available at: http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do

EUROSTAT. *Glossary: Unemployment* [online]. 2017g [cit. 2017-01-16]. Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Unemployment

EUROSTAT. *Unemployment rates by sex, age and nationality (%)* [online]. 2017h [cit. 2017-03-04]. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfsa_urgan&lang=en

EUROSTAT. *Employment and activity by sex and age - annual data* [online]. 2017i [cit. 2017-02-15]. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfsi_emp_a&lang=en

EUROSTAT. *Population on 1 January by five years age group and sex* [online]. 2017j [cit. 2017-01-03]. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_pjangroup&lang=en

EUROSTAT. *Population structure and ageing* [online]. 2017k [cit. 2017-01-16]. Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Population_structure_and_ageing

EUROSTAT. *Glossary: Migration* [online]. 2017l [cit. 2017-01-16]. Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Migration

FASBENDER, U. AND M. WANG. Negative *Attitudes toward Older Workers and Hiring Decisions: Testing the Moderating Role of Decision Makers' Core Self-Evaluations.* Frontiers in Psychology [online]. 2017, 7 [cit. 2017-03-24]. DOI: 10.3389/fpsyg.2016.02057. ISSN 16641078.

FLOREA, O. *Relationship between inflation and unemployment in Romania, age group 20-24 years.* SEA: Practical Application of Science [online]. 2014, 2(1) [cit. 2017-03-26]. ISSN 23602554.

FUERTES, V., V. EGDELL AND R. MCQUAID. *Extending working lives: age management in SMEs*. Employee Relations [online]. 2013, vol. 35, no. 3 [cit. 2017-03-26]. ISSN 01425455.

GALLEGATI, M., J. B. RAMSEY AND W. SEMMLER. *Does Productivity Affect Unemployment? A Time-Frequency Analysis for the US.* In: Research gate [online]. 2014 [cit. 2017-03-25]. Available at: https://www.researchgate.net/publication/292206112_Does_Productivity_Affect_Unemployment_A_Time-Frequency_Analysis_for_the_US

HASSAN, M. AND R. NASSAR. *Effects of debt and GDP on the unemployment rate: An empirical study.* Journal of International Business Disciplines [online]. 2015, 10(2) [cit. 2017-03-25]. ISSN 19341814.

HERMAN, E. *Inflation and unemployment in the Romanian economy.* Annals of the University of Petrosani Economics [online]. 2010, 10(2) [cit. 2017-03-26]. ISSN 15825949.

KARAÇOR, Z., İ. ÖZMEN AND F. N. YORGANCILAR. C*ausal Relationship Between Unemployment, Inflation And The Minimum Wage: Case of Turkey (1987-2010).* Proceedings of the Multidisciplinary Academic Conference [online]. 2013[cit. 2017-03-25].

KHAN, M. A., M. RASHEED AND M. HANIF. *Estimating the liaison between Unemployment and GDP beyond the Mean of the Distribution.* Journal of Economics [online]. 2014, 20(1) [cit. 2017-03-25].

KHAN, M. A., A. SABOOR, S. A. MIAN AND A. ANWAR. *Modelling the relationship between GDP and unemployment for Okun's law specific to Pakistan during 1976-2010.* Theoretical [online]. 2013, 20(10) [cit. 2017-03-26]. ISSN 18418678.

LEFÈBVRE, M. *Unemployment and Retirement in a Model with Age-specific Heterogeneity.* LABOUR: Review of Labour Economics [online]. 2012, 26(2) [cit. 2017-03-25]. DOI: 10.1111/j.1467-9914.2012.00543.x. ISSN 11217081.

MITSIS, P. *Effects of Minimum Wages on Total Employment: Evidence from Cyprus.* Journal of Labor Research [online]. 2015, 36(3) [cit. 2017-04-01]. DOI: 10.1007/s12122-015-9205-0. ISSN 01953613.

MONGE-NARANJO, A. AND F. SOHAIL. *The Composition of Long-term Unemployment Is Changing toward Older Workers.* In: Federal reserve bank of St. Louis [online]. 2015 [cit. 2017-03-24]. Available at: https://www.stlouisfed.org/~/media/Publications/Regional-Economist/2015/October/unemployment.pdf

OECD. *Short-Term Labour Market Statistics : Unemployment Rates by age and gender* [online]. 2017 [cit. 2017-01-16]. Available at: http://stats.oecd.org/index.aspx?queryid=36499

OLDER PEOPLE IN EUROPE: EU policies and programmes [online]. 2014 [cit. 2017-01-18]. Available at: http://www.europarl.europa.eu/RegData/bibliotheque/briefing/2014/140811/LDM_BRI(2014)140811_REV1_EN.pdf

PEJAKOVIĆ, G. *Inflation and unemployment: Phillips regularity in the EU.* Zbornik Radova [online]. 2010, (30) [cit. 2017-03-26]. ISSN 05817439.

POPOVIĆ, G. AND J. POPOVIĆ. *Inflation and unemployment in the EU: Comparative analysis of Phillips regularity.* Proceedings of the Conference on the Economy of Integrations (ICEI) 2011 [online]. 2011 [cit. 2017-03-26]. ISSN 24902616.

ROŽMAN, M., S. TREVEN AND V. ČANČER. *Stereotypes of older employees compared to younger employees in Slovenian companies.* Management: Journal of Contemporary Management Issues [online]. 2016, 21(2) [cit. 2017-03-24]. ISSN 13310194.

STAUBLI, S. AND J. ZWEIMÜLLER. *Does Raising the Retirement Age Increase Employment of Older Workers?* [online]. 2011 [cit. 2017-04-01]. Available at: http://ftp.iza.org/dp5863.pdf

VÎRJAN, D. AND A. Ş. CREȚU. *The Correlation between Employment and Productivity of Older Workers.* Theoretical [online]. 2015, 22(4) [cit. 2017-03-24]. ISSN 18418678.

9 List of figures

Fig. 1 Development of the total unemployment rate within the EU 33

Fig. 2 Development of the unemployment rate of the age category 55-64 within the EU 34

Fig. 3 Total unemployment rates among the EU member states, 2015 35

Fig. 4 Unemployment rates of the age category 55-64 among the EU member states, 2015 36

Fig. 5 Median age of the EU population 39

Fig. 6 Multiple X-Y scatter plots 53

Fig. 7 Residual plot 59

Fig. 8 Histogram 62

Fig. 9 Residual Q-Q plot 63

Fig. 10 Actual vs. fitted plot 64

10 List of tables

Tab. 1 Expected signs of independent variables 25

Tab. 2 Summary statistics 51

Tab. 3 OLS for the original model 54

Tab. 4 OLS for modified model 55

Tab. 5 Analysis of variance (ANOVA) 57

Tab. 6 Confidence intervals 58

Tab. 7 Specification tests 59

Tab. 8 Heteroskedasticity tests 60

Tab. 9 Collinearity test 61

Tab. 10 Normality test 61

Tab. 11 Used data 82

Appendix

A Used data

Tab. 11 Used data

Country	Unemployment of age category 55-64	Long-term unemployment	Total unemployment	Monthly minimum wage	Average age of retirement for men	Average age of retirement for women	Duration of working life	Productivity	GDP	Inflation	Membership in the Euro area
Belgium	5,6	4,4	8,6	1501,82	65	65	32,6	102,2	117	0,6	1
Bulgaria	8,7	5,6	9,2	184,07	64,3	61,3	32,1	112,9	46	-1,1	0
Croatia	11,6	10,3	16,5	395,61	65	61,25	32,6	103,8	58	-0,3	0
Czech Republic	4,4	2,4	5,1	331,71	62,8	61,4	35,1	105,6	85	0,3	0
Estonia	6	2,4	6,3	390	63	62,1	37	104,5	74	0,1	1
France	7,4	4,3	10,4	1457,52	65	65	34,9	102,4	106	0,1	1
Germany	4,7	2	4,7	1440	65,3	65,3	38	103,1	125	0,1	1
Greece	17,5	18,2	25,1	683,76	67	67	32,3	95,5	71	-1,1	1
Hungary	5,8	3,1	6,8	332,76	65	65	32,6	101,1	68	0,1	0
Ireland	7,8	5,3	10	1461,85	66	66	35	129,5	145	0	1
Latvia	9,3	4,5	10,1	360	62,5	62,5	35,2	113,1	64	0,2	1
Lithuania	8,7	3,9	9,3	300	63,1	63,1	34,8	112,1	74	-0,7	1
Luxembourg	4,7	1,9	6,7	1922,96	65	65	33,5	101,9	271	0,1	1
Malta	4,8	2,4	5,5	720,46	62	62	33,4	105,9	89	1,2	1
Netherlands	8,1	3	6,9	1501,8	65,2	65,2	39,9	103,6	129	0,2	1
Poland	5,4	3	7,6	409,53	65,6	60,6	32,6	111,8	69	-0,7	0
Portugal	12,5	7,2	12,9	589,17	66	66	36,8	101,7	77	0,5	1
Romania	3,7	3	7	217,5	65	60	32,8	120,7	57	-0,4	0
Slovak Republic	9,3	7,6	11,5	380	62	61	33,5	108,1	77	-0,3	1
Slovenia	7,8	4,7	9,1	790,73	64,33	64,33	34,3	104,4	83	-0,8	1
Spain	18,6	11,4	22,2	756,7	65,25	65,25	34,9	105,1	92	-0,6	1
United Kingdom	3,5	1,6	5,7	1378,87	65	62,3	38,6	103,1	110	0	0

Source: Eurostat (2017), edited by author.