RASA RAILAITĖ

AN ASSESMENT OF PUBLIC HEALTH INVESTMENT IMPACT TO HUMAN CAPITAL IN THE CONTEXT OF POPULATION AGEING

SUMMARY OF DOCTORAL DISSERTATION

SOCIAL SCIENCES, ECONOMICS (S 004)

Kaunas
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KAUNAS UNIVERSITY OF TECHNOLOGY
KLAIPĖDA UNIVERSITY
LITHUANIAN ENERGY INSTITUTE

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INTRODUCTION

Relevance of the topic

The tendency of population ageing is identified in different countries of the world and is affecting various areas of social life: country's economy, individual economic behaviour (Kudrna & Woodland, 2006), functioning of social institutions (Alekna, & Melvidaitė, 2012), the country's social security system, education (Serban, 2012), taxes, savings, volume of chronic illness, needs of care (Marešová, Mohelská, & Kuča, 2015), population health, migration (Lopreite & Mauro, 2017) and others. As the proportion of the working population and older people is changing, the major focus of most researchers is drawn to the analysis of the impact of population ageing on the labour market. This phenomenon is related with such impact areas as: labour force size and quality, production (Serban, 2012) its taxation (Lopreite & Mauro, 2017), and labour shortages (Marešová et al., 2015. In the context of population ageing, researchers are searching for methods of how to effectively use the existing resources and deal with coming challenges. Taking an aging population into account, various researchers, such as Connolly & Postma (2010), highlight the importance of maintaining productivity of each available worker.

Based on scientific literature, changes of the labour force productivity depends on technological development, along with physical and human capital (Marešová et al., 2015). Spijker (2015) also presents a similar position and relates higher productivity with greater human capital. Human capital itself is often defined in terms of its positive spill-over effects existing in 3 main levels: individual, organizational and social. Synthesis of scientific literature identifies that greater human capital is related with increased individual income (Čadil, Petkovová, & Blatná, 2014; Šileika & Tamašauskienė, 2003), labour force productivity (Teixeira & Queirós, 2016), economic growth (Jozičić & Škare, 2016; J. W. Lee & Lee, 2016; Pelinescu, 2015; Teixeira & Queirós, 2016), technology development (Teixeira & Queirós, 2016), quality of society life (Omankhanlen, Ogaga-Oghene, Obarisiagbon, & Okorie, 2014) and other positive impact areas. Considering human capital as an investment in such a form receives more significance in the context of population ageing when the size of the working age population is changing.

However, discussing human capital development and population ageing health also plays a significant role. Human capital is embodied in individuals and consists of many elements that must be constantly developed. Health is one of such components. In most cases, analysis of human capital concentrates on the education component, however health is also a significant component. One justification is presented by Frimpong (2014). According to this researcher, without health the labour force knowledge cannot be transformed to goods and services. Researchers also stress that health affects the quality and the quantity of the labour force, its creativity and productivity. Health is also related with the time

that can be used for economic activity (Connolly & Postma, 2010). Similarly, the whole human capital in better health is an investment in such an area and is related with various positive impact areas.

Scientific literature also identifies health as an input to other forms of human capital (Bloom & Canning, 2003). Villa (2017) stresses the existing relationships between health and education. According to Villa (2017), health affects results of education and counter cognitive abilities affects individual behaviour related with health. Baldacci et al. (2008) also stress that individuals with better health have greater propensity to invest in education. The performed analysis also shows that various researchers highlight the importance in health investments for human capital development, such as Schultz (1972), Dauda (2011), Gižienė, Simanavičienė (2012), Tchanturia, Beridze, Kurashvili (2015), Ilegbinosa (2013) cit. Gbosi (2007), Shuaibu, Oladayo (2016), (Mačiūlytė-Šniukienė & Matuzevičiūtė, 2018) Praise, George-Anokwuru (2018). The importance of health investments is also highlighted in the context of population ageing. Researchers such as Keene (2010) and Silcock, Sinclair (2012) emphasize that future health care costs can be reduced by current health investment.

Considering the importance of health investments, governments play a significant role. Fujii (2018) stresses the importance of public health financing by highlighting that these financial resources can improve the health of millions of people. Bučinskas (2012) points out that different states choose different strategies for investing available funds. Dang, Likhar, Alok, (2016) emphasis that limited resources are used for publicly funded health systems, so funding decisions must be made for effective health care interventions. However, the performed studies also show some issues in this area. Empirical analysis performed by Fujii (2018) shows that private health spending (compering with public) has a greater impact to health outcomes, however in the case of effective governments the public spending has similar impact as private spending. Therefore, it could be noticed that results of public spending impact are sensitive for analysis perspective selection. Based on The World Bank information, Lim et al. (2018) states that given the potential benefits of human capital, countries underinvest in health and education, while on the other hand Gatti, Watsa, et.all (2018) point out that countries with higher social spending have better human capital outcomes, but also stresses that the quality of such spending is also important and that higher spending is not sufficient for better outcomes.

Scientific problem and review of its existing analysis

Analysis of different scientific papers has shown that the relationships between human capital and health (and its investments) are described based on different perspectives. Analysis variate based on the terms used, main focus area, research methods, chosen country or group and the analysed time period. However, the performed analysis also identifies some contradictions that encourage researchers to analyse this topic in more detail.

First of all, it is noticed that various terms are used in order to describe the relationship between health and human capital. From one side, health is identified as a part of human capital; to express it researchers use such terms as: component (Piabuo & Tieguhong, 2017) or dimension (Jivan & Toth, 2012), while on the other side, health is identified as a factor for human capital longevity and efficiency (Bučinskas, 2012). Researchers also separate human capital into education capital and health capital (for example Mandiefe, Chupezi, 2015).

Secondly, analysis of the scientific literature shows that health (as a component of human capital) compared to education is analysed or included in empirical research less often. This problematic aspect is highlighted by such researchers as Amadu, Eseokwea, & Ngambi, (2017), Becker (2007); Churchill, Yew, & Ugur, (2015); Cuaresma, Lutz, & Lutz, (2009), Gyimah-Brempong & Wilson (2004), Jones, Chiripanhura (2010) Prettner et al., (2013); and Razmi, Abbasian, Mohammadi, (2012).

Existing studies analyse health investment and human capital in economic growth studies. This area can be described as one of the most widely analysed. Existing research on the relationship between human capital and economic growth can also be divided into several groups:

1) studies analyzing the relationship between economic growth and human capital expressed through the education component;

2) studies analyzing the relationship between economic growth and human capital expressed through the health component;

3) studies where human capital is expressed based on both components.

In these kinds of studies, researches (such as Piabuo & Tieguhong (2017)) try to investigate how health expenditure as a human capital affects economic growth.

The performed analysis also identifies other research directions related with this topic, where the impact of (public) health expenditure to health outcomes are performed (Bein, Olowu, & Kalifa, 2017; Nixon & Ulmann, 2006; Oster, Shoulson, & Dorsey, 2013). However, it can also be noted that such indicators as life expectancy at birth (used to express health outcomes) are commonly used as quantitative indicators to express a country‘s human capital. Therefore, considering these indicators, this group of studies is also related with the topic of the health investments impact to human capital. However, results of these kinds of studies also present some contradictions. From one side, positive impact of (public) health expenditure on life expectancy is proven (for example Kim, Lane (2013)) while based on other studies, such as Nixon & Ulmann (2006), health expenditures are marginally related with improvements in life expectancy.

Even though the importance of investments in health is highlighted by Schultz (1972) and other researchers, the performed analysis shows that the impact of health investments to human capital at a country level is not analysed as widely. The relationships between health investments/expenditure and human capital (or

particular Human development index) is analysed by Edeme (2014), Ehimare et al., (2014), Kairo, Mang, Okeke, Augustine, Dura (2017), Ndugbu, Osuka, & Duruechi (2018), Okafor et al., (2017), Opreana & Mihaiu (2010); Razmi et al., (2012); Sapuan, Nasional, & Sanusi (2013); and Sudirman (2017). Literature analysis shows that most research is focused to developing countries. The performed literature analysis also identifies an existing gap in the scientific literature - in most cases common health expenditure is analysed, but they are not specified.

In summary, it could be stated that health as a component of human capital received less attention compared with the education component. Different regions and countries have a different stock of human capital, so an important question becomes an identification of the reasons that leads to this difference and how health investments relate with such differences. In most cases health is defined as an important element in the theory of human capital, however existing contradictions, different term usage and other issues encourage researchers to analyse this topic in more depth. Health is understood as a component of human capital and also a condition of effective human capital usage. Based on the results of existing studies and taking into account the context of population ageing, where the age structure of the labour force is changing and the number of older people who have greater health care needs is increasing, the author sees the need to analyse the relationships between public health investments and human capital in order to identify whether higher health investments improves the stock of human capital at a country level.

Scientific problem: how to evaluate what the impact of public health investment to human capital is in the context of population ageing.

Aim of the research - to assess the impact of public investment in health to the human capital in the context of an aging population, by developing and adapting an evaluation model that includes public investment in health and other external factors that may have an impact on human capital development.

Objectives:

1. to analyse the theoretical aspects of human capital by systematizing the approaches of the interpretation of the concept of human capital, distinguishing the main components of human capital and substantiating the significance of health as one of the components of human capital.
2. to perform an analysis of the aspects of human capital formation and development by evaluating factors affecting human capital and identifying the main investment areas.
3. to analyse the aspects of human capital measurement and identify the most appropriate measures for the country's human capital assessment.
4. to develop a model for assessing the impact of public investment on health to human capital considering the context of an aging society.

5. to adopt the created theoretical model for assessment of the impact of public health investments in the context of an aging population.

Defensive statements

An assessment of the impact of public health investment into human capital in the context of an aging population is sensitive to the recorded measure of human capital. Taking into account the multidimensional nature of human capital, the choice of different indicators as proxies of human capital shows the value of the impact coefficient and its significance differs.

An assessment of the impact of public health investment into human capital is case-sensitive. The impact of public health investment into human capital varies across groups of countries with different levels of population aging.

Research methods

Different research methods were used in order to achieve the aim and objectives of this thesis. Systematic, comparative analysis of scientific literature sources is carried out in order to analyse the theoretical aspects of human capital and make a theoretical background for evaluation model that will allow the study to evaluate how public investments in health affects human capital development in the context of population ageing.

Econometric models of panel data were used to quantitatively evaluate the impact of public investments in health to a country's human capital expressed in different variables. Econometric models were estimated based on the least squares method. In order to evaluate public health investments or the impact of other factors, the author used 3 main models of panel data: ordinary least squares (OLS), fixed effects (hereinafter – FE), and random effects (hereinafter – RE). The selection of independent variables to be included in the models are based on the determination of correlation relationships.

Eviews software was used for unbalanced panel data (including 2000-2017 years observations of 28 European Union countries).

Scientific novelty of the work and its practical applicability

By emphasizing the importance of the health component, this work will extend the theoretical aspects of human capital in several aspects:

- The concept of human capital has been clarified by highlighting the most frequently mentioned components in the literature, the significance of their usage and giving attention to the influence of investments, along with external factors to human capital. In this work, human capital is defined as a set of innated and investment-supported knowledge, skills, experience, health, and other components (at some point in time) embodied in an individual affecting a person's productivity and generating monetary and non-monetary benefits. The creation and development of this form of capital is based on the allocation of investment in the main components of human capital and the influence of other external environmental factors.

- The paper reveals the relationship between health and human capital, systematizes the different approaches describing these relationships and presents the variety of concepts used to describe them. Attention is drawn to the fact that health is not only a significant component of human capital, but also affects the development and use of other elements and is linked to the quality of human capital.
- The synthesis of the literature allowed the research to detail the directions of investment in health, such as: health workforce, infrastructure and equipment, nutrition and medical care, prevention, health information, etc., which are related to investment in human capital.
- Taking into account that the formation and development of human capital is influenced by different external factors, the main groups of factors described by Lithuanian and foreign authors have been expanded by including factors such as the following: birth rate, aging population, quality of education system and its improvement, the country's social model, the improvement of economic infrastructure, the level of poverty, the level of urbanization, alcohol consumption, racial discrimination, etc.
- The created model for assessing the impact of public health investment to human capital is based on the input-output principle. After evaluating the methodological problems of human capital assessment, it was proposed to assess the impact of public health investment by using 4 selected human capital indicators. Given that the Grossman's human capital model and the health production function (which includes the assessment of the impact of different groups of external factors) are used to analyze the impact of health expenditure on health outcomes (such as life expectancy), the developed model also includes an evaluation of broader evaluation of external factors.
- The created model has been practically applied to assess the situation in European Union countries, where the ageing trend is observed. The grouping of countries into two groups according to the values of the old-age dependency ratio allowed the study to compare the impact of public investment in health to human capital in groups of countries with different expressions of aging.
- The created evaluation model is focused on the case of the European Union countries and the health policy pursued in this region, but it can also be applied for the analysis of other regions. In practice, the evaluation model can be used as a useful source of information for health policy development.

Limitations

There is no consensus in the scientific literature of which measure of a country's human capital stock is the most suitable. Researchers use single indicators, indicator groups or constructed human capital indexes. A new Human Capital Index has been introduced in recent years, but this index measures the situation from 2018 and cannot be selected for panel data analysis.

A literature analysis revealed that the evaluation results are sensitive for human capital measurement variable selection, therefore in this case the results of assessment of the public health investments impact to human capital development can be influenced by different selected human capital variables. On the other hand, human capital measures that are often used in the literature are also chosen for evaluation, but the impact of public investment in health on less frequently used measures is not assessed.

One of the greatest limitations of the empirical assessment model application is the shortage of statistical data. In order to evaluate the trends in panel data it would be useful to use as long a time series as it is possible, however based on the selected dependent and independent variables availability, only 18 years of data was selected.

Additionally, existing data does not allow researchers to analyse public health investments that are targeted to different age groups (which would be appropriate to use for assessing the impact of health investment in the context of an aging population) or for more detail kinds of health investment. In order to assess the impact of public health investment in health impact, the author used statistical data available in main official statistical websites, however these datasets do not present data where investment and maintenance expenditure are divided. Therefore, considering this aspect, the author used the general public health expenditure statistics for the health investments impact evaluation. A shortage of statistical data also does not allow the study to evaluate all factors affecting human capital that were identified during the literature analysis.

As a research limitation, it could also be mentioned that only public sector investments are included, while private health investments could also have a meaningful and significant impact.

Structure and scope of work

The thesis consists of 3 main chapters and 178 pages. The logical structure of this thesis can be seen in figure 1. Theoretical aspects of public health investment impact to human capital is analysed in the first chapter. This analysis includes systematization of different human capital definitions, its positive impact areas, analysis of human capital components and health as an important component of this form of capital. The first chapter also includes an analysis of factors affecting human capital development, detailing the possible kinds of human capital investments, and the significance of public level in processes of human capital development. In the second chapter, the author creates a methodology for public health investment impact evaluation. Firstly, human capital measurement aspects are described, secondly, the author reviewed results of existing studies where the impact of health expenditure on health outcomes or human capital are evaluated. Finally, an assessment model is presented. The third chapter is focused on the practical assessment model application and empirical results evaluation in the context of ageing European Union countries.

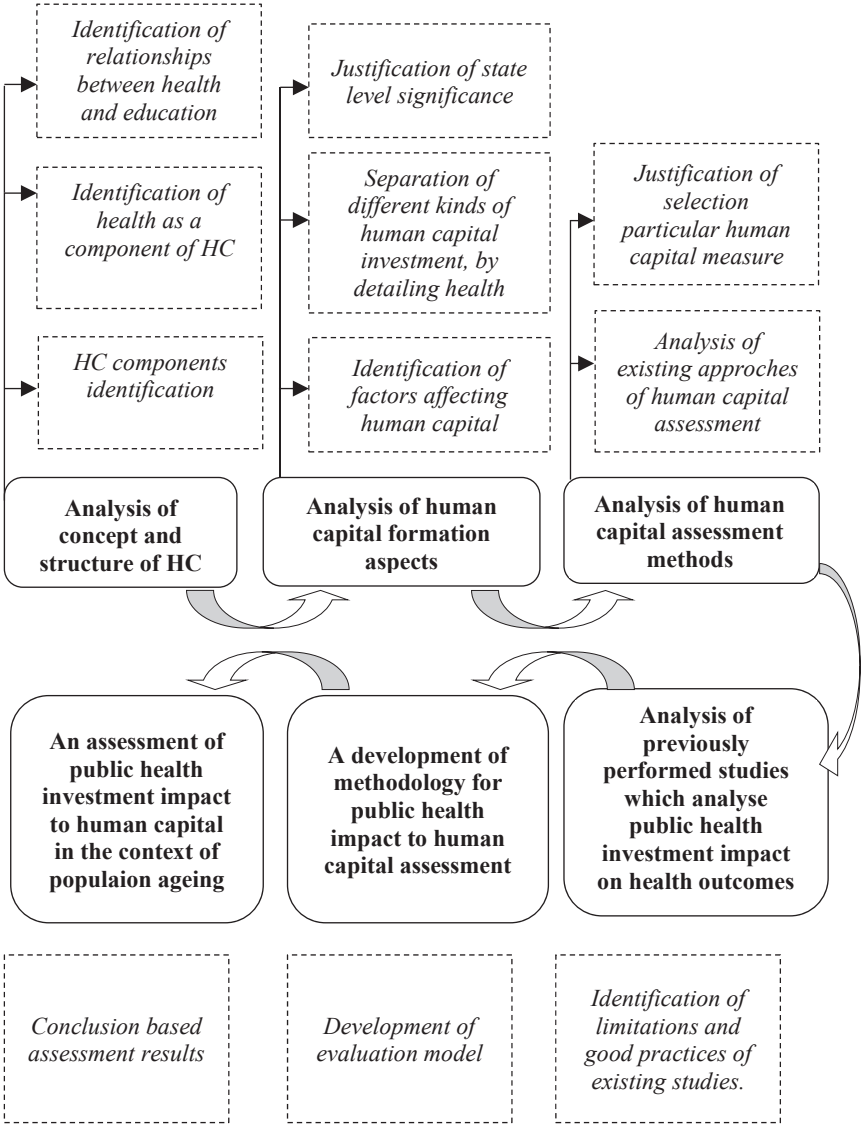

Figure 1 Logical structure of the thesis

I. THEORETICAL JUSTIFICATION FOR THE ASSESSMENT OF THE IMPACT OF HEALTH INVESTMENTS ON HUMAN CAPITAL

The first part of this dissertation focuses on the theory of human capital, its historical evolution, main human capital components and the different kinds of investments in it. The analysis also focuses on the evaluation of the existing theoretical links between human capital theory and health.

1.1. Human capital theory and its connections with classical, neoclassical and endogenous growth theory.

The performed literature analysis shows that the background of the concept of human capital is related with classical, neoclassical and endogenous economic growth theories. Based on Potelienė, Tamašauskienė (2014) and Bagdanavičius (2002), the emergence and development of the theory of human capital is linked to XVII- XIX centuries economics classics works analysing the need for investing in people in order to increase their productivity. Following this, the theory has evolved and gone through certain development stages. It could be noticed that such researchers as: A. Smith, I. Fisher, W. Petty, I. Mincer, T. Schultz, G. Becker, Romer and Lucas made a huge impact on the development of human capital theory. T. Schultz is presented as the first researcher who used the term of human capital in the modern economic literature and who attributed costs of human capital development to investment rather than consumption (Tamašauskienė, Šileika, & Masėnienė, 2008).

Researchers such as Neeliah & Seetanah (2016) connect human capital theory development with neoclassical economic growth theory and with the works of Solow (1956) and Swan (1956), where economic growth was related with capital and labour inputs. Further development of human capital theory by Neeliah & Seetanah (2016), Čadil et al. (2014), Šileika, Tamašauskienė (2003) and other researchers is linked with the endogenous growth theory. Čadil et al. (2014) point out that starting from Nelson and Phelps (1966) and later Romer (1986), Lucas (1988) works on the role of human capital in technology adaptation and economic growth was highlighted. Čadil et al. (2014) also stress that based on Aghion, Howitt (1998), human capital was identified as a factor that promotes a higher investment in technology. Comparing these two theories it is noticed that the impact of public policy and the influence of public expenditure is explained differently. According to Hjerppe, Hämäläinen, Kiander, Viren (2007) based on the neoclassical growth theory, public expenditure does not affect economic growth, while based on endogenous growth models the human capital formation and economic growth can be affected by public health and education expenditure.

1.2. The positive effects of investing in human capital.

After reviewing the historical development of human capital theory, the author focuses on the identification of positive human capital impact areas that

allows to justify the need to invest in such form of capital. The performed literature analysis shows that the positive influence of human capital can be analysed from 3 main levels: individual, organization and society (Kwon, 2009). Looking from the individual level, human capital is related with impact on an individual's, wage level, productivity (Čadil et al., 2014; Harpan & Draghici, 2014; Kwon, 2009; Šileika & Tamašauskienė, 2003), employment (Kwon, 2009; Olaniyani, D. A., Okemakinde, 2008; Son, 2010) attitudes to knowledge acquisition processes (Gižienė, Simanavičienė, 2012), and health (Becker, 1994; Kwon, 2009). At the organizational level, researchers emphasis the impact to labour force productivity (Ejere, 2011; Kucharčíková, Tokarčíková, & Blašková, 2015) and its quality (Ejere, 2011), organizational competitiveness (Tamašauskienė et al., 2008), and culture (Harpan & Draghici, 2014 cit. Kwon (2009)). At the macroeconomic level, the impact of human capital on country economic growth is highlighted. By using different methods and different variables representing human capital, various researchers try to investigate this form of capital related with a country's economic growth. Such kind of studies are performed by Adekola (2014), Awel (2013), Čadil et al., (2014), Gebrehiwot (2016), Pelinescu (2015), Solaki (2013) Torruam & Abur, (2014). With the exception of Čadil et al. (2014), most cases gained results to support the importance of human capital and investment in it. Macroeconomic studies also highlight that human capital affects national competitiveness (Blundell et al.,1999; Mačiūlytė-Šniukienė & Matuzevičiūtė, 2018), socioeconomic development (Shuaibu & Oladayo, 2016), differences in regional development (Kuliešis, Pareigienė, & Naus, 2012), influence in reducing regional inequalities (Fleisher, Li, & Zhao, 2010), affects internationalization (Godelytė & Korsakienė, 2015), and technological development (Day & Dowrick, 2004; Matovac et al., 2010; Teixeira & Queirós, 2016; Tiruneh & Radvansky, 2011).

1.3. Theoretical aspects of the concept of human capital and its constituent elements.

Although the theory of human capital has been developed for several decades and the importance of this form of capital is widely recognized, the performed literature analysis shows that the concept of human capital is interpreted differently and there is no common definition of human capital. It is described differently by concentrating on different perspectives and using different approaches. The term of human capital is often linked to components that are embodied in individuals, an individual productivity, income growth, the ways in which these elements are acquired, its importance to a country's economic growth or technological development. The definition of human capital is explained by using microeconomic or macroeconomic approaches (Kucharčíková, 2011), genetic – historical, attributive, reproduction, functional approaches (Bagdanavičius, 2002); perspectives based on individual features, education and

accumulation, or perspectives based on productivity and production orientation (Houghton, 2017). Human capital is also divided into general and specific human capital (Au, Altman, & Rossel, 2008) or to innate, biological, educational or social human capital (Perepelkin, Perepelkina, & Morozova, 2016). Based on the performed literature analysis, the author of this thesis analyses the terms of human capital by grouping them into the following groups:

- *macroeconomic perspective orientated to growth* (an example of such kind of human capital definition is presented by Kucharčíková (2011) where human capital is understood as a production factor and a source of economic growth);
- *perspective orientated to human capital accumulation processes and its benefits* (an example of such kind of human capital definition is presented by Konara, Wei (2019) where human capital is defined as "productive investments embodied in human agents that improve knowledge and skills".
- *perspective orientated to the main components of human capital and their impact at individual or organizational level* (for example, Ilegbinosa (2013) defines human capital as an aggregate of skills, knowledge and energies that are available in a country (p. 7)).

Schultz (1972), as one of the main contributors for the human capital theory, identified innate and acquired skills as key components of human capital. However, it can be noted that today's human capital definition involves a much wider list of human capital components. The performed analysis shows that one of the most frequently mentioned components of human capital are skills and knowledge, however researchers also mention such components as capabilities, experience, health, education, motivation, competence, innovativeness and others.

Therefore, it can be concluded that based on the research purpose and the main focus area, human capital is defined differently. In some cases, researchers emphasize the importance of human capital for country economic development; in other cases, academics focus on human capital structure, its development and consequently the aggregate positive impact areas. The performed literature analysis enables this study to define human capital as a set of knowledge, skills, abilities, experience, health, and other components used in economic activities that are embodied, innated, and invested in an individual and that affect a person's productivity and generates monetary and non-monetary benefits. Against this background, the creation and development of this form of capital is based on the allocation of investment in key components and the influence of other external environmental factors.

1.4. Health as a component of human capital.

Analysis of human capital definitions revealed that health is reported as a part in the theory of human capital. Firstly, according to Bloom, Canning, Jamison (2004), human capital is lost when people die. Secondly, according to Razmi et al., (2012), together with decreasing health stock; individual effectiveness is also

decreasing. By analysing contemporary literature, it is noticed that researchers, such as Moene (2002) Acaroğlu, Ada (2014), Adekola (2014), Landau (1997), Potelienė, Tamašauskienė (2014), Godelytė, Korsakienė (2015) Connolly, Postma (2010), Baldacci, Clements, Gupta, Cui (2008), Becker (2007), Bloom, Canning (2003), Bučinskas (2012), Cuaresma et al. (2009), Goldin, (2014), Jermolajeva, Znotiņa (2008), Jones, Chiripanhura (2010), Juščius, Adaškevičiūtė, (2010), Meiling (2014), Šileika, Tamašauskienė (2003), Jivan, Toth (2012), Edeme, Emecheta, Omeje (2017) distinguishes health as a component of human capital.

Despite the fact that health has been mentioned as a part of human capital definitions by many authors, more detailed analysis revealed that the relationships between these two concepts are defined by using different terms and differently linking health and human capital. Scientific literature defines health as a *form* (Bleakley, 2013; Bučinskas, 2012; Gyimah-Brempong & Wilson, 2004; Torruam & Abur, 2014), *dimension* (Baldacci et al., 2008; R. Lee & Mason, 2010; Villa, 2017), *domain* (Villa, 2017), *component or element* (Attanasio, Meghir, Nix, & Salvati, 2017; Bilan, Mishchuk, & Dzhyhar, 2017; Dauda, 2011; Emmanuel, Vukenkeng, & Emmanuel, 2014; Hartwig, 2010; Kanayo, 2013; Kgakge-Tabengwa, 2014) of human capital. Health is also understood as a human capital *factor or determinant* (Bilan et al., 2017). Health is also defined as a *qualitative aspect* of human capital (Kuliešis et al., 2012; Sapuan & Sanusi, 2013; Solaki, 2013). On the other hand, Bleakley (2013) not only identifies health as human capital but also stresses that it affects other human capital elements.

1.5. The link between health and education as two key components of human capital

The performed literature analysis identifies a close relationship between education and health as two main human capital components. It is stated that on the one hand, better health can increase the return on education, however on the other hand, education can increase the return on health (Umaru, 2011). It is also highlighted that children's health affects their learning results, therefore healthier children become more educated adults (Vogl, 2012). Health affects the pace of work experience (Gupta et al. 2002). Based on scientific literature, healthier employees receive a greater return of education and work experience, therefore it allows more investment in these areas. In addition, it is highlighted that healthier workers live longer (Bloom, Canning, 2003). Considering it an investment in health are identified as a complementary investment for education investments (Gardner & Gardner, 2001). Consequently, this encourages the assumption that health investment is not only focused to health outcome improvements but also has a much wider effect for human capital development.

1.6. Factors influencing the formation and development of human capital.

Health and education as a component of human capital are not only closely related and influence each other, but the list of various groups of factors can also affect human capital development. Therefore, in order to objectively evaluate the impact of health investments on human capital, an analysis of factors affecting human capital development was performed. Potelienė,Tamašauskienė (2014) cit. Verhoglyadova (2006) and separates these groups of factors: demographic, socio-demographic, social, economic, factors influencing efficiency, organization - economic and ecological. A similar set of factors is distinguished by other researchers, like Mukhambetova et al. (2016). They also distinguish such factor groups as: demographic, sociodemographic, ecological, social and economic factors, however the list of factors is also extended by including new groups of factors such as: integration, institutional, social and mental or production factor groups. Therefore, based on the scientific literature systematization results, these lists of external factors affecting human capital development can be separated into the following groups:

- ***Demographic factors*****:** *population size* (Mukhambetova et al., 2016; Potelienė & Tamašauskienė, 2014), *population distribution according to sex and age* (Mukhambetova et al., 2016; Potelienė & Tamašauskienė, 2014; Roupelienė & Lukė, 2017), *natural population growth/ residential growth* (Emmanuel et al., 2014; Mukhambetova et al., 2016; Potelienė & Tamašauskienė, 2014; Roupelienė & Lukė, 2017), *life expectancy* (Mukhambetova et al., 2016; Potelienė & Tamašauskienė, 2014; Roupelienė & Lukė, 2017), *migration* (Znotina, 2014), *fertility* (Alders, 2005; UNECE Task Force on Measuring Human Capital, 2016), *population ageing* (UNECE Task Force on Measuring Human Capital, 2016), *mortality rate, ageing* (UNECE Task Force on Measuring Human Capital, 2016).
- ***Social – demographic factors***: *labour life expectancy* (Mukhambetova et al., 2016; Potelienė & Tamašauskienė, 2014), *number of employed persons and their administrative and territorial distribution* (Mukhambetova et al., 2016; Potelienė & Tamašauskienė, 2014; Roupelienė & Lukė, 2017), *number of unemployed persons and their administrative and territorial distribution* (Mukhambetova et al., 2016; Potelienė & Tamašauskienė, 2014; Roupelienė & Lukė, 2017), *number of economically active residents* (Roupelienė & Lukė, 2017), *distribution of population by industries and sectors of the economy* (Mukhambetova et al., 2016; Potelienė & Tamašauskienė, 2014)
- ***Social factors:*** *population health state* (Mukhambetova et al., 2016; Potelienė & Tamašauskienė, 2014; Roupelienė & Lukė, 2017; Shuaibu & Oladayo, 2016), *cultural level* (Mukhambetova et al., 2016; Perepelkin et al., 2016; Potelienė & Tamašauskienė, 2014; Roupelienė & Lukė, 2017), *migration rate* (Potelienė & Tamašauskienė, 2014; Roupelienė & Lukė, 2017; Tchanturia et al., 2015), *development of social infrastructure* (Potelienė & Tamašauskienė,

2014; Roupelienė & Lukė, 2017; Tchanturia et al., 2015) *general level of education* (Mukhambetova et al., 2016; Potelienė & Tamašauskienė, 2014), *quality of the education system and labour force experience* (Shuaibu & Oladayo, 2016), *professional training of the population* (Mukhambetova et al., 2016; Potelienė & Tamašauskienė, 2014), *improvements in the education system* (Tchanturia et al., 2015), *morbidity* (Mahony & Samek, 2016; Shuaibu & Oladayo, 2016), *the type of social model* (E. Popova, 2014), *illiteracy, imbalances in the educational system, quality of education. social stratification* (Garavan, Ardichvili, Zavyalova, & Minina, 2012), *alcohol consumption* (Lye, Hirschberg, 2010).

- ***Economic factors:*** *improvements in economic infrastructure* (Tchanturia et al., 2015), *increase of population income* (Tchanturia et al., 2015), *people distribution based on income groups* (Roupelienė & Lukė, 2017), *people paying potential* (Roupelienė & Lukė, 2017), *inflation level* (Roupelienė & Lukė, 2017), *level of economic stability* (Roupelienė & Lukė, 2017), *economic situation in a country* (Potelienė & Tamašauskienė, 2014; Roupelienė & Lukė, 2017), *country's economic and technological development* (Potelienė & Tamašauskienė, 2014; Roupelienė & Lukė, 2017), *labour supply characteristics* (Potelienė & Tamašauskienė, 2014), *poverty level* (Attanasio et al., 2017; Garavan et al., 2012; Y. Popova, 2014; Villa, 2017) *people stratification level* (Garavan et al., 2012; Y. Popova, 2014), *GDP per capita* (Popova 2014), *level of economic freedom* (Y. Popova, 2014),
- ***Ecological and environmental factors:*** *ecologic environment* (Roupelienė & Lukė, 2017), *sanitary and hygienic conditions* (Potelienė & Tamašauskienė, 2014; Roupelienė & Lukė, 2017), *ecological situation* (Potelienė & Tamašauskienė, 2014; Roupelienė & Lukė, 2017), *country's recreation characteristics* (Potelienė & Tamašauskienė, 2014; Roupelienė & Lukė, 2017), *climatic characteristics* (Potelienė & Tamašauskienė, 2014; Roupelienė & Lukė, 2017), *the quality of food and drinking water* (Potelienė & Tamašauskienė, 2014; Shuaibu & Oladayo, 2016), *natural resources* (Sun, Sun, Geng, & Kong, 2018), *access to electricity* (Shuaibu, Oladayo, 2016).
- ***Other factors***: *development of social partnership* (Tchanturia et al., 2015), *development of social society* (Tchanturia et al., 2015), *an effectiveness of all economic levels management* (Potelienė & Tamašauskienė, 2014), *urbanization level* (Baldacci et al., 2008; Kuliešis et al., 2012), *demographic freedom* (Popova, 2014), *social transfers* (Popova, 2014), *labour productivity increasement* (Popova, 2014), *information* (Perepelkin et al., 2016), *racial discrimination* (Garavan et al., 2012).

Academics also stress the importance of different kinds of investments as determinants affecting human capital development. In this case, investments in education (Shuaibu & Oladayo, 2016), health/ healthcare (Shuaibu & Oladayo, 2016) R&D and innovation technologies (Popova, 2014), and ecological projects

(Popova, 2014) are highlighted. It is also necessary to state that human capital is influenced by organizational or individual factors, however considering the focus area of this thesis, these groups of factors are not included in the previous list.

1.7. Investment in human capital development.

Considering the fact that the main input in human capital development are different kinds of investments, a literature analysis of human capital investments was performed. Results of the systematization of information from different sources shows that *the main groups of investments in human capital was separated by Schultz (972) who presented the following classification: "investments in schooling and higher education, postschool training and learning, preschool learning activities, migration, health, information and investment in children (p. 4).* It is noticed that further research studies refer to the same basic investment areas with slight addition or by using synonyms or more specific names of the kinds of investments. In the area of health investment (focused in the area of human capital development) such detailing of the kinds of investments was identified: *health (care) in a general sense* (Dauda, 2011; Ejere, 2011; Gižienė & Simanavičienė, 2012; Ilegbinosa, 2013; Mačiūlytė-Šniukienė & Matuzevičiūtė, 2018; Praise & George-Anokwuru, 2018; Schultz, 1972; Shuaibu & Oladayo, 2016; Tchanturia et al., 2015) *medical care* (Becker, 1962; Schultz, 1972), *physical and mental health promotion* (Akpolat, 2014)*, vitamin consumption* (Becker, 1962), *health maintenance* (Tamašauskienė et al., 2008)*, medical spending, medical treatment* (Ejere, 2011; Guangfeng & Xia, 2012; Tao & Stinson, 1997), *health protection (*Guangfeng, Xia, 2012), h*ealth information* (Nistor, 2007)*, nutrition* (Frankenberg & Thomas, 2017; Goldin, 2014; Praise & George-Anokwuru, 2018; Schultz, 1972), *health workforce and infrastructure* (Novignon et al., 2012) *health care services and prevention* (Razmi et al., 2012).

1.8. The role of the state in shaping human capital.

Human capital formation is analysed not only on the basis of different kinds of investment, but also on different levels of investors. This thesis focusses on the state level and public sector investment in health and its impact to the county's stock of human capital. This choice is justified by the fact that firstly, based on Zakharova, Kratt (2014), healthcare is financed from the national budget, secondly, investment in human capital is closely related with national laws. Balcerzak (2016) relates human capital quality with national strategies. Public sector analysis is also considered important, based on Bloom, Canning (2003), where limited resources are used. Therefore, it is important to evaluate the efficiency of resource usage.

1.9. Changes in health investment in the context of an aging population

An effective resource usage and care of good health are also very important in the context of population ageing. This phenomenon raises new challenges for an ageing society. First of all, as population ageing is related with the decreasing part of the working age population, this implies that less income will be generated for health systems. Secondly, taking into account the specific of elderly health status, the increasing share of such aged people is also related with changes in the demand of health services (Lopreite & Mauro, 2017).

In summary it could be stated that based on the scientific literature analysis, investment in health is one of the methods of how human capital can be affected.

Therefore, further analysis focused on existing empirical studies and the development of methodology for heath investment impact assessment is suggested.

II. METHODOLOGY FOR EVALUATING THE IMPACT OF PUBLIC HEALTH INVESTMENTS TO HUMAN CAPITAL IN THE AGEING POPULATION

2.1. Methods of human capital measurement.

During analysis of the scientific literature several approaches for human capital evaluation was identified, mainly; cost based, income based and output based approaches. From one perspective, human capital is evaluated based on the different subject's costs for human capital development; such as parental costs for child education, health. On the other hand, human capital is assessed based on income that individuals gain. The third approach is named as "output based" and in the greater part focuses on education outcome indicators.

An analysis of the scientific literature also shows that the assessment of this multidimensional form of capital remains quite complex and often covers only a certain aspect of human capital. It is also emphasized that the existing methods of human capital valuation have their own advantages and disadvantages. Therefore, it is appropriate to take account of the country's human capital evaluation and in the selection of measures for human capital evaluation.

2.2. Analysis of studies analysing the impact of health expenditure on health indicators and 2.3. impact to human capital.

In most cases, health expenditures are associated with positive outcomes expressed in terms of life expectancy and infants or children under 5 years' mortality rates. However, analysis of the scientific literature also shows some contradictions. Researchers such as Jaba, Balan, & Robu (2014) identify that health expenditure positively and significantly affects health outcomes, while other researcher such as Rahman, Khanam (2018) do not identify any significant relationship between health spending and life expectancy improvements. The authors also reveals several problematic aspects of the evaluation of this

relationship. According to Nixon, Ulmann (2006) evaluating these relationships makes it difficult to assess the impact of health input elements on outcomes. It is noted that indicators such as infant mortality and life expectancy reflect only a part of the state of health. It is also emphasized that an indicator such as infant mortality is not particularly sensitive to changes in health expenditure.

A similar situation is observed by evaluating the impact of public health expenditure to human capital expressed by the human development index (HDI). Part of the studies, such as Razmi et al., (2012), identifies a statistically significant relationship between public health expenditure and HDI, while all others describes this relationship as positive but insignificant (for example Asmita, Fitrawaty, & Ruslan, 2017). During the literature analysis it was observed that the existing literature mostly focuses to such countries as Nigeria, Indonesia or some Africa regions, however there are a lack of studies of European cases. This problematic aspect, on the one hand, encourages a deeper analysis of the European case and on the other hand, makes it more difficult to compare the results with those of previous studies.

2.4. Methodological approaches to assessing the impact of public investment in health on human capital.

Taking into account that different countries have a different stock of human capital encourages and leads to such questions as: how to evaluate what the impact of public health investment to human capital in the context of population ageing are. Based on the literature analysis, the author makes the theoretical assumption that the greater the health investment leads to a higher human capital. Evaluation of human capital is based on Laverde et al. (2018) equation:

$$HC=\lambda IV+u \quad (1)$$

Where human capital (HC) is expressed as a vector of input elements (IV) and vector of other factors (u). Therefore, the impact evaluation is based on an input-output system evaluation (see *Figure 2*).

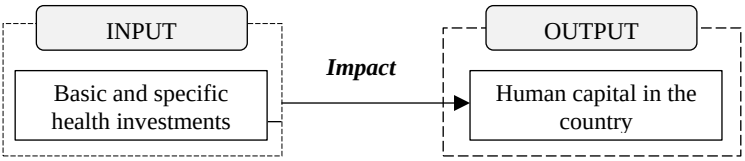

Figure 2 Input – output model for public health investment impact to human capital evaluation

Input selection. Analysis of scientific literature shows that there are different kinds of investment in human capital. Investment in health is one of such

kinds of investments. Considering the topic of this thesis, government health expenditure was selected as a main input into a country's human capital and used as a proxy of public health investment. The literature review found that various types of health expenditures can be identified as an investment in human capital. Considering this, the analysis also assessed the impact of detailed types of health expenditures on human capital.

Output selection. In order to evaluate the impact as to which public health investments make the main issue is to measure the existing country's human capital. Results of literature analysis shows that human capital measurement is problematic. The author of this thesis uses the output-based approaches for human capital measurement.

The 4 variables for human capital expression are selected based on the literature analysis. These are: *life expectancy at birth* (Akpolat, 2014; Kokotovic, 2016; Neeliah & Seetanah, 2016; Ogundari & Awokuse, 2018; Sapuan & Sanusi, 2008) *secondary school enrolment rate* (Baldacci et al., 2008; Eigbiremolen & Anaduaka, 2014; Gebrehiwot, 2016; Neeliah & Seetanah, 2016; Ogundari & Awokuse, 2018; Solaki, 2013; Tiruneh & Radvansky, 2011; Wolff, 2000), HDI (Emmanuel et al., 2014; Kairo et al., 2017; Ndugbu et al., 2018; Omankhanlen et al., 2014; Razmi et al., 2012; Shuaibu & Oladayo, 2016) *and 55-64 year old people employment level* (Balcerzak, 2016) *that have tertiary education.*

Selection of the factors affecting human capital. Analysis of scientific literature has also shown that the impact of health expenditure on health outcomes is explained by using the Grossman human capital model and health production function. Considering this model and function, in this thesis the impact evaluation is based on Fayissa, Traian (2011) equation where health outcomes is explained by economic, social, demographic and environmental factors. The performed analysis shows that different factors also affect human capital development (see *1.6 chapter*). Comparing studies analysing the impact of public spending on health outcomes with studies assessing the impact of public spending on human capital or directly to HDI, it was found that fewer control variables are used in the second group of studies.

The analysis of the literature identified the following indicators - factors that are used in the studies evaluating the impact of health spending and at the same time are singled out as factors affecting human capital. Thus, the assessment of the impact of public investment in health to human capital includes input, output elements, and external factors - control variables that can also affect output. The created public health investment impact evaluation conceptual scheme is presented graphically in Figure 3.

The inclusion of factors in the evaluation model are based on the analysis of correlations, assessing the relationships between the chosen measure of human capital and the human capital factor identified in the literature. The impact of public investment is assessed using ordinary least squares (OLS), fixed effect (FE)

and random effect (RE) models. Two types of models were created. The first model included the government health expenditure as a main input variable analysed in this study and also two more variables. GDP per capita was selected taking into account the frequency of its usage in the previous studies. The group of 65 years and older population was selected based on its relationships with population ageing.

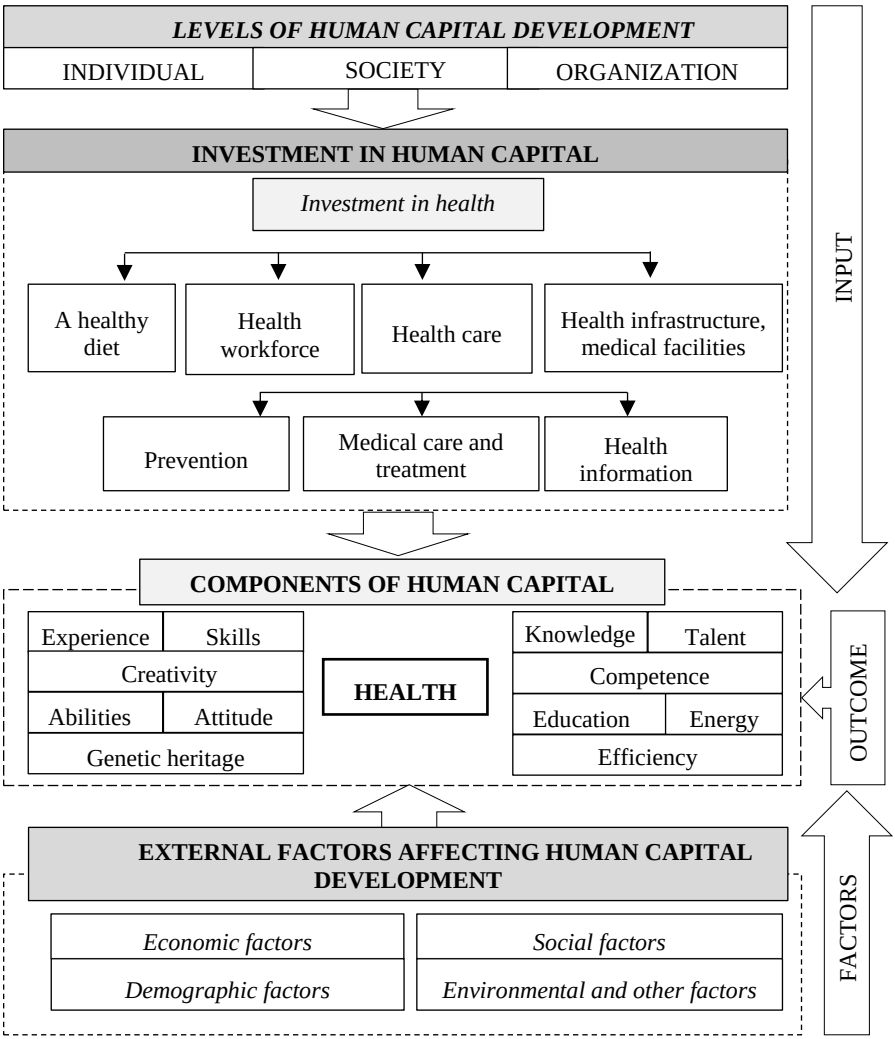

Figure 3. A conceptual scheme of measuring the impact of public health investments on human capital

The basic evaluation model can be expressed as follow:

$$\ln HC_{it} = \alpha + \beta_1 \ln GOV\_HE\_GDP_{it-1} + \beta_2 \ln GDP\_PC_{it-2} + \beta_3 \ln POP65\_UP_{it-1} + e_{it} \quad (2)$$

Where: *α – constant, HC – human capital expressed in one 4 selected variables, βi- coefficient, GOV_HE_GDP - public health expenditure (% GDP), GDP_PC – GDP per capita (Eur), POP_65_UP – population 65 and older (%), i- country, t- time*

The variables used in the equation are presented in logarithmic form. The results obtained are evaluated as coefficients of elasticity. The valuation model measures how last year's investment in health (*t-1*) affected the current year's human capital ratio.

The second model included a wider list of factors that possibly affect human capital development. The selection of these variables was based on the scientific literature analysis and results of correlation analysis of these factors and selected proxies of human capital. After the correlation analysis, the extended evaluation model was created that can be expressed as follow:

$$\begin{aligned} lnHC_{it} = {} & \alpha + \beta_1 lnGOV\_HE\_GDP_{it-1} + \beta_2 ln\text{GDP\_PC}_{it-1} + \\ & \beta_3 lnPOP\_15\_64_{it-1} + \beta_4 ln\text{POP\_65\_UP}_{it-1} + \beta_5 lnFE_{it-1} + \\ & \beta_6 lnEDAT\_PRIM_{it-1} + \beta_7 ln\text{UNEMPL\_PROC}_{it-1} + \beta_8 ln\text{GRE\_GAS}_{it-1} + \\ & \beta_9 ln\text{URB\_POP}_{it} + \beta_{10} lnHOSP\_BEDS_{it-1} + \beta_{11} lnALCOHOL\_CONS_{it-1} + u_{it-1} \end{aligned} \quad (3)$$

Where: *α – constant, HC – human capital expressed in one 4 selected variables, βi- coefficient, GOV_HE_GDP - public health expenditure (% GDP), GDP_PC – GDP per capita (Eur), POP_15_64 – 15-64 years old population (%), POP_65_UP – population 65 and older (%), FE- fertility rate (births per women), EDAT_PRIM - 15–64 years population with 0-2 education level (per cent), UNEMPL_PROC - unemployment rate (% of total labour force), GRE_GAS - greenhouse gas emissions (tonnes per capita), URB_POP – urbanization level, HOSP_BEDS - number of hospital beds (per person), ALCOHOL_CONS - alcohol consumption (per capita), i- country, t- time.*

EU data from 2000-2017 was used for panel data analysis. The selection of data took into account their completeness and availability in the official statistical databases. The data sources for the dependent and independent variables used in the basic and extended models are presented in the table.

Table 1 Data sources of selected dependent and independent variables

Acronym	*Variable*	*Source*
LE	Life expectancy at birth	United Nations Development Programme (2018)
SEC_ENR	Secondary school enrolment rate (%)	World Bank. World Development Indicators (2019)
EMP_55_64_ TERTIARY	55-64 aged persons with tertiary education employment rate (%)	Eurostat (2019)
HDI	Human development index	United Nations Development Programme (2018)
GOV_HE_GDP	Total general government expenditure on health (% of GDP)	Eurostat
GDP_PC	GDP per capita (Eur)	Eurostat
POP_15_64_PROC	Population aged 15-64 (per cent)	World development indicators
POP_65_UP_PROC	Population aged 65 and over (per cent)	World development indicators
FE	Fertility rate (births per woman)	World development indicators
EDAT_PRIM	15–64 years population with 0-2 education level (per cent)	Eurostat
UNEMPL_PROC	Unemployment rate (% of total labour force)	World development indicators
GRE_GAS	Greenhouse gas emissions (tonnes per capita)	Eurostat
URB_POP	Urbanization level (%)	World development indicators
HOSP_BEDS	Number of hospital beds (per person)	Eurostat
ALCOHOL_CONS	Alcohol consumption (per capita)	WHO - GHO
Total general government expenditure on:		
GOV_HE_HO_GDP	Hospital services (% of GDP)	Eurostat
GOV_HE_ME_GDP	Medical products, appliances and equipment (% of GDP)	Eurostat
GOV_HE_OU_GDP	Outpatient services (% of GDP)	Eurostat
GOV_HE_PHS_GDP	Public health services (% of GDP)	Eurostat
GOV_HE_RD_GDP	R&D Health (% of GDP)	Eurostat
GOV_HE_H_GDP	Health n.e.c. (% of GDP)	Eurostat

Given that population aging is described as a process associated with an increase in the relative share of older people, a coefficient of old age dependency was chosen to assess the context of population aging. Basic and extended models were applied for 3 cases: general case including all 28 EU countries, and two country groups separated based on the old-age dependency ratio median value of the year 2018. The first group includes: Italy, Finland, Portugal, Greece, Germany, Bulgaria, France, Sweden, Croatia, Latvia, Malta, Denmark, Estonia and Lithuania. These are countries where the old age dependency ratio is higher than the median of values of EU case, while the second group includes countries: Slovenia, Czech Republic, Netherlands, Spain, Belgium, Hungary, United Kingdom, Austria, Romania, Poland, Slovakia, Ireland, Luxembourg and Cyprus.

III. EMPIRICAL APPLICATION OF THE MODEL TO ASSESS THE IMPACT OF PUBLIC INVESTMENT ON HEALTH IN HUMAN CAPITAL IN THE CONTEXT OF AGING

OLS, FE and RE models were developed with each dependent variable. Firstly, the basic evaluation model was created. Based on the results of Breusch – Pagan LM test, F- test and Hausman test the best model was selected. The results gained during analysis is summarized in the *Table 2*.

Table 2 Results of basic model for public health investment impact to different variables expressing human capital

Case of 28 EU country	***LE***	***HDI***	***SEC_ENR***	***EMP_55_64 _TERTIARY***
	RE	***FE***	***FE***	***FE***
Government health expenditure$_{(t-1)}$	0,025*	*0,009**	*-0,008*	*-0,011*
GDP per capita$_{(t-1)}$	Positive*	Positive*	Positive	Positive*
Population 64 up$_{(t-1)}$	Positive*	Positive*	Positive*	Positive*
R-squared	*0,832*	*0,982*	*0,832*	*0,789*
Observations	473	473	458	470
Case of I group	***RE***	***FE***	***RE***	***FE***
Government health expenditure$_{(t-1)}$	0,017*	*-0,013**	*-0,062*	*-0,052*
GDP per capita$_{(t-1)}$	Positive*	Positive*	Positive*	Positive*
Population 64 up$_{(t-1)}$	Positive*	Positive*	Positive*	Positive*
R-squared	*0,835*	*0,984*	*0,199*	*0,813*
Observations	237	237	230	234
Case of II group	***RE***	***FE***	***RE***	***FE***
Government health expenditure$_{(t-1)}$	0,032*	*0,026**	*0,066**	*0,019*
GDP per capita$_{(t-1)}$	Positive*	Positive*	Positive	Positive*
Population 64 up$_{(t-1)}$	Positive*	Positive*	Positive*	Positive*
R-squared	*0,836*	*0,983*	*0,293*	*0,732*
Observations	236	236	228	236

**-significant impact*

The results of the performed study show that in all cases public health investments positively and significantly affect human capital expressed in a variable of life expectancy. However, the impact assessments using other HC indicators produce different results. Positive and significant impact coefficients are identified only in a part of the created models. The results obtained indicate that the exposure results are sensitive to the optional HC measure.

In order to evaluate the impact of public health investments, variables expressing different external factors were included. Results of different econometric models are presented in *Table 3*.

Table 3 Results of extended impact evaluation model for 28 EU countries

Case of 28 EU countries	***LE***	***HDI***	***SEC_ENR***	***EMP_55_64_ TERTIARY***
	FE	***FE***	***RE***	***FE***
Government health expenditure$_{(t-1)}$	0,013***	0,006	-0,007	0,074**
GDP per capita$_{(t-1)}$	0,029***	0,059***	0,082***	0,080***
15-64 age population$_{(t-1)}$	-0,087***	0,103***	-1,909***	0,064
64 up population$_{(t-1)}$	0,032***	0,132***	-0,190**	0,594***
Fertility$_{(t-1)}$	0,021***	-0,007	-0,225***	0,002
Population with primary education$_{(t-1)}$	-0,014***	-0,020***	-0,089***	-0,093**
Unemployment$_{(t-1)}$	0,008***	0,005***	-0,011	-0,103***
Green gasses emission$_{(t-1)}$	-0,012***	0,000	-0,094**	-0,04
Urban population$_{(t-1)}$	0,073***	0,016	0,308***	0,316
Hospital beds$_{(t-1)}$	-0,008**	0,008*	-0,006	0,163***
Alcohol consumption$_{(t-1)}$	0,001	-0,020***	0,076**	0,018
R-squared	0,987	*0,986*	0,367	0,841
Observations	450	450	*437*	437

****- 1% significance, **- 5% significance, *- 10% significance.*

The results show that a greater number of significant independent variables was found in the econometric model evaluating the impact to human capital expressed by the life expectancy variable. Depending on the selected human capital variable, the impact of public health investment variates from 0,013 to 0,074 %. However, negative and insignificant impact of public health investment was identified expressing human capital by HDI and secondary school enrolment.

Application of this econometric model for group I and II country cases have shown that results are different for different groups that are separated based on the old age dependency ratio (see. *Table 4*). The valuation of public health investment impact to life expectancy in 3 of 3 cases shows positive and in 2 cases a significant impact. This confirms that in the context of population ageing, public health investment makes a positive impact if the human capital is measured by the life expectancy variable. A positive impact was also identified when human capital

was expressed by the 55-64 aged people employment variable. However, in 2 of 3 cases this impact was identified as statistically insignificant. In all cases, an insignificant public health investment impact was identified to the secondary school enrolment rate. When human capital is measured by the HDI index, a significant and positive impact of public health investments was only identified in the case of the II group.

Table 4 Public health investment impact to different human capital measurements (results of extended model)

CASE	*LE*	*HDI*	*SEC_ENR*	*EMP_55_64_ TERTIARY*
Case of 28 EU countries	0,013***	0,006	-0,007	0,074**
Case of I group countries	0,013***	-0,003	-0,055	0,014
Case of II group countries	0,0003	0,014**	0,005	0,077

****- 1% significance, **- 5% significance, *- 10% significance.*

In the case of all the developed models, not only the impact of public investment in health was assessed but also the impact of other factors. The analysis showed that in all cases, GDP growth had a positive effect on the selected human capital indicators, but this effect was not statistically significant in all cases. The impact is explained by emphasizing that income levels are related to housing, education, employment, medical care and other choices (Smith & Goldman, 2007). It was found that in all cases (except for the secondary school enrollment rate) the increase in the share of the elderly population also has a positive effect. Meanwhile, the increase in the share of the working age population was more often associated with a negative effect on the selected human capital indicators. Fertility rates are described as a factor affecting human capital. The results of the extended model revealed that there is a positive and statistically significant relationship between fertility rates and life expectancy, and in the case of general and group I, a negative and statistically significant relationship between fertility rates and participation rates in secondary education.

The literature analysis allowed the study to identify the links between the two main components of human capital (education and health). When assessing the impact of the share of the population with the lowest education on the selected human capital indicators, it was found that this impact was mostly negative. Thus, low education had a negative impact on human capital. However, as in the case of the factors discussed earlier, this effect was not always identified as statistically significant.

The number of hospital beds in the country is related to the available health care resources that affect health and are singled out as input elements of the health production function (Jebeli & Hadian. 2019). Assessing human capital by different

indicators, the impact factor of this indicator was different: in 2 out of 3 cases, the increase in this indicator had a negative impact on life expectancy, but a positive impact on the employment of people aged 55-64 with a tertiary education level.

Assessing the unemployment factor, a statistically significant, negative relationship was found between unemployment and human capital expressed by the employment of people aged 55-64. Contrary to expectations, a positive relationship was identified with respect to life expectancy. However, it is assumed that this result may have been offset by changes in the unemployment rate during the financial crisis.

In most cases (except 1), a positive effect of the urbanization was identified, but it was significant only for the general group and group II, measuring human capital by life expectancy or secondary school enrollment, and for group I when measuring human capital by HDI. The analysis showed that the impact of greenhouse gases on the selected measures of human capital was more often negative, but not always significant.

Based on literature analysis, different kinds of health investments were evaluated. Analysis was performed for a case of 28 EU counties. Factors that were identified as statistically significant in assessing the impact on life expectancy in the extended model were also included in the assessment model analysing detailed health investments. Due to limited opportunities to have a natural logarithm for negative numbers, a usual variable expression was used. Results of the performed analysis shows that the greatest impact for human capital expressed by the life expectancy variable was made by government health expenditure on R&D Health. The identified impact coefficient is significant and equal to 2,729. Positive and significant impact coefficient was also identified for government health expenditure for hospital services, where the coefficient is equal to 0,431. General government health expenditure also made a positive and significant impact to life expectancy. The identified impact coefficient is equal to 0,225. Impact of other kinds of health expenditure were identified as insignificant.

CONCLUSIONS

Summarizing the results of the performed theoretical and empirical research, the following conclusions may be made:

1.1 The analysis of theoretical aspects of human capital proves the importance of human capital at various levels, starting with the individual, his / her employability, productivity and income, and ending with the often emphasized impact on the country's economic growth. Results of performed literature analysis shows that human capital is a complex form of capital, including a set of innate and acquired elements used in the production process. A more detailed analysis of the elements of the structure of human capital revealed that human capital is usually associated with elements such as education, knowledge, experience, skills and health. Less commonly described elements, such as talent, innovation, energy,

etc. are also associated with this form of capital. Literature analysis allowed the study to renew the concept of human capital by proposing to define this capital as human capital with a set of knowledge, skills, experience, health and other components that are personally embodied, innated and created by investments and used in economic activities that affect individual productivity and generate monetary and non-monetary benefits. The creation and development of this form of capital is based on the allocation of key investments and the influence of other external environmental factors.

2.1 Based on the analysis of health as a component of human capital theoretical aspects, the study identified that between health and human capital there are several connection areas. From the one side, health, similarly like knowledge and skills are described as a component of human capital, while on the other hand health is defined as a factor affecting development of other elements of human capital and its usage efficiency, longevity, quality and quantity. Health is also identified as a condition for knowledge transformation to products. The analysis found that different terms are used to describe health as a part of human capital. The health component also identified a close link between this element and education. Better health is associated with higher educational attainment, returns and vice versa.

3.1 The results of the performed analysis identified the main kinds of human capital investment and health as one of such. Literature analysis has shown that health investments in the context of human capital can be detailed by distinguishing such as: investments in health / care (prevention, medical care and treatment and health information), health workforce, health infrastructure, medical facilities and facilities or healthy nutrition. When analysing the issue of investment in human capital, factors that may influence the development of human capital are also evaluated. The synthesis of literature sources allowed the study to extend the existing lists of factors and to include new, unmentioned factors. The focus was on external factors at state level. The synthesis of literature sources also allowed the study to expand the groups of factors identified by previous researchers, supplementing them with such factors as: birth rate, aging population, quality of education system and its improvement, country's social model, economic infrastructure improvement, poverty level, urbanization level, alcohol consumption, racial discrimination, etc.

4.1 After evaluation of the theoretical approaches of the topic and the results of the existing empirical research, an econometric model for the evaluation of the impact of health investments on human capital was developed. Literature analysis has shown that there is still no consensus that measure best and reflects human capital. Considering this, different researchers use different measures of human capital. In this regard, the developed evaluation model uses 4 assessment indicators - life expectancy, secondary school enrolment rate, human development index and employment rate of 55-64 year-olds with tertiary education. A basic

model was created in order to evaluate the impact of health investment. The government health expenditure was included as one of the main input elements. In addition, two additional independent variables (GDP per capita, and population up to 64) were included. The health production function and external environmental factors were included in the evaluation. The extended human capital model involves not only the selected human capital measures, health investments but variables expressing external environment factors affecting human capital development. External factors were selected based on the existing correlation between each of them and human capital measure. The following variables were selected: GDP per capita, public health expenditure, unemployment, share of population aged 15-64 with primary education, alcohol consumption, proportion of population aged 15-64, older than 64 population, greenhouse gas emissions, urbanization rate, number of hospital beds.

5.1 The impact of public health investment on human capital was evaluated based on the applied model. Panel data from 2000-2017 was used for the evaluation. In order to evaluate the impact of public health investments on human capital and its constituent elements, 4 dependent variables were included in the evaluation. Taking into account, the different levels of aging, 3 cases were analysed: general - covering all 28 EU countries, group I - covering countries with an aging index higher than 30% and group II - covering countries with an aging index below 30%.

5.2 An analysis of a common EU-28 case study reveals that 2 selected human capital measures, i.e. life expectancy and HDI index, are significantly and positively influenced by public health investment in the basic model. The results obtained are evaluated as coefficients of elasticity. Therefore, a 1 percent increase in public health investment increases life expectancy by 0.025% and HDI increases by 0.009%. A negative impact of public health expenditure was identified in the secondary school enrolment rate and to 55-64 aged peoples' employment rate. However, this impact was identified as insignificant. Comparing the results with the extended model, it is observed that the inclusion of additional variables results in a lower impact on health investment. The results of the performed study show that a 1 percent increase of public health expenditure increases life expectancy at 0,013 percent, and the 55-64 age people employment increases by 0,074 percent. The impact of investments on these indicators were identified as positive and statistically significant. Meanwhile, when assessing the impact on the HDI, the impact coefficient was 0.006 but insignificant. The impact of investment on participation in secondary education remained negative and insignificant. Comparison of the obtained evaluation results in different groups showed different results. In the evaluation of health investment impact at group I country case it was identified that a 1 percent increase in public health expenditure the life expectancy increases by 0,017 percent (in basic model) and 0,013 percent (in extended model). Meanwhile, for the remaining HR indicators, a negative impact was found, and only for HDI, a significant impact on health investment

was found. Evaluation of public health investment impact in the group II countries has shown that a 1 percent increase affects life expectancy by 0,032, HDI by 0,026 and secondary school enrolment by 0,066 percent in the case of basic model. This effect was identified as positive and statistically significant, whereas the effect on employment of persons aged 55-64 was identified as positive but not significant. In the case of the extended model for II country group, a 1 percent increase of public health affects HDI positively and statistically significantly. The impact coefficient is 0,014. Meanwhile, impact ratios for other human capital indicators are positive but not statistically significant. The results of the evaluation show that public health investments have a positive and significant impact on human capital in the context of an aging population. However, the results also allowed the study to confirm the assumption that results are sensitive to the measure of human capital. The sensitivity of the results to country specificity was also identified.

5.3. The evaluation of detailed public health investment impact to selected human capital measure - life expectancy was identified that both the general public health investments and investments for individual or collective service groups have a positive and significant impact. Significant and positive impact coefficients have been identified in the assessment of public health expenditure on hospital services and public expenditure on health research and development. The government health expenditure for research and development has been identified as having the highest impact to life expectancy. Therefore, investments in this area are very important in order to reach better results in the area of human capital.

REFERENCE

1. Acaroğlu, H., & Ada, A. A. (2014). The Relation between Human Capital and Economic Growth in MENA Countries. *Journal of Public Administration and Governance*, *4*(3), 205–216. https://doi.org/10.5296/jpag.v4i3.6127
2. Adekola, A. I. (2014). Public Investment in Human Capital and Economic Growth in Nigeria: Analysis on Regime Shifts. *Journal of Economics and Development Studies*, *2*(2), 213–231.
3. Akpolat, A. G. (2014). The Long-Term Impact of Human Capital Investment on GDP : A Panel Cointegrated Regression Analysis. *Economics Research International*, 220–222. https://doi.org/10.1155/2014/646518
4. Alders, P. (2005). Human capital growth and destruction: the effect of fertility on skill obsolescence. *Economic Modelling*, *22*(3), 503–520. https://doi.org/10.1016/j.econmod.2004.09.001
5. Amadu, I., Eseokwea, N. F., & Ngambi, M. (2017). Contribution of Public Health Investments to the Economic Growth of Cameroon. *Business and Economics Journal*, *6*(4), 1–9. https://doi.org/http://dx.doi.org/10.4172/2151-6219.1000189
6. Asmita, Fitrawaty, & Ruslan, D. (2017). Analysis of Factors

Affecting the Human Development Index in North Sumatra Province. *IOSR Journal of Business and Management (IOSR-JBM)*, *19*(10), 27–36. https://doi.org/10.9790/487X-1910072736

7. Attanasio, O., Meghir, C., Nix, E., & Salvati, F. (2017). Human capital growth and poverty: Evidence from Ethiopia and Peru. *Review of Economic Dynamics*, *25*, 234–259. https://doi.org/10.1016/j.red.2017.02.002

8. Au, A. K. M., Altman, Y., & Rossel, J. (2008). Employee training needs and perceived value of training in the Pearl River Delta of China: A human capital development approach. *Journal of European Industrial Training*, *32*(1), 19–31. https://doi.org/10.1108/03090590810846548

9. Awel, A. M. (2013). The long-run Relationship between Human Capital and Economic Growth in Sweden. *MPRA Paper*, *45183*.

10. Bagdanavičius, J. (2002). *Žmogiškasis kapitalas. Mokymo metodinė priemonė*. Vilnius.

11. Balcerzak, A. P. (2016). Multiple-criteria Evaluation of Quality of Human Capital in the European Union Countries. *Economics & Sociology*, *9*(2), 11–26. https://doi.org/10.14254/2071-789X.2016/9-2/1

12. Baldacci, E., Clements, B., Gupta, S., & Cui, Q. (2008). Social Spending, Human Capital, and Growth in Developing Countries. *World Development*, *36*(8), 1317–1341. https://doi.org/10.1016/j.worlddev.2007.08.003

13. Becker, G. (1994). Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education (3rd Edition). *Journal of Chemical Information and Modeling*, *53*(9), 1689–1699.

14. Becker, G. S. (1962). Investment in Human Capital: A Theoretical Analysis. *The Journal of Political Economy*, *70*(5), 9–49.

15. Becker, G. S. (2007). Health as human capital: synthesis and extensions. *Oxford Economic Papers*, *59*(3), 379–410. https://doi.org/10.1093/oep/gpm020

16. Bein, M. A., Unlucan, D., Olowu, G., & Kalifa, W. (2017). Healthcare spending and health outcomes: Evidence from selected East African countries. *African Health Sciences*, *17*(1), 247–254. https://doi.org/10.4314/ahs.v17i1.30

17. Bilan, Y., Mishchuk, H., & Dzhyhar, T. (2017). Human capital factors and remuneration: analysis of relations, modelling of influence. *Business: Theory and Practice*, *18*, 208–214. https://doi.org/10.3846/btp.2017.022

18. Bleakley, H. (2013). Health, Human Capital, and Development. *Annu Rev Econom*, *2*, 283–310. https://doi.org/10.1146/annurev.economics.102308.124436

19. Bloom, D., & Canning, D. (2003). Health as Human Capital and

its Impact on Economic Performance. *Geneva Papers on Risk and Insurance: Issues and Practice*, *28*(2), 304–315.

20. Bloom, D. E., Canning, D., & Jamison, D. T. (2004). Health, Wealth and Welfare. *Finance & Development*, (March), 10–15.

21. Blundell, R., Dearden, L., Meghir, C., & Sianesi, B. (1999). Human Capital Investment: The Returns from Education and Training to the Individual, the Firm and the Economy. *Fiscal Studies*, *20*(1), 1–23. https://doi.org/10.1111/j.1475-5890.1999.tb00001.x

22. Bučinskas, A. (2012). Investicija į vaikų sveikatą - svarbi žmogiškojo kapitalo kaupimo prielaida darnios plėtros kontekste. *Tiltai*, *3*, 213–230.

23. Čadil, J., Petkovová, L., & Blatná, D. (2014). Human Capital, Economic Structure and Growth. *Procedia Economics and Finance*, *12*(March), 85–92. https://doi.org/10.1016/S2212-5671(14)00323-2

24. Churchill, S. A., Yew, S. L., & Ugur, M. (2015). *Effects of Government Education and Health Expenditures on Economic Growth: A Meta-analysis Sefa*. *Monash Business School, DISCUSSION PAPER 40/15*.

25. Connolly, M. P., & Postma, M. J. (2010). Health care as an investment: Implications for an era of ageing populations. *Journal of Medical Marketing*, *10*(1), 5–14. https://doi.org/10.1057/jmm.2009.43

26. Cuaresma, J. C., Lutz, W., & Sanderson, W. (2009). The Dynamics of Age Structured Human Capital and Economic Growth. In *New Directions in the Economic Analysis of Education Milton Friedman Institute, University of Chicago November 20-21, 2009*.

27. Dang, A., Likhar, N., & Alok, U. (2016). Importance of Economic Evaluation in Health Care: An Indian Perspective. *Value in Health Regional Issues*, 78–83. http://dx.doi.org/10.1016/j.vhri.2015.11.005

28. Dauda, R. S. (2011). Health as a Component of Human Capital Formation : Does it Matter for the Growth of the Nigerian Economy ? *Canadian Social Science*, *7*(4), 207–218. https://doi.org/10.3968/j.css.1923669720110704.185

29. Day, C., & Dowrick, S. (2004). Ageing economics: human capital, productivity and fertility. *Agenda: A Journal of Policy Analysis and Reform*, *11*(1), 1–20.

30. Edeme, R. K. (2014). Analyzing the Effects of Sectoral Public Spending On Human Development in Nigeria : Evidence from Panel Data. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, *19*(9), 1–13.

31. Edeme, R. K., Emecheta, C., & Omeje, M. O. (2017). Public Health Expenditure and Health Outcomes in Nigeria. *American Journal of Biomedical and Life Sciences*, *5*(5), 96. https://doi.org/10.11648/j.ajbls.20170505.13

32. Eigbiremolen, G. O., & Anaduaka, U. S. (2014). Human Capital

Development and Economic Growth: The Nigeria Experience. *International Journal of Academic Research in Business and Social Sciences*, *4*(4), 25–35. https://doi.org/10.6007/IJARBSS/v4-i4/749

33. Ejere, E. S. I. (2011). Human Capital Formation as Catalyst for National Development: Nigeria in Perspective. *International Business and Management*, *2*(2), 98–104.

34. Emmanuel, O. N. B., Vukenkeng, A. W., & Emmanuel, S. M. P. (2014). Mechanisms of the Influence of Human Capital on Economic Growth : A Panel Data Analysis of the Cemac Region. *Asian Economic and Financial Review*, *4*(5), 625–640.

35. Eurostat. (2019). Population: Structure indicators. Retrieved from http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=teina225&plugin=1

36. Fayissa, B., & Traian, A. (2011). Estimation of a Health Production Function: Evidence from East -European Countries, 25.

37. Fleisher, B., Li, H., & Zhao, M. Q. (2010). Human capital, economic growth, and regional inequality in China. *Journal of Development Economics*, *92*(2), 215–231. https://doi.org/10.1016/j.jdeveco.2009.01.010

38. Frankenberg, E., & Thomas, D. (2017). *Human Capital and Shocks: Evidence on Education, Health and Nutrition. National Bureau Of Economic Research. Working Paper 23347*.

39. Frimpong, A. O. (2014). Health as an Investment Commodity: A Theoretical Analysis. *Journal of Behavioural Economics, Finance, Entrepreneurship, Accounting and Transport*, *2*(3), 58–62.

40. Fujii, T. (2018). Sources of health financing and health outcomes: A panel data analysis. *Health Economics*, *27*(12), 1996–2015. https://doi.org/10.1002/hec.3817

41. Garavan, T. N., Ardichvili, A., Zavyalova, E., & Minina, V. (2012). Human capital development: Comparative analysis of BRICs. *European Journal of Training and Development*, *36*(2–3), 213–233. https://doi.org/10.1108/03090591211204724

42. Gardner, H. H., & Gardner, B. D. (2001). Health as Human Capital: Theory and Implications. A New Management Paradigm. In *HCMS Group.* (pp. 1–19).

43. Gatti, R. V., Kraay, A. C., Avitabile, C., Collin, M. E., Dsouza, R., & Dehnen, N. A. P. (2018). *Human Capital: A Project for the World*. *Paper prepared by the World Bank Group for the October 13, 2018 Development Committee Meeting.*

44. Gebrehiwot, K. G. (2016). The Impact of Human Capital Development on Economic Growth in Ethiopia: Evidence from ARDL Approach to Co-Integration. *Bahir Dar Journal of Education*, *16*(1), 34–55.

45. Gižienė, V., & Simanavičienė, Ž. (2012). Žmogiškojo kapitalo

vertinimo koncepcija. *Busines Systems and Economics*, *2*(1), 116–131.

46. Godelytė, L., & Korsakienė, R. (2015). Mažų ir vidutinių įmonių internacionalizacija ir žmogiškasis kapitalas. *Mokslas-Lietuvos Ateitis. Verslas XXI Amžiuje*, *7*(2), 157–162.

47. Goldin, C. (2014). Human Capital.

48. Guangfeng, Y. E., & Xia, Z. (2012). Measurement Model on Human Capital Cost of Enterprise. *International Business and Management*, *5*(2), 138–141. https://doi.org/10.3968/j.ibm.1923842820120502.Z0961

49. Gupta, S., Verhoeven, M., & Tiongson, E. R. (2002). The effectiveness of government spending on education and health care in developing and transition economies. *European Journal of Political Economy*, *18*(4), 717–737. https://doi.org/10.1016/S0176-2680(02)00116-7

50. Gyimah-Brempong, K., & Wilson, M. (2004). Health human capital and economic growth in Sub-Saharan African and OECD countries. *Quarterly Review of Economics and Finance*, *44*(2), 296–320. https://doi.org/10.1016/j.qref.2003.07.002

51. Harpan, I., & Draghici, A. (2014). Debate on the Multilevel Model of the Human Capital Measurement. *Procedia - Social and Behavioral Sciences*, *124*(0), 170–177. https://doi.org/10.1016/j.sbspro.2014.02.474

52. Hartwig, J. (2010). Is health capital formation good for long-term economic growth? - Panel Granger-causality evidence for OECD countries. *Journal of Macroeconomics*, *32*(1), 314–325. https://doi.org/10.1016/j.jmacro.2009.06.003

53. Hjerppe, R., Hämäläinen, P., Kiander, J., & Viren, M. (2007). Do government expenditures increase private sector productivity?: Cross-country evidence. *International Journal of Social Economics*, *34*(5), 345–360. https://doi.org/10.1108/03068290710741598

54. Houghton, E. (2017). *Human capital analytics and reporting: exploring theory and evidence*. Retrieved from https://www.cipd.co.uk/Images/human-capital-analytics-and-reporting_tcm18-22281.pdf

55. Ilegbinosa, I. A. (2013). Human Capital Investment as an Effective Tool for Economic Development in Nigeria. *International Journal of Management and Business Studies*, *9519*(2000), 7–13.

56. Jaba, E., Balan, C. B., & Robu, I.-B. (2014). The Relationship between Life Expectancy at Birth and Health Expenditures Estimated by a Cross-country and Time-series Analysis. *Procedia Economics and Finance*, *15*(14), 108–114. https://doi.org/10.1016/s2212-5671(14)00454-7

57. Jebeli, H., & Hadian, S. (2019). Study of health resource and health outcomes: Organization of economic corporation and development panel data analysis. *Journal of Education and Health Promotion*, *8*(70).

58. Jermolajeva, E., & Znotiņa, D. (2008). Investments in the Human Capital for Sustainable Development, (1971), 1–17.

59. Jivan, A., & Toth, M. (2012). Dimensions of Human Capital - Specific Health Approach of Nations Capital. *Annals of the University of Oradea, Economic Science Series*, *21*(1), 312–317.

60. Jones, R., & Chiripanhura, B. (2010). Measuring the UK's human capital stock. *Economic & Labour Market Review*, *4*(11), 36–63. https://doi.org/10.1057/elmr.2010.155

61. Jozičić, K. J., & Škare, M. A review of theoretical and empirical research on human capital quality in Croatia, Review of Innovation and Competitiveness 67–96 (2016).

62. Juščius, V., & Adaškevičiūtė, E. (2010). Žmogiškojo kapitalo vaidmuo formuojant Lietuvos įmonių konkurencinį pranašumą. *Organizacijų Vadyba: Sisteminiai Tyrimai*, *56*, 33–46.

63. Kairo, I. C., Mang, J. N., Okeke, A., Augustine, A., & Aondo, C. (2017). Government Expenditure and Human Capital Development in Nigeria: an Auto-Regressive Distributed Lagged Model Approach (ARDL). *International Journal of Advanced Studies in Economics and Public Sector Management*, *5*(1), 143–158.

64. Kanayo, O. (2013). The Impact of Human Capital Formation on Economic Growth in Nigeria. *Economics*, *4*(2), 121–132. https://doi.org/10.1016/S2212-5671(15)00258-0

65. Keene, L. (2010). *New Zealand's ageing population and health expenditure*. *Wellington: New Zealand Council of Trade Unions*. Retrieved from http://union.org.nz/sites/union/files/Working Paper on Health No 1.pdf

66. Kgakge-Tabengwa, G. G. (2014). Impact of Shocks to Public Debt and Government Expenditure on Human Capital and Growth in Developing Countries. *Journal of Economics and Behavioral Studies*, *6*(1), 44–67.

67. Kim, T. K., & Lane, S. R. (2013). Government Health Expenditure and Public Health Outcomes : A Comparative Study among 17 Countries and Implications for US Health Care Reform. *American International Journal of Contemporary Research*, *3*(9), 8–13.

68. Kokotovic, F. (2016). A Panel Regression Analysis of Human Capital Relevance in Selected Scandinavian and Se European Countries. *UTMS Journal of Economics*, *7*(1), 13–24.

69. Konara, P., & Wei, Y. (2019). The complementarity of human capital and language capital in foreign direct investment. *International Business Review*, *28*(2), 391–404. https://doi.org/10.1016/j.ibusrev.2018.10.009

70. Kucharčíková, A. (2011). Human Capital – Definition and Approaches. *Human Resource Management & Ergonomic*, *5*(2), 60–70.

71. Kucharčíková, A., Tokarčíková, E., & Blašková, M. (2015). Human Capital Management – Aspect of the Human Capital Efficiency in University Education. *Procedia - Social and Behavioral Sciences*, *177*(July 2014), 48–60. https://doi.org/10.1016/j.sbspro.2015.02.332

72. Kudrna, G., & Woodland, A. (2006). Economic effects of population growth and ageing in Australia. In *Population Growth and Ageing* (pp. 41–55).

73. Kuliešis, G., Pareigienė, L., & Naus, I. (2012). *Kaimo žmogiškojo kapitalo raida*. Lietuvos agrarinės ekonomikos institutas.

74. Kwon, D.-B. (2009). Human capital and its measurement. The 3rd OECD World Forum on 'Statistics, Knowledge and Policy'Charting Progress, Building Visions, Improving Life. In *The 3rd OECD World Forum on 'Statistics, Knowledge and Policy'Charting Progress, Building Visions, Improving Life Busan, OECD World Forum, Korea, October* (pp. 1–15).

75. Landau, D. L. (1997). Government expenditure, human capital creation and economic growth. *Journal of Public Budgeting, Accounting & Financial Management*, *9*(3), 467.

76. Lee, J. W., & Lee, H. (2016). Human capital in the long run. *Journal of Development Economics*, *122*, 147–169. https://doi.org/10.1016/j.jdeveco.2016.05.006

77. Lee, R., & Mason, A. (2010). Fertility, Human Capital, and Economic Growth over the Demographic Transition. *European Journal of Population*, *26*(2), 159–182. https://doi.org/10.1007/s10680-009-9186-x

78. Lim, S. S., Updike, R. L., Kaldjian, A. S., Barber, R. M., Cowling, K., York, H., … Murray, C. J. L. (2018). Measuring human capital: a systematic analysis of 195 countries and territories, 1990–2016. *The Lancet*, *392*(10154), 1217–1234. https://doi.org/10.1016/S0140-6736(18)31941-X

79. Lopreite, M., & Mauro, M. (2017). The effects of population ageing on health care expenditure: A Bayesian VAR analysis using data from Italy. *Health Policy*, *121*(6), 663–674. https://doi.org/10.1016/j.healthpol.2017.03.015

80. Lye, J., & Hirschberg, J. (2010). Alcohol consumption and human capital: a retrospective study of the literature. *Journal of Economic Surveys*, *24*(2), 309–338. https://doi.org/10.1111/j.1467-6419.2009.00616.x

81. Mačiūlytė-Šniukienė, A., & Matuzevičiūtė, K. (2018). Impact of Human Capital Development on Productivity Growth EU Member States. *Business, Management and Education*, *16*(1), 1–12.

82. Mahony, M. O., & Samek, L. (2016). Health and Human Capital. In *34th IARIW General Conference*. Retrieved from http://www.iariw.org/dresden/omahony.pdf

83. Mandiefe, S. P., & Chupezi, J. T. (2015). Contribution of Public Health Investments to the Economic Growth of Cameroon. *Business and*

Economics Journal, *6*(4), 1–9.

84. Marešová, P., Mohelská, H., & Kuča, K. (2015). Economics Aspects of Ageing Population. *Procedia Economics and Finance*, *23*(October 2014), 534–538. https://doi.org/10.1016/S2212-5671(15)00492-X

85. Mason, A., Lee, R., & Jiang, J. X. (2016). Demographic dividends, human capital, and saving. *The Journal of the Economics of Ageing*, *7*, 106–122. https://doi.org/10.1016/j.jeoa.2016.02.004

86. Matovac, A. V., Bilas, V., & Franc, S. (2010). Understanding the Importance of Human Capital and Labor Market Competitiveness in the EU Candidate Countries and Selected EU Members. *Ekon. Misao Praksa DBK. God XIX*, *2*, 359–382.

87. Mei-ling, S. (2014). Empirical analysis on the relationship between human capital investment and economic growth in rural areas : Based on the data of Henan. *Journal of Chemical and Pharmaceutical Research*, *6*(3), 378–382.

88. Mexican Commission on Macroeconomics and Health. (2004). *Investing in Health for Economic Development. Executive Summary.* Retrieved from http://www.who.int/macrohealth/action/sintesis15novingles.pdf

89. Mukhambetova, L., Turekulova, D., Tulemissov, O., Issabekov, B., Baigabulova, K., Auezova, K., & Chimgentbayeva, G. (2016). Conditions and Factors of Competetive Human Capital Development in Kazakhstan. *International Journalof Economic Perspective*, *10*(3), 176–187.

90. Ndugbu, M. ., Osuka, B. ., & Duruechi, A. . (2018). Public Sector Investments and Human Capital Development in Nigeria : 1981 – 2016. *IIARD International Journal of Economics and Business Management*, *4*(2).

91. Neeliah, H., & Seetanah, B. (2016). Does human capital contribute to economic growth in Mauritius? *European Journal of Training and Development*, *40*(4), 248–261. https://doi.org/10.1108/EJTD-02-2014-0019

92. Nistor, A. (2007). Implications of Human Capital Public Investments for Regional Unemployment in Indiana. *The Journal of Regional Analysis & Policy*, *37*(3), 279–286.

93. Nixon, J., & Ulmann, P. (2006). The relationship between health care expenditure and health outcomes: Evidence and caveats for a causal link. *European Journal of Health Economics*, *7*(1), 7–18. https://doi.org/10.1007/s10198-005-0336-8

94. Novignon, J., Olakojo, S. A., & Nonvignon, J. (2012). The effects of public and private health care expenditure on health status in sub-Saharan Africa: new evidence from panel data analysis. *Health Economics Review*, *2*(1), 22. https://doi.org/10.1186/2191-1991-2-22

95. Ogundari, K., & Awokuse, T. (2018). Human capital contribution to economic growth in Sub-Saharan Africa: Does health status matter more than education? *Economic Analysis and Policy*, *58*, 131–140. https://doi.org/10.1016/j.eap.2018.02.001

96. Okafor, C. N., Ogbonna, K. S., & Okeke, C. I. (2017). An Economic Analysis of Government Expenditure on Human Capital Development And Economic Growth In Nigeria. *IIARD International Journal of Banking and Finance Research*, *3*(2), 1–14.

97. Olaniyani, D. A., Okemakinde, T. (2008). Human Capital Theory: Implication for Educational Development. *Pakistan Journal of Social Sciences. Medwell Journals*, *5*(5), 479–483.

98. Omankhanlen, A. E., Ogaga-Oghene, J., Obarisiagbon, E. I., & Okorie, U. E. (2014). The Nigerian Government Expenditure on Human Capital Development : an Efficiency Analysis. *European Journal of Business and Social Sciences*, *3*(7), 1–13.

99. Opreana, A., & Mihaiu, D. M. (2010). Correlation Analysis Between the Health System and Human Development Level Within the European Union. *International Journal of Trade, Economics and Finance, 2*(2), 99–102.

100. Orji, O. I., Nwokoye, E. S., & Udu, A. A. (2017). Does Government Human Capital Spending Contribute To Human Capital Development ? – Evidence From Nigeria. *International Journal of Sciences and Research*, *73*(8), 135–156.

101. Oster, E., Shoulson, I., & Dorsey, E. R. (2013). Limited Life Expectancy, Human Capital and Health Investments. *American Economic Review*, *103*(5), 1977–2002.

102. Pelinescu, E. (2015). The Impact of Human Capital on Economic Growth. *Procedia Economics and Finance*, *22*(November 2014), 184–190. https://doi.org/10.1016/S2212-5671(15)00258-0

103. Perepelkin, V. A., Perepelkina, E. V., & Morozova, E. S. (2016). Evolution of the concept of "Human Capital" in economic science. *International Journal of Environmental and Science Education*, *11*(15), 7649–7658.

104. Piabuo, S. M., & Tieguhong, J. C. (2017). Health expenditure and economic growth - a review of the literature and an analysis between the economic community for central African states (CEMAC) and selected African countries. *Health Economics Review*, *7*(1), 23. https://doi.org/10.1186/s13561-017-0159-1

105. Popova, E. (2014). Social model type as a determinant of human capital. *Прикладная Информатика*, *2*(50), 115–123.

106. Popova, Y. (2014). Functional Dependencies of the Human Capital Factors. *Economics and Management*, *18*(4), 816–828.

https://doi.org/10.5755/j01.em.18.4.4208

107.Potelienė, S., & Tamašauskienė, Z. (2014). Žmogiškojo kapitalo konceptualizacija: raida, samprata ir formavimas. *Business Systems & Economics*, *4*(1), 89–106. https://doi.org/10.13165/VSE-14-4-1-08

108.Praise, U. I., & George-Anokwuru, C. C. (2018). Empirical Analysis of Determinants of Human Capital Formation : Evidence from the Nigerian Data. *Journal of World Economic Research*, *7*(2), 73–81. https://doi.org/10.11648/j.jwer.20180702.14

109.Prettner, K., Bloom, D. E., & Strulik, H. (2013). Declining fertility and economic well-being: Do education and health ride to the rescue? *Labour Economics*, *22*, 70–79. https://doi.org/10.1016/j.labeco.2012.07.001

110.Rahman, M. M., Khanam, R., & Rahan, M. (2018). Health care expenditure and health outcome nexus : New evidence from the SAARC-ASEAN region. *Globalization and Health*, *14*(113), 1–30. https://doi.org/10.1186/s12992-018-0430-1

111.Razmi, M. J., Abbasian, E., & Mohammadi, S. (2012). Investigating the Effect of Government Health Expenditure on HDI in Iran. *Journal of Knowledge Management, Economics and Information Technology*, *2*(5), 1–13.

112.Roupelienė, A., & Lukė, R. (2017). Factors affecting human capital formation in logistics enterprices. In *Proceedings of the 8th International Scientific Conference Rural Development 2017* (pp. 2–7).

113.Sapuan, N. M., & Sanusi, N. A. (2008). Assessing the Effect of Public Social Expenditure and Human Capital Development on Malaysian Economic Growth : A Bound Testing Approach. *Knowledge Management. International Conference*, 78–82.

114.Sapuan, N. M., & Sanusi, N. A. (2013). Cointegration Analysis of Social Services Expenditure and Human Capital Development in Malaysia: a Bound Testing Approach. *Journal of Economic Cooperation and Development*, *34*(1), 2013.

115.Schultz, T. W. (1972). Human Capital: Policy Issues and Research Opportunities. *Economic Research: Retrospect and Prospect*, *6*, 1–84.

116.Serban, A. C. (2012). Aging Population and Effects on Labour Market. *Procedia Economics and Finance*, *1*(12), 356–364. https://doi.org/10.1016/S2212-5671(12)00041-X

117.Shuaibu, M., & Oladayo, P. T. (2016). Determinants of Human Capital Development in Africa : A Panel Data Analysis. *Oeconomia Copernicana*, *7*(4), 523–549. http://dx.doi.org/10.12775/OeC.2016.030

118.Silcock, D., & Sinclair, D. (2012). *The cost of our ageing society*.

119.Šileika, A., & Tamašauskienė, Z. (2003). Investicijos į žmogiškąjį

kapitalą ir jų efektyvumas. *Ekonomika*, *64*, 146–157.

120. Smith, K. V, & Goldman, N. (2007). Socioeconomic differences in health among older adults in Mexico. *Social Science & Medicine*, *65*, 1372–1385. https://doi.org/10.1016/j.socscimed.2007.05.023

121. Solaki, M. (2013). Relationship Between Education and GDP Growth : A Bi-variate Causality Analysis for Greece. *International Journal of Economic Practices and Theories*, *3*(2), 133–139.

122. Son, H. H. (2010). Human capital development. *Asian Development Review*, *27*(2), 29–56.

123. Spijker, J. (2015). Alternative Indicators of Population Ageing. In *Vienna Institute of Demography Working Papers 4/2015.* (pp. 1–37).

124. Sudirman, M. Z. M. (2017). The Effect of Government Expenditures in Education and Health against Human Development Index in Jambi Province. *The International Journal of Social Sciences and Humanities Invention*, *4*(8), 3823–3829.

125. Sun, H. P., Sun, W. F., Geng, Y., & Kong, Y. S. (2018). Natural resource dependence, public education investment, and human capital accumulation. *Petroleum Science*, *15*(3), 657–665. https://doi.org/10.1007/s12182-018-0235-0

126. Šurkienė, G., Stukas, R., Alekna, V., & Melvidaitė, A. (2012). Populiacijos senėjimas kaip visuomenės sveikatos problema. *Gerontologija*, *13*(4), 235–239.

127. Tamašauskienė, Z., Šileika, A., & Masėnienė, L. (2008). Investicijų į žmogiškąjį kapitalą ir jų grąžos tyrimas UAB "ARKARA." *Ekonomika ir Vadyba: Aktualijos ir Perspektyvos*, *3*(12), 346–357.

128. Tao, H.-L., & Stinson, T. F. (1997). An Alternative Measure of the Human Capital Stock. *Economic Development Center*, *97*(1), 1–31.

129. Tchanturia, N., Beridze, T., & Kurashvili, G. (2015). Features of Development of the Human Capital in Georgia. *Procedia - Social and Behavioral Sciences*, *213*, 580–585. https://doi.org/10.1016/j.sbspro.2015.11.453

130. Teixeira, A. A. C., & Queirós, A. S. S. (2016). Economic growth, human capital and structural change: A dynamic panel data analysis. *Research Policy*, *45*(8), 1636–1648. https://doi.org/10.1016/j.respol.2016.04.006

131. Tiruneh, M. W., & Radvansky, M. (2011). The Contribution of Human capital to European Economic Growth : An empirical exploration from a panel data. In *EcoMod2011, No. 3264*.

132. Torruam, J. T., & Abur, C. C. (2014). Public Expenditure on Human Capital Development as a Strategy for Economic Growth in Nigeria : Application of Co Integration and Causality Test Analysis. *International Journal of Research in Humanities and Social Studies*, *1*(2), 14–23.

133.Umaru, A. (2011). Human capital:Education and Health in Economic Growth and Development in Nigerian Economy. *British Journal of Economics, Finance and Management Sciences*, *2*(1), 22–36.

134.UNECE Task Force on Measuring Human Capital. (2016). Guide on Measuring Human Capital, (January), 27–29. Retrieved from https://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/2016/mtg/HumanCapitalGuide_CES-Consult.pdf

135.United Nations Development Programme. (2018). Human Development Index and its components. Retrieved from http://hdr.undp.org/en/composite/HDI

136.Villa, K. M. (2017). Multidimensional human capital formation in a developing country: Health, cognition and locus of control in the Philippines. *Economics and Human Biology*, *27*, 184–197. https://doi.org/10.1016/j.ehb.2017.06.003

137.Vogl, T. S. (2012). Education and Health in Developing Economies, (December), 1–20. http://dx.doi.org/10.1016/B978-0-12-375678-7.00109-7

138.Wolff, E. N. (2000). Human capital investment and economic growth: Exploring the cross-country evidence. *Structural Change and Economic Dynamics*, *11*(4), 433–472. https://doi.org/10.1016/S0954-349X(00)00030-8

139.World Bank. World Development Indicators. (2019). World Development Indicators. Retrieved from https://databank.worldbank.org/source/world-development-indicators/Type/TABLE/preview/on

140.Zakharova, O., & Kratt, O. (2014). Economic Study and Risk Estime of the Investment in the Human Capital. *Economics & Sociology*, *7*(2), 94–108. https://doi.org/10.14254/2071-789X.2014/7-2/8

141.Znotina, D. (2014). Human capital formation and factors influencing it in Latvia. Retrieved from http://gisap.eu/node/804

PUBLIKACIJOS

1. Čiutienė, R., Railaitė, R. (2014). Challenges of managing an ageing workforce. In *Procedia social and behavioral sciences: 19th international scientific conference economics and management 2014, ICEM-2014, 23-25 April 2014, Riga, Latvia* (vol. 156, p. 69-73). Amsterdam: Elsevier. doi:10.1016/j.sbspro.2014.11.121
2. Čiutienė, R., Railaitė, R. (2014). Vyresnio amžiaus darbuotojų senėjimo valdymo darbinėje aplinkoje ypatumai. *Ekonomika ir vadyba: aktualijos ir perspektyvos: mokslo darbai,* 2, p. 29-36
3. Čiutienė, R., Railaitė, R. (2015). A development of human capital in the context of an aging population. *In Procedia social and behavioral sciences: 20th international scientific conference economics and management 2015 (ICEM-2015)*, 213, p. 753-757). Amsterdam: Elsevier. doi:10.1016/j.sbspro.2015.11.463
4. Čiutienė, R.; Railaitė, R. (2015). Age management as a means of reducing the challenges of workforce aging. *Inžinerinė ekonomika/ Engineering economics*, 26 (4), p. 391-397. doi: 10.5755/j01.ee.26.4.7081.
5. Railaitė, R. (2016). Žmogiškojo kapitalo formavimosi veiksniai globalios ekonomikos sąlygomis. *Žmogiškųjų išteklių valdymo aktualijos: mokslinių straipsnių rinkinys [elektroninis išteklius],* p.36-42
6. Railaitė, R., Čiutienė, R. (2020). The impact of public health expenditure on health component of human capital. *Inžinerinė ekonomika/ Engineering economics* (publikavimo procese, pažyma Nr. 293).

PRANEŠIMAI MOKSLINĖSE KONFERENCIJOSE

1.Žmogiškųjų išteklių valdymo aktualijos: respublikinė mokslinė konferencija. 2015 m. kovo 17 d., Vilniaus universiteto Kauno humanitarinis fakultetas. Pranešimo tema: *Žmogiškojo kapitalo formavimosi veiksniai globalios ekonomikos sąlygomis*;
2. International Scientific Conference Economics and Management – 2015, ICEM, 2015, gegužės 6-8 d. Kaunas. Pranešimo tema: *A Development of Human Capital in the Context of an Aging Population*;
3. Baltic Dynamics 2015:XX Anual International Conference 2015 gegužės 27-29 d., Kaunas. Pranešimo tema: *Challenges of an aging society*;
4. Social Transformations in Contemporary Society 2015: International Scientific Conference for Young Researchers, STICS 2015, 2015 birželio 4-5 d., Mykolo Romerio universitetas. Pranešimo tema: *Population aging and its impact areas*;
5. Social Transformations in Contemporary Society 2016: International Scientific Conference for Young Researchers, STICS 2016, 2016 birželio 2-3 d., Mykolo

Romerio universitetas. Pranešimo tema: *Health care expenditure in the context of an aging population*;
6. 13th international scientific Prof. Vladas Gronskas' conference for young researchers "Development in Economics: Theory and Practice" 2016 m. gruodžio 9 d., Kaunas. Pranešimo tema: *The Benefits of Health Investment in the Context of Ageing Population*;
7. Slaugos proceso normavimas: iššūkiai ir galimybės. Seminaras/ kūrybinės dirbtuvės. 2017 m. balandžio 26d. Kauno technologijos universitetas. Pranešimo tema: *Kaštų naudos analizės metodas sveikatos priežiūros įstaigų sprendimams*;
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REZIUMĖ

Temos aktualumas

Visuomenės senėjimo tema pastaruoju metu susilaukia nemenko įvairių sričių tyrėjų, kurie akcentuoja šio reiškinio keliamus iššūkius, dėmesio. Moksliniuose šaltiniuose, kuriuose analizuojama visuomenės senėjimo tematika, akcentuojamas šio reiškinio poveikis ekonomikai bei individų ekonominei elgsenai (Kudrna, Woodland, 2006; Mason, Lee, Jiang, 2016). Anot Lopreite, Mauro (2017), šis reiškinys veikia visas šalies gyvenimo sritis, pradedant ekonomikos augimu, mokesčių sistema, sveikata, migracija bei baigiant šeimos sudėtimi. Visuomenei senėjant kinta studijuojančių ir išeinančiųjų į pensiją proporcinė dalis. Praradus balansą tarp jaunų ir vyresnio amžiaus grupių, tai atitinkamai paveikia šalies ekonominius rodiklius. Šis poveikis pasireiškia per darbo jėgos dydžio kitimą (Boucekkine, De La Croix ir Licandro, 2002). Kintanti demografinė situacija skatina didesnį dėmesį skirti esamos darbo jėgos sveikatai, vyresnio amžiaus asmenų aktyvesniam dalyvavimui darbo rinkoje (Suhrcke ir kt., 2005). Visuomenei senstant dar didesnis reikšmingumas suteikiamas žmogiškajam kapitalui (toliau – ŽK) bei jo tobulinimui. Remiantis Spijker'iu (2015), ŽK išskiriamas kaip svarbus veiksnys, padedantis sumažinti neigiamą visuomenės senėjimo poveikį šalyje. Kita vertus, visuomenės senėjimas

išskiriamas kaip labiau nei mirštamumas ŽK neigiamą poveikį darantis veiksnys (UNECE Task Force on Measuring Human Capital, 2016).

ŽK koncepcija itin dažnai analizuojama akcentuojant šios kapitalo formos teigiamą įtaką įvairioms visuomeninio gyvenimo sritims: šalies ekonomikos augimui, darbuotojų produktyvumui, jų gaunamoms pajamoms, visuomenės gyvenimo kokybei ir kt. Mokslinėje literatūroje ne tik gausu skirtingų teigiamo ŽK poveikio akcentų, tačiau skirtingai apibrėžiama ir pati ŽK sąvoka. Gana dažna ŽK sampratos aiškinimo kryptis – ŽK apibrėžimas išskiriant pagrindines jo dedamąsias: išsilavinimą, žinias, patirtį, įgūdžius, sveikatą ir kt.

Tačiau sveikatos dedamoji ŽK kontekste vis dar interpretuojama įvairiai. Sveikata įvardijama tiek kaip ŽK sudėtinis elementas, apibūdinamas sąvokomis ŽK dimensija, ŽK komponentas, ŽK elementas ar kaip ŽK veikiantis veiksnys. Lee ir kt. (2007) sveikatą įvardija kaip vieną iš ŽK koncepcijos sudedamųjų dalių, kita vertus, šie autoriai geresnę sveikatą išskiria kaip sąlygą ŽK formuoti. Sveikata – tai ne tik viena pagrindinių ŽK dedamųjų, tačiau, anot Bučinsko (2012), taip pat ir reikšmingas veiksnys, lemiantis ŽK panaudojimo efektyvumą bei ilgaamžiškumą. Remiantis Villa (2017), sveikata yra svarbi formuojant kitas ŽK sritis. Pabrėžiama ir tai, kad ŽK sritys tarpusavyje yra susijusios: sveikata veikia švietimo rezultatus, o kognityviniai gebėjimai veikia individų sveikatos elgseną.

Mokslinės literatūros analizė atskleidžia, jog investicijos į švietimą yra viena dažniausiai minimų investicijų į ŽK kryptis, tačiau taip pat ne mažiau reikšmingos yra investicijos į sveikatą. Šių investicijų svarbą tobulinant ir plėtojant ŽK akcentuoja Schultz'as (1972), Dauda (2011), Gižienė ir Simanavičienė (2012), Tchanturia, Beridze ir Kurashvili (2015), Ilegbinosa (2013) cit. Gbosi (2007), Shuaibu ir Oladayo (2016), Mačiūlytė-Šniukienė ir Matuzevičiūtė (2018), Ejere (2011), Praise ir George-Anokwuru (2018) ir kt. Lyginant moksliniuose šaltiniuose pateikiamą informaciją galima teigti, jog dažnai empiriniuose tyrimuose analizuojant ŽK, dėmesys skiriamas tik su švietimu susijusiems ŽK elementams bei investicijoms į šią sritį, o sveikata, kaip reikšminga ŽK dedamoji, yra įtraukiama kur kas rečiau (Amadu, Eseokwea ir Ngambi, 2017; Becker, 2007; Churchil, Yew ir Ugur, 2015; Cuaresma, Lutz ir Lutz, 2009; Gyimah-Brempong, Wilson, 2004; Jones ir Chiripanhura, 2010; Prettner ir kt., 2013; Razmi, Abbasian ir Mohammadi 2012). Tačiau pabrėžiama ir tai, jog pastaruoju metu pastebima teigiamų pokyčių.

Sveikatos reikšmingumas literatūroje aprašomas išskiriant keletą aspektų. Frimpong'as (2014) pabrėžia, jog „be sveikatos darbo jėga negali transformuoti turimų žinių į prekių ir paslaugų gamybą" (p. 58). Nustatyta, kad sveikata įvairiais būdais veikia darbo rinką, t. y., jos kiekį ir kokybę, darbo jėgos produktyvumą bei kūrybiškumą, laiką, kuris gali būti skiriamas ekonominei veiklai (galimybę ilgiau dirbti iki išėjimo į pensiją, išvengti ligų bei joms skiriamo laiko) (Connolly, Postma, 2010). Ilgesnis laikas, kuris gali būti skiriamas darbui, remiantis Grossmano žmogiškojo kapitalo modeliu, apibūdinamas kaip vienas iš būdų,

kuriais sveikata didina ŽK. Akcentuodami tai, Homaie Rad'as ir kt. (2014) pabrėžia investicijų į sveikatą svarbą šalies lygmeniu bei teigia, jog viešosios sveikatos išlaidos, veikdamos visuomenės narių sveikatą, padidina ŽK.

ŽK formavimo bei tobulinimo metu svarbų vaidmenį turi valdžios sektorius. Valdžios sektoriaus reikšmingumas pasireiškia keliais būdais. Žvelgiant iš švietimo dedamosios perspektyvos, Annabi'is, Harvey ir Lan'as (2011) pabrėžia, jog valdžios sektorius teikia lėšas švietimui bei moksliniams tyrimams. Analogišką sąsają galima identifikuoti ir kalbant apie sveikatos dedamąją. Kita vertus, šios srities analizė yra glaudžiai susijusi su šalies plėtra, o gyventojų sveikata yra ne menką dalį užimanti valstybės politikos sritis. Bučinskas (2012) teigia, jog skirtingos valstybės pasirenka skirtingas turimų lėšų investavimo strategijas. Analizuojant investicijų į sveikatą klausimą, akcentuotina tai, kad valstybės finansuojamoje sveikatos apsaugos sistemoje panaudojami riboti ištekliai, todėl itin svarbu šiuos išteklius skirti efektyvioms ir visuomenės poreikius atitinkančioms sveikatos intervencijoms (Dang, Likhar, Alok, 2008). Literatūroje taip pat pabrėžiama optimalaus išteklių panaudojimo, siekiant maksimizuoti gyventojų sveikatą, svarba. Teigiama, kad nuolat atsirandant alternatyvoms, nukreiptoms į prevenciją ar gydymą, asmenys, priimantys sveikatos apsaugos sprendimus, turi gebėti paskirstyti ribotus išteklius ir tai atlikti sistemiškai, o ne intuityviai (Eichler, Kong, Gerth, Mavros ir Jönsson, 2004).

Mokslinė problema ir jos ištirtumo lygis

Nepaisant augančio susidomėjimo ŽK, vis dar kyla probleminių klausimų, kurių atsakymai gali teigiamai paveikti šios srities mokslinius tyrimus. Disertacijoje dėmesys kreipiamas į valstybės sektorių bei viešųjų investicijų poveikio ŽK vertinimą visuomenei senėjant, tačiau taip pat verta atkreipti dėmesį, jog šios problemos ištirtumo lygis siejasi su keliomis ŽK bei investicijų į sveikatą analizės kryptimis.

Analizuojant ŽK tematikos literatūrą galima išskirti vieną dažniausiai aprašomų analizės krypčių – ***ŽK bei ekonomikos augimo ryšių analizę***. Teorinio ar empirinio pobūdžio darbuose ŽK bei ekonomikos augimo ryšius mini ar išsamiau analizuoja įvairūs tyrėjai (Adekola, 2014; Awel, 2013; Benhabib ir Spiegel, 1994; Čadil, Petkovová ir Blatná, 2014; Eigbiremolen ir Anaduaka, 2014; Fleisher, Li ir Zhao, 2010; Gebrehiwot, 2016; Gong, Li ir Wang, 2012; Gottheil, 2013; Hanushek, 2013; Kokotovic, 2016; Landau, 1997; Lee ir Lee, 2016; Obialor, 2017; Oluwatoyin, 2012; Pelinescu, 2015; Qadri ir Waheed, 2014; Škare, 2001; Solaki, 2013; Son, 2010; Teixeira ir Queirós, 2016; Thamma–Apiroam, 2018; Tiruneh ir Radvansky, 2011; Torruam ir Abur, 2014; Webber, 2010; Zhang ir Zhuang, 2011) ir kt. Taikant papildytą Solow'o augimo modelį, Mankiw'o, Romer'io, Weil'o gamybos funkciją ir kitus modelius tyrėjai analizuoja ekonomikos augimo ryšius Europos šalyse, Kinijoje, besivystančių šalių grupėje, Nigerijoje, Etiopijoje, Pakistane bei kitose šalyse. Egzistuojančius ŽK ir

ekonomikos augimo ryšių tyrimus galima suskirstyti į kelias grupes: 1) tyrimus, kuriuose analizuojami ekonomikos augimo ir *ŽK, išreikšto per švietimo dedamąją*, ryšiai (Eigbiremolen ir Anaduaka, 2014; Kanayo, 2013; Ogbonna, 2017; Siddiqui ir Rehman, 2017); 2) tyrimus, kuriuose analizuojami ekonomikos augimo ir *ŽK, išreikšto per sveikatos dedamąją*, ryšiai (Hartwig, 2010; Piabuo ir Tieguhong, 2017); 3) tyrimus, kuriuose analizuojami ekonomikos augimo ir *ŽK, išreikšto per švietimo ir sveikatos dedamąsias*, ryšiai (Acaroğlu ir Ada, 2014; Akpolat, 2014; Amadu ir kt., 2017; Bloom, Canning ir Sevilla, 2004; Churchill ir kt., 2015; Emmanuel, Vukenkeng ir Emmanuel, 2014; Gyimah-Brempong ir Wilson, 2004; Landau, 1997; Okafor, Ogbonna ir Okeke, 2017; Olimpia, 2013; Torruam ir Abur, 2014). Nors ŽK bei ekonomikos augimo ryšių tematika yra gana plačiai išanalizuota, tačiau vis dėlto literatūroje išlieka tam tikrų prieštaravimų, susijusių su investicijų į sveikatą svarbos vertinimu. Nors didesnėje mokslinės literatūros dalyje akcentuojama, jog sveikata daro teigiamą poveikį ekonomikos augimui, Mandiefe, Chupezi (2015) teigia, jog šis poveikis pastebimas tik ilguoju laikotarpiu.

Kaip atskirą egzistuojančių tyrimų grupę galima išskirti ***sveikatos kapitalo tyrimų grupę*** (Cropper, 1977; Galama, van Kippersluis, 2013; Hartwig, 2010; Kelly, 2017; Kim ir Wickrama, 2016). Sveikatos kapitalas kaip ir švietimo kapitalas neretai įvardijami kaip sudėtiniai ŽK elementai (Jivan, Toth, 2012).Vienas pagrindinių šios tematikos tyrėjų M. Grossmanas 1972 metais pristatė ŽK modelį, į kurį įtraukta sveikatos paklausos dedamoji bei analizuojami priežastiniai ryšiai tarp formalaus švietimo bei geros sveikatos. Tyrimai grindžiami namų ūkio produkcijos bei naudingumo funkcijomis (Grossman, 2000). Cropper (1977) modeliuose gilinamasi į individo lygmenį bei analizuojami individų motyvai investuoti į sveikatą, tikintis sumažinti ligų tikimybę, o vertinami profesijos pasirinkimo sprendimai siejami su investicija į sveikatą. Nors ši tyrimų kryptis taip pat padarė nemenką indėlį tiriant pasirinktą disertacijos tematinę sritį, tačiau reikia paminėti, kad šie tyrimai daugiau kreipia dėmesį į individo, o ne šalies lygmenį.

Atskirą tyrimų grupę taip pat sudaro ***tyrimai, orientuoti į viešųjų ir (ar) privačiųjų sveikatos išlaidų poveikį sveikatos rezultatams***, tokiems kaip tikėtina gyvenimo trukmė, kūdikių mirtingumas ir pan. (Bein, Olowu ir Kalifa, 2017; Nixon ir Ulmann, 2006; Novignon, Olakojo ir Nonvignon, 2012; Oster, Shoulson ir Dorsey, 2013). Galima teigti, jog tikėtina gyvenimo trukmė dažnu atveju naudojama kaip rodiklis ŽK išreikšti, todėl ši tyrimų grupė taip pat yra reikšminga analizuojant investicijų į sveikatą poveikį ŽK.

Nors investicijų į sveikatą svarba tiriant ŽK paminėta ŽK teorijos klasiko T. W. Schultzo (1972) ir kitų tyrėjų darbuose, tačiau atlikta analizė rodo, jog sveikatos išlaidų poveikis bendram šalies ŽK dydžiui yra analizuotas ne itin plačiai. Analizuojant mokslinę literatūrą identifikuota tyrimų grupė ***analizuojanti sveikatos išlaidų bei ŽK (ar konkrečiai Žmogaus socialinės raidos indekso,***

toliau – ŽSRI) ryšius, ***investicijų efektyvumą ir jų daromą poveikį*** (Edeme, 2014; Ehimare, Ogaga-Oghene ir Obarisiagbon, 2014; Kairo, Mang, Okeke, Augustine ir Dura, 2017; Ndugbu, Osuka ir Duruechi, 2018; Okafor ir kt., 2017; Opreana ir Mihaiu, 2010; Orji, Nwokoye ir Udu, 2017; Razmi ir kt., 2012; Sapuan, Nasional ir Sanusi, 2013; Sudirman, 2017). Analizuojant tirtus atvejus pastebima, jog didžioji tyrimų dalis yra orientuota į besivystančias šalis (Nigeriją, Iraną, Malaiziją). Tyrimų, susijusių su ES šalių atvejais, rasta mažai (pavyzdžiui, Opreana, Mihaiu (2010)).

Skirtingos šalys pasižymi skirtingais turimo ŽK lygmenimis, todėl aktualiu uždaviniu tampa priežasčių, lemiančių šiuos skirtumus, identifikavimas. Daugeliu atveju pritariama, jog sveikata yra reikšminga dedamoji ŽK teorijoje, tačiau kita vertus, literatūroje taip pat identifikuojamas požiūris, jog sveikata yra prigimtinis žmogaus išteklius. Šiuo atveju sveikatos išlaidų poveikis ŽK grindžiamas ne kaupimo principu, o poveikiu siekiant išvengti fizinės būklės pablogėjimo kartu teigiant, jog negali egzistuoti tiesioginė sąsaja tarp šios srities investicijų bei kapitalo dydžio (Soboleva, 2010). Pabrėžiant tai, jog sveikų žmonių sveikatos išlaidų poreikis nėra didelis, taip pat akcentuojama, jog nėra aišku, koks ryšys egzistuoja tarp sveikatos išlaidų ir šios srities rezultatų (Fujii, 2018). Analizuojant literatūros šaltinius pastebima, jog kyla diskusijos dėl didesnių išteklių skyrimo svarbos pervertinimo. Atlikdamas ŽK tyrimus Gatti ir kt. (2018) pabrėžia, jog finansiniai ištekliai yra svarbūs, tačiau jie negarantuoja geresnių rezultatų. Tai literatūroje kelia klausimą, ar tikslinga skirti didesnius išteklius sveikatos srities finansavimui, ar vis dėlto tikslingiau yra didinti šių lėšų panaudojimo efektyvumą. Atsižvelgiant į ankstesnių tyrimų rezultatus vis dar egzistuoja poreikis išsamiau išanalizuoti ŽK bei sveikatai skiriamų viešųjų investicijų ryšį, nustatant ar išties didesni sveikatai skiriami ištekliai sąlygoja aukštesnį ŽK lygį šalyje. Mokslinėje literatūroje pasigendama tyrimų, kuriuose ŽK būtų ne tarpinė grandis investicijų į sveikatą poveikiui ekonomikos augimui paaiškinti, tačiau būtų analizuojamas viešųjų investicijų į sveikatą poveikis pačiam ŽK. Taip pat, įvertinant pokyčius darbo jėgos struktūroje, pasigendama tyrimų, kuriuose analizuojama kaip viešosios investicijos į sveikatą veikia ŽK kai kinta darbo jėgos struktūra, daugėja vyresnio amžiaus asmenų bei atitinkamai paveikiami sveikatos paklausos rodikliai. Tai suponuoja **mokslinę problemą**. *kaip įvertinti, kokį poveikį senėjant visuomenei daro viešosios investicijos į sveikatą ŽK*? Šis tyrimo klausimas suformuluotas atsižvelgiant į teorines Novignon'o ir kt. (2012), Homaie Rad'o ir kt. (2014) prielaidas, jog makroekonominiu lygiu investicijos į sveikatą turėtų veikti ne tik sveikatos sistemos rezultatus, bet ir šalies ŽK.

Tyrimo tikslas – įvertinti viešųjų investicijų į sveikatą poveikį ŽK senėjant visuomenei, sukuriant bei pritaikant vertinimo modelį, apimantį viešąsias investicijas į sveikatą ir kitus išorinius veiksnius, galinčius turėti įtakos ŽK vystymui.

Tyrimo uždaviniai:

1. išanalizuoti ŽK teorinius aspektus, susisteminant ŽK sampratos aiškinimo požiūrius, išskiriant pagrindines ŽK dedamąsias bei pagrindžiant sveikatos kaip vienos iš ŽK dedamųjų reikšmingumą;

2. išnagrinėti ŽK formavimo bei vystymo aspektus, identifikuojant ŽK veikiančius veiksnius bei pagrindines investicijų į ŽK sritis;

3. išanalizuoti ŽK vertinimo aspektus bei identifikuoti tinkamiausius matus šalies ŽK vertinti;

4. parengti viešųjų investicijų į sveikatą poveikio ŽK vertinimo modelį, kartu atsižvelgiant į visuomenės senėjimą;

5. pritaikant sukurtą vertinimo modelį, atlikti viešųjų investicijų į sveikatą poveikio ŽK senėjant visuomenei empirinį tyrimą.

Ginamieji teiginiai

Viešųjų investicijų į sveikatą poveikio ŽK vertinimas visuomenės senėjimo metu yra jautrus pasirenkamam ŽK matui. Atsižvelgiant į ŽK daugiadimensiškumą bei vertinti pasirenkant skirtingus ŽK išreiškiančius rodiklius, identifikuojamos skirtingos poveikio koeficiento reikšmės bei jų statistinis reikšmingumas.

Viešųjų investicijų į sveikatą poveikio ŽK vertinimas yra jautrus pasirenkam šalies atvejui. Skirtingu visuomenės senėjimo lygiu pasižyminčiose šalių grupėse viešųjų investicijų į sveikatą poveikis ŽK skiriasi.

Mokslinio tyrimo metodai

Darbo tikslui ir uždaviniams pasiekti naudoti įvairūs tyrimo metodai. Pirmajame ir antrajame skyriuose analizuojant ŽK bei sveikatos koncepcijos teorinius aspektus bei formuojant vertinimo modelio teorinį pagrindimą atlikta sisteminė, palyginamoji mokslinės literatūros analizė.

Valstybės investicijų į sveikatą poveikiui ŽK kiekybiškai įvertinti panaudoti sekinių duomenys (angl. *panel dates*) ir sudaryti ekonometriniai modeliai. Sekinių duomenų analizei panaudota *Eviews* programinė įranga, su kuria vertintas nesubalansuotų sekinių duomenų rinkinys, jungiantis 28 ES šalis bei 2000–2017 metų laiko eilutes. Poveikiui įvertinti suformuoti mažiausiųjų kvadratų (toliau – OLS), fiksuotojo poveikio (toliau – FE) bei atsitiktinio poveikio (toliau – RE) modeliai. Į modelį įtraukiamų nepriklausomų kintamųjų atranka, grįsta koreliacinių ryšių nustatymu. Suformuoti modeliai leido įvertinti viešųjų investicijų į sveikatą įtaką skirtingais rodikliais išreikštam ŽK bei padaryti išvadas, ar viešųjų investicijų į sveikatą pokyčiai gali paaiškinti ŽK svyravimus skirtingose ES šalyse.

Darbo mokslinis naujumas ir rezultatų praktinė reikšmė

Darbas keliais aspektais praplečia ŽK teorines nuostatas akcentuodamas sveikatos dedamąją bei išteklių skyrimo šiai sričiai svarbą.

- Patikslinta ŽK sąvoka, išryškinanti dažniausiai literatūroje minimas ŽK dedamąsias, jų panaudojimo reikšmę bei atkreipiant dėmesį į investicijų bei išorinių veiksnių įtaką ŽK. Šiame darbe ŽK apibrėžiamas kaip (tam tikru laiko momentu) individe įkūnytų, įgimtų bei panaudojant investicijas sukurtų ir palaikomų žinių, įgūdžių, patirties, sveikatos bei kitų ekonominėje veikloje naudojamų dedamųjų rinkinys, veikiantis asmens produktyvumą bei generuojantis piniginę ir nepiniginę naudą. Šios kapitalo formos kūrimas ir plėtotė grindžiamas investicijų į pagrindines ŽK dedamąsias skyrimu bei kitų išorinių aplinkos veiksnių įtaka.
- Darbe atskleistas sveikatos ir ŽK ryšys, susisteminti skirtingi šiuos ryšius aprašantys požiūriai bei pristatyta jiems apibūdinti vartojamų sąvokų įvairovė. Atkreiptas dėmesys į tai, jog sveikata yra ne tik reikšminga ŽK dedamoji, tačiau veikia kitų ŽK elementų vystymą bei panaudojimą ir yra siejama su ŽK kokybe.
- Mokslinės literatūros sintezė leido detalizuoti investicijų į sveikatą kryptys: sveikatos srities darbo jėga, infrastruktūra ir įrenginiai, sveika mityba bei medicinos priežiūra, prevencija, informavimas su sveikata susijusiais klausimais ir kt., kurios yra siejamos su investavimu į ŽK.
- Atsižvelgiant į tai, jog ŽK formavimas bei vystymas yra veikiamas skirtingų išorinių veiksnių, Lietuvos bei užsienio literatūros šaltinių autorių išskirtos pagrindinės veiksnių, veikiančių ŽK formavimą, grupės bei juos atspindinčių rodiklių sąrašas papildytas tokiais veiksniais: gimstamumas, visuomenės senėjimas, švietimo sistemos kokybė bei jos tobulinimas, šalies socialinis modelis, ekonominės infrastruktūros tobulinimas, skurdo lygis, urbanizacijos lygis, alkoholio vartojimas, rasinė diskriminacija ir kt.
- Sukurtas viešųjų investicijų į sveikatą poveikio ŽK vertinimo modelis, grindžiamas įvesties ir išvesties principu. Įvertinus literatūroje identifikuotas ŽK vertinimo metodologines problemas, viešųjų investicijų į sveikatą poveikį pasiūlyta vertinti panaudojant 4 pasirinktus ŽK rodiklius. Atsižvelgiant į tai, jog Grossmano ŽK modelis bei sveikatos produkcijos funkcija, apimanti skirtingų išorinių veiksnių grupių įtakos vertinimą, yra panaudojama analizuojant sveikatos išlaidų poveikį sveikatos rezultatams (pavyzdžiui, tikėtinai gyvenimo trukmei), į sukurtą vertinimo modelį taip pat įtrauktas ir platesnis išorinių veiksnių įtakos vertinimas.
- Sukurtas modelis praktiškai pritaikytas vertinant situaciją ES šalyse, kuriose pastebima visuomenės senėjimo tendencija. Analizuojamų šalių grupavimas į dvi grupes pagal išlaikomo amžiaus pagyvenusių žmonių koeficiento reikšmes leido palyginti viešųjų investicijų į sveikatą poveikį ŽK skirtinga visuomenės senėjimo raiška pasižyminčiose šalių grupėse.

- Sukurtas vertinimo modelis orientuotas į ES šalių atvejį bei šiame regione vykdomą sveikatos politiką, tačiau jis gali būti panaudojamas ir kitų regionų atvejo analizei. Praktikoje vertinimo modelis gali būti panaudojamas kaip naudingas informacijos šaltinis sveikatos politikos plėtrai.

Tyrimo apribojimai

Literatūroje iki šiol nėra sutariama dėl tinkamiausio ŽK vertinimo būdo. Tyrėjai naudoja pavienius rodiklius, rodiklių grupes ar kuria ŽK indeksus. Iki šiol sukurti ŽK indeksai (pavyzdžiui, Pasaulio banko ŽK indeksas) apima trumpą vertinimo trukmę, todėl tai apriboja šio rodiklio naudojimą panašaus pobūdžio tyrimuose.

Literatūros analizė parodė, jog vertinimo rezultatai yra jautrūs ŽK mato pasirinkimui, taigi ir šiuo atveju atliekant empirinį tyrimą, įtaką gali daryti vertinimo rodiklių pasirinkimas. Kitą vertus, taip pat vertinimui pasirinkti literatūroje dažnai naudojami ŽK matai, tačiau nevertinama viešųjų investicijų į sveikatą įtaką rečiau panaudojamiems matams.

Vienas didžiausių apribojimų siekiant empiriškai pritaikyti vertinimo modelį yra statistinės informacijos trūkumas. Siekiant kuo tiksliau bei objektyviau įvertinti investicijų daromą poveikį, tikslinga naudoti kiek įmanoma ilgesnį laikotarpį, tačiau dėl duomenų trūkumo analizuotas 2000–2017 metų laikotarpis.

Oficialiuose statistikos portaluose pateikiami duomenys nesudaro galimybių analizuoti viešųjų investicijų į sveikatą, skirtų skirtingoms amžiaus grupėms (jas būtų tikslinga analizuoti vertinant senėjančios visuomenės kontekstą) ar išsamiau apibūdinant investicijas į sveikatą. Tyrimui naudojamos bendrosios sveikatos išlaidos, kurios nėra skirstomos į investicijas bei palaikymo kaštus. Atsižvelgiant į tai, viešosios sveikatos išlaidos darbe priskiriamos viešosioms investicijoms į sveikatą. Statistinių duomenų trūkumas taip pat neleidžia įvertinti visų identifikuotų veiksnių, kurie gali turėti įtakos ŽK.

Darbe analizuojamas tik viešasis sektorius, tačiau nevertinamos privačiosios sveikatos išlaidos ar ŽK veiksniai, kurie negali būti išreiškiami kiekybiškai. Vertinimui taip pat pasirinktas vienas iš 3 galimų lygmenų – valstybės lygmuo, tačiau nevertinama investicijų į sveikatą įtaką ŽK individo ar organizacijos lygmeniu.

Darbo struktūra ir apimtis

Disertacijos apimtis 178 psl. (su priedais). Struktūrą apima 3 pagrindiniai skyriai, atspindintys darbo loginę struktūrą. Pirmajame skyriuje „*Viešųjų investicijų į sveikatą poveikio žmogiškajam kapitalui vertinimo teorinis pagrindimas*“ analizuojami investicijų į sveikatą poveikio ŽK teoriniai aspektai apimant ŽK sampratą, ŽK dedamųjų ryšių analizę, sveikatos kaip ŽK dedamosios reikšmingumą, ŽK veikiančius veiksnius bei valstybės lygmens reikšmingumą formuojant ŽK. Antrajame skyriuje „*Viešųjų investicijų į sveikatą poveikio*

žmogiškajam kapitalui vertinimo metodologija“ analizuojami ŽK vertinimo ypatumai, atliktų tyrimų rezultatai bei pateikiamas sukurtas teorinis vertinimo modelis. Trečiasis disertacijos skyrius „*Investicijų į sveikatą poveikio žmogiškajam kapitalui visuomenės senėjimo kontekste vertinimo modelio empirinis taikymas*“ orientuotas į empirinio tyrimo rezultatų analizę.

IŠVADOS

Apibendrinant atliktų teorinių bei empirinių tyrimų rezultatus gali būti daromos šios išvados.

1.1 Atlikta žmogiškojo kapitalo teorinių aspektų analizė įrodo žmogiškojo kapitalo reikšmingumą įvairiais lygmenimis, pradedant individu, jo įsidarbinimo galimybėmis, produktyvumu ir gaunamomis pajamomis bei baigiant dažnai akcentuojamu poveikiu šalies ekonomikos augimui. Atlikus mokslinės literatūros analizę nustatyta, jog žmogiškasis kapitalas – tai kompleksinė kapitalo forma, jungianti gamybos procese panaudojamų įgimtų ir įgytų dedamųjų rinkinį. Išsamesnė žmogiškojo kapitalo sandaros analizė atskleidė, jog dažniausiai žmogiškasis kapitalas siejamas su švietimo srities dedamosiomis, žiniomis, išsilavinimu, įgūdžiais bei sveikata. Su šia kapitalo forma taip pat siejami tokie, rečiau aprašomi elementai, kaip talentas, novatoriškumas, energija ir kt. Atlikta mokslinės literatūros analizė leido patikslinti ŽK sampratą siūlant šį kapitalą apibrėžti kaip individe įkūnytų, įgimtų bei panaudojant investicijas sukurtų ir palaikomų žinių, įgūdžių, gebėjimų patirties, sveikatos bei kitų ekonominėje veikloje naudojamų dedamųjų rinkinį, veikiantį asmens produktyvumą bei generuojantį piniginę ir nepiniginę naudą. Atsižvelgiant į tai, šios kapitalo formos kūrimas ir plėtojimas grindžiamas investicijų į pagrindines dedamąsias skyrimu bei kitų išorinių aplinkos veiksnių įtaka.

2.1 Išanalizavus sveikatos, kaip žmogiškojo kapitalo dedamosios koncepcijos teorinius aspektus, nustatyta, jog egzistuoja keli sveikatos bei žmogiškojo kapitalo sąlyčio taškai. Viena vertus, sveikata kaip ir žinios, patirtis, įgūdžiai ar kt. yra identifikuojama kaip žmogiškojo kapitalo dedamoji, kita vertus, sveikata apibūdinama kaip veiksnys, veikiantis kitų žmogiškojo kapitalo dedamųjų vystymą, žmogiškojo kapitalo panaudojimo efektyvumą, ilgaamžiškumą, jo kiekį ir kokybę. Sveikata taip pat apibūdinama kaip būtina sąlyga kitų dedamųjų (žinių) transformavimui į produktus ir paslaugas. Atlikus analizę nustatyta, jog, kaip žmogiškojo kapitalo dalis, sveikata apibūdinama vartojant skirtingus terminus (pavyzdžiui, žmogiškojo kapitalo komponentas, sveikatos kapitalas, sveikas žmogiškasis kapitalas ir pan.). Vertinant sveikatos dedamąją taip pat identifikuotas glaudus ryšys tarp šio elemento bei švietimo. Šį ryšį galima apibūdinti kaip abipusį. Geresnė sveikata siejama su aukštesniais švietimo pasiekimais, teikiama grąža ir priešingai.

3.1. Atlikus investicijų į žmogiškąjį kapitalą analizę identifikuotos pagrindinės investicijų kryptys, tarp kurių išskiriamos ir investicijos į sveikatą. Literatūros analizė parodė, jog inversijos į sveikatą analizuojant žmogiškąjį kapitalą gali būti detalizuojamos išskiriant investicijas į sveikatos apsaugą / priežiūrą (prevenciją, medicininę priežiūrą ir gydymą bei sveikatos informavimą), sveikatos srities darbo jėgą, sveikatos infrastruktūrą, medicinos įstaigas ir įrenginius ar sveiką mitybą. Analizuojant investicijų į žmogiškąjį kapitalą klausimą įvertinti veiksniai, galintys turėti įtaką žmogiškojo kapitalo vystymui. Literatūros šaltinių sintezė leido praplėsti ankstesnių tyrėjų identifikuotas veiksnių grupes, jas papildant tokiais veiksniais kaip: gimstamumas, visuomenės senėjimas, švietimo sistemos kokybė bei jos tobulinimas, šalies socialinis modelis, ekonominės infrastruktūros tobulinimas, skurdo lygis, urbanizacijos lygis, rasinė diskriminacija ir kt.

4.1 Atlikus literatūros analizę bei įvertinus empirinių tyrimų rezultatus parengtas investicijų į sveikatą poveikio žmogiškajam kapitalui visuomenės senėjimo metu vertinimo ekonometrinis modelis. Mokslinės literatūros analizė parodė, jog iki šiol nesutariama, kuris matas geriausiai atspindi šalyje esantį žmogiškąjį kapitalą, todėl skirtingi tyrėjai naudoja skirtingas žmogiškojo kapitalo kiekybines išraiškas. Atsižvelgiant į tai, suformuotame vertinimo modelyje vertinimui pasiūlyti 4 rodikliai – su sveikatos dedamąja siejama tikėtina gyvenimo trukmė, su švietimu susijęs dalyvavimo viduriniame ugdyme, ŽSRI bei visuomenės senėjimo laikotarpiu aktualus 55–64 metų asmenų, turinčių aukštąjį išsilavinimą, užimtumo lygis. Siekiant įvertinti viešųjų investicijų į sveikatą poveikį sukurtas bazinis vertinimo modelis, įtraukiantis pagrindinį įvesties elementą – viešąsias investicijas į sveikatą bei du papildomus nepriklausomus kintamuosius: gyventojui tenkantį BVP bei 65 ir vyresnių amžiaus gyventojų dalies rodiklį. Investicijoms į sveikatą vertinti panaudota sveikatos produkcijos funkcija, apimanti skirtingų išorinių veiksnių grupes. Praplėstas modelis jungia ne tik atrinktus žmogiškojo kapitalo matus, investicijų į sveikatą rodiklius, tačiau į vertinimą įtraukti ir literatūros analizės metu identifikuoti žmogiškojo kapitalo vystymą veikiantys veiksniai, kurie sveikatos išlaidų poveikio tyrimuose naudojami kaip nepriklausomi kintamieji. Atsižvelgiant į tai, jog literatūros analizės metu identifikuotas gana gausus veiksnių sąrašas, į tolimesnį vertinimą įtraukti veiksniai, koreliuojantys su pasirinktais ŽK matais. Atlikus atrankos procedūrų įvertinimą įtraukti tokie veiksniai kaip: gyventojui tenkantis BVP, viešosios sveikatos išlaidos, nedarbo lygis, 15–64 metų gyventojų dalis, turinti pradinį išsilavinimą, alkoholio suvartojimas, 15–64 metų amžiaus gyventojų dalis, 65 ir vyresnio amžiaus gyventojų dalis, šiltnamio efektą sukeliančių dujų išmetimas, urbanizacijos lygis, ligoninių lovų skaičius.

5.1 Pritaikant sukurtą teorinį vertinimo modelį, atliktas investicijų į sveikatą poveikio vertinimas ES šalyse, kurios gali būti apibūdinamos kaip demografiškai senos. Vertinimui panaudoti 2000–2017 metų sekinių duomenys.

Siekiant įvertinti kokį poveikį viešosios investicijos į sveikatą daro žmogiškajam kapitalui bei jį sudarantiems elementams į modelį įtraukti 4 priklausomi kintamieji (kiekvienam iš jų suformuotas ekonometrinis modelis bei palyginti vertinimo rezultatai). Atsižvelgiant į šalyse pastebimą skirtingą senėjimo lygį, analizuoti 3 atvejai: bendrasis, apimantis visas 28 ES šalis; I grupė, apimanti šalis, kuriose išlaikomo amžiaus pagyvenusių žmonių koeficientas yra aukštesnis ir II grupė, kur šis koeficientas yra žemesnis.

5.2. Atlikus bendrojo atvejo analizę nustatyta, jog, viešąsias investicijas į sveikatą vertinant pagal bazinį modelį, reikšmingą bei teigiamą įtaką ši investicijų grupė daro 2 pasirinktiems žmogiškojo kapitalo matams, t. y., tikėtinai gyvenimo trukmei bei ŽSRI indeksui. Atsižvelgiant į tai, jog vertinimas atliktas naudojant kintamuosius, išreikštus natūraliais logaritmais, gauti rezultatai vertinami kaip elastingumo koeficientai. Taigi, 1 proc. padidėjus viešosioms investicijoms į sveikatą, tikėtina gyvenimo trukmė pailgėja 0,025 proc., o ŽSRI padidėja 0,009 proc. Likusiems 2 rodikliams šis poveikis identifikuotas kaip statistiškai nereikšmingas. Lyginant gautus rezultatus su išplėstiniu modeliu nustatyta, jog įtraukus papildomus kintamuosius, viešųjų investicijų į sveikatą poveikio koeficientas tampa mažesnis. Nustatyta, jog didėjant viešosioms investicijoms į sveikatą 1 proc., tikėtina gyvenimo trukmė padidėja 0,013 proc., o 55–64 metų amžiaus asmenų užimtumo rodiklis 0,074 proc. Investicijų įtaka šiems rodikliams identifikuota kaip teigiama bei statistiškai reikšminga. Vertinant poveikį ŽSRI rodikliui nustatyta, jog poveikio koeficientas yra lygus 0,006, tačiau jis yra nereikšmingas. Investicijų poveikis dalyvavimui viduriniame ugdyme išliko neigiamas bei nereikšmingas.

Palyginus gautus vertinimo rezultatus pagal visuomenės senėjimo rodiklius, išskirtose šalių grupėse gauti skirtingi rezultatai. Vertinant viešųjų investicijų į sveikatą poveikį, I grupėje padidėjus 1 proc. viešosioms investicijoms į sveikatą, tikėtina gyvenimo trukmė pailgėja 0,017 proc. bazinio modelio atveju ir 0,013 proc. išplėstinio modelio atveju. O likusių ŽK rodiklių atveju nustatyta neigiama ir tik ŽSRI atveju reikšminga investicijų į sveikatą įtaka. Bazinio modelio atveju vertinant viešųjų investicijų į sveikatą įtaką II grupės šalims nustatyta, jog viešosioms investicijoms į sveikatą padidėjus 1 proc., tikėtina gyvenimo trukmė pailgėja 0,032 proc., ŽSRI indeksas 0,026 proc., o dalyvavimas viduriniame ugdyme 0,066 proc. Šis poveikis identifikuotas kaip teigiamas bei statistiškai reikšmingas, o poveikis 55–64 metų asmenų užimtumui identifikuotas kaip teigiamas, tačiau nereikšmingas. Išplėstinio modelio atveju II grupėje viešosioms sveikatos investicijoms pakitus 1 proc. tik ŽSRI rodiklis pakinta teigiamai bei statistiškai reikšmingai. Poveikio koeficientas lygus 0,014 proc. Poveikio koeficientai kitiems žmogiškojo kapitalo rodikliams yra teigiami, tačiau statistiškai nereikšmingi. Gauti vertinimo rezultatai įrodo, jog viešosios investicijos į sveikatą tam tikrais atvejais daro teigiamą bei reikšmingą įtaką žmogiškajam kapitalui senstant visuomenei, tačiau vis dėlto patvirtinama

literatūroje identifikuota prielaida, jog rezultatai yra jautrūs pasirenkamam žmogiškojo kapitalo matui. Atsižvelgiant į tai, kad skirtingu senėjimo lygiu pasižyminčiose šalyse identifikuoti poveikio vertinimo rezultatų skirtumai galima teigti, jog identifikuotas rezultatų jautrumas šalies specifiškumui skirtingų rodiklių atžvilgiu. Tai leidžia patvirtinti Filmer'io ir Pritchett'o (1999) nuostatą, jog viešųjų sveikatos išlaidų poveikio vertinimo rezultatai yra jautrūs pasirenkamam atvejui.

5.3. Vertinant detalizuotų viešųjų investicijų į sveikatą poveikį pasirinktam žmogiškojo kapitalo matui, t. y., tikėtinai gyvenimo trukmei, bendruoju ES šalių atveju nustatyta, jog teigiamą bei reikšmingą įtaką daro tiek bendrosios viešosios investicijos į sveikatą, tiek ir individualioms ar kolektyvinėms paslaugų grupėms skirtos investicijos. Reikšmingas bei teigiamas poveikio koeficientas identifikuotas vertinant valdžios sektoriaus sveikatos išlaidas ligoninių paslaugoms bei valdžios sektoriaus išlaidas tyrimams ir mokslinei veiklai sveikatos srityje. Pastarosios grupės poveikio koeficientas atlikus skaičiavimus nustatytas kaip aukščiausias.

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