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Evaluating the adequacy of pensions systems: example of the Baltic states

Master's thesis

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The author's declaration

I have written this Master's thesis independently. All viewpoints of other authors, literary sources and data from elsewhere used for writing this paper have been referenced.

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The defence will take place on ……./ date / at …….. / time /

……. / address / in auditorium number …… / number /

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Abstract

Pension systems around the European Union (hereinafter EU) are facing concerning external and social factors, which are creating discomforts and complications to a considerate proportion of the population. The previous scenario is burdening the pension systems at such levels, that the adequacy and sustainability of these systems is under pressure. Considering the complexity and vast array of components in pension systems, this research focuses on the concept of adequacy. The aim of this thesis is to evaluate the adequacy of pension systems, by mostly focusing on the example of the Baltic states. The concept of pension system adequacy highlights the overall complexity, when analysing or evaluating pension systems, because of the lack of academical clarity and the difference in multidimensional measurement methods.

In order to analyse pension system adequacy, the theoretical framework and methodology was based on F. Chybalski's multidimensional approach to analysing the adequacy of pension systems (APS) (Chybalski, 2012). Taking into consideration that Chybalski's results are relatively outdated, this research renewed the APS values with the most recent and available data. During the evaluation and measurement process of the preliminary data and empirical analysis, the need for further development surfaced. The contribution to this research topic, was to propose a new index, that evaluated the adequacy of both pensions and pension systems, by different dimensions. The new proposed index was titled, as the: adequacy of pensions and pension systems – APPS.

The preliminary data and empirical analysis answered the hypothesis of the research, which proved that the Baltic pension systems are one of the most inadequate pension systems in the EU. Different measurement methods mostly provided similar and overlaping results, which both confirmed and questioned the new proposed indexes contribution. The new proposed index provides an alternative approach to analysing the adequacy of pension systems or pensions, but further research and development would be recommended.

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List of abbreviations

APS – Adequacy of pension systems

APPS – Adequacy of pensions and pension systems

AROP – At-risk-of-poverty

AROPE – At-risk-of-poverty or social exclusion

ARR – Aggregate replacement ratio

EC – European Commission

EU – European Union

GDP – Gross Domestic Product

NDC – Notional Defined Contribution

OECD – Organisation for Economic Co-operation and Development

PAYG – Pay-as-you-go pension system

PSI – Pension Sustainability Index

RIA – Retirement Income Adequacy Indicator

TRR – Theoretical replacement rates

Introduction

Research regarding pensions and pension systems is gathering and gaining more relevancy in today's society or context. This relevancy is facilitated by the numerous social factors or characteristics, that are burdening the social assistance, protection, or pension systems of our nations. Social factors or characteristics such as: aging populations; higher dependency for social benefits; increased life expectancy; declining birth rates; longer employment periods; increased retirement age; and many other possibly worrying social factors or characteristics.

The necessity to conduct further research in regard to pensions and pension systems, also stems from the tasks, functions, and obligations that pensions and pension systems entail or provide to the wider population. The pension system and pensions in general, are portrayed as a public virtue. Holzmann & Hinz provide an introductory understanding of what a pension system should achieve:

> "*The primary goals of a pension system should be to provide adequate, affordable, sustainable, and robust retirement income, while seeking to implement welfare-improving schemes in a manner appropriate to the individual country: (...)"* (Holzmann & Hinz, 2005: 15).

The pension system or pensions aim to protect retired, injured, and elderly individuals (that lack the proper knowledge of financial institutions or financial services), from lacking finances and from the risk of falling into poverty (European Commission, 2019). In a shorter sense, pension systems mainly aim to alleviate or to protect people from poverty, by providing basic income (Holzmann & Hinz, 2005: 14). Pensions cover almost a quarter of the EU's population, as a source of income (European Commission, 2019). This percentage or share of pensioners, posts similarities between the Baltic pension systems, where pensioners cover almost a quarter to a third of the Baltic states population (Central Statistical Bureau of Latvia, 2020; LRT English, 2019 & Sotsiaalkindlustusamet, 2019).

Considering that a quarter to a third of the EU's and Baltic states population depend on pensions and pension systems, the need for further analysis is self-explanatory. As Holzmann and Hinz previously described, a pension system should provide various obligations and ultimately comprehensive social benefits, to its citizens or certain population groups (Holzmann & Hinz, 2005: 15). This description, which was provided by the previous authors, highlighted a crucial place for concern, when trying to evaluate pensions and pension systems, which is the lack of clarity and fragmentation of factors, in regard to the adjectives or concepts, that are used for analysing pension systems and pensions (adequate, affordable, sustainable, …) (Holzmann & Hinz, 2005: 15).

It must be observed, that analysing the entire dimension of pensions or pension systems, by each of the previously described concepts or adjectives, would be unreasonable and frankly unachievable. Taking into consideration the previous observations and obstacles, this research will focus on pension system adequacy, but also analysing the main component, which is pension adequacy. The supportive aim of this research paper is to introduce and highlight the difficulties, in order to analyse pension systems and pensions, by choosing only one of these known concepts - adequacy. Later analysis will exhibit, how conflicted, yet similar, are the concepts of pension system adequacy and pension adequacy. Also highlighting how difficult or complex it is to construct a comprehensible analysis with clear results, factors, recommendations, and conclusions.

In order to construct the research or analysis, the selection of the research subjects is needed. The research subjects selected for this research paper are the Baltic states (Estonia, Latvia, Lithuania). The Baltic states are chosen for this analysis, because of their compatibility and similar pension systems (Volskis, 2012). The decisive factor, which led to the selection of the Baltic states and their pension systems, concerns the low levels of adequacy in pensions and pension systems, which these three countries present. The Baltic states are in the lowest group of underperformance, when comparing the three states to the EU's average or against the other member states. F. Chybalski's analysis highlighted that the three Baltic states are one of the worst performing European member states, in regard to pension system adequacy (Chybalski, 2012: 13).

Different indicators, such as the: at-risk-of-poverty (AROP) and at-risk-of-poverty or social exclusion (AROPE), which are used to analyse the adequacy of both pension and pension systems, also exhibited that the Baltic states are amongst the lowest performing countries, in terms of poverty protection (European Commission, 2018b). Allianz SE Group's analysis of retirement income adequacy, also seconds the previous arguments, that the adequacy of the Baltic pensions and pension systems is decreasing (Allianz SE, 2015). Taking into consideration the previous findings, arguments, and discussions, the aim of this research needs to be proposed.

The aim of this research paper is to evaluate the adequacy of pension systems, by example of the Baltic states. The tasks in order to achieve the research aim or purpose, are the following: 1. Opening the concepts of pension system adequacy and pension adequacy; 2. Comparing the previous evaluation or measurement approaches; 3. Preliminary data analysis of the main indicators; and 4. Trial testing of different indexes. The contribution of this thesis to the research topic of pension system adequacy and pension adequacy, will be aimed at providing a new comprehensive measure or index, to further evaluate the adequacy of pension systems and pensions. This new or enhanced measure or index, will include and synthesize multiple dimensions and indicators, based on the previous approaches and the author's own propositions.

The author hypothesizes that the adequacy of the Baltic pension systems and pensions are decreasing or maintaining a low level of performance. The author also hypothesizes, that the proposal and enactment of a new measure or index will be difficult to construct, which is credited to the lack of clarity, in regard to the overall concept and measurement methods. The thesis has the following structure. The next chapter will introduce, open, and compare the concepts and measurement methods of pension system adequacy and pension adequacy. The second chapter describes the pension systems of the Baltic states. The third chapter updates Chybalski's method and proposes a new modified multidimensional index. The conclusion discusses the results and offers further avenues for research.

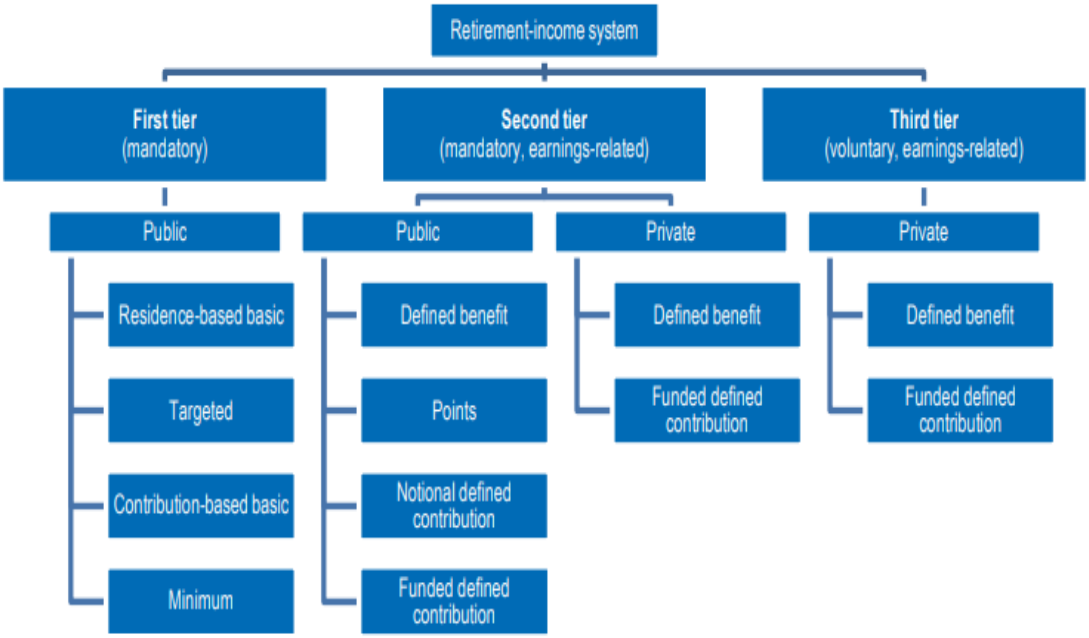
1. Adequacy of pension systems and pensions

1.1. Classification of pension systems

Firstly, this chapter will analyse and compare the concepts of pension system adequacy and pension adequacy, by providing different approaches or definitions. Secondly, this chapter will present and compare the different evaluation or measurement methods, in order to analyse and evaluate the adequacy of pensions and pension systems. Thirdly, this chapter will analyse and compare the found or discussed measurement methods, later providing an in-depth comparison of strengths, weaknesses, limitations, and overall feasibility of these methods or approaches. Before analysing the concepts and evaluation methods of pension adequacy or pension system adequacy, the need for further discussion is necessary, especially in terms of different pension systems and the different components related to it.

Pension systems vary substantially among countries, especially in different political, social, and economic structures. In order to simplify the vast and broad concept of pension systems and what they contain or entail, this section provides a brief insight into the different components of a pension system. The taxonomy used for this overview, comes from the OECD's biennial report: *"Pensions at a Glance"* (OECD, 2019). Figure 1 (page 11) presents the different parts, types, or components of a retirement-income system, in other words: a pension system (OECD, 2019: 133). The first tier represents the pension systems mandatory programmes, where the main purpose is to offer social protection from falling into poverty or social exclusion, by providing an adequate (basic) level of income (OECD, 2019: 132). The second tier represents the pension systems mandatory, but earnings-related programmes, where the main purpose is to offer a more adequate standard of living (OECD, 2019: 132). The third tier represents the pension systems voluntary, but earning-related programmes, where the main focus is based on the private or voluntary contributions of the retirees or employers, in order to further raise the level of retirement income (OECD, 2019: 132).

Figure 1: "Taxonomy: Different types of retirement-income provision"



Source: OECD, 2019: 133

Based on the OECD's taxonomy of different types of pension systems and their components, the most common or known pension systems among European states are a combination of these components, like the three-pillar system. These pension systems are mostly defined as:

- **Pay-as-you-go (PAYG)** system**:** The most common public pension system, where retirement benefits are paid or financed (not pre-funded) by current contributions, either from tax revenues (taxes), employers/employees, or other mandatory payments (Eatock, 2015: 2).
- **Bismarckian** system: earnings- and profession-related system, where social benefits are mostly forwarded to citizens, who work and strive for better professions. Minimum pensions are usually guaranteed to people, who have not been fully implicated to the labour market (Lannoo; Barslund; Chmelar & von Werder, 2014: 15).

- **Beveridgean** system: pension system, where a flat-rate pension or basic income is provided to each citizen or beneficiary, not taking into consideration their profession, occupation, earnings, or other relevant factors (Lannoo; Barslund; Chmelar & von Werder, 2014: 15).
- **Three-pillar system:** pension system, where the structure is divided into three pillars, where the first pillar is compulsory, either state-funded or managed, with the aim of avoiding old-age poverty; the second pillar is either earnings-related or funded (mandatory or voluntary), providing replacement rates; and the third pillar is voluntary, where the growth and benefits depend mostly on individuals own motivation, to collect additional savings (Lannoo; Barslund; Chmelar & von Werder, 2014: 9).

The pension system, which will be chosen and subjected to further analysis, will be the **three-pillar pension system**, which is currently used in all of the Baltic states, which are the main research subjects for the empirical analysis (Rajevska, 2014b & Volskis, 2012). Chapter 2.1. (page 32) will analyse the Baltic three-pillar systems in more detail, by highlighting the components and the previous reforms. In the next subchapter (Chapter 1.2., page 13), the concepts of pension system adequacy and pension adequacy are discussed. The justification for this approach is based on the understanding, that pension system adequacy and pension adequacy are well-known and broad concept by themselves, but when analysing and comparing the different explanations and definitions of pension system adequacy and pension adequacy, the functions and definitions are relatively similar to each other, with the only difference being related to the scope of influence (system vs income).

1.2. The concept of pension system adequacy and pension adequacy

Adequacy, pension adequacy, or pension system adequacy are politically used concepts, which conceptually lack the overall clarity or definition amongst various scholars or institutions, but are still widely used in political discussions, in regard to pensions and pension systems (Freudenberg, 2015 & Grech, 2013). Definitions vary amongst scholars and international organizations, which create additional difficulties, in terms of interpretation, selection, and analysis. Problems also arose from the shortage of benchmarks or thresholds, when analysing both pension system adequacy and pension adequacy. Benchmarks or thresholds, that could later confirm if a pension (income) or pension system is either adequate or inadequate, which also later questions the measures or methods, that collect the needed data or results (Grech, 2013). Not many research methods use these kinds of benchmarks or thresholds, when analysing the adequacy of pensions or pension systems. Most of these research methods, which analyse either pension adequacy or retirement income adequacy are multidimensional approaches, which create further misunderstandings and difficulties in interpretation.

Firstly, to differentiate the definitions and functions of pension adequacy and pension system adequacy, two specific approaches are highlighted. Eurostat (2019) describing pension adequacy, while Holzmann & Hinz (2005) describe pension system adequacy. The proposed definitions are the following:

- Eurostat describes pension adequacy as a concept, where pensions (current or future) prevent old-age poverty and provide or maintain post-retirement benefits (Eurostat, 2019).
- Holzmann & Hinz, who describe an adequate pension system as: *"An adequate system is one that provides benefits to the full breadth of the population that are sufficient to prevent old-age poverty on a country-specific absolute level in addition to providing a reliable means to smooth lifetime consumption for the vast majority of the population"* (Holzmann & Hinz, 2005: 16).

Comparing the two results against each other, the main aim or purpose of these two differing concepts, is quite similar. Mainly, to provide and maintain an adequate level of benefit or income, that would prevent people from falling into poverty, while also providing an adequate living standard. Secondly, a variety of different approaches and definitions regarding pension adequacy, are provided. They are provided, in order to exhibit the difference, fragmentation, and lack of certainty, when describing the concepts of pension adequacy and pension system adequacy against each other. In order to bring more clarity to the concept of what pension adequacy actually represents as a component of pension system adequacy and what it entails, Table 1 (page 14) gives a brief overview of these different approaches to pension adequacy.

Table 1: Different definitions to the approach of pension adequacy

Author or organisation	Definition of pension adequacy
Eatock (2015)	Measurement method, where the adequacy of pensions is measured by the ability of the pensions or benefits to prevent poverty. Evaluation is conducted by the difference or ratio between pre-retirement and retirement incomes, with the current average incomes of people or citizens, who are under the pensionable or retirement age (Eatock, 2015: 2)
European Commission (2018a)	Firstly, pension adequacy is the ability of the pension benefits or income to prevent poverty. Secondly, the capacity to provide similar replacement rates or incomes, to the pre-retirement period. Thirdly, the adequate correlation between the length of retirement and the entitled benefits (European Commission, 2018a: 23).
Tkalec (2020)	The relative ratio or difference between available incomes between the pre-retirement and retirement period (Tkalec, 2020: 1)

Source: author's compilation

Considering the previously described approaches to defining pension system adequacy and pension adequacy, the somewhat mutual understanding is that, both concepts of adequacy have a similar purpose or relative function, but with a different scope of influence. The main difference is the scope of influence, that these concepts are trying to enact or influence (system vs income). The purpose of adequacy for pension systems or pensions, is the ability to provide similar benefits or forms of income, during both pre-retirement and retirement periods, which have the potential and ability to protect the retirees, from falling into either poverty or social exclusion. Table 1 (page 14), only exhibited the theory or explanation, regarding the concept of pension adequacy and what it represents, but when trying to analyse the adequacy of both pensions and pension systems with different evaluation or measurement methods, the similarities in the selection of indicators, values, or dimensions for evaluation and conclusion making, further reduce the differences between the two concepts.

Regarding that the aim of this research paper was also to analyse the adequacy of both pensions and pension systems of the Baltic states, by using different measurement methods, then the next subchapter (Chapter 1.3., page 16), will analyse and compare the different measurement methods.

The selection process also provided additional difficulties, in order to find approaches or methods, which could facilitate the needs of the empirical analysis and the different characteristics of the Baltic pension systems. These approaches have been chosen because of their comprehensiveness, uniqueness, and suitability. The following approaches are the following: 1. The European Commission's Pension Adequacy Report (European Commission, 2018a); 2. F. Chybalski's adequacy of pension systems mearsurement method (Chybalski, 2012); 3. A.G Grech's alternative pension adequacy measurement method (Grech, 2013); 4. the Allianz SE Group's Retirement Income Adequacy Indicator (Allianz SE, 2015); and 5. the OECD's approach, presented by P. Antolin (Antolin, 2009).

1.3. The measurement methods of pension system and pension adequacy

1.3.1. The European Commission's Pension Adequacy Report

Every three years, the European Commission provides a versatile and in-depth overview about the European member states pension systems, reforms, and policies, concerning dimensions, such as: adequacy, sustainablity, shortcomings, and the possible future opportunities, guidelines, or scenarios for member states (European Commission, 2018a: 7). The report is labelled as the: Pension Adequacy Report. Previous studies (European Commission, 2003 & European Commission, 2006a) and reports have also been conducted concerning the notion of adequacy by the European Commission, but the Pension Adequacy Report provides a more in-depth, recent, and broader analysis. The reports main focus is to highlight the possibilities, shortcomings, and also weaknesses, in order to analyse, if the current or future pension systems or policies are adequate, sustainable, and systematically coherent enough, in order to provide adequate old-age income. Specifically, with the aim of preventing old-age poverty and also to maintain important adequate income, during the future recipient's life span or retirement period (European Commission, 2018a: 7).

The report is conducted in two volumes. The first volume: Volume I, reflects on the pension systems and policies, across the European Union (general conclusions), giving a comparative analysis regarding the main economic and social topics, such as: living standards; pension reforms; adequacy of pensions; sustainability of these pension systems; future and current challenges; possibilities, and also gender differences, mostly focusing on gender equality (European Commission, 2018a: 184). Volume II provides a more in-depth overview of each European member states pension systems and pension policies, mainly focusing on the same priority as this research paper, which is the dimension of pension adequacy and the adequacy of pension systems (European Commission, 2018a: 184).

By dividing the report into two volumes, this method provides ways of making both general conclusions and identifying specific characteristics, without losing the relevancy and necessity for this research. Regarding that the main research subjects will be the Baltic states, this report also provides previous insight and additional information, in regard to the pension adequacy and the adequacy of pension systems, specifically highlighting the situation in the Baltic states (European Commission, 2018b).

In the Commission's Pension Adequacy Report, the European Commission measures adequacy in three dimensions or aspects. Figure 2 (page 18) gives a more illustrative view of these aspects. These dimensions or aspects are the following (European Commission, 2018a: 22-23):

1. **Poverty protection** – this aspect of adequacy analyses the capacity and capability of member states pensions (income) and pension systems, from preventing old-age poverty for both men and women, especially aged 65 and over. The rate of AROP (at-risk-of-poverty) and AROPE (at-risk-of-poverty and social exclusion) is taken into consideration, when measuring poverty protection (European Commission, 2018a: 23).
2. **Income maintenance** – this aspect of adequacy measures the capacity and possibility of member states pensions (earned income) and pension systems, to guarantee or replace similar levels of income or earnings during retirement, comparing to the pre-retirement age earned means. In this section, the report uses different income maintenance indicators, but includes the TRR indicator methodology (theoretical replacement rates), which estimates and measures the person's earnings before retirement and during the first year, when the person has become a retiree (European Commission, 2018a: 48).
3. **Pension duration** – this aspect of adequacy analyses the dilemmas, challenges, and possibilities of finding the sustainable balance between the duration of one's working life and length of retirement. Length of retirement is referred to the time period (years), where the beneficiaries are entitled to their pensions or benefits. Also by adjusting and measuring the balance and connection between pension duration and life expectancy (European Commission, 2018a: 101).

This method combines both qualitative and quantitative methods and data, which potentially could provide a more comparative and trustworthy end result. The biggest challenge with using this adequacy related method, stems form the fact that this report is already a regular project, which questions necessity to renew the results.

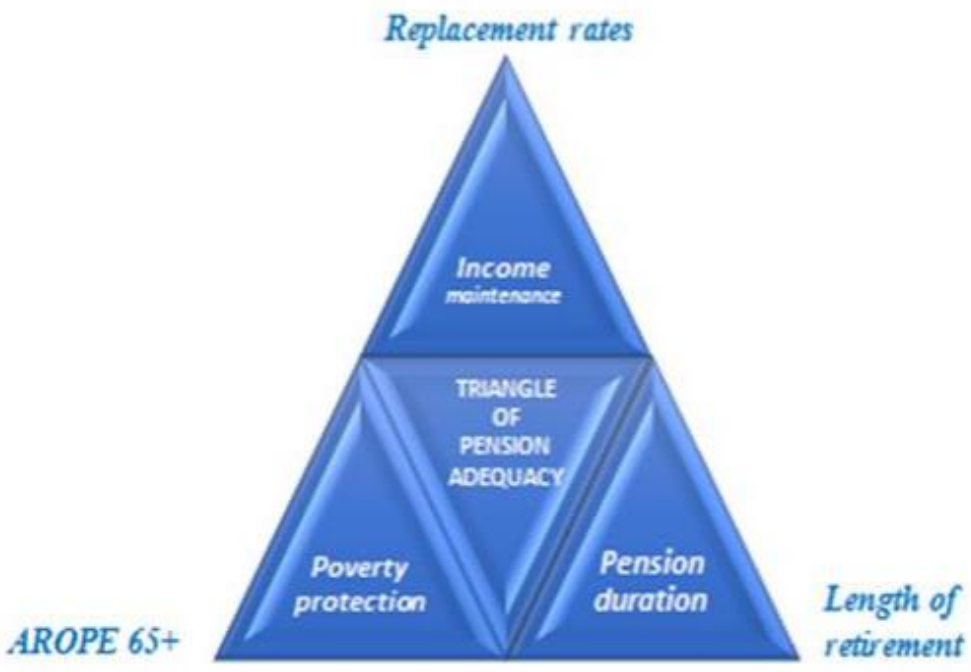


Figure 2: "The triangle of pension adequacy"

Source**:** European Commission, 2018a: 23

1.3.2. F. Chybalski's adequacy of pension systems measurement method

In F. Chybalski's article (2012): *"Measuring the multidimensional adequacy of pension systems in European countries",* Chybalski analyses the adequacy of pension systems (hereinafter APS) of 26 European countries, later presenting the generated APS values and ranks, derived from his own indicators and analysis (Chybalski, 2012: 2).

Chybalski's analysis of pension system adequacy is significantly quantitative in its approach, which does not provide additional reasoning nor precedents for the low or high values of APS in certain countries, such as the Baltic states. Chybalski mostly derives his initial indicators or sub-indicators from the European Commission's (hereinafter EC) document (2006), named: "*Portfolio of Overarching Indicators and Streamlined Social Inclusion, Pensions, and Health Portfolios"*, because of the multidimensional approach to analysing pension adequacy, which F. Chybalski later expands by proposing new indicators and later synthesizing the dimensions into a single synthetic indicator - **APS** (European Commission, 2006b & Chybalski, 2012: 4-5). Chybalski identifies three dimensions, which create his multidimensional approach to analysing pension system adequacy. The following dimensions are (Chybalski, 2012: 5-6):

1. **Income** – Chybalski notes, that he considers two different factors of measuring income, which are: earnings over the lifecycle; and the current level or value of the GDP divisions between generations.
2. **Poverty** – The need for redistribution of resources and the minimisation of poverty, either intra- or intergenerational.
3. **Gender-based variances/differences** - promoting and ensuring gender equality

From these initial dimensions, Chybalski generates three groups of indicators, which are used to generate the values or measures of APS. The proposed indicators are the following (Chybalski, 2012: 7):

1. Pensioner Income Indicators – **PI**
2. Pensioner Poverty Indicators – **PP**
3. Pensioner Gender Differences Indicators – **GD**

In order to comprehend the full spectrum of these proposed indicators, which later create the new APS value, an illustration is provided, in the form of Table 2 (page 20).

Table 2: Indicators of pension system adequacy

Pensioner Income Indicators – PI		
Symbol	Name of indicator	Source
P11	Median relative income ratio of elderly people	*Portfolio of Overarching Indicators...* (European Commission 2006)
P12	Aggregate replacement ratio (excluding other social benefits)	*Portfolio of Overarching Indicators...* (European Commission 2006)
P13	Relative inequality of income distribution ratio	Chybalski's proposition
P14M P14F	Net pension wealth by gender	OECD
Pensioner Poverty Indicators – PP		
PP1	At-risk-of-poverty rate of older people (after social transfers)	*Portfolio of Overarching Indicators...* (European Commission 2006)
PP2	Change in at-risk-of-poverty rate of older people after retirement (after social transfers)	Chybalski's proposition
Pensioner Gender Differences Indicators – GD		
GD1	Gender differences in the at-risk-of-poverty rate of poverty rate of older people (after social transfers)	*Portfolio of Overarching Indicators...* (European Commission 2006)
GD2	Gender differences in aggregate replacement ratio	*Portfolio of Overarching Indicators...* (European Commission 2006)
GD3	Change in at-risk-of-poverty rate of older people after retirement by gender (after social transfers)	Chybalski's proposition
GD4	Median relative income ratio of elderly people by gender	Chybalski's proposition
GD5	Relative difference in net position wealth by gender	Chybalski's proposition

Source: Chybalski, 2012: 7

The statistical data, which F. Chybalski collected, ranged through the years of 2005 - 2009, dividing the years into three different periods, which were: 2005, 2007 and 2009 (Chybalski, 2012: 13). The allocation of periods was implemented, in order to increase the generality of conclusions and the performance of the measurements, in regards to the generated values (Chybalski, 2012: 13). In today's context, the information or statistics generated by Chybalski's analysis would be deemed inadequate or out of date, in regard to making any general conclusions or assumptions (Chybalski, 2012: 13).

From the formula or quantitative perspective, Chybalski's conclusion draws on the argument that all of the proposed and generated sub-indicators have had a significant influence on the outcome or value of the synthetic measures, by using the Pearson correlation coefficient for evaluation (Chybalski, 2012: 14). The only exception was the replacement rate indicator (PI2), which was the main indicator or approach of the EC, concerning pension system adequacy (Chybalski, 2012: 14). Using the Spearman rank correlation coefficient with unified values of sub-indicators, mainly for assessing and comparing the values of APS and other indicators, Chybalski finds that the replacement rate is not the most representative indicator, when it comes to his adequacy measurement method (Chybalski, 2012: 14).

Chybalski also argues, that the former evaluation of pension adequacy by the EC's multidimensional approach, concerning replacement rates without the broader notion of pension incomes, is too simplified and one-dimensional (Chybalski, 2012: 14-15). Chybalski's analysis generates APS values, which reveal that the most adequate pension systems are mostly in: Western or Central European countries (Germany, France, Luxembourg and the Netherlands), while the least adequate systems are in: Eastern and Northern European countries, especially the Baltic states (Chybalski, 2012: 14).

1.3.3. A.G. Grech's pension adequacy measurement method

Grech's (2013) analysis provides a new alternative method to measuring pension adequacy, which relies by using indicators, which are based on pension wealth (Grech, 2013: 2). Grech defines the term pension wealth as:

> " (…) *estimates of pension wealth (i.e. the total projected flow of benefits through retirement) calculated using more realistic labour market assumptions"* (Grech, 2013: 30).

Grech's approach also provides a benchmark or a threshold, which most pension adequacy measurement methods do not provide or share much relevance and attention too (Grech, 2013: 24). This benchmark or threshold provides a quantitative and illustrative dimension, helping to compare and reflect on the proposed, analysed, or measured results. Grech's benchmark provides a reflection of the needed or required pension entitlements, in order to keep a person out of poverty during their retirement period (Grech, 2013: 30).

This proposed net pension wealth requirement is set to: 60% of the median equivalised income, which in Grech's approach, should protect the person of poverty and falling into the AROP category. However, this percentage is the weighted average by population (Grech, 2013: 24). The positive aspect circles around the notion, that the benchmark provides an illustrative view, if the analysed pension or the system in itself (for example Poland), is strong enough to alleviate poverty (Grech, 2013: 24). The negative aspect circles around the same problem as Chybalski's analysis, which is making conclusions, based on the measured results (Grech, 2013: 29-30).

In Grech's analysis, he takes ten countries under review, later illustrating the results and analysing the changes, problems, possibilities, and opportunities concerning pension wealth and pension entitlements (Grech, 2013: 21). The selected countries have taken considerable pension reforms during a certain period, which is why they were chosen (Grech, 2013: 21). Grech also advocates his choice of countries, by taking into consideration different pension system structures or reforms, and the fact that these countries cover more than two-thirds of the EU's population (up to 70%) (Grech, 2013: 21).

The selected countries are:

- Austria, Finland, France, Germany, Hungary, Italy, Poland, Slovakia, Sweden and the UK (Grech, 2013: 21).

Grech's analysis uses the APEX (*Analysis of Pension Entitlements across countries*) model, in order to measure the pension adequacy or pension wealth of his selected countries (Grech, 2013: 21). In simpler matters, as Grech also comments, his analysis or model uses only state pensions, where they estimate and compare: *"(...) pre-reform (i.e. the pension system rules for pensioners retiring now) with the post-reform (i.e. the rules under which people will retire in 2050) pension systems"* (Grech, 2013: 21-22).

In order to bring uniqueness and relevance, Grech only analyses the proportion of the population, who are dependent on state pensions and are more situated in the lower part of the wage distribution order (Grech, 2013: 22). The other proposed quantitative benchmark is: *"If net pension wealth is higher than this 'net pension requirement", on average, the pension system would be preventing poverty during retirement"* (Grech, 2013: 23).

The biggest challenge or restriction with using this adequacy measurement method is quite similar to Chybalski's method of APS, which is the lack of possibility in making and creating conclusions, reasoning, or answers, based on the newly measured or generalized results. Questions such as: What are the main reasons or factors for these results?; What has caused this low level or measure of pension adequacy (for example in Estonia)?, will be quite difficult to answed, based on the derived results. The positive aspect is creating an actual value or measure with a threshold or benchmark, which provides a comparable unit of measurement, presenting an opportunity to analyse the adequacy of pensions, across the European Union and its member states.

1.3.4. Allianz SE Retirement Income Adequacy Indicator

Allianz SE Group's (2015) analysis provides an alternative and quantitative method to measuring adequacy. This method measures retirement income adequacy, which in terminological sense differentiates to some degree from the notion of pension adequacy, but is suprisingly connected. The method describes adequacy as a relative measure, which does not have a complete approach or definition.

Adequacy, in their analysis, is described either as a standard, value, or quantitative measurement, such as: poverty lines, income ratios, replacement rates (pre-retirement vs retirement), or a selection of non-quantitative needs (Allianz SE, 2015: 6). This method relies on pension system and non-pension system criteria, which provides insights also to pension adequacy, since the method analyses replacement rates, coverage, and other assets of pensions and pension systems (Allianz SE, 2015: 23-28). The pension and non-pension system criterias or sub-indicators are presented in Figure 3 (page 25) and Figure 4 (page 26).

This approach offers a wide but country-specific comparison of 49 countries, from European (Western, Central and Eastern), American (North and Latin), Asian, and Oceanic countries (Allianz SE, 2015: 8). The approach tries to examine if the selected countries are able to provide an adequate level of retirement income and if the providing pension systems are sustainable enough, in order to provide them (Allianz SE, 2015: 8).

The results are ranked by a created indicator, called the: Retirement Income Adequacy indicator (hereinafter RIA), where the parameters or sub-indicators are scored between 1 (least adequate) to 10 (most adequate) (Allianz SE, 2015: 5). This indicator or ranking system provides a quantitative and illustrative dimension, helping to compare and reflect on the analyzed or measured results. The ranking system helps to analyse and identify the best practices or systems, regarding pension systems and their contributions to the retirees (Allianz SE, 2015: 5). Allianz SE Group's approach provides a quantitative method with illustrative examples, which is a rare approach in the field of analysing adequacy.

The approach helps to discover best practices, provide country-specific recommendations and also new alternative dimensions, mainly concerning the influence of private pension schemes and alternative financing measures (Allianz SE, 2015: 5). The relevancy of this approach also stems from the fact that it includes the three Baltic states, which are the main research subjects. This method gives a chance to update and compare the RIA index values with up-to-date data. The weakpoint of this analysis is the focus on retirement income adequacy, not pension adequacy.

Trying to synchronize these two terms or approaches, could potentially create disputes and irregularities. This approach has been selected for discussion, because of the rising demand for private contributions in the pension systems, to counter the possible rising expenditures in later retirement (Allianz SE, 2015: 24).

This approach notes the important aspect or dimension, which should not be forgotten, which is that the RIA indicator or index uses an intervallic scale, which helps to correlate both quantitative data (pension system criteria) and qualitative elements (non-pension criteria), because the actual RIA index does not pose a metric value (Allianz SE, 2015: 23). The pension and non-pension system criterias or sub-indicators are presented in Figure 3 (page 25) and Figure 4 (page 26).

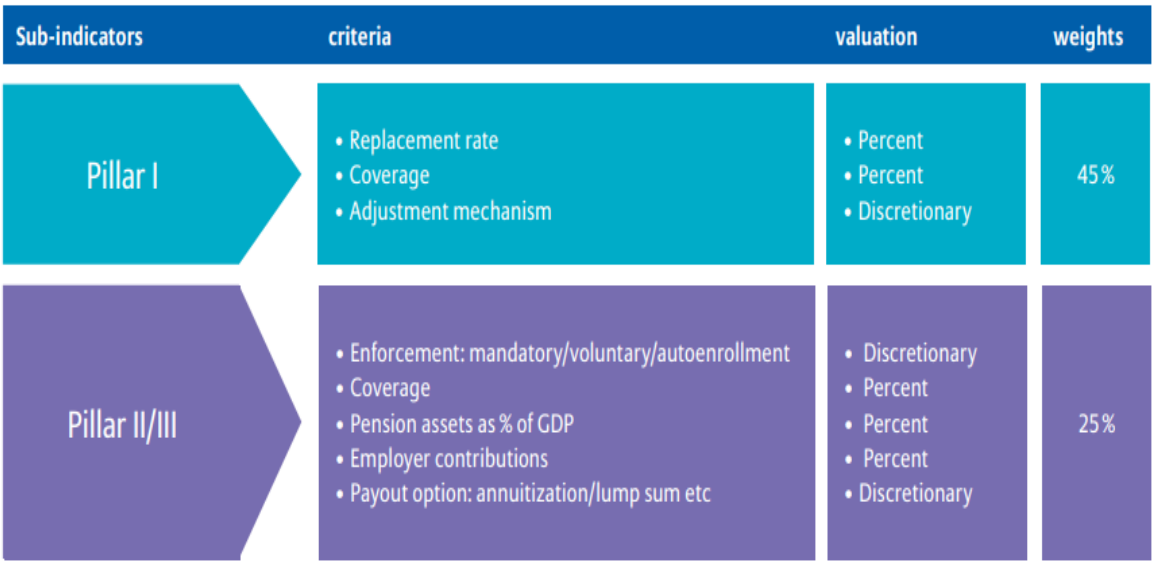


Figure 3: "Retirement income adequacy – Sub-indicator "Pension system"

Source: Allianz SE, 2015: 7

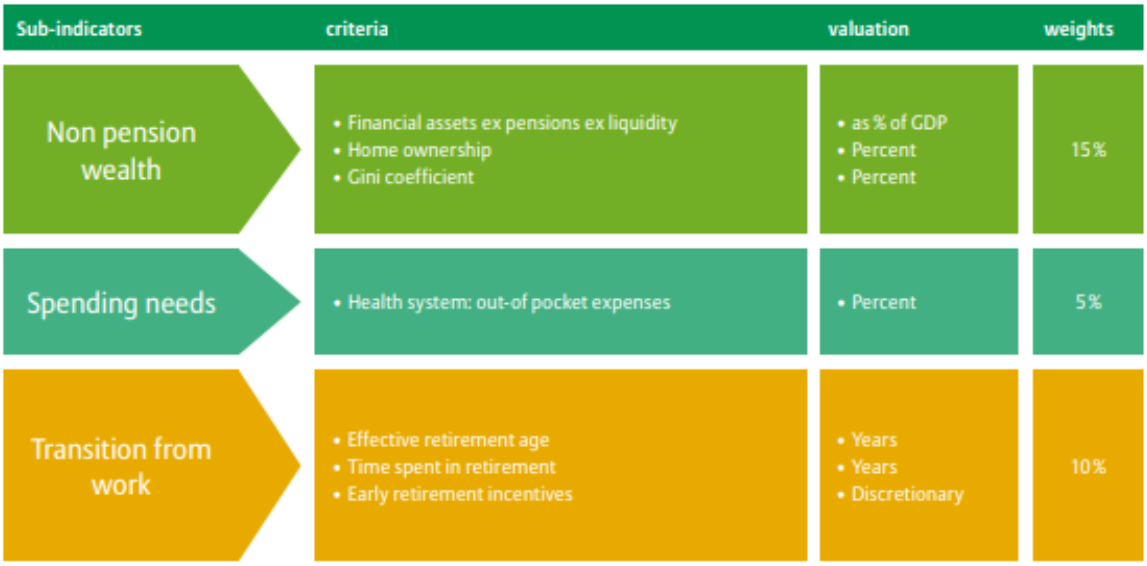


Figure 4: "Retirement income adequacy – Sub-indicator "other factors"

Source: Allianz SE, 2015: 7

Allianz SE Group's approach also provides a unique perspective to the notion of analysing pension adequacy. It includes the dimension of fiscal sustainability, because pensions and pension systems are facing many policy challenges, that threaten the sustainability of these systems (Allianz SE, 2015: 18). The research includes another index, labelled the: Pension Sustainability Index (hereinafter PSI), which analyses the first pillars of pension systems, mainly their structure, characteristics, and the recent reforms (Allianz SE, 2015: 18). The PSI index divides them into three different groups (colours) (Allianz SE, 2015: 18):

- "Green" - Sustainable
- "Yellow" - Moderately sustainable, but additional reforms might be needed
- "Red" - Not sustainable – Definite need for reforms and structural change

The approach links both these two indicators together, which creates a map of country patterns, to show both the adequacy and sustainablity dimension. This creation posts interesting scenarios, where the system is sustainable, but not adequate (Estonia) (Allianz SE, 2015: 19).

The negative side to this approach is the evaluation process and method. Analysing one countries retirement income adequacy requires knowing the whole pension system of the selected country, which is unquestionably difficult. Expertise is needed, in order to provide a comprehensive value or judgement. The results are very easily identifiable and concluding, but highly debateable.

1.3.5. OECD's approach

OECD's contribution to the field of analysing adequacy needs to be mentioned. Concerning the approach and focus of the research, which is the special field of pension adequacy, the OECD's terminological approach is somewhat different from pension adequacy, but not so different in the content. OECD's approaches or reports mostly use terms, such as: retirement savings adequacy, retirement income adequacy, or adequacy of retirement income, but also concentrate on the adequacy of pensions and pension systems (Antolin, 2009).

OECD's approaches (including OECD, 2013a; OECD 2013b & OECD, 2019) mostly associate retirement income adequacy or adequate retirement income with replacement rate ratios/differences (pre-retirement vs retirement), which is usually the main determinant to analysing adequacy (Antolin, 2009: 2). OECD's approaches mostly view an adequate retirement income or an adequate pension, which can provide both poverty protection and additional benefits, as 70% of pre-retirement income or wage, but should be higher for low-income workers (Antolin, 2009: 3). Taking into consideration that different pension systems and funding methods exist, the OECD method proposed by P. Antolin, mostly analyses: *defined contribution (*hereinafter *DC)* pension plans (Antolin, 2009: 3).

This approach provides a unique and different aspect to the notion of adequacy, which is including both private pension schemes (II and III pillar schemes) and personal contributions (Antolin, 2009: 3). Taking into consideration both aging populations and the increasing reduction of public sector funding, this method considers contribution rates *(ceteris paribus*) (Antolin, 2009: 3).

The inclusion of the contribution rate value or percentage, is based on the assumption or positive correlation, that if the contribution rate increases, then the provided income is higher (Antolin, 2009: 3). In this approach, different arguments are proposed, which can lead to a more adequate retirement income. Firstly, Antolin argues that raising or doubling the contribution rate, will see substantial raises in replacement rates (Antolin, 2009: 3). He proposes that the contribution rates from the retirees should range between 5 to 15%, but depending on the replacement rates of the different pension systems (Antolin, 2009: 17).

Secondly, Antolin argues that if the return on investment increases, then the replacement rates also increases in a positive manner (Antolin, 2009: 3). He proposes that the future pension, retirement income, or benefit should be adjusted and indexed to inflation, in order to prevent losses in purchasing power (Antolin, 2009: 18).

Thirdly, Antolin argues that contribution levels depend on the number of years in employment and the expected years in retirement, specifically the correlation between them (Antolin, 2009: 4). Antolin's approach proposes that the retiree should either start to save earlier or postpone their inclusion into retirement even further (Antolin, 2009: 5-6).

Taking into consideration both recent reforms, such as Estonia's decision to make the II pension pillar voluntary, giving more freedom to choose personal options and Lithuania's new alternative sources of financing (3% from gross wage and 1.5% state contribution from national average wage), this approach could provide an alternative and even up-to-date way to analysing pension system and pension adequacy (Estonian Ministry of Finance, 2020 & European Commission, 2020).

1.4. Comparison of the different evaluation approaches

The aim of this sub-chapter is to further evaluate and compare the different approaches, which analyse and evaluate pension adequacy and pension system adequacy. Table 3 (page 30) exhibits the comparison of this evaluation, which are based on various criteria. The criteria and the evaluation process might be considered similar to a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats), but the criteria used to evaluate the different approaches, are more focused and interested to identify, compare, and highlight. A comprehensible SWOT analysis completes also these similar functions, but rather sets its focus on the improvement and enhancement of something or someone (organization, individual, group, …), not a theory or method, as per say (Emerald Works Limited, 2021). The criteria selected for further evaluation of the different approaches, are the following:

1. **Strengths:** Strengths, which would differentiate the method or make it compatible for analysis. Strengths, which would provide further opportunities to either renew, emulate, or analyse the results. For example: Does the method possess a solid framework? Does the method provide either a benchmark or an index?
2. **Weaknesses:** Weaknesses, which would pose restrictions to the renewal or portration of the approach. For example: Is it a regular research project?; Does the method measure pension adequacy or retirement income adequacy?
3. **Feasibility:** Feasibility, in terms of the possibility to emulate or renew the evaluation approach. Meaning, that the method might not be renewable, because of the lack of available data. The judgement of the feasibility dimension is subjective and ranges between: not feasable to high feasibility (high).
4. **Usability:** Usability, in terms of using the results or findings from the evaluation process for further situations, such as: policy making. Meaning, that the results provide the ability to make conclusions or discussions. For example: What are the main reasons for such low APS values? The judgement of the usability dimension is also subjective and ranges between: not usable to high usability (highly usable).

Table 3: Different evaluation approaches of pension system and pension adequacy

Approach/ Criteria	**European Commission** (pension adequacy)	**Chybalski (**pension system adequacy)	**Grech** (pension adequacy)	**Allianz SE (**pension adequacy)	**OECD** (pension adequacy)
Strengths	- Provides country-specific overviews - Measures pension adequacy - High credibility	- Provides an index (APS) - Measures pension system adequacy - Tested method	- Measures pension adequacy - Provides a benchmark - Provides an index (APEX)	- Alternative method - Solid framework - Includes personal contributions - Provides indexes (RIA + PSI)	- Alternative method - Solid framework - Includes personal contributions - Provides benchmnarks
Weaknesses	- Regular research project - Lacks necessity	- Mostly quantitative - Has not been emulated for 10 years - Dismissal of indicators	-Simplified - Minimal selection of research subjects	- Measures retirement income adequacy - Expertise needed - No metric value - Debatable results	- Measures retirement income adequacy - Debatable benchmark (70% of pre-retirement income)
Feasibility	- High	- High	- Moderate	- Moderate	- Moderate
Usability	- Highly usable	- Usable	- Usable	- Usable	- Moderately usable

While comparing the different evaluation methods or approaches against each other, the difficulty to choose between either one specific evaluation model or a combination of them, becomes even more hindered. Firstly, this shows that the overall concepts or evaluation methods of pension system adequacy and pension adequacy, have a vast room for interpretation. In some cases, the difference is more terminological rather than substantive, which also creates additional confusion. Some of the methods use pension adequacy as a term, the others might use alternative terminological terms, such as: retirement income adequacy. Secondly, because there is no common, accepted, or fixed concept of pension adequacy or pension system adequacy, the evaluation methods also post additional differences, in both selection, evaluation, and implementation processes. Some methods lack thresholds or benchmarks, others are more quantitative or qualitative in their approaches, and some are regular publications, while some have not been re-analysed for years, not knowing if they can be emulated or renewed with the most recent and available data.

Taking into consideration the previous comparison and the findings from it, the most logical approach would be to combine the strengths of the different approaches by a quantitative framework or medium, which can facilitate the multidimensional approaches and their multidimensional data, while also providing a possibility to make assumptions or conclusions. This quantitative framework and medium will be further discussed in Chapter 3.1 (page 44). From the different evaluation approaches already discussed and evaluated, Chybalski's measurement method will be the theoretical framework or methodology for this empirical analysis. Since Chybalski analyses only pension system adequacy, the need for a preliminary data analysis is needed, which analyses the indicators, which are used for analysing pension adequacy. This preliminary data analysis is conducted in Chapter 2.2 (page 36). The next chapter will firstly, highlight the structure and previous reforms of the Baltic pension systems, in order to analyse, if the previous reforms have possibly widened or narrowed the adequacy of pensions or pension systems. Secondly, the chapter will conduct a preliminary data anaysis, in regard to the adequacy of pensions and pension systems in the Baltic states, to assess the current situation.

2. Pension system and pension adequacy in the Baltic states

Firstly, this chapter will briefly describe the selection of the Baltic states as the main research subjects, simultaneously presenting an overview of the pension system structures and previous pension reforms undertaken by the three Baltic states, until the current year (2021). By doing so, this process will provide and present the differences and similarities in the Baltic pension systems, which will help to possibly analyse the potential reasons or factors, that have caused such pension adequacy or pension system adequacy levels. Secondly, this chapter will conduct a preliminary data analysis of the adequacy of pensions and pension systems in the Baltic states, specifically by providing information about the current situation or levels, in terms of pension adequacy and also sustainability.

2.1. The Baltic states as research subjects

Why the Baltic states and their pension systems? The Baltic States are chosen because of their compatibility. Compatibility, in terms of similar pension systems, strong regional cohesiveness, shared history (declaration of independence, Soviet occupation, restoration of independence and the accession to the EU), and the similar levels or concerns for the adequacy of their pension systems and pensions, which will later be presented in further detail (Chapter 2.2, page 36). All of the three Baltic States share a similar: three-pillar pension system, which makes the analysis more systematic, constructive, relevant, and most of all: comparable (Volskis, 2012; Rajevska, 2014a). The Baltic States, while taking into consideration the similarities previously mentioned, mostly concerning the worrying levels of pension system adequacy and the similar structurization processes of the pension systems, the three states possess a range of notable differences, especially in the second, voluntary (third), or quasi-mandatory pension pillars, in terms of participation, opportunities and legal obligations (Rajevska, 2013: 83).

To justify the selection of the Baltic states as research subjects and the previously mentioned dimensions of compatibility, an in-depth overview has been constructed in order to exhibit, analyse, and present the similarities, differences, or other relevant features, in regard to the Baltic pension systems and their nuances. These are illustrated by: Appendix 1; Appendix 2; and Appendix 3 (pages 73-78), which mostly highlight the previous pension reforms that all of the Baltic states have undertaken (individually), from the restoration of independence (1990-1991) until the current year (2021). It must be taken into consideration, that the constructed table may exhibit some shortcomings with presenting all of the important reforms and decisions, that the three Baltic states have initiated during this 20-year period.

Taking into consideration the findings in Appendices 1-3 (pages 73-78), the first similarity that the Baltic pension system strucutralization process highlighted, was the immanent removal of the old Soviet pension system (PAYG system) and the gradual development of the new three-pillar pension system, which was both influenced by the necessity and transition from a command economy to a market economy, plus the outside influence or interest by: international organizations (World Bank, IMF, …); regional peers (Poland, Hungary, …), or other European nations (Sweden, …) (Fultz, 2006: 415). Arguments can be made concerning the level of commitment and influence that these organizations actually presented to the different Baltic states (Latvian example), especially concerning the preparation, development, and implementation periods. The most relevant conclusion is that, all of the three Baltic states had the desire, need, and also somewhat success, to opt for a three-pillar pension system (Fultz, 2006: 368).

The second similarity that the Baltic pension system structuralization process highlighted, was the close and similar sequence of processes, regarding the establishment, implementation, and restructuring of the second and third pillars, or the overall privatisation of the pension systems (Fultz, 2006: 355). This aspect gifted the Baltic citizens more options, in terms of new alternative contribution efforts or additional benefits to be obtained, upon joining the retirement age.

The previous notion and the high proportion of new entries into the newly constructed pension systems, caused the Baltic states substantial financial, political, and administrative problems or issues, outside of the already problems caused by: high levels of inflation and considerate economic turmoil, which was present in all of the three Baltic states during the 1990s (Fultz, 2006: 358). Privatization would ideally provide more flexibility, diversification, and also some level of protection, if the public pension schemes would be either politically mismanaged or exposed to external risks (Fultz, 2006: 362).

The third similarity that the Baltic pension system structuralization process highlighted, was the gradual equalization and increasement of the retirement or pensionable age, for both men and women. The Baltic states saw these political decisions as measures, that were constructed to maintain key cost-containment burdens, which were caused by the sudden changes in participants, aging populations, high unemployment rates, and increased usage of early retirement options (Fultz, 2006). Postponing retirement and keeping the workforce occupied in the labour market for longer periods, helped to maintain higher pension payments to the retirees when entering retirement, because of the reduction of low-paid pension payment occurences, which the Latvian NDC pension formula exhibited and promoted (Fultz, 2006: 358-359).

The first noteworthy difference in the Baltic pension system structuralization process, was highlighted by the variation in selection and adaptation of different three-pillar pension systems, which were largely based on the similar recommendations, made by the World Bank and other foreign partners (Fultz, 2006: 8). Estonia adopted for a PAYG (reformed) contributions-based first pillar, mandatory prefunded second pillar, and a supplementary or voluntary third pillar account (Fultz, 2006: 405). Latvia adopted for a NDC formula based first-pillar system, which is similar to a contributions-based pension, but the pension contributions are based on the entire economy, which are unfunded and where a notional pension capital account is created, where the assets are not accumulated (Fultz, 2006: 171). Latvia adopted for a similar prefunded second pillar and a private voluntary third pillar, like Estonia (Fultz, 2006: 164-165).

Lithuania adopted for a two-tier first pillar system, which combines both flat-rate pensions (related to service) and an earnings-related component (Fultz, 2006: 303). Lithuania adopted for both a voluntary/optional second and third pillar system (funded), which was the most unique and different system in the Baltic states (Fultz, 2006: 321-322). The different adaptations of the three-pillar systems, could be somewhat explained or linked to the different commitment and influence that previous regional or international peers, partners, or organizations presented, during the preparation, development, and implementation periods (Fultz, 2006: 365). Although the Baltic states suffered from similar problems (high inflation, economic turmoil, political uncertainties, …), it is quite understandable that the three states adopted for a similar system, but with non-identical nuances (Fultz, 2006).

The second noteworthy difference in the Baltic pension system structuralization process, concerned the legal, financial, and participation obligations, in regards to the second pension pillar. Firstly, all of the three Baltic states either created, implemented, or restructured their second pension pillar frameworks and systems in close sequence, but the legal, financial, and participatory obligations differed substantially (Fultz, 2006: 355). When Estonia and Latvia decided to both impose and offer participation into the second pillar, Lithuania chose a different route, making participation voluntary and providing additional flexibility (Fultz, 2006). The argument for this decision was based on the reasoning that this would be a reasonable compromise, which would first give freedom to the individual, then would stimulate and promote private sector participation or activity, and lastly reducing the fiscal burden on the social insurance system (Fultz, 2006: 327). Secondly, now the situation has switched stances, where the participation in the second pillar has become voluntary in Estonia, but on the contrary in Lithuania, participation in the second pillar is now mandatory (Estonian Ministry of Finance, 2020; Pivoriene & Ambrazeviciute, 2020). Latvia has been the only Baltic state, which has continuously sustained the notion of mandatory participation in the second pension pillar.

In order to understand how these decisions or reforms have possibly impacted the adequacy of the Baltic pension systems, Chapter 2.2. (page 36), will provide more insight into the current situation, regarding the adequacy of pensions and pension systems in the three Baltic states.

2.2. The adequacy of pension systems and pensions in the Baltic states

One of the main and concerning similarities between the Baltic pension systems, is the inadequacy of their pensions and pension systems. Previous approaches, which were previously described in Chapter 1.3 (page 16), proved that the situation in the Baltic states is moderately alarming. Results from Chybalski's analysis confirmed, that the Baltic states ranked among the lowest of the analysed European countries (Chybalski, 2012: 13).

In the Allianz SE Group's approach, the analysis revealed similar results for the Baltic states, but with a new additional dimension – sustainability (Allianz SE, 2015). Firstly, in the Allianz SE Group's approach, the RIA index showed that the worst adequacy level between the Baltic states was obtained by Estonia (4.61 out of 10), second best was Latvia (5.25 out of 10), and the best level was obtained by Lithuania (5.44 out of 10) (Allianz SE; 2015: 29-30). In comparison to the other analysed countries or the EU average (5.5 out of 10, which was additionally calculated), the RIA index results could describe the adequacy levels in the Baltic states being between: (just) moderately adequate (5 out of 10) and not adequate (below 5) (Allianz SE, 2015: 29-30). Secondly, the Allianz SE Group's approach also integrated the funded pension scheme sub-indicator to their RIA index, which now analyses and compares the total pension system adequacy (Allianz SE, 2015: 20). The new results showed that no positive changes occurred, which means that the pension systems of the Baltic states are moderately stable, robust, and in need for structural reforms (Allianz SE; 2015: 21).

Thirdly, when taking into consideration the newly added notion of sustainability, which is analysed by the PSI index, then the results provide some positivity for the Baltic states, where the Estonian and Latvian pension adequacy and pension system adequacy are described as: 'sustainable', except for Lithuania, which is described as: 'moderately sustainable' (Allianz SE, 2015: 19). In the "*2016 Pension Sustainability Index"* paper, Allianz SE Group analysed the same selected countries, but focusing their analysis on sustainability, not adequacy (Allianz SE, 2016). The PSI index showed that the worst sustainability level between the Baltic states was obtained by Lithuania (6.94 out of 10), second best was Estonia (7.28 out of 10), and the best level was obtained by Latvia (7.41 out of 10) (Allianz SE, 2016: 29).

In comparison to the other Central and Eastern European countries, or the EU average (6.53 out of 10, which was additionally calculated), then the PSI index results exhibited positive results for the Baltic states (Allianz SE, 2016: 29). Latvia and Estonia are even in the top 10 of the analysed countries, while Lithuania is lacking a little bit behind (Allianz SE, 2016: 12). The sustainability of the Baltic pension systems is credited to the reforms, which the countries have taken in recent years, especially in increasing retirement age and reducing additional costs (Allianz SE, 2016: 12). Table 5 (page 37) presents the RIA and PSI values.

Table 5: Adequacy and Sustainability in the Baltic States (RIA vs PSI)

Indicator	**RIA**	**PSI**
Estonia	**4.61**	**7.28**
Latvia	**5.25**	**7.41**
Lithuania	**5.44**	**6.94**
EU average (28 countries)	**5.55**	**6.53**

Source(s): Allianz SE, 2015 & Allianz SE, 2016

In the European Commission's Pension Adequacy Report, the notion of adequacy is measured by three dimensions, which are: 1. poverty protection (e.g. AROPE 65+); 2. income maintenance (replacement rates, e.g. ARR); and 3. pension duration (length of retirement, e.g. years) (European Commission, 2018a: 23). In the last Pension Adequacy Report, which was conducted in 2018, presented concerning results, especially regarding the adequacy of the Baltic states pensions and pension systems (European Commission, 2018b).

Firstly, in terms of poverty protection (AROPE 65+ rates), the Baltic states are one of the lowest in the European Union (data from 2016) (European Commission, 2018b). AROPE 65+ mearsures the at-risk-of-poverty or social exclusion population groups, who are facing substantial material deprivation or have other negative circumstances, that can cause serious problems to them (European Commission, 2018b: 278). Latvia has the highest AROPE 65+ rate in the Baltic states (43.1%) and even one of the highest in the EU (EU average is 18.3%) (European Commission, 2018b: 135). Estonia also has one of the highest AROPE 65+ rates in the EU (41.4%) (European Commission, 2018b: 59). Lithuania has the smallest rate in the Baltic states (37.4%), in terms of AROPE 65+, but still doubling the EU average (18.3%) (European Commission, 2018b: 146). Comparing the results from the Pension Adequacy Report with the latest AROPE 65+ rates (2019), the ratios have mostly increased for the Baltic states.

Latvia still has the highest AROPE 65+ rate in the Baltic states (50.6%) and in the EU (EU average is 19%, which was additionally calcuated), increasing from 43.1% to 50.6%, which is 2-3% each year (Eurostat, 2021c). Estonia has the third highest AROPE 65+ rate in Europe, having substantially increased from 41.4% to 45.1%, while the Lithuanian rate has been stable (37.4%) (Eurostat, 2021c). The Baltic states are among the five lowest underperfoming states in the EU, in terms of AROPE 65+ rates (Eurostat, 2021c). Table 6 (page 39) presents the amplitude of Baltic pensioners, who should be considered, when discussing the dimension of poverty protection. An additional dimension was constructed in Table 6, which is the change in AROPE 65+ rates, between 2016 to 2019.

Table 6: Poverty protection differences in the Baltic states (AROPE 65 rates)

Indicator	AROPE 65+ (%)		Change (+/-)
Year/ Country	**2016**	**2019**	
Estonia	**41.4**	**45.1**	**+3.7**
Latvia	**43.1**	**50.6**	**+7.5**
Lithuania	**37.4**	**37.4**	**-**
EU average (28 countries)	**18.3**	**19.0**	**+0.7**

Source(s): European Commission, 2018b; Eurostat, 2021c; and the author's calculations

Taking into consideration that the Pension Adequacy Report prioritizes the AROPE 65+ ratios more than the earlier AROP (at-risk-of-poverty) version, this chapter will additionally discuss the AROP rates of the Baltic states, because it includes a common threshold used in measuring pension adequacy or pension system adequacy, which is the 60% of the national median equivalised disposable income (European Commission, 2018b: 278).

In terms of AROP rates (data from 2016), the Baltic states are ranked amongst the lowest performing countries in the EU (EU average is 14.7%) (European Commission, 2018b: 274). Estonia posts the highest AROP rate (40.2%) between the Baltic states, while Latvia posts the second highest AROP rate (38.1%), while Lithuania is posting a substantially lower AROP rate (27.7%), in comparison to Estonia and Latvia (European Commission, 2018b). A common concerning problem between the Baltic states and the AROP rates, is the gender differences between men and women. All of the three Baltic states present substantial gender differences in the AROP rates, even the highest differences in the EU, ranging from 12 to 21% between men and women, while the EU average is 5% (European Commission, 2018b).

Comparing the results from the Pension Adequacy Report with the latest AROP rates (data from 2019), the ratios have mostly increased for the Baltic states (EU average is 16.5%) (Eurostat, 2021d). Latvia has overtaken Estonia and now posts the highest AROP rates (47.9%) between the Baltic states, while Estonia posts the second highest AROP rates (43.7%), while Lithuania is still posting substantially lower AROP rates (31.6%), in comparison to Estonia and Latvia (Eurostat, 2021d). Table 7 (page 40) presents the proprotion of people, who are at a substantial risk of poverty. An additional dimension was constructed in Table 7, which is the change in AROP rates, between 2016 to 2019.

Table 7: Poverty protection differences in the Baltic states (AROP rates)

Indicator	**AROP (%)**		**Change (+/-)**
Year/ Country	**2016**	**2019**	
Estonia	**40.2**	**43.7**	**+3.5**
Latvia	**38.1**	**47.9**	**+9.8**
Lithuania	**27.7**	**31.6**	**+3.9**
EU average (28 countries)	**14.7**	**16.5**	**+1.8**

Source(s): European Commission, 2018b; Eurostat, 2021d; and the author's calculations

Secondly, in terms of income maintenance, the Baltic states again present worrying results, in two differnt ratios, which are the: 1. aggregate replacement ratio (ARR), which measures and compares the median earnings (or pensions) between people, who are already in retirement or aged between 65-74, and the median incomes between people aged 50-59, who are considered pre-retirement population groups; and the 2. relative median income ratio, which compares the median equivalised disposable income of persons aged 65+ and the people, who are aged between the years of 0-64 (European Commission, 2018b: 278).

In terms of ARR (data from 2016), the Baltic states are substantially lower than the EU's average (0.58) (European Commission, 2018b: 276). Latvia has one of the lowest ARR ratios in the European Union (0.42), while Estonia and Lithuania are presenting a little better ratio (0.45), but still ranking in the lowest group of European underperforming countries (European Commission, 2018b). Comparing the results from the Pension Adequacy Report with the latest ARR ratios (2019 data), the ratios are decreasing for the Baltic states (Eurostat, 2021a). In terms of the latest ARR ratios, Latvia has fallen the most between the Baltic states (from 0.42 to 0.38), while Lithuania and Estonia have not experienced such dramatic drops (0.43 and 0.44 respectively) (Eurostat, 2021a). Considering that the Baltic states were one of the lowest underperforming countries in the EU, already in terms of ARR, which the Pension Adequacy Report highlighted, then the further decreasing numbers can be viewed as possibly alarming (Eurostat, 2021a).

In terms of relative median income ratio (65+) (data from 2016), the Baltic states are again in the lowest group of the analysed countries. Estonia posts the lowest relative median income ratio (0.60) in the EU, with Latvia being close second (0.63). Lithuania's ratio is higher than the other Baltic states (0.71), but substantially under the EU average (0.93) (European Commission, 2018b). Comparing the results from the Pension Adequacy Report with the latest relative median income ratios (data from 2019), the Baltic states ratios have decreased during the years and still belong in the lowest performing countries (EU average 0.90) (Eurostat, 2021b). The highest decrease has been in Latvia, where the ratio has fallen from 0.63 to 0.58 in three years, whereas Estonia and Lithuania having also significant decreases in relative median income ratios (to 0.58 and 0.68 respectively) (Eurostat, 2021b). Table 8 (page 42) shows the differences in income maintenance. An additional dimension was constructed in Table 8, which is the change in ARR and relative median income rates, between 2016 to 2019.

The preliminary data analysis excluded the comparison of theoretical replacement rates (TRR), because of the unavailability and dismissal of the European average value, and the overly hypothetical assumptions (European Commission, 2018b: 280). The empirical analysis included the: new base case of the TRR value (2016), because it correlates more to the current worker's employment scenario (European Commission, 2018b: 281).

Table 8: Income maintenance differences in the Baltic states

Indicator	ARR		Change	Relative median income		Change
Year/ Country	**2016**	**2019**		**2016**	**2019**	
Estonia	**0.45**	**0.44**	**-0.01**	**0.60**	**0.58**	**-0.02**
Latvia	**0.42**	**0.38**	**-0.04**	**0.63**	**0.58**	**-0.05**
Lithuania	**0.45**	**0.43**	**-0.02**	**0.71**	**0.68**	**-0.03**
EU average (28 countries)	**0.58**	**0.57**	**-0.01**	**0.93**	**0.90**	**-0.03**

Source(s): European Commission, 2018b; Eurostat, 2021a; Eurostat, 2021b; and the author's calculations

Thirdly, the Baltic states face a similar problem or concern, which is the large difference in life expectancy between men and women, which creates substantial gender gaps in pension payments (European Commission, 2018b). In Lithuania, the gender gap in pension payment duration is quite substantial between men and women (16.2 vs 24.4 years), which needed additional reforms, such as increasing the retirement age (European Commission, 2018b: 146). In Latvia, the gender gap in pension payment duration posts similar numbers between men and women (16.0 vs 23.5 years) (European Commission, 2018b: 140). In Estonia, the gender gap in pension payment duration posts the highest differences, in both the Baltic states and between the European member states (17.2 vs 25.7 years) (European Commission, 2018b: 60).

Considering the previous findings, which firstly highlighted the concerns with the Baltic pension system structures (previous or ongoing reforms), secondly by describing the dimension of pension system adequacy and pension adequacy, and by concluding, that the current situation in the Baltic states is somewhat concerning, as it was in the 1990s, when the three Baltic states faced the difficult transition from command economy to a market economy, where the focus was based on creation and implementation (Fultz, 2006: 414).

Currently, the main focus is not directed nor distributed to the creation or implementation, but to the stabilization and improvement of these pension systems and pensions (adequacy vs sustainability). In terms of the previous findings, the adequacy of pension systems and pensions in the Baltic states, posts quite concerning and decreasing results, because of the inadequate replacement rate ratios and substantial gender differences in pension payment durations. The only positive aspect that can be addressed from the previous findings is the sustainability of these pension systems, which also should be further questioned and analysed, taking into consideration the ongoing concerns, such as: aging populations, increased life expectancy, longer employment periods, and also external factors, such as: COVID-19.

The next chapter, Chapter 3 (page 44), will conduct and highlight the results of the empirical analysis part of the thesis. Firstly, Chapter 3.1. (page 44), will discuss the methodology and theoretical framework used, in order to conduct the empirical analysis. The theoretical framework and methodology are based on: F. Chybalski's multidimensional measurement method of analysing pension system adequacy (APS) (Chybalski, 2012). Secondly, Chapter 3.2. (page 47), will renew F. Chybalski's APS measurement method, by using the most recent and available data obtainable, while also including aspects or indicators (PI4), which Chybalski himself did not include or analyse, for different reasons (Chybalski, 2012). Thirdly, Chapter 3.3. (page 53) will try to propose a new evaluation or measurement index, for evaluating or measuring both the adequacy of pensions and pension systems. The inclusion of both pension systems and pensions is based on the previous findings, that when analysing the adequacy of pensions systems or pension system adequacy, the main component, which was pension adequacy, does not differ that much substantively or terminologically, but only in the scope of influence (system vs income).

3. Empirical analysis

3.1. Methodology

The methodology for the empirical analysis is based on: F. Chybalski's multidimensional measurement method (see Chapter 1.3.2, page 18). Chybalski's measurement method is based on the selected sub-indicators and generated synthetic indicators, which were previously presented in Table 2 (page 20) (Chybalski, 2012: 12). In order to justify the values and the different dimensions, the sub-indicators and synthethic indicators were standardized into a higher value system (0-1 scale), in order to affect the single synthetic indicator (APS), in similar fashion (Chybalski, 2012: 12). This process was also constructed, in order to perceive the higher values as more desirable. The higher the value, the more adequate the pension system (Chybalski, 2012: 12). Chybalski standardizes destimulant and nominant variables, by using different formulas. The transformation formula for the destimulant variables (smaller values are desirable) is the following:

$$x_{ij}^{'} = \max_{i} x_{ij} - x_{ij}$$

Formula 1: Transformation formula for destimulant variables

Source: Chybalski, 2012: 12

***Note**: Where xij is the value of indicator j for country i.*

The transformation formula for the nominant variables is the following:

$$x_{ij}^{'} = -\left| x_{ij} - x_{ij}^{N} \right|.$$

Formula 2: Transformation formula for nominant variables

Source: Chybalski, 2012: 12

***Note**: Where xij^N is the desired value of indicator j for country i, either 0 (for differences) or 1 (for ratios). Larger values from ideal situations are considered worse (the latter is achieved with the negative sign in fron of the absolute deviance).*

After the transformation process of the destimulant and nominant variables, the variables are then standardized using a unification formula, which Chybalski himself formulated (Chybalski, 2012: 12). The unification formula is the following:

$$z_{ij} = \frac{x_{ij} - \min_i x_{ij}}{\max_i x_{ij} - \min_i x_{ij}}.$$

Formula 3: Unification formula for the standardization of the variables

Source: Chybalski, 2012: 12

Following the standardization of different variables, the aggregation of sub-indicators is constructed, which is composed of two different stages: 1. aggregating the sub-indicators into different synthetic indicators (PI, PP and GD) (Equations 1, page 45); and 2. aggregating the calculated synthetic indicators of individuals dimensions into a single synthetic indicator, which is the: APS indicator (Equations 2, page 46) (Chybalski, 2012: 12).

$$PI = \frac{1}{3}(PI1 + PI2 + PI3),$$

$$PP = \frac{1}{2}(PP1 + PP2),$$

$$GD = \frac{1}{4}(GD1 + GD2 + GD3 + GD4).$$

Equations 1: The formula for calculating individual dimensions of adequacy

Source: Chybalski, 2012: 12

$$APS = \frac{1}{3}(PI + PP + GD)$$

Equations 2: The formula for calculating the synthetic indicator – APS

Source: Chybalski, 2012: 12

Taking into consideration, that Chybalski's analysis could not evaluate the PI4 indicator *(net pension wealth by gender*), due to the lack of statistical data, this empirical analysis includes the PI4 indicator, which alters the PI synthetic indicator measurement formula (Chybalski, 2012: 9). The renewed formula adds the four PI dimension indicators together, after dividing them by the number of indicators used. The formula is the following:

$$PI = (PI1+PI2+PI3+PI4) / 4$$

Equations 3: The renewed formula for calculating the PI dimension

Source: Author's proposition

In order to visualize this multidimensional data, a visualisation tool is needed. The visualisation tool (often) used in this empirical analysis, is called the: *"spider diagram"* (Edrawsoft, 2021). The two-dimensional diagram, graph, or chart, called the: *"spider diagram",* is used in order to compare different items, values, or multidimensional data, on a two-dimensional graph (Edrawsoft, 2021). The *"spider diagram"* provides an opportunity to successfully visualise different multidimensional data, either to make general conclusions, or to analyse different features and characteristics of different approaches (Edrawsoft, 2021). This diagram provides a vital opportunity for this research, in order to visualise and analyse the overall adequacy of the Baltic pensions and pension systems. One of the potential bottlenecks or concerns with this chart is the redundancy and discrepancy of the analysed data (Edrawsoft, 2021). Edrawsoft additionally comments, that when using the spider diagram, the selection and amount of statistical values or metrics, should not be more than six items or values (Edrawsoft, 2021).

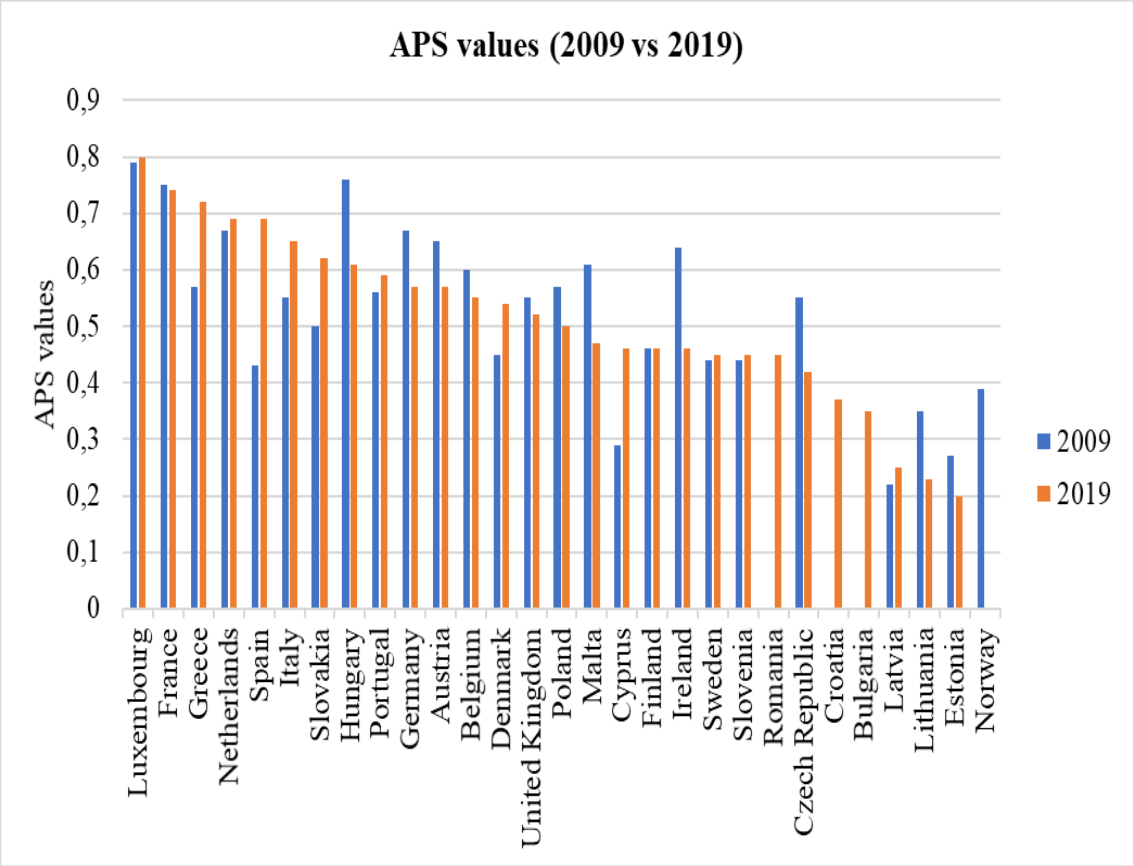
The reason for this recommendation is the fact that, if too much different data or metrics are placed into one diagram or chart, then the observation and visualisation of the data will be significantly obstructed and the possibility of making clear conclusions, will also be difficult (Edrawsoft, 2021). Taking into consideration that the different approaches previously described (OECD, Allianz SE, Grech, …) exhibited both different values, scales, and statistical ranges, this quantitative tool is certainly vital and highly necessary. Taking into consideration the importance of the spider diagram for the empirical analysis, different quantitative graphs, tables, or other visulization tools are used and presented.

The next sub-chapter (Chapter 3.2., page 47) aims to renew and compare Chybalski's analysed APS values (data from 2009) with the renewed values (data from 2019), in order to evaluate the differences in adequacy levels of the selected pension systems. Considering the focus of the thesis, further attention will be given to the Baltic states.

3.2. Renewal of Chybalski's APS values

Firstly, the aim of this sub-chapter is to renew Chybalski's APS values with the most available and recent data (2019), which can be obtained. Secondly, the aim is to compare the APS values from Chybalski's analysis with the renewed values, potentially providing interesting findings and results. The statistical data for the analysis was gathered from different statistical offices or organisations, such as: OECD and Eurostat (OECD Data, 2019, Eurostat, 2021j, some on page 55). Before the renewal and comparison of the APS values, the countries selected for evaluation, spcifically between the two studies, post some variations. In Chybalski's analysis, the inclusion of Norway is present and exhibited, but in the renewed version of the APS values, Norway is excluded from the analysis. This decision is based on the fact, that Norway is not and has not been an EU member state, which the other research subjects are or have been (the UK). Considering that most of the analysis includes the EU member states, then in the renewed version of the analysis, countries such as: Bulgaria, Croatia, and Romania are included. Figure 5 (page 48) and Table 9 (page 49) present the difference in Chybalski's APS values, between 2009 and 2019 (author's calculations).

Figure 5: Difference in Chybalski's APS values (2009 vs 2019)



Source: author's calculations

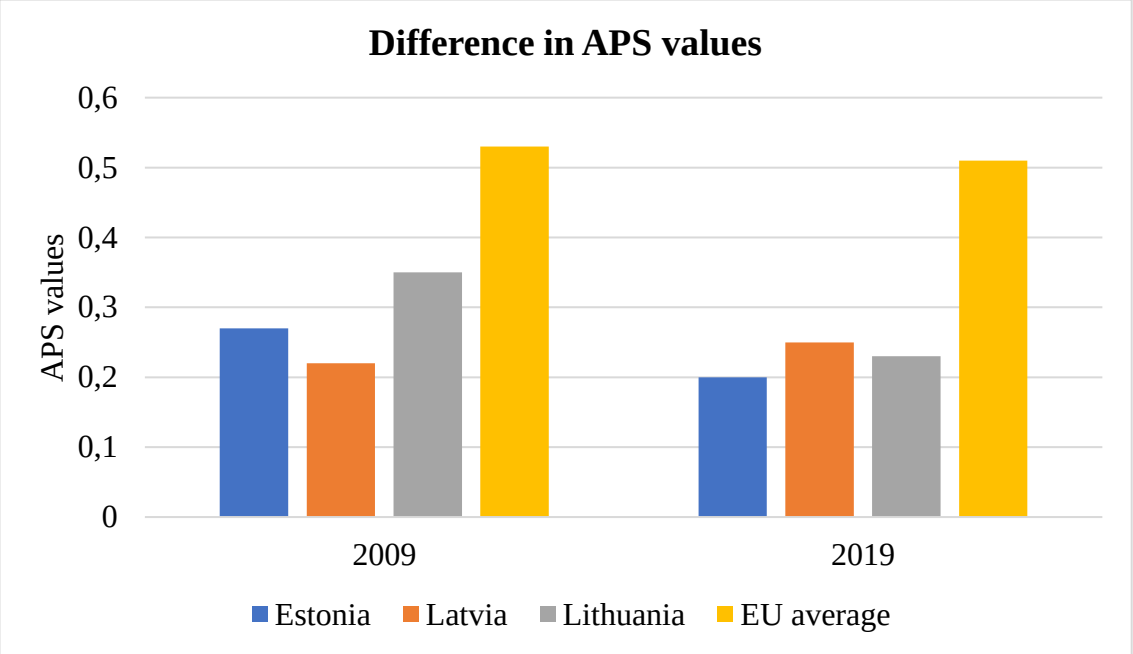
Table 9: Difference in Chybalski's individual dimensions and APS values

Country/ Indicator	2009					Country/ Indicator	2019				
	PI	PP	GD	**APS**	**Rank**		PI	PP	GD	**APS**	**Rank**
Luxembourg	0.70	0.98	0.67	**0.79**	**1**	Luxembourg	0.89	0.99	0.51	**0.80**	**1**
Hungary	0.73	0.96	0.59	**0.76**	**2**	France	0.49	0.81	0.93	**0.74**	**2**
France	0.94	0.61	0.70	**0.75**	**3**	Greece	0.64	0.90	0.61	**0.72**	**3**
Netherlands	0.55	0.66	0.81	**0.67**	**4**	Netherlands	0.42	0.71	0.95	**0.69**	**4**
Germany	0.56	0.65	0.80	**0.67**	**5**	Spain	0.62	0.80	0.64	**0.69**	**5**
Austria	0.88	0.52	0.54	**0.65**	**6**	Italy	0.62	0.71	0.62	**0.65**	**6**
Ireland	0.59	0.60	0.72	**0.64**	**7**	Slovakia	0.43	0.78	0.63	**0.62**	**7**
Malta	0.50	0.48	0.85	**0.61**	**8**	Hungary	0.51	0.84	0.48	**0.61**	**8**
Belgium	0.50	0.41	0.89	**0.60**	**9**	Portugal	0.47	0.65	0.65	**0.59**	**9**
Greece	0.34	0.47	0.90	**0.57**	**10**	Germany	0.24	0.57	0.89	**0.57**	**10**
Poland	0.53	0.65	0.53	**0.57**	**11**	Austria	0.53	0.59	0.58	**0.57**	**11**
Portugal	0.61	0.50	0.57	**0.56**	**12**	Belgium	0.26	0.56	0.83	**0.55**	**12**
United Kingdom	0.44	0.42	0.79	**0.55**	**13**	Denmark	0.28	0.62	0.73	**0.54**	**13**
Czech Republic	0.35	0.69	0.60	**0.55**	**14**	United Kingdom	0.31	0.51	0.74	**0.52**	**14**
Italy	0.68	0.46	0.51	**0.55**	**15**	Poland	0.36	0.66	0.48	**0.50**	**15**
Slovakia	0.43	0.56	0.50	**0.50**	**16**	Malta	0.39	0.30	0.73	**0.47**	**16**
Finland	0.54	0.37	0.47	**0.46**	**17**	Cyprus	0.27	0.39	0.73	**0.46**	**17**
Denmark	0.25	0.33	0.77	**0.45**	**18**	Finland	0.35	0.52	0.51	**0.46**	**18**
Sweden	0.67	0.38	0.27	**0.44**	**19**	Ireland	0.16	0.51	0.70	**0.46**	**19**
Slovenia	0.61	0.42	0.27	**0.44**	**20**	Sweden	0.35	0.52	0.49	**0.45**	**20**
Spain	0.37	0.40	0.53	**0.43**	**21**	Slovenia	0.27	0.47	0.61	**0.45**	**21**
Norway	0.57	0.44	0.16	**0.39**	**22**	Romania	0.41	0.45	0.48	**0.45**	**22**
Lithuania	0.24	0.44	0.36	**0.35**	**23**	Czech Republic	0.31	0.37	0.58	**0.42**	**23**
Cyprus	0.28	0.00	0.59	**0.29**	**24**	Croatia	0.15	0.30	0.66	**0.37**	**24**
Estonia	0.24	0.26	0.30	**0.27**	**25**	Bulgaria	0.43	0.19	0.43	**0.35**	**25**
Latvia	0.11	0.08	0.48	**0.22**	**26**	Latvia	0.10	0.03	0.62	**0.25**	**26**
						Lithuania	0.21	0.25	0.23	**0.23**	**27**
						Estonia	0.20	0.05	0.34	**0.20**	**28**

Source: Chybalski, 2012 & author's calculations

Looking at results from Figure 5 (page 48) and Table 9 (page 49), the concerning finding or result featured in this comparsion, highlights the further decrease in pension system adequacy, for the Baltic pension systems. The decrease has been quite significant for Estonia and Lithuania, while the Latvian APS value has improved, but not significantly. In 2009, Cyprus was presenting similar results as the Baltic pension systems, in terms of APS, but when comparing the older values with the renewed values, the improvement of the Cyprian pension system has been quite significant, but on the contrary for the Baltic states. When analysing and comparing the earlier results with the renewed results, the hypothesis of the thesis has been answered, meaning, that the Baltic pension systems are still one the most inadequate pension systems in the EU, in terms of pension system adequacy. Figure 6 (page 50), shows the difference of APS values, specifically between the Baltic states and the EU average. The EU average value, from the year 2009, includes 25 European member states (without Bulgaria, Croatia and Romania), while the EU average value from the year 2019, inlcudes 28 European member states (including the UK). These EU average values were calculated by the author.

Figure 6: Difference in APS values between the Baltic states (2009 vs 2019)



Source: author's calculations

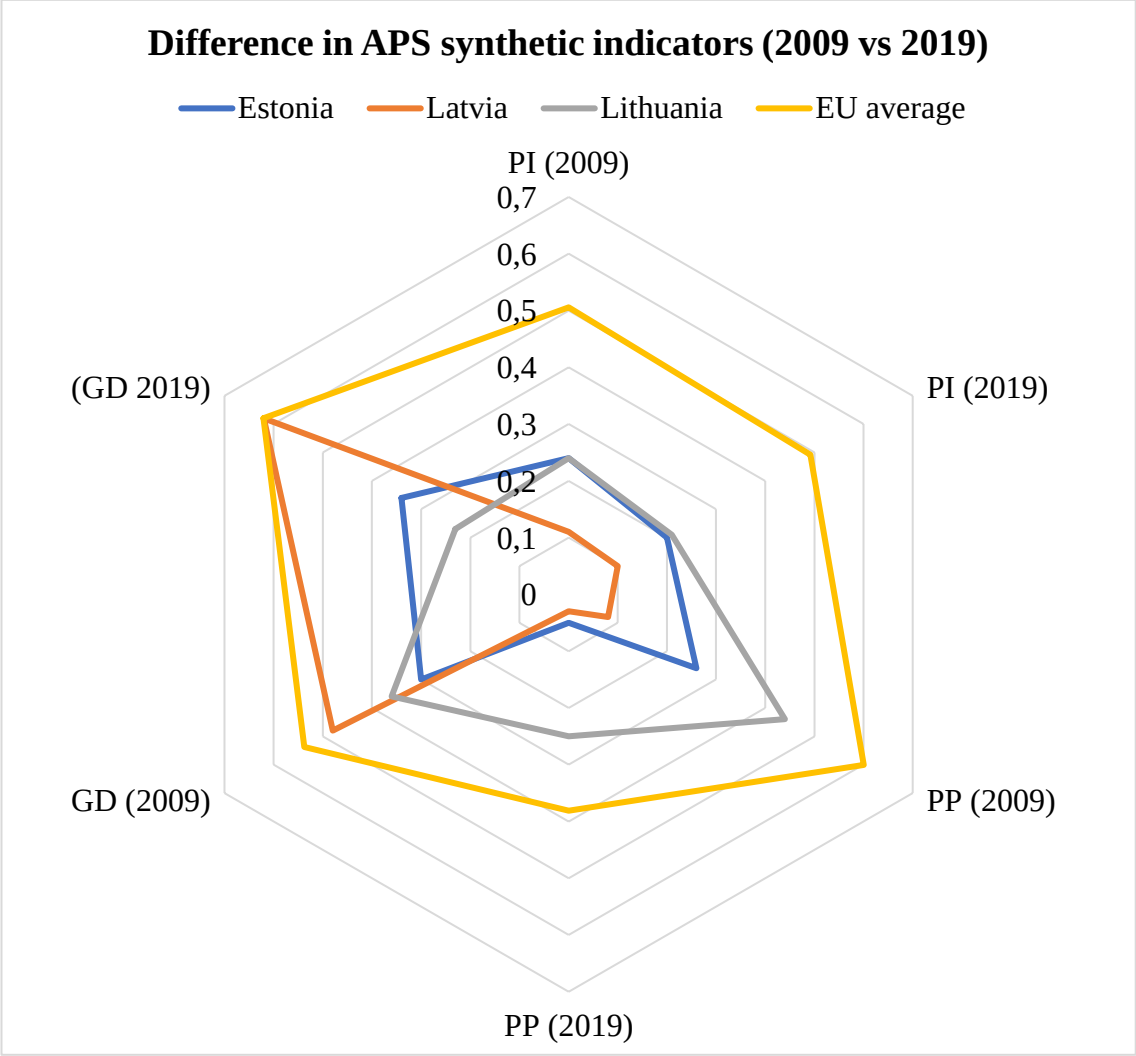
When analysing and comparing the different synthetic indicators against each other (see Figure 7, page 52) some positive, but questionable findings can be observed. Firstly, in terms of gender differences (GD), the Baltic pension systems (especially Latvia), have mostly narrowed down gender differences between men and women, when observing the renewed APS values. Only the Lithuanian pension system has showed decreasing results, which indicate that the pension system itself widens the difference between men and women. This is an intresting finding. On the contrary, the Pension Adequacy Report's results exhibited significant inequalities or differences between men and woman, either in pension payment durations or AROP rates (European Commission, 2018b). Quite similar indicators are used in Chybalski's method (see Table 2, page 20) and the European Commission's approach (see page 17), when comparing the two. This situation highlights quite a common academical problem, when analysing or evaluating pension system adequacy or pension adequacy. Similar indicators are used, but the evaluation and measurement approaches differ significantly, that the results obtained or calculated are proportionally different, which in itself question the results that are obtained.

Having such different results from such similar indicators or data, restricts also the conclusion making process. These kinds of situations also question, which method would be considered more adequate, correct, or trustworthy. The previous situation indirectly answers the second hypothesis of the thesis, which shows that the complexity and lack of clarity, in regard to the measurement methods and concepts of both pension system adequacy (Chybalski) and pension adequacy (Pension Adequacy Report), create restrictions in evaluating and renewing previous results or methods, or even proposing a new alternative approach.

Secondly, in terms of pension income and pension poverty indicators (PI and PP), all of the Baltic pension systems are showing decreasing results. The previous preliminary data analysis, which also used different pension adequacy indicators, exhibited similar results or findings, when analysing the differences in AROP, AROPE, and different income or replacement ratios (ARR, relative median income ratio …).

The similarity of the results is understandable, considering that the preliminary data analysis mostly focused on the Pension Adequacy Report's used indicators, which Chybalski's analysis also includes. Considering, that the results from these synthetic indicators (PI and PP) matched the results from the preliminary data analysis, while also highlighting the same concers or deficiencies, questions the evaluation and inclusion of the dimension of gender, in Chybalski's analysis. Figure 7, exhibits the differences in individual synthetic indicators, specifically between the Baltic states and the EU average.

Figure 7: Difference in the APS synthetic indicators (2009 vs 2019)



Source: author's calculations

Taking into consideration the previous results, findings, restrictions, and opportunities, from the different appoaches, the next sub-chapter (Chapter 3.3., page 53) will try to propose a new evaluation index, which aims to connect and analyse both the adequacy of pension and pension systems.

3.3. Proposal of the new evaluation index

The aim of this sub-chapter is to propose a new evaluation or measurement index. The methodology is based on F. Chybalski's approach (see Chapter 3.1., page 44). The structure of the sub-chapter is the following. Firstly, the identification and selection of sub-indicators, which are presented in Table 10 (page 55). Secondly, the identification and aggregation of synthetic indicators (see Table 10, page 55). Thirdly, the identification and aggregation of the single synthetic indicator, which is titled the: **APPS** (adequacy of pensions and pension systems). Data was gathered from different international statistical offices (OECD & Eurostat) and also the previous approaches used in this research.

Taking into consideration the strengths, weaknesses, restrictions, and other relevant factors or findings from the previous measurement methods, five synthetic indicators have been identified, in order to construct the new proposed index. These five synthetic indicators are based on sub-indicators, which were selected from the previous approaches and from the author's own propositions. The five synthetic indicators are the following:

1. **Poverty protection (PP) –** this indicator exhibits the ability of the pensions and pension systems, at preventing people from falling into poverty or social exclusion. The indicators or values used in this dimension, are the: 1. AROP (at-risk-of-poverty); and 2. AROPE 65+ (at-risk-of-poverty or social exclusion) rates. The higher the value, the better the pension and the pension system is, at protecting people from falling into poverty or social exclusion. Based on the European Commission's Pension Adequacy Report (European Commission, 2018a).

2. **Income maintenance (IM) –** this indicator exhibits, how effective or sufficient are the pensions and pension systems, at replacing or guaranteeing the pre-retirement earnings to the retirement-based earnings. The indicators or values used in this dimension, are the: 1. ARR (aggregate replacement ratio); 2. Relative median income ratio; 3. TRR (net theoretical replacement rates) (2016 new base case); and 4. Net pension replacement rates. The higher the value, the better the pension or pension system is, at replacing or sustaining the previous earnings. Based on the European Commision's Pension Adequacy Report and author's propositions (European Commission, 2018a).

3. **Sustainability (SUST) –** this indicator exhibits the potential change in fiscal sustainability, during the timeframe between 2016 to 2070 and the year 2070. It will present the change in obligatory payments or contributions to public pensions. The indicators or values used in this dimension, are the: 1. Public pensions, gross as % of GDP (Change between 2016-2070); and the 2. Public pensions, gross as % of GDP (year 2070). The higher the value, the more sustainable the pension and pension systems will be in the future (assumption). Based on the European Commission's 2018 Ageing Report and author's propositions (European Commission, 2018c).

4. **Employment (EMP) –** this indicator exhibits, if the balance between a person's overall life, employment, and retirement periods are adequately proportionate. The indicators or values used in this dimension, are the: 1. Life expectancy by age and sex (from 65); 2. Life expectancy by age and sex (total); 3. Employment and activity by sex and age (55 to 64); and the 4. Duration of working life. The higher the value, the more proportionate are the different life periods between each other. Based on the European Commission's Pension Adequacy Report and the author's propositions.

5. **Expenditure (EXP) –** this indicator exhibits, what is the proportion or percentage of contributions towards pensions and pension systems, specifically from the total expenditure or GDP of the selected countries. The indicators or values used in this dimension, are the: 1. Total Current Pension expenditure (% of GDP); and 2. Total expenditure on social protection (% of GDP). The higher the value, the more attention and resources are allocated to the pensions and pension systems. Based on the author's propositions.

After the synthetic indicators are aggregated, the single synthetic indicator needs to be calculated, from the individual synthetic indicators. The formula for the proposed APPS index is similar to Chybalski's APS evaluation formula (Equations 2, page 46). The APPS calculation process is based on two steps: 1. The synthetic indicators are added together; and 2. then divided by the number of synthetic indicators used. The formula for the calculation process of the APPS index, is shown in Equations 4 (page 56).

Table 10: Overview of the selected sub-indicators and synthetic indicators

Dimension/Indicator	Indicators or metrical values used	Source(s)
Poverty protection	1. AROP (at-risk-of-poverty) rates 2. AROPE 65+ (at-risk-of-poverty or social exclusion) rates	Eurostat, 2021d Eurostat, 2021c
Income maintenance	1. ARR (aggregate replacement ratio) 2. Relative median income ratio 3.TRR (theoretical replacement rates, new 2016 base case) 4. Net pension replacement rates	Eurostat, 2021a Eurostat, 2021b European Commission, 2018a OECD Data, 2021
Sustainability	1. Public pensions, gross as % of GDP (Change between 2016-2070) 2. Public pensions, gross as % of GDP (year 2070)	European Commission, 2018c European Commission, 2018c

Employment	1. Life expectancy by age and sex (from 65) 2. Life expectancy by age and sex 3. Employment and activity by sex and age (55 to 64) 4. Duration of working life	Eurostat, 2021i Eurostat, 2021i Eurostat, 2021e Eurostat, 2021f
Expenditure	1. Total Current Pension expenditure (% of GDP) 2. Total expenditure on social protection (% of GDP)	Eurostat, 2021h Eurostat, 2021g

Source: Author's proposition

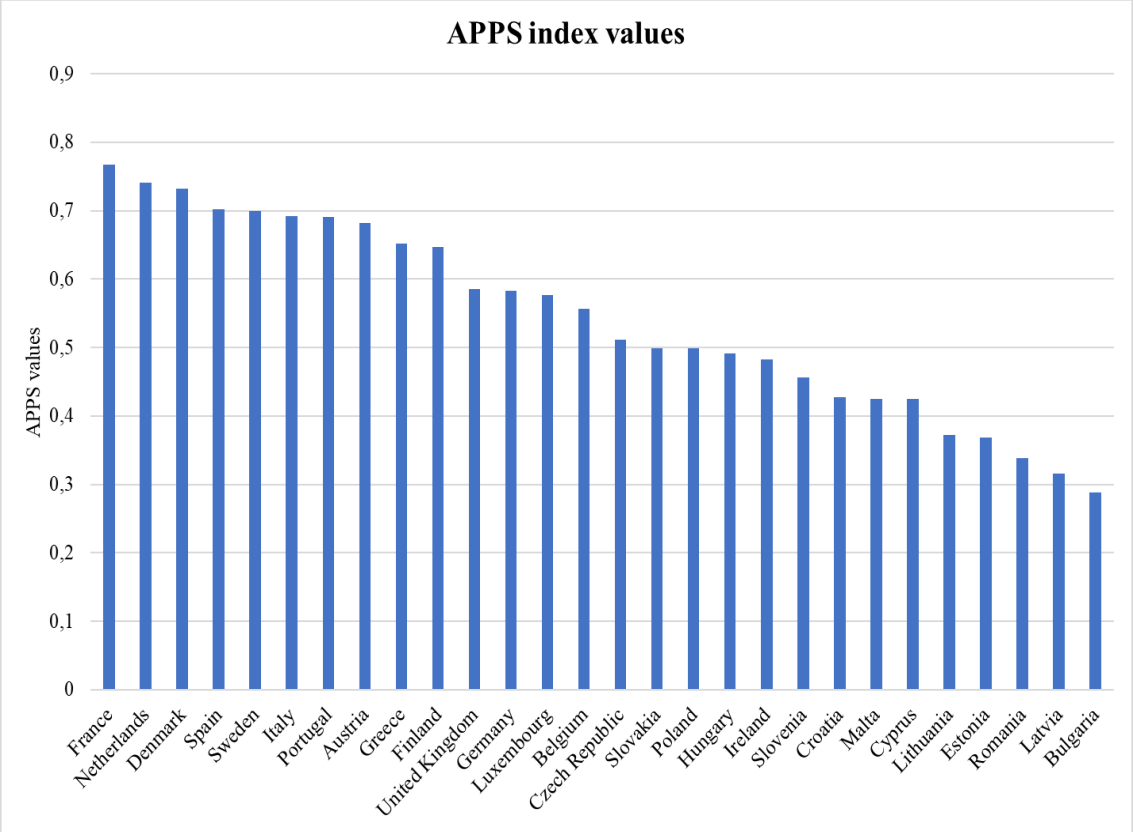
$$\boldsymbol{APPS} = (PP + IM + SUST + EMP + EXP) / 5$$

Equations 4: The formula for calculating the APPS synthetic indicator

Source: Author's proposition

Figure 8 (page 57) presents the new APPS index values or results, from the selected and analysed countries. The countries were placed in the ranking order from the best (France) to worst (Bulgaria) APPS index values.

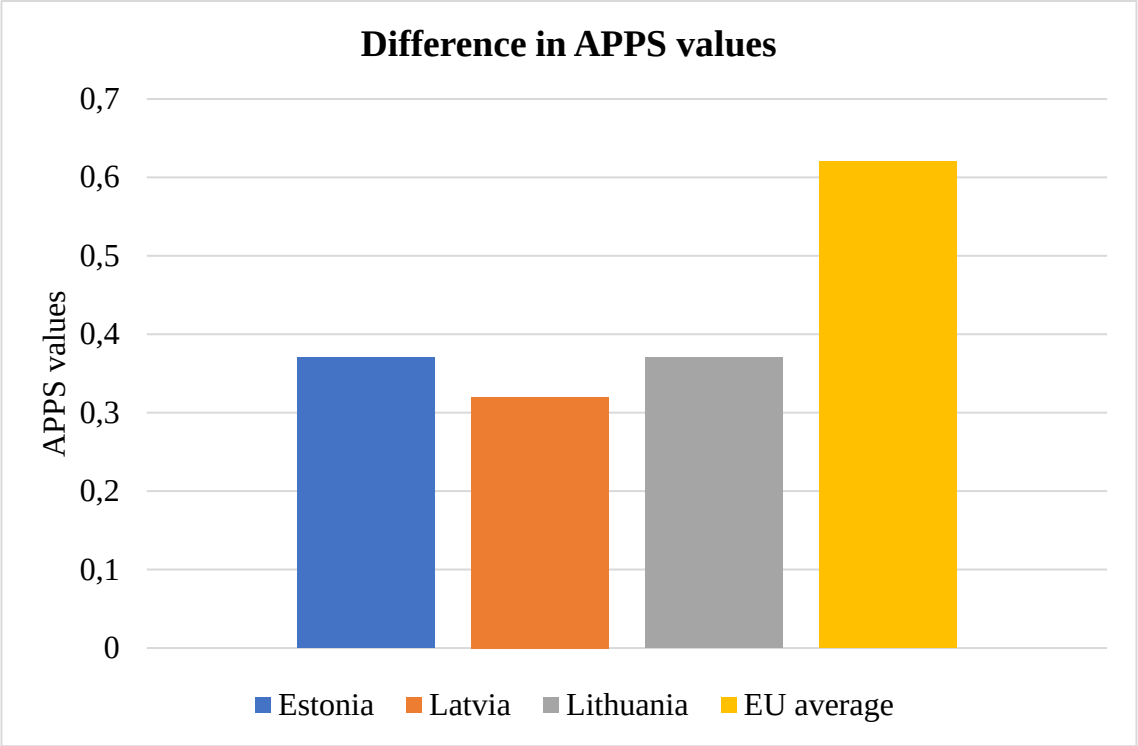
Figure 8: The new proposed APPS index values



Source: author's calculations

From the results of the new APPS index, similar conclusions can be made as from Chybalski's APS values, that the adequacy of pensions and pension systems of the Baltic states, are one of the most inadequate in Europe. In terms of adequacy, the most inadequate pensions or pension systems mostly stem from the Eastern and also some Southern European member states, such as: Bulgaria, Romania, Croatia, Cyprus, (...). The best performing member states, in terms of adequacy, mostly stem from the Central and Western European member states, such as: Luxembourg, Austria, France, Netherlands, and so forth. Figure 9 (page 58) shows the difference in APPS values, between the Baltic states and the EU average, which was additionally calculated for visualisation purposes.

Figure 9: Difference in APPS values between the Baltic states



Source: author's calculations

This diagram already exhibits the evolving conclusion of this research, which is that the adequacy of pensions and pension systems in the Baltic states, posts unpleasant and alarming results. Considering that the EU average value is at 0.62 out of 1, which almost doubles the Latvian APPS value (0.32 out of 1), the reason for concern is self-explanatory. Taking into consideration the results and findings from just the APPS index values, further evaluation is needed in order to understand, why these APPS values are so low. In order to find out the reasons for such low APPS values, further evaluation of the synthetic indicators is needed. All of the synthetic indicators and APPS index values are presented in Table 11 (page 59), to give a more comprehensible understanding of the values and what might they possibly represent. Figure 10 (page 60) highlights the synthetic indicator values and results of the Baltic states, to give a more specific oveview.

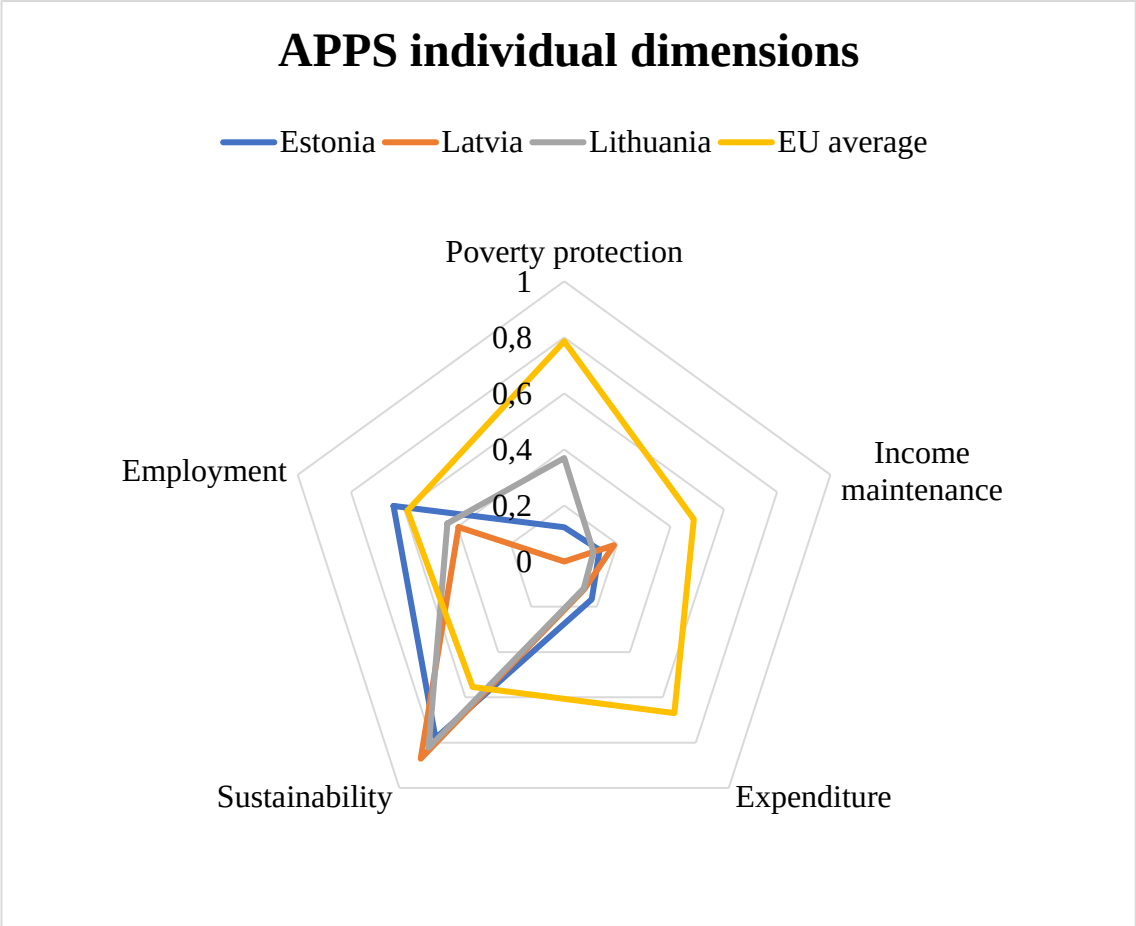
Tabel 11: Values of the synthetic indicators and APPS index ranks

Country/Indicator	PP	IM	SUST	EMP	EXP	**APPS**	**Rank**
France	0.97	0.62	0.62	0.68	0.94	**0.77**	**1**
Netherlands	0.92	0.61	0.65	0.83	0.70	**0.74**	**2**
Denmark	0.99	0.42	0.72	0.77	0.77	**0.73**	**3**
Spain	0.85	0.77	0.61	0.70	0.58	**0.70**	**4**
Sweden	0.85	0.33	0.74	0.96	0.62	**0.70**	**5**
Italy	0.78	0.75	0.49	0.58	0.86	**0.69**	**6**
Portugal	0.76	0.76	0.60	0.68	0.64	**0.69**	**7**
Austria	0.87	0.72	0.41	0.62	0.79	**0.68**	**8**
Greece	0.82	0.45	0.78	0.44	0.78	**0.65**	**9**
Finland	0.86	0.41	0.42	0.77	0.78	**0.64**	**10**
United Kingdom	0.71	0.39	0.55	0.72	0.56	**0.59**	**11**
Germany	0.77	0.29	0.41	0.75	0.70	**0.58**	**12**
Luxembourg	0.99	0.98	0	0.52	0.40	**0.58**	**13**
Belgium	0.83	0.41	0.30	0.54	0.71	**0.56**	**14**
Czech Republic	0.80	0.39	0.42	0.67	0.28	**0.51**	**15**
Slovakia	0.94	0.42	0.56	0.33	0.24	**0.50**	**16**
Poland	0.77	0.40	0.61	0.31	0.40	**0.50**	**17**
Hungary	0.91	0.60	0.49	0.26	0.19	**0.49**	**18**
Ireland	0.76	0.28	0.66	0.71	0	**0.48**	**19**
Slovenia	0.74	0.33	0.27	0.53	0.41	**0.46**	**20**
Croatia	0.43	0.24	0.83	0.23	0.41	**0.43**	**21**
Malta	0.52	0.39	0.46	0.66	0.10	**0.43**	**22**
Cyprus	0.60	0.31	0.46	0.52	0.24	**0.43**	**23**
Lithuania	0.37	0.11	0.82	0.44	0.12	**0.37**	**24**
Estonia	0.12	0.13	0.78	0.64	0.17	**0.37**	**25**
Romania	0.49	0.30	0.61	0.14	0.14	**0.34**	**26**
Latvia	0	0.19	0.87	0.40	0.12	**0.32**	**27**
Bulgaria	0.20	0.34	0.51	0.20	0.20	**0.29**	**28**

Source: author's calculations

When analysing the individual synthetic indicators or dimensions of the APPS index values, which are presented both in Table 11 and Figure 10 (page 60), several worrying findings can be highlighted.

Figure 10: Empirical results from the individual dimensions of the APPS index



Source: author's calculations

Firstly, in terms of poverty protection, the Baltic states rank amongst the lowest in the EU. The pensioners in the Baltic states are at a high risk of falling into poverty or social exclusion. This connects and correlates to both Chybalski's previous results (PP levels) and the results from the preliminary data analysis. The Baltic state pensioners or retirees are at a high risk of falling into poverty or social exclusion, possibly, because of the low levels of income, which are paid or replaced to the pensioners, during their retirement periods. The risk of falling into poverty or social exclusion, could also be connected to the low levels of expenditure, into social protection or pension systems, meaning, that the governments do not allocate significant additional benefits to the pensioners.

Secondly, in terms of income maintenance, the Baltic states rank amongst the lowest in the EU. The retirees or pensioners in the Baltic states, are receiving significantly lower levels of income during their retirement periods, in comparison, to when they were employed. This also connects and correlates to both Chybalski's previous results (PI levels) and the results from the preliminary data analysis. The low levels of income maintenance can possibly be related to the dimension of expenditure, because in the dimension of expenditure, the Baltic states are also ranked amongst the lowest performing group, meaning, that the governments of Baltic states do not invest or contribute significant proportions of their expenditure, neither to social protection or pension systems. Less investments from the state could correlate to the low level of income for the pensioners, or the chance to obtain additional benefits. Keeping the expenditure low and not investing significant amounts into social protection or the pension systems, is making the Baltic pension systems fiscally sustainable, as can be seen from Table 11 (page 59) or Figure 10 (page 60).

Thirdly, the low level of expenditure from the governments to social protection or the pension system, could entail that in the future the level of personal contributions, in order to have an adequate pension, could rise quite significantly. Taking into consideration the new Estonian pension reform, where participation in the second pillar has now become voluntary, similar reforms can take place in the near future, not just in the Baltic states, but also in EU (Estonian Ministry of Finance, 2020). This could possibly result in the lowering of state pensions by the Baltic governments, which could be already assumed, based on the lowering expenditure to public pensions from the European Commission's assumptions (European Commission, 2018c).

Fourthly, another significantly concerning finding or result, comes from the employment dimension. The Baltic states are just above (Estonia) or just below the EU average (Latvia & Lithuania), in terms of employment. In Latvia and Lithuania, the different periods for a person are not adequately balanced, meaning, that the people living in these countries, are working longer than the average EU citizen, have a shorter life expectancy than the average EU citizen, and also a shorter retirement period than the average EU citizen.

Taking into consideration the previous findings, regarding the adequacy of the pensions and pension systems of the Baltic states, the overall results are concerning. In conclusion, the Baltic pension systems are in that sense sustainable, but highly inadequate and in need for structural reforms, to counter and possibly resolve the decreasing results. When viewing both the findings and results from the empirical and preliminary data analysis, even the only positive dimension, which was fiscal sustainability, is questionable. This result exhibits that the contributions by the Baltic governments towards public pensions or pension systems, will possibily decline, which will further decrease the overall adequacy of the Baltic pension systems and their pensions.

Before the conclusions of this thesis, some additional places of thought are provided, in order to analyse the new proposed index and its potential. Firstly, taking into consideration that neither F. Chybalski's analysis or other approaches to evaluating the adequacy of pensions or pension systems (either previously mentioned or in the research subject in general), do not provide performance vectors or relative weights. An almost ideal representation of what this multi-dimensional or multicriteria analysis should or could be, is exhibited in the works of E. Siskos; D. Askounis & J. Psarras (2014), who evaluated the performance of e-government (Siskos; Askounis & Psarras, 2014). These performance vectors or relative weights would quantitatively guarantee some kind of minimal and maximal results and not the dismissal of odd results. Unfortunately, this analysis also does not provide such relative weights. Attempts were made in order to collect and calculate these relative weights from government officials or other influential stakeholders, but unfortunately, these attempts were unsuccessful due to the current situation and complications connected to the ongoing COVID-19 pandemic.

Secondly, further development should also be invested into the development of a threshold or benchmark, to the new proposed APPS index. The difficulty in trying to propose or generate a threshold or benchmark, relies in the complexity of trying to implement different indicators, values, or dimensions into a multidimensional analysis. The simplest version would be to set a benchmark to the overall APPS value itself, without considering the values of the synthetic indicators, but this could create scenarios, where the overall APPS value could be high (for example 0,8), but the synthetic indicators could post minimal values (for example, income maintenance = 0,3).

The best version would be to set benchmarks or thresholds, to both the single synthetic indicator (APPS) and to the individual synthetic indicators (PP, IM, SUST, EMP, EXP). This would guarantee that all of the dimensions themselves, which create the overall APPS index value, could be deemed adequate. Adequacy should represent and include all of the dimensions, not just some or high valued dimensions, which boost the overall APPS value.

Thirdly, considering that the new results and findings from the APPS index correlate to the results and findings from Chybalski's, or the preliminary data's analysis, the new index shows some convincing potential. While the new proposed index excluded the dimension of gender or gender differences, the inclusion of new dimensions, such as: sustainability, employment, and expenditure, provided additional opportunities for further discussion and evaluation. The overlap of similar results could question the necessity for a new evaluation or measurement method, but considering the complexity and fragmentation of the research topic in general, the proposal of a new evaluation method could be regarded as a contribution to the research topic and possbily, bring more clarity into the research fields of pension system adequacy and pension adequacy.

Conclusion

This Master's thesis set out to evaluate the adequacy of pension systems. The necessity and justification for this research was based on three factors. Firstly, the pension systems and pensions in the European Union in general, are facing concerning or worrying external and social factors, such as: aging populations; higher dependency for social benefits; longer employment periods; increased retirement ages; and other factors, which are burdening and testing the adequacy or sustainability of these systems. The need for further evaluation and analysis stems from the breadth of the population, who will be affected or influenced by the decisions, that these governments will propose and enact.

Secondly, the concepts and evaluation methods used in order to analyse the adequacy of pension systems or pensions, differ substantially. Pension systems and pensions entail a vast array of components and classifications, which evaluate the performance and success of a pension system. Considering the lack of clear definitions and complex multidimensional evaluation or measurement methods, the research analysed pension system adequacy and its main component, which was pension adequacy. When analysing the two terms or components against each other, the difference was minimal. The main difference was the scope of influence, that these concepts were trying to enact or influence (system vs income). The purpose of adequacy for pension systems or pensions, was the ability to provide similar benefits or forms of income, during both pre-retirement and retirement periods, which has the potential and ability to protect the retirees or pensioners, from falling into either poverty or social exclusion.

Thirdly, the research subjects selected for the research, where the Baltic states or the Baltic pension systems. The justification for choosing the Baltic states, was based on the worringly low and decreasing results of different indicators and indexes, which evaluate the adequacy of both pension systems and pensions. The Baltic states were also chosen for their compatibility, because of their similar three-pillar pension systems.

The inclusion of Chybalski's APS approach provided a solid and comprehensible framework and methodology, which provided both important empirical results and findings by itself, or further avenues for development, in order to enhance the research topic of pension system adequacy, and its evaluation or measurement methods. This research also enhanced and contributed to Chybalski's original measurement method, because it included some measurement indicators, that Chybalski himself could not measure or evaluate. The renewal of Chybalski's method was not ideal, because all of the indicators that Chybalski proposed in his original method, were not renewed or evaluated, due to different factors. Further development and renewal of Chybalski's measurement method and other methods, which were included in the research, would be recommended.

By using these different multidimensional measurement approaches or methods, the hypothesis of the research was answered. The Baltic states are and were one the most inadequate systems in the EU. Both the preliminary data analysis and the empirical analysis supported this claim. The only positive, yet concerning finding was related to the dimension of sustainability, meaning, that the Baltic pension systems are fiscally sustainable, because of the low expenditure into social protection or pension systems, which correlate to the low levels of income paid or allocated to the Baltic states pensioners. The Baltic pension systems are sustainable, but highly inadequate in different dimensions, which cause further complications and risks for the Baltic states pensioners.

This research was able to address the complexity and difficulty of analysing pension systems and pensions, by one of its main components, classifications, or concepts, which was: adequacy. The research also exhibited, that a significant amount of approaches use similar indicators, in order to conduct their evaluations or measurements, but showcase conflicting and different results, which can portray the pension system either negatively or positively. Considering that most of the approaches selected and the results they exhibited, could be considered outdated and irrelevant in today's context, meaning, that the renewal and evaluation of these approaches by this reseach, gave back the relevance and necessity to them.

The relevancy of this research also stems from the contribution it made. Further attention, time, energy, and development should be addressed to this research topic, and potentially to the new proposed index The proposal of a new index might possibly trigger an after effect or process, where more attention will be allocated or invested, into the research topic of pension system adequacy. Taking into consideration the usage and importance of this concept, this would be highly appreciated or recommended. The new proposed index should possess perfomance vectors and relative weights, which would guarantee the existence of results, either being minimal or maximal. The inclusion of more dimensions should also be considered. The exclusion of the some dimensions, such as gender, or gender differences, was justified in this specific research, but taking into consideration the conflicting results that the research presented, further attention should be allocated to this dimension and several others.

Considering the importance of pension systems and pensions, either as a source of income or as a safety net to the pensioners, specifically from falling into poverty or social exclusion, the citizens or the people in the Baltic states, should also be more knowledgeable and invested in the opportunities, threaths, and structure of their pension systems. These pension systems will play an important role in their future, especially during their retirement periods.

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&zSelection=DS-208320SEX,T;DS-208320INDICATORS,OBS_FLAG;&rankName1=TIME_1_0_0_0&rankName2=GEO_1_2_0_1&rankName3=INDICATORS_1_2_-1_2&rankName4=SEX_1_2_-1_2&sortC=ASC_-1_FIRST&rStp=&cStp=&rDCh=&cDCh=&rDM=true&cDM=true&footnes=false&empty=false&wai=false&time_mode=ROLLING&time_most_recent=false&lang=EN&cfo=%23%23%23%2C%23%23%23.%23%23%23 , used: 06.04.2021

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Appendices:

Appendix 1: Previous pension reforms in Estonia

State pension scheme (I pillar)	**Compulsory funded pension scheme** (II pillar)	**Voluntary funded pension scheme** (III pillar)
- **1992**: Introduction of the flat-rate pensions.[1] - **1998**: Equalisation of the pensionable age for men (2001) and women (63 years) (2016).[2] - **1999**: New three-pillar pension formula. Pension variation based on social tax paid (contribution-related) during full career, not just lenght-of-service.[3] - **1999**: Tax Office as the main collecting organization.[4] - **1999:** Employers have to pay, declare and indicate social tax for each employee.[5] - **2002**: Taxation of pensions. Pensions as taxable incomes	- **2002**: Introduction and implementation of the second pillar.[10] - **2002-2010:** Compulsory for people born after 1 January 1983 and voluntary for people born before 1983.[11] - **2004**: Accumulation of second-pillar pensions from self-employed individuals.[12] - **2004**: Additional supplementary contributions are allocated to parental benefit recipients (2012 = 1%; 2013 = 4%). [13][14] - **2005**: Changing or switching funds (once a year).[15] - **2021**: Restructuring of the second pillar. Participation in the second pillar is voluntary.[16]	- **1998**: Enactment of the legal framework[17] - **2012**: Contributions by employers are allowed.[18]

[1] Fultz, E (2006): "Pension Reform in the Baltic States", International Labour Office, Subregional Office for Central and Eastern Europe, International Labour Organization, Budapest, Hungary

[2] Fultz, 2006, p. 62
[3] Fultz, 2006, p. 49
[4] Fultz, 2006, p. 59
[5] Fultz, 2006: p. 59
[10] Fultz, 2006, p. 70
[11] Fultz, 2006, p. 70
[12] Fultz, 2006, p. 74
[13] Fultz, 2006, p. 74
[14] Riigi Teataja (2021): "Funded Pensions Act", Riigikogu
[15] Fultz, 2006, p. 76
[16] Estonian Ministry of Finance (2020): "Restructuring of the second pillar of the funded pension", Ministry of Finance of the Republic of Estonia, Estonian Government
[17] Fultz, 2006, p. 54
[18] Riigi Teataja (2021): "Funded Pensions Act", Riigikogu

with certain thresholds or allowances.[6] **- 2002**: Enacting pension indexation. Helps to determine changes between the individual's and state's pension obligations. Measurement is constructed by an index, which equally weighs (50/50) Consumer Price Index (CPI) and the increases of social tax revenues. [7] **- 2008**: Reformation of the indexation formula. 20% from the CPI index and 80% from the increase in social tax revenues (annual growth). [89]		

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Appendix 2: Previous pension reforms in Latvia

State pension scheme (I pillar)	**Compulsory funded pension scheme** (II pillar)	**Voluntary funded pension scheme** (III pillar)
- **1995-1996**: New first pillar - Notional Defined Contribution) scheme (NDC).[19] - **1995**: People retiring after 1996 are automatically in the NDC scheme (before 1996 are in the old PAYG scheme).[20] - **1995**: Equalisation of the pensionable age for men and women (1995 = 60 years; 1999 = 62 years; and 2012 = 65 by 2025).[2122] - **1995**: Reducing the social tax rate (from 38% in 1995 to 33% by 2001).[23] - **1996** (applied in 1998): Compulsory for employees and also self-employed (over the age of 15) people (unfunded). Contribution is 20% of wage.[24] - **1996**: Social pension is replaced with the new social security benefit.[25] - **1997**: New indexation system (double indexation).[26]	- **2001**: Introduction and implementation of the second pillar.[3435] - **2001**: Mandatory for people under 30 (born after 1971), voluntary between 31 to 49 and inaccesible for people over 50, on the year of its introduction (2001).[36] - **2007**: Private companies as main assestment managers (State Treasury as the previous).[37] - **2007-2013**: Reduction of the contribution rate during the financial crisis (8% to 2%).[38] - **2013-2016**: Increasing the contribution rate after the financial crisis (2013 = 4%; 2015 = 5%; 2016 = 6%).[39]	- **1998**: Enactment of the legal framework.[40] - **2005**: Relieving taxation policies (employee's contributions non-taxable).[41]

[19] Fultz, 2006, p. 171
[20] Fultz, 2006, p. 180
[21] Fultz, 2006, p.162
[22] Clements, B; Eich, F & Gupta, S (2014): „Equitable and Sustainable Pensions: Challenges and Experience", International Monetary Fund, Washington, DC, U.S.A
[23] Fultz, 2006, p. 177
[24] Fultz, 2006, p. 162
[25] Fultz, 2006, p. 174
[26] Fultz, 2006, p. 182
[34] Fultz, 2006, p. 199
[35] ETUI, 2017
[36] Fultz, 2006, p. 200-201
[37] ETUI, 2017
[38] ETUI, 2017
[39] ETUI, 2017
[40] Fultz, 2006, p. 193
[41] Fultz, 2006, p. 196

- **1998**: Reducing the burden of employers and enhacing employee contributions (16.5% each). [27] - **1999**: Restrictions in indexation processes (annually).[28] - **2001**: Liberalization of the indexation process (CPI + 50% of the real growth in contribution wage sum).[29] - **2004**: Further amendments in the indexation process.[30] - **2011**: Increasement of the social tax rate or social contribution (now 35.09%).[31] - **2014**: Reducing the insurance payment period to 25 years. [32] - **2014**: Increasing the minimum insurance payment period to 15 years (in 2025, it will be 20 years).[33]		

[27] Fultz, 2006, p. 178
[28] Fultz, 2006, p. 184
[29] Fultz, 2006, p. 185
[30] Fultz, 2006, p. 192
[31] Volskis, 2012, p. 9
[32] ETUI (2017): „Pension reforms in Latvia: background summary“, Brussels, Belgium
[33] ETUI, 2017

Appendix 3: Previous pension reforms in Lithuania

State pension scheme (I pillar)	**Compulsory funded pension scheme** (II pillar)	**Voluntary funded pension scheme** (III pillar)
- **1990**: Establishment of the pension system and state social insurance fund – SODRA.[42] - **1995**: New pension formula (basic pension + earnings-related supplement).[43] - **1995**: Mandatory participation for employees (under contract) and for the self-employed (some restrictions).[44] - **1995**: Establishment of additional statues or guarantees (1. state and 2. social pensions [45] - **1995:** Establishment of the contribution period restrictions (15 years for partial pensions and 30 years for full basic pension).[46] - **1995:** Increasing the retirement age (62 years and 6 months for men and 60 years for women, by 2009).[47] - **1995**: New conditions in pension benefit entitlement (full pensions only for people aged over 65 or if the	- **2002**: Restructuring of the second pillar. Participation is voluntary.[54] - **2004**: Introduction and implementation (pension funds) of the second pillar. [55] - **2018**: New contribution formula (4 + 2—4% by participant, 2% from the state budget).[56] - **2019**: Establishment of new contribution sources.[57] - **2019**: Restructuring of the second pillar. Auto-enrolment procedure (people up to 40 years old, but the option to opt-out).[58]	- **2000-2001**: Enactment of the legal framework (improved in 2001).[59] - **2004**: Introduction and conversion of private funds (pension privatization).[60] -**2006**: Introduction of occupational pension schemes.[61]

[42] Fultz, 2006, p. 292
[43] Fultz, 2006, p. 301
[44] Fultz, 2006, p. 300
[45] Fultz, 2006, p. 304
[46] Fultz, 2006, p. 301
[47] Fultz, 2006, p. 301
[54] Fultz, 2006, p. 325
[55] Fultz, 2006, p. 325
[56] Pivoriene & Ambrazeviciute, 2020
[57] European Commission, 2020
[58] Pivoriene & Ambrazeviciute, 2020

[59] Fultz, 2006, p. 323
[60] Fultz, 2006, p. 325
[61] Pension Funds Online, 2021

working pensioners earn 1.5 times the minimum wage).[48] - **1999**: Increase in the social contribution rate (1999 = 31% employers and 3% employees). [49] - **2003:** Partial privatization of pension scheme.[50] - **2004**: Re-introduction of early retirement.[51] - **2016:** Increasing the basic pension and insured income amounts. (112€ to 120€; and 445€ to 476€, respectively).[52] - **2018**: Gradual inncrease in the contribution period (by 6 months) (2020 = 31 years and 6 months).[53]		

[48] Fultz, 2006, p. 301
[49] Fultz, 2006, p. 293
[50] Fultz, 2006, p. 269
[51] Pension Funds Online (2021): „Pension System in Lithuania“, Wilmington Plc
[52] Pivoriene, J & Ambrazeviciute, K (2020): „Lithuania“, Chapter 25, Extended Working Life Policies,
[53] European Commission (2020): „Lithuania – Old-age pension“, Employment, Social Affairs & Inclusion

Summary in Estonian

Pensionisüsteemide adekvaatsuse hindamine: Balti riikide näitel

Heiko Zoober

Resümee

Balti ja Euroopa Liidu liikmesriikide pensionisüsteemid seisavad silmitsi mitmete murettekitavate sotsiaalsete ning demograafiliste katsumustega. Sotsiaalsed ja demograafilised katsumused, nagu: elanikkonna vananemine; suurenenud sõltuvus sotsiaaltoetustest; sündimuse langemine; pikenev tööelu; kõrgendatud pensioniiga; ja paljud teised. Need sotsiaalsed ja demograafilised katsumused potentsiaalselt ohustavad nii pensionisüsteemide adekvaatsust kui ka jätkusuutlikkust. Arvestades, et pea veerand kuni kolmandik Euroopa Liidu ja Balti riikide elanikest sõltuvad pensionidest ja pensionisüsteemidest sissetulekuallikana, oli edasise analüüsi vajadus õigustatud (European Commission, 2019; Central Statistical Bureau of Latvia, 2020; LRT English, 2019 & Sotsiaalkindlustusamet, 2019).

Pensionisüsteemide komplektsuse tõttu oli raske analüüsida pensionisüsteeme kõikide kasutuselolevate akadeemiliste lähenemiste või kontseptsioonide abil. Kontseptsioon või lähenemine, mis osutus käesoleva uuringu raames valituks, oli: adekvaatsus, täpsemalt pensionisüsteemide adekvaatsus. Uuringu eesmärk oli hinnata ning analüüsida pensionisüsteemide adekvaatsust, fokusseerides tähelepanu peamiselt Balti riikidele. Pensionisüsteemide adekvaatsuse hindamisel tuli arvesse võtta selle suurimat komponenti, milleks oli: pensionite adekvaatsus. Uuringu käigus selgus, et peamine erinevus nende kahe kontspetsiooni või lähenemise puhul, oli pelgalt mõju ulatuses (süsteem vs sissetulek). Mõlemal kontspetsioonil eksisteeris üsnagi ühtlane eesmärk, milleks oli tagada või garanteerida piisav kogus sissetulekut, et kaitsta inimesi, täpsemalt pensionäre, langemast vaesusesse või sotsiaalsesse tõrjutusse.

Uurimisprobleem oli seotud Balti riikide pensionisüsteemide ja pensionite adekvaatsuse madalate näitajatega, mis viitasid, et Balti riikide pensionisüsteemid olid kõige ebaadekvaatsemad Euroopas (Chybalski, 2012: 13). Balti riikide kui uurimisobjektide valik tuli samuti tingituna pensionisüsteemide ühilduvusest. Kõigil kolme riigil eksisteerivad pensionisüsteemid, mis toetuvad kolmele sambale ja mille ülesehituse protsesside kulg oli ühtlane (Fultz, 2006 & Volskis, 2012). Andmete esialgse analüüsi tagajärjel võis hinnata Balti riikide pensionisüsteemide adekvaatsuse langust progresseeruvaks kui ka kohati murettekitavaks. Arvestades, et uuringu eesmärk oli hinnata ning analüüsida Balti riikide pensionisüsteemide adekvaatsust, oli vaja leida metoodika, mis suudaks seda teostada. Metoodika ja teoreerilise raamistiku valimisel tuli esile mitmeid takistusi. Teatud lähenemisi polnud mitmeid aastaid uuendatud, või vastupidiselt just uuendatud, kuna tegemist oli regulaarse publikatsiooniga (raportiga). Erinevate teooriate ning metoodikate omavahelise võrdlemise ja analüüsimise tagajärjel, sai vajalik metoodika valitud. Empiirilise analüüsi vajalikuks metoodikaks ning teoreetiliseks raamistikuks osutus: Filip Chybalski multidimensionaalne meetod, mis hindab pensionisüsteemide adekvaatsust (*adequacy of pension systems – APS)* (Chybalski, 2012).

Chybalski meetod analüüsib kolme dimensiooni: vaesus (*poverty)*; sissetulek (*income)*; sugu (*gender)*, erinevate indikaatorite abil (Chybalski, 2012: 7). Chybalski meetodi peamisteks valikupõhjenduseks olid: 1. meetodi uuendamise vajadus; 2. võrdlusmomendi teostatavus; ja 3. meetodi edasiarendamise võimalus. Töö empiirilise analüüsi struktuur oli järgnev: 1. Chybalski meetodi uuendamine, kasutades kõige uusimaid ning kättesaadavaid andmeid; 2. Chybalski ning käesoleva uuringu analüüsi tulemuste võrdlemine; ja 3. uue indeksi või meetodi ettepanek, mis hindaks nii pensionisüsteemide kui pensionite adekvaatsust. Chybalski meetodi uuendamise tagajärjel saadi uuringu hüpoteesile kinnitust, et Balti pensionsüsteemide adekvaatsuse väärtused olid langemas ning Euroopa madalaimad. Chybalski ning käesoleva uuringu tulemuste võrdlemisel tuli esile murettekitav situatsioon, et pea igas valdkonnas, mida Chybalski metoodika analüüsis (vaesus, sissetulek, sugu), vähenesid tulemused kümne aasta vahemikus (2009 vs 2019).

Chybalski meetodi uuendamise ja teiste meetodite analüüsimise protsessi käigus tuli ilmseks, et eksisteerivad mitmed kitsendused ning nõrkused, täpsemalt indikaatorite valikus kui ka arvutamises. Uuringu üheks eesmärgiks oli uue indeksi või meetodi ettepanek, mis hindaks nii pensionisüsteemide kui ka pensionite adekvaatsust. Uus indeks põhines viiel dimensioonil, milleks olid: 1. vaesuse kaitse (*poverty protection)*; 2. sissetulekute säilitamine (*income maintenance)*; 3. jätkusuutlikkus (*sustainability)*; 4. tööhõive või teenistus (*employment)*; ja 5. kulutused (*expenditure).* Dimensioonid põhinesid uuringus varasemalt analüüsitud lähenemistest ja autori enda ettepanekutest. Uueks pakutud indeks tuli: APPS (*adequacy of pensions and pension systems)* ehk pensionite ja pensionisüsteemide adekvaatsus.

APPS indeksi tulemused kinnitasid samuti uuringu hüpoteesi, et Balti pensionisüsteemide ja pensionite adekvaatsus on üks madalamaid Euroopas. APPS indeksi tulemuste põhjal selgus, et Balti pensionisüsteemid ning pensionid on jätkusuutlikud, kuid äärmiselt ebaadekvaatsed ning vajavad selgelt reforme. Balti pensionite ja pensionisüsteemide jätkusuutlikkus oli tingitud asjaolust, et Balti riikide valitsused ei investeeri piisvalt vahendeid sotsiaalkaitse- ega pensionisüsteemidesse, mis korrelleerusid madalate pensionite näol. Selliste madalate pensionite tõttu eksisteerib Balti riikide pensioniäridel suur oht langeda vaesusesse või sotsiaalsesse tõrjutusse.

Pakutud indeks ei saavutanud enda maksimaalset potentsiaali, kuna puudusid teatud (vajalikud) komponendid, nagu: jõudlusvektorid (*performance vectors)* ja suhtelised kaalud *(relative weights).* Eelnev kitsendus kinnitas uuringu teist hüpoteesi, et uue indeksi või meetodi ettepanekud on raskendatud, kuna pensionisüsteemide ja pensionite adekvaatsuse uurimisvaldkond on üsnagi kompleksne kui ka killustatud, kus ei eksisteeri üldist definitsiooni ega selgeid kvantitatiivseid meetode. Autori panus analüüsitud uurimisvaldkonda võib aidata seda ebaselgust ning killustatust vähendada, pakkudes uusi dimensioone, indikaatoreid, kui ka kvantitatiivse indeksi, mille abil analüüsida ning hinnata pensionite kui ka pensionisüsteemide adekvaatsust.

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