The Government's Role in the Pension Plan Markets

El Papel del Gobierno en los Mercados de Planes de Pensiones.

TESIS DOCTORAL

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INFORME RAZONADO DEL/DE LOS DIRECTOR/ES DE LA TESIS

(se hará mención a la evolución y desarrollo de la tesis, así como a trabajos y publicaciones derivados de la misma)

La presente tesis trata sobre la situación originada en el riesgo financiero de los titulares de pensiones contributivas asociada a la forma de financiación de las mismas. En la transición de sistemas de prestación definida y financiación mediante el método de PAYG, se ha observado que las cohortes con prestaciones inferiores y financiación a través de pilares externos, el riesgo actuarial se incrementa por lo que se propone y estudia un sistema mixto en el que existe una prestación definida mínima para estas cohortes, similar a la existente en los sistemas PAYG, estando el resto financiada a través de un pilar externo. En estos casos se consigue un aseguramiento de estos niveles mínimos con un coste asociado que supone una proporción menor en el resto del sistema, es decir, algo asumible y que elimina riesgos financieros que difícilmente son controlables por los pensionistas. La transición a sistemas mixtos está impulsada por la posibilidad de trasladar la responsabilidad de generar los recursos necesarios para el sistema a entes externos y a los propios pensionistas, por lo que la tendencia al abandono de los sistemas de prestación definida, como el que existe en la mayoría de los países comunitarios, es algo que libera a los gestores responsables de tener que mantener de forma continua el equilibrio financiero del sistema, y del consiguiente riesgo, que así sería asumido por los beneficiarios. Se plantea corregir este riesgo que afecta en exceso a ciertas cohortes mediante un sistema mixto. Se plantean modelos de simulación, utilizando procesos de Wiener, y usando bases de datos de fondos de pensiones en el estado de Israel, con lo cual, se cuantifica el riesgo y se propone el modelo óptimo de financiación. Los resultados han originado las correspondientes publicaciones, y son relevantes para que el trabajo sea presentado ante el tribunal correspondiente.

Por todo ello, se autoriza la presentación de la tesis doctoral.

Córdoba, 29 de marzo de 2021

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List of Abbreviations

CEE – Central and Eastern Europe

CPI – Consumer Price Index

DB – Defined Benefit (pension system)

DC – Defined Contribution (pension system)

ESPN – European Social Policy Network

EC – European Commission

EU – European Union

ILO – International Labor Organization

IMF – International Monetary Fund

ISSA – International Social security Association

NDC – Notional (Non-Financial) Defined Contribution (pension system)

OECD – Organization for Economic Co-operation and Development

PAYG – Pay-As-You-Go (pension system)

WB – World Bank

Summary

The western world deals with a continuous trend of aging, low fertility, and debt crisis that pushes the governments toward funded-capitalized pension schemes (Holzmann & Hinz, 2005; Feldstein, 2005). A common trend is for public pension benefits to decline. Moreover, systemic reforms have changed the nature of pension provisions to shift more risks toward the pension earners. The privatization of pension plans world-wide and the global process toward appearance of more defined contribution plans raise important questions and thoughts regarding the proper pension scheme (Barr & Diamond, 2009).

The sharp downturn in the value of financial assets between 2007 and 2009 and the current financial crisis now arisen from the COVID-19 pandemic serve as sharp examples of how risky assets quickly lose a significant part of their value. The financial crises and continuing concerns about retirement security have generated new interest in the role of the country to provide adequate old-age benefits to its citizens. That interest is not merely reflected in vast recent literature; we are witnessing a great wave of pension withdrawals from funded-capitalized schemes toward more governmental intervention. Most of the countries experiencing the crises were the first to implement the new liberal pension schemes during the 1990s (Ebbinghaus, 2019; Altiparmakov, 2018; Grech, 2018).

In the era of an increasingly aging population and declining birth-rates on the one hand and the deep financial crisis, on the other hand, this thesis contributes to the debate on the optimal implementation of modern funded pension schemes. This thesis seeks the economic equilibrium that would enable funded pension schemes to remain sustainable to provide adequate benefits in old age. The novelty of this thesis is in its risk perspective. In this research, the government and various earning cohorts have been attributed roles as actors in the pension field.

After laying down the fundamentals of the modern pension theory, this thesis presents three studies that deeply examine the funded-capitalized pension schemes and their characteristics. Each chapter studies distinct dimensions of the pension schemes and all three lead to the same conclusion that it is necessary to consider various earning cohorts as distinct actors and strengthen the pension design with risk-sharing mechanisms. The

mutual aim of these chapters is to identify a pension design that would enable the aged to received adequate pension benefits without placing a fiscal burden on the government.

The first investigation is a theoretical study that further develops the portfolio theory of Markowitz and analyzes the financial relationship between the participant and the government. I claim that each actor in the field of pension tries to transfer risks that they cannot avoid successfully to the other actors. Therefore, this study argues that through political or fiscal pressure the pension designs converge to an equilibrium design that has risk-sharing mechanisms of bi-pathways of risks, including from the participant to the government. In this study, I point to countries that have moved through reforms toward radical privatization, mainly the Central East Europe (CEE) and Latin American countries, and demonstrated the process of convergence on to risk-sharing design.

The next two chapters analyze the funded pension design, each one from a different perspective. The first chapter looks at the public as a pension actor and differentiates among the earning cohorts. Here the optimal pension design that strikes a balance between funded and unfunded pension pillars has been derived using an Over-Lapping Generation (OLG) model and simple utility function, calibrated to suit the average OECD countries. While simulating different pillars' sizes, this study reveals a socio-economic anomaly in which low-earning cohorts absorb higher economic cost compares to the rest of the participants. This is caused by unbalances contribution rates to the funded and unfunded pension pillars. These uneven contribution rates arise from the inefficient hedging capability of the pension portfolios. Further, this research concludes that the mechanism of minimum pension guarantee is an efficient system stabilizer as it distributes the economic cost equitably among the earning cohorts.

The third chapter in this part continues along the direction set in the preceding chapter, which is to explore the socio-economic anomaly among earning cohorts during the shift to a funded pension scheme. This investigation is conducted mainly via an option benefit model, modeling the financial relationships among different earning cohorts and the government. Here the financial position reveals a socio-economic anomaly caused by exposure to financial and systemic risks and lack of insurance against such risks. Here, from another perspective, I also find that the minimum pension guarantee is a rebalancing mechanism that increases the probability of a pension scheme being sustainable. Specifically, this research argues that implementing the guarantee with an intra-

generational, risk-sharing mechanism is the most efficient way to reduce the effect of this anomaly. Moreover, the second part of this chapter describes the convergence process toward implementing minimum pension guarantee in countries, which have capitalized their pension systems during the last three decades.

These three chapters consider the risks and point toward the need to balance funded pension schemes to increase the probability of a pension system being sustainable and capable of providing adequate old-age benefits.

The third part of this thesis demonstrates the influence of risk and the effect of the minimum pension guarantee from accrual pension records of the Israeli market. This study aims to empirically examine the adequacy of the future benefits of the funded pension scheme. This study investigates a large real data sample from the largest pension fund in Israel and simulates expected benefits using a pension simulator. Here I find that even with relatively high market returns, the shift of pension provision from defined benefit (DB) to defined contribution (DC) results in a significant shift of risk from capital to labor and might push elderly participants into poverty during their retirement phase. The COVID-19 pandemic crisis in 2020 demonstrates that the expected pension benefits are vulnerable to financial, career, and systemic shocks. This research demonstrates the inadequacy of benefits and suggests embracing central risk-sharing mechanisms that can be implemented without increasing governmental debt level.

This thesis closely examines the role of the state as the central planner. In this research, it is assumed that one of the socio-economic roles of the state is to provide adequate benefits to its retired citizens. The state has to navigate through risks, challenges, and constraints to attain success in that role. The oft-repeated motive of this thesis is to find risk-sharing mechanisms that alleviate the risk burden on the individual and to ensure adequate benefit in old age. However, implementing such mechanisms required the government to play an active part in the pension market.

Keywords: pension system, risk sharing, social security, minimum pension guarantee, externalities, funded pension scheme

JEL: D14, E21, E61, G11, G18, G22, G32, H23

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I. Introduction

"I believe in the diversity of individual preferences and the ability of most individuals to act in their own self-interest. But I also believe that there is a role for government that justifies the provision of social insurance benefits. I come to this conclusion on utilitarian grounds rather than from any philosophical commitment to social solidarity." (Feldstein, 2005)

1.1. Motivation

National economies are characterized by a variety of welfare programs. These measures come into realization during old age by maintaining some standard of living for the elderly during their retirement phase.

In recent years, pension arrangements have moved to the top of policymakers' agenda. The current period of pension reforms is driven mainly by growing concern surrounding the economic impact of ageing and a requirement for fiscal restraint, leading to more privatized, partially funded, more delayed, and less sufficient income support in old age (Bonenkamp et al. 2017). Particular attention is devoted to the question of how economic and political acts can be made to deal with the ongoing challenge of ageing of the Western society (William, 2019; Arza, 2008; World Bank, 1994).

Countries with relatively high levels of public spending may hope for some relief from the demographic strain on their welfare systems through a decreasing share of beneficiaries at this end (Orenstein, 2013). Therefore, many countries have started to shift away from traditional unfunded to new private-funded pension plans. The consequence is limited possibility to share risks (Kourtonas & Yew, 2017).

According to Ebbinghaus, "We have witnessed a dual paradigm shift to privatization and marketization in pension policy, which demands reconsideration after the crash of the financial market in the last decade. As part of the "new politics" of reform, the state has increasingly retreated from its responsibility to maintain income in old age" and left private funded pensions to the "drift" of private actors (Ebbinghaus, 2015, p.2). However, following the financial crisis, there seems to be an increasing need and mounting political pressure for the state to reverse reforms and to secure adequate level of pensions in the future (Bohn, 2010). Over the last decade, it was observed that governments around the world are considering increasing their share in response to fluctuations in the market and providing solutions for social affairs, such as income inequality and poverty in old age (Grech, 2018). Financial crisis, including the recent COVID-19 pandemic, has intensified this trend (Gerard et al. 2020). Drawing a cyclical process, the conservative trend evolved in the 1980s and the 1990s, with the state shifting responsibility for old age income being under examination.

The challenge is to improve pension coverage and ensure adequate benefits, although the way to achieve this target is still under continuous debate. From one side, demographic challenges fiscally threaten the western world's conservative pension design and social security (Feldstein, 2005). From the other side, the privatization and capitalization highly expose the individual to a variety of risks and may aggravate poverty and income inequality in old age.

Due to the latest pension reforms of the 1990s, the future benefit levels and their risk exposures to the market fluctuations have not been truly analyzed. Many research papers such as Ortiz et al. (2018), Herd et al. (2018), Gustman & Steinmeier (2013), and Barr and Diamond (2009) warn about the low expected replacement levels of the benefits of capitalized privatized plans. According to the UNDESA, in 2015, one in eight people worldwide was aged 60 years or above. A major concern today is that the elderly population is not adequately secured through the manifold pension systems that are in place. Moreover, the current working force in the western world faces an increased risk from under-protection and poverty (Ortiz et al. 2018; Conesa & Kehoe, 2018). Results of recent reforms might limit the redistributive focus of social security towards the income of the poor. The individualization of risks may restrict a broader share of elderly to the bottom end of the income distribution (Hardy, 2020). Although considerable literature has emerged with respect to the preferred pension scheme, not many papers have been written from the risk perspective, taking into account the future consequences of preserving or reforming pension designs, both for the public and the government.

For a major part of the time spent writing this thesis and studying the government's role in the pension market, unfortunately, the COVID-19 pandemic crisis struck terror globally. The virus has not only cost the lives of more than 2.5 million victims worldwide but has also tragically affected the economic world around us. Governments are thus trying to fight the virus with parallel plans for bailouts and social transfers. Never has there been a realization of systemic risks globally affecting the labor market and financial markets such as now, during the current crisis.

Studying that the challenge of pension design got a surprising turn-around in these days of the pandemic, one has to wonder: What is the state role in the pension market these days? Shall the government intervene in this market like in does in other markets? Is this question relevant only to retirees or those who about to retire in the near future? Is there

a perfect pension design that may handle the above-mentioned challenges and minimize risks? What is the priority of risk to manage, risks for the individual, or fiscal risk to the government?

These questions are in the back of the mind of every economist dealing with pension designs, especially in these days where the market is unstable. With the decoration of the crisis and the evolving contradicting challenges, this dissertation attempts to throw light on these issues, examining them from the risk perspective.

While it is well recognized that each state has its different socio-economic challenges and, therefore, different pension designs, naturally, it does not decrease the motivation to match different pension schemes to socio-economic situations and try to find the way to optimize pension design. Many scholars map common features in groups of states (Fultz & Hirose, 2019; Natali, 2018; Altiparmakov, 2018; Mesa-Lago & Valero, 2020). From there, the path is short to analyze which steps were implemented well and which were taken in the wrong direction. The unstable pension landscape since the 2008 financial crisis and the uncertainty these days have boosted the motivation to find strategic paths to alleviate some of the risks. This may include considerable financial, labor, information, and fiscal risks, both for the government and the public.

1.2. Objectives and Contribution

1.2.1. Aim and Novelty

The aim of this dissertation is to improve the understanding the operations of central planner in the pension market, specifically in this era of shifting from traditional pension schemes to funded-capitalized designs. The derivative scope of this work lies in revealing the government's crucial importance in assuring adequate and sustainable pension benefits, which alleviate old-age poverty and income inequalities. The work demonstrates the significance of implementing risk-sharing mechanisms alongside the pension pillars, between the individual the government and among successive generations, in order to achieve a sustainable pension design and grant adequate benefits to retirees.

Drawing on last three decades of cyclical pension reforms around the globe and the unstable pension landscape, this thesis aims at researching sustainable pension designs

that balance fiscal constraints and aging stress with the need to provide adequate pension benefits. With this, the dissertation enriches the scientific discussion on the proper modern pension design in an aging world.

Across the different chapters of this thesis, we assume that the government is a separate actor in the pension market, who operates on behalf of the public to optimize their welfare. Consequently, the thesis is directed to improve the pension designs in the western world from the eyes of both the participant and the government, considering fiscal stability. Moreover, the work aims to elaborate recommendations for governments, based on the analysis and pension research from the risk perspective.

Continuing the new debate on pension design, this thesis recommends focusing not only on one target, such as fiscal sustainability, but to take into considerations income security while tailoring pensions to the needs of heterogeneous consumers. The terminology of risk perspective introduced here changes the phrase of success/failure of pension design in fulfilling one target or another in order to increase/reduce the odds for pension reform instead.

The novelty of this dissertation comes from an expression by its financial perspective to pension reforms, including analytical and empirical analyses. This unique perspective enables new works of research that are included in this thesis, studying the shift to funded pension designs and the significant role of the government a mediator and as a player in the pension market. The thesis contributes to the literature by the following:

- Suggesting bi-path ways of risks between the government and the individual in an equilibrium of pension design;
- Providing an analytical explanation for pension evolution across Europe in the last three decades;
- Revealing social-economic anomalies by shifting to funded scheme by two different research works, one involving the utility function and the Over-Lapping Generation model and the other involving exchange options;
- Conducting empirical research by studying the future benefits of a funded pension scheme with minimum government intervention.

When detailing the interests of variety of actors, avoiding relating to the public as one single actor, economic theories from the 1990s seems less relevant and even erroneous in cases of pension designs, especially during financial crises.

Analytically, by synthesizing financial and economic points of view, this work suggests an equilibrium of risk sharing between agents in the pension market. We claim that deviation from that equilibrium might lead to a cyclical pension reform.

The thesis addresses the following research areas:

1) The preliminary research question starts by mapping the different actors in the pension market. Here, the thesis asks whether the public is one single actor or if it represents different actors with a variety of interests.
2) The thesis inquires if there are inherent repetitive anomalies or difficulties in the funded scheme that may explain some of the recent pension reversals. Here, the thesis contributes to the vast literature on pension reforms, amassed over the last decades, attributing the risk dimension.
3) After analyzing the players, the relations among them, and the different interests revealed by anomalies, we turn to explore how the pension system can be stabilized. We look into the ways in which the government can balance the pension market both fiscally and by ensuring adequate pension benefits, alleviating the risk of poverty in old age.
4) Studying the interplay in the pension system from the risk perspective, we put forth our thoughts on the government's role in the era of post pension-reforms across Europe and after the financial crisis. Obviously, this question is linked to the boundaries of the responsibility of the government as a mediator between participants, among generations, and as a regulator. This question is also connected to the socio-economic role the government plays in the achievement of social targets such as reducing income inequality and poverty.

These targets of study come to an expression via the theoretical and analytical chapters in this thesis and will be concluded in final chapter. In the next subsection, we present an overview of the main contribution of this thesis to the vast literature of pension, which has emerged over the last years.

1.2.2. Contribution to Existing Literature

The field of pension economy is a multifaceted field of study, sharing links with the disciplines of economy, population growth, and sociology. Researchers in the field of economics are mostly concerned with financial and fiscal sustainability. Others may seek to discover the social consequences for specific groups as specific mixes of public and private regulations shape them.

Many pension research institutions have been established, concentrating on pension issues, e.g., Pension Institute at City University of "London, Pension Center" at the "London School of Economics", "Mannheim Research Institute" for the "Economics of Aging", and the "Research Center for Inter-Generational Contracts" in Freiburg University. These mentioned institutions, together with the Pension Research Center in Ben-Gurion University, Israel, have present some significant works of research that form the basis of this thesis.

In recent years, the literature has revealed insights on the significance of underfunded governance defined-benefits pension funds and their link to fiscal decisions in the present and the future. Surprisingly, there is lack of research studying government behavior and incentives in the business/private pension markets. The privatization of responsibility for old-age income and the shift towards more funded pensions, thus, raise important issues that warrant revisiting. In particular, there is not enough research on policy direction in the era after reforms that target the effect of social causes, such as poverty, on old age.

This thesis connects to different strands of pension literature. This subsection describes the main building blocks of the literature used in this thesis.

- The Economics of Pension

The traditional pension economics, led by Feldstein (2002, 2005), World Bank (1994), Samuelson (1956), and Friedman (1987), push for capitalizing and privatizing pension schemes, in order to reduce the financial burden on the government.

The research in this dissertation pointing to the significance of the unfunded and funded pension pillars as a coherent pension system, continues, in fact, the former novel works of Ebbinghaus (2015), Brown (2014) Barr and Diamond (2009), Barr (2002), Orszag and

Stiglitz (2001), and other scholars, who emerged a new literature strand on pension studies. This strand claims that the traditional economic literature focuses only on one target of fiscal sustainability due to aging and low growth, ignoring many other socio-economic targets. This emerged literature strand suggests the need to balance targets and constraints and avoid suggesting only one pension design.

Additionally, this strand of literature recommends that pension designs should not exclusively follow one pension scheme or another but should take a coherent perspective in risk management. Eventually, however, the Gross Domestic Product (GDP) growth is equal to the market yield, so any differentiations between these two designs are relevant in the short term or in the inter-cohort perspective. In addition, the capitalized scheme might be insufficient for meeting other social targets. The thesis continues this line of thoughts and claims that every model should address different objectives and be careful in adapting failures that have caused cyclical reform across Europe and certain other countries.

- Pension Reforms

As part of the theoretical-analytical part of this dissertation, it is argued that sustainable funded pension design is associated with the provision of adequate benefits, with mutual risk-sharing between the participants and the government. Consequently, across the years, as function of political pressure, pension designs converge, eventually, to mix pension designs with risk sharing mechanisms, both between the public and the government and between earning cohorts—equilibrium of sustainable pension design. We demonstrate this convergence process through the global experience of cyclical pension reforms over the last two decades. Here, we continue the line of Ortiz et al. (2018), Grech (2018), Natali (2018), and Ebbinghaus (2015), who claim in various recent works, that the unstable pension landscape in countries of Central East Europe (CEE) and Latin America can be interpreted as a lack of risk-sharing mechanisms between the actors and failing to meet the inherent socio-economics anomalies in the funded scheme. Additionally, the thesis leans heavily on some global economic organizations, which contribute vast literature on this surprising phenomenon, including the "World Bank" (WB), the "International Monetary Fund" (IMF), the "International Social Security Association" (ISSA), and the "International Labor Organization" (ILO).

- Finance and the Portfolio Theory

There exists a small literature discussing and analyzing a mix coherent pension pillars model. This thesis belongs to the strand of literature that addresses the issue of optimal of pension system design in a stochastic framework using the optimization of utility function. In the literature, the portfolio-choice framework is used to explore the optimal mix of an unfunded and a funded plan benefits from risk diversification.

The thesis introduces two models that examine the risk relationship among the pension actors. The first is an over-lapping generation (OLG) model, and the second is an option exchange model. Both models assume the individual's pension account is a portfolio of financial assets, implementing Markowitz theory[1]. In fact, Merton (1983) was the first to surmise that a mix of funded and unfunded pensions systems may be optimal due to the diversification effect. Hence, the social security (or unfunded pension pillar) can be then interpreted as a "quasi-asset." Merton's (1983) interpretation of unfunded pension plan as 'quasi-asset' was further explored by Dutta et al. (2000), Masten & Thogensen (2004), De Menil et al. (2006) and Knell (2010). Here, we base the utility function and the OLG model in the analytical part on these works of research. The portfolio-choice approach considers the low-yielding but also low-risk PAYG pension scheme as a quasi-financial asset.

In addition, there is a small amount of literature that explores the combination of PAYG public pensions and funded pensions. Examples are Masten & Thorgensen (2004), De Menil (2006), Knell (2010), and Chen et al. (2014).

In contrast to Masten & Thorgensen (2004), who evaluates the welfare of future generations over the second period of an individual's life, the current work regards the welfare of population, including working years as in Chen et al. (2014) and Knell (2010).

The optimal size of unfunded social security programs appears to depend critically on the settings of the plan. This may include, among others, the type of the individual welfare function[2], social welfare evaluation, the characteristics of the economy, such as open or

[1] One can find the connections to pension in Markowitz's composition from 2010.
[2] Relative standing, constant relative risk aversion.

closed (Wolf & Caridad, 2021; Knell, 2010), and cross-country differences in the dynamics of wage and investment income and their covariance (De Menil et al. 2006).

- Old-Age Income Security System

The growing challenge of adequate pension benefits is a repetitive motive in this thesis. This thesis considers the target of alleviating poverty in old age as a key feature in any design of sustainable pension scheme and as integrated part of risk sharing mechanism between the government and the individual. In fact, we claim that inadequate pension benefits in funded schemes increase the odds to pension reversals. The sustainability and adequacy of different pension schemes and the ways to successfully implement them are widely discussed in the late literature and studied across Europe.

Across the second part of this thesis, we consider the integration of minimum guarantee or the unfunded pillars as important tools that may keep well redistributions and diversify variety of risks. The motive of protection will be analytically tested in this work with an OLG model.

1.3. Thesis Structure

This dissertation is divided into two parts, with the first part forming a base ground to the one that follows. In this subsection, a short review of each paper is presented. Since each chapter is connected to a variety of literature strands, relevant literature review is provided at the beginning of each chapter.

1.3.1. Part A

The first part provides the theoretical and historical framework of pension designs as a solid basis for the subsequent analysis portion.

Chapter 2 overviews the fundamentals of modern pension schemes, their objectives in the modern era, and the ways they were organized. This dissertation started and concluded with descriptions of the pension system's objectives, as it is claimed that, eventually, it is the interests of the pension field's actors that significantly affect the pension design. In particular, the chapter details the variations in different pension funding, their ways of finance, and the consequent risk sharing. The theoretical framework of pension designs

enables the deepening, in this thesis, of not only the pension's risks and challenges but also the derived solutions to risk diversification, such as combinations of different pillars and implementation of risk-sharing mechanisms. The variety of pension concepts studied in this chapter are translated into repetitive motives across the rest of this thesis.

Chapter 3 sets the theoretical and historical background of the evolution of pension systems. This includes the description of the challenges of government and societies in this era with increased aging and low fertility when it comes to financing adequate pensions for the aged. Moreover, this chapter overviews the evolution of pension schemes across Europe and presents the debate in the literature on proper pension schemes. This chapter analyzes the global process that privatized the pension market and prejudiced the level of benefits and standard of living for the older population.

The second part of Chapter 3 includes a literature overview of the late pension reform wave in Europe. Cross-national comparative studies on institutional differences and their outcomes provide an essential understanding of the consequences of a specific pension framework with regards to past and future reform needs. Such evidence-based policy advice is beneficial for future pension policies. Through this study, the challenges associated with pension plans, social security systems, and the outcomes of recent reforms will be brought to light. Significant weight is given, in this chapter, to the pension reversal trend in Latin America and CEE countries. In fact, there is an emergence of a new economic voice that challenges the merits of the traditional economics study, which asserts minimization of state interventions in the market. We analyzed the reasons for this trend and instigated thinking about the state's role in the pension market. These two issues are getting important perspectives in the current times of financial crisis when the governments take the responsibility of executing large bailout plans.

1.3.2. Part B

The second part is essentially the core novelty of this work, containing theoretical, analytical and empirical research approaches. Chapter 4 characterizes the risks associated with the pension schemes from different perspectives and studies the balance between the interests of the central pension actors'. In the conclusion, the study realized the significance of implementing risk-sharing mechanisms as a pre-condition to the

sustainability of funded-capitalized pension schemes. The absence of such mechanisms in funded or mixed pension schemes may increase income gaps, foster old-age poverty, generate socio-economic anomalies, and weaken the system, especially in times of financial crisis and systemic shocks.

Chapter 4 is a theoretical study, which implements the portfolio theory of Markowitz on pension design (Markowitz, 1991). It is realized through the diversification of risks both for the public and the government, at some level. Mutual interests will push the pension design into an array of equilibrium of pension market design.

Chapter 4 starts by characterizing the financial relationships between the pension field players. Here, the thesis argues that although the government shifts risks through funded pension designs, a pension scheme cannot be sustainable unless the government actively participates in the risk-sharing cycle and diversifies risks that is hard to be handled by an individual.

While shifting to a funded pension scheme, the government transfers deliberately un-diversifiable risk to the individual such as longevity risk, improving its fiscal obligations. In the opposite side, this dissertation claims that the individual does not stay indifferent. The pension reform is an opportunity for him to transfer, in some level, idiosyncratic risks, such as wage/career risk and structural risks that are connected to market failures. Not recognizing the risk-sharing mechanisms where the individual shifts idiosyncratic risks to the government may result in pension reversal. This composition enriches the literature on pension reforms in CEE countries (for e.g. Hinrich, 2021; Guardiancich & Guidi, 2020; Altiparmakov, 2018; Natali, 2018). Here, the argument is that due to insufficient government intervention in the market and risk-sharing mechanisms, which were realized by flowed market design, countries have rolled back to a dominant state's PAYG pension schemes. Moreover, the fiscal challenge that CEE governments have faced during the financial crisis is a symptom of the bi-pathways of risks needed in the funded pension schemes.

Chapter 5 innovated while analytically revealing the socio-economic anomaly. In this chapter, the study deepens in relation to the public actor while avoiding the analysis of the public as a single actor versus the government. This composition differentiates among earning cohorts and their utility while transitioning to funded pension schemes. The

chapter introduces a simple model that aims at maximizing the participant's utility function in an economy with a multi-pillar pension scheme during the entire life cycle. The model includes an OLG model, two stochastic variables, and Monte-Carlo simulation techniques. The results show that the optimal pillar sized favors high-earning cohorts at the expense of low earners. Moreover, there is substantive exposure of low earners to financial risks due to high earners' preferences. We relate to this situation as an "Externality". Consequently, this composition suggests two key features. The first one is the significance of substantiating weight for an unfunded pillar as a hedging asset. The second is a protection mechanism that addresses the model targets of alleviating old-age poverty and the influence of the plans' weights.

In Chapter 6, the thesis analytically analyzes the risk-sharing mechanisms in the pension system from another angle, which is by linking pension schemes in order to exchange options' benefits. The theoretical framework based on an option's value model describes the interests of the actors in the pension field by shifting from the public PAYG pension scheme to a more capitalized one. Here, the option benefit model enables differentiation between high-earning cohorts and low-earning cohorts and once again avoiding to portray the public as a single player. The financial position reveals that during the transition, high-earning cohorts benefit at the expense of low earners, as shown in the previous chapter, using the utility function. Here, we highlight an intra-generational risk-sharing mechanism that acts as a stabilizer to the pension design, which may reduce the probability of another pension reversal. In particular, we focus on minimum pension guarantees in the form of an economic "collar".

This chapter presents the conclusion of the theoretical study through the global experience of individuals in CEE and Latin American countries. That includes pension reversals and strengthening of the public pillar in most of the countries that had implemented a funded pension scheme during the 1990s.

Chapter 7 is an empirical study. In this paper, we deeply investigated the Israeli pension system. Israel, as a country with a neoliberal pension system, is the closest country that fits the definition of a "pure defined contribution" scheme can be an excellent "playground" to study and analyze the implications and consequences of such a policy. One of the innovations of this dissertation realized in this study is the opportunity to calibrate the analytical part with data pertaining to the real financial records of more than

10,000 real individuals' contributions and benefits collected from the largest private pension fund in Israel.

The calibrated model enables the analysis of the previous chapters' outcomes regarding the vulnerability of pension benefits and the long-term effect of a financial crisis. In particular, this research is the most relevant during these days when the world is struggling with the COVID-19 pandemic. We especially look for anomalies and difficulties found in the previous part, in order to demonstrate them empirically, from real pension data. This research facilitates an opportunity for the discussion of future consequences of radical pension designs and the current financial crisis of benefits. Moreover, the investigation of such a unique database is refreshing in pension research and enables the study of the future consequences of funded-capitalized pension designs.

This thesis concludes with a summary of the main findings of the study in Chapter 8. In this composition, we translated the findings and conclusions to a few specific suggestions for central planners in order to ensure the implementation of a successful and coherent pension model. Moreover, this chapter explicitly sums up the main pension system challenges, particularly in dealing with poverty and inequality, and the main findings of the analytical model. This dissertation concludes by pointing out the issues related to future pension policies that are of key importance for both analysts and stakeholders.

Here, we heavily value the government's role in managing the pension market, ensuring sustainability, and considering the interests of different players, including the public, financial institutions, and the past/future generations. The study's final remarks also point to the limitations of this monograph and highlight future research needs and alternatives.

Summary and Introduction - References

Altiparmakov, N. (2018). Another Look at Causes and Consequences of Pension Privatization Reform Reversals in Eastern Europe. *Journal of European Social Policy, 28*(3) 224–241. https://doi.org/10.1177/0958928717735053.

Arza, K. (2008). Pension Reform in Latin America: Distributional Principles, Inequalities and Alternative Policy Options. *Journal of Latin American Studies*, 40(1):1–28. http://www.jstor.org/stable/40056624

Barr, N. (2002). The pension puzzle: Prerequisites and Policy Choices in Pension Design. IMF, Economic Issue 29. Washington DC. ISBN 1-58-906111-X

Barr N., Diamond, P., (2009), Reforming Pensions: Principles, Analytical Errors and Policy Directions, International Social security Review, 62(2): 5-29. https://doi.org/10.1111/j.1468-246X.2009.01327.x

Bohn, H. (2011). Should Public Retirement Plans be Fully Funded? J*ournal of Pension Economics and Finance*, 10(2): 195–219. http://doi.org/10.1017/S1474747211000096

Bonenkamp, J., Meijdam, L. & Ponds, E. et al. (2017). Ageing-Driven Pension Reforms. *Journal of Population Economics*, 30: 953–976. https://doi.org/10.1007/s00148-017-0637-0

Brown, R. L. (2014). The Essence of Social Security: Debunked Myths, Australian Journal of Actuarial Practice, 2: 5-12.

Chen, D., Beetsma, R., Ponds, E., & Romp, W. (2014). Intergenerational Risk-Sharing Through Funded Pensions and Public Debt. *Journal of Pension Economics and Finance, 15*(2): 127-159. https://doi.org/10.1017/S1474747214000365

Conesa, J.C. & Kehoe, T. (2018). An Introduction to the Macroeconomics of Aging. The Journal of the Economics of Ageing, 11:1-5. https://doi.org/10.1016/j.jeoa.2018.03.002.

De Menil, G., Murtin, F., & Sheshinsky, E. (2006). Planning for the Optimal Mix of Paygo Tax and Funded Savings. *Journal of Pension Economics and Finance, 5*(1), 1-25. https://doi.org/10.1017/S1474747205002283

Disney, R., & Johnson, P. (2001). Pension Systems and Retirement Incomes across OECD countries. Cheltenham: Edward Elgar Publishing. Available at http://www.e-elgar.com/shop/isbn/9781840645637

Dutta, J., Kapur, S., & Orszag, J. M. (2000). A Portfolio Approach to the Optimal Funding of Pensions. *Economic Letters, 69*(2): 201-206. https://doi.org/10.1016/S0165-1765(00)00271-8

Ebbinghaus, B. (2015). The Privatization and Marketization of Pensions in Europe: A Double Transformation Facing the Crisis. European Policy Analysis, 1(1):56–73. https://doi.org/10.18278/epa.1.1.5.

Ebbinghaus, B. (2019). Multi-Pillarisation Remodelled: the Role of Interest Organizations in British and German Pension Reforms, Journal of European Public Policy, 26(4): 521-539, http://10.1080/13501763.2019.1574875.

Feldstein, M. (2005). Structural Reform of Social Security. *Journal of Economic Perspectives*, 19 (2): 33-55. http://doi.org.10.1257/0895330054048731

Feldstein, M. Liebman, J.B. (2002). The Distributional Aspects of Social Security and Social Security Reform. University of Chicago Press

Friedman, B., & Warshawsky, M. (1987). Annuity Prices and Savings Behavior in the United States. In Z. Bodie, J. Shoven, & D. Wise, Pensions in the U.S. Economy pp. 53-84. Chicago: University of Chicago Press.

Fultz, E. & Hirose, K. (2019). Second-Pillar Pensions in Central and Eastern Europe: Payment Constraints and Exit Options. *International Social Security Review*. 72 (2): 3-22. https://doi.org/10.1111/issr.12201

Gerard, F., Imbert, C. & Orkin, K. (2020). Social Protection Response to the COVID-19 Crisis: Options for Developing Countries, *Oxford Review of Economic Policy*, 36(1): 281–S296, https://doi.org/10.1093/oxrep/graa026

Grech, A., (2018). What Makes Pension Reforms Sustainable? *Sustainability*. 2018. 10(8). https://doi.org/10.3390/su10082891

Guardiancich, I. & Guidi, M. (2020). The Political Economy of Pension Reforms in Europe under Financial Stress, *Socio-Economic Review*; mwaa012, https://doi.org/10.1093/ser/mwaa012.

Gustman, A., Steinmeier, T. & Nahid, T. (2013). Redistribution under the Social Security benefit formula at the individual and household levels, 1992 and 2004, *Journal of Pension Economics & Finance*, 1(1): 1-27, http://doi.org. 10.1017/S1474747212000108.

Hardy, M. (2020). Diversification in Retirement Inequality, *The Journals of Gerontology*, Series B 75 (4, May 2020): 823–826. https://doi.org/10.1093/geronb/gbz147.

Herd, P., Favreault, M., Meyer, M. & Timothy M. (2018). A Targeted Minimum Benefit Plan: A New Proposal to Reduce Poverty among Older Social Security Recipients. RSF: The Journal of the Social Sciences, 4(2): 74-90. http://doi.org.10.7758/rsf.2018.4.2.04.

Hinrichs, K. (2021). Recent Pension Reforms in Europe: More Challenges, New Directions. An overview. *Social Policy Administration*. https://doi.org/10.1111/spol.12712.

Holzmann, R. & Hinz, R. (2005). Old-Age Income Support in the 21st Century: An International Perspective on Pension Systems and Reform. The World Bank. https://doi.org/10.1596/0-8213-6040-X

Knell, M. (2010). The Optimal Mix Between Funded and Unfunded Pension Systems when People Care About Relative Consumption. *Economica, 77*(308): 710-733. https://doi.org/10.1111/j.1468-0335.2009.00797.x

Kourtonas, E. & Yew., S., (2017), Considerations in Pension Reforms: A Review of the Challenges to Sustainability and Distributive Impartiality, *Malayan Journal of Economic Studies*, 54 (1): 159-177. https://doi.org/10.22452/MJES.vol54no1.8

Markowitz, H. (1991). Foundations of Portfolio Theory. *The Journal of Finance*, 46(2): 469-477. http://doi.org.10.2307/2328831

Masten, E., & Thorgesen, O. (2004). Designing Social Security – A Portfolio Choice Approach. *European Economic Review, 48*(4): 883-904. https://doi.org/10.1016/j.euroecorev.2003.09.006

Merton, R. C. (1983). On Consumption-Indexed Public Pension Plans. *In Z. Bodie & J. B. Shoven (Eds.), Financial Aspects of the United States Pension System (pp. 259-290*). Chicago: University of Chicago Press. Retrieved from https://www.nber.org/system/files/chapters/c6035/c6035.pdf

Mesa-Lago, C. & Valero, D. (2020). The New Wave of Pension Reforms in Latin America. In: Peris-Ortiz M., Álvarez-García J., Domínguez-Fabián I., Devolder P. (eds) Economic Challenges of Pension Systems. Springer, Cham. https://doi.org/10.1007/978-3-030-37912-4_12

Natali, D. (2018). Recasting Pensions in Europe: Policy Challenges and Political Strategies to Pass Reforms. *Swiss Political Science Review*, 24 (1). https://doi.org/10.1111/spsr.12297.

Ortiz, I., Durán-Valverde, F., Urban, S., & Wodsak, V. (2018). Reversing Pension Privatizations: Rebuilding public pension systems in Eastern Europe and Latin America. Geneva: International Labour Organization. http://dx.doi.org/10.2139/ssrn.3275228.

Orenstein M. A. (2013). Pension Privatization: Evolution of a Paradigm. Governance, 26(2): 259–281, https://doi.org/10.1111/gove.12024.

Orszag, P. R., & Stiglitz, J. E. (2001 Rethinking Pension Reform: Ten Myths about Social security Systems. In R. Holzmann, & J. E. Stiglitz (Eds.), New Ideas about old age security: Toward sustainable pension systems in the 21st century. World Bank, 17–56.

Samuelson, P. A. (1958). Aspects of Public Expenditure Theories. *The Review of Economics and Statistics, 40*(4): 332-338. https://doi.org/10.2307/1926336

Wolf, I. & Ocerin, J. M. C. (2021). The Transition to a Multi-Pillar Pension System: the Inherent Socio-Economic Anomaly. *Journal of Financial Economic Policy.* https://doi.org/10.1108/JFEP-07-2020-0162

World Bank. (1994) Averting the Old-Age Crisis: Policies to Protect the Old and Promote Growth; Oxford University Press: Oxford, United Kingdom.

Part A

Fundamentals of Pension Schemes and Theoretical Framework

Chapter II: Pension Systems Designs

Chapter III: The Recent Evolutions of Pension Design

II. Pension Systems Designs

"A Pension Scheme is an arrangement by which individuals are provided with an income (a regular periodical payment) when they have reached a certain age and are no longer earning a steady income from employment"

(Definition of International Labor Organization, p.25)

2.1. Introduction

This chapter sets down the fundamentals of pension system study and discusses the taxonomy of pension systems and their functional and organizational elements. The typologies and pension structure studies will be further developed as this thesis progresses. The published works of such experts in the study of pension as the World Bank (WB), Nicholas Barr, the Nobel laureate in economics, Peter Diamond have been perused to review their constructs of the theoretical framework of pension schemes. The conceptual framework for assessing pension systems and reforms in them has been developed gradually by a group of WB pension experts led by Robert Holzmann. He had authored and co-authored many books and papers dealing with different aspects of pensions (Holzmann, 2000, 2012). Bernardt Ebbinghaus also generalize the theoretical aspect of pension system taxonomy, the Director of Mannheim Center for European Social Research and in OECD-authored monographs. The political economy of pension has been studied by the abovementioned economist as well as in the works of Pierre Pestieau (2006, 2012) of the University of Liege.

In the next section, I study the various important objectives of pension systems, including private and public schemes. These include such social targets as alleviation of poverty and inequality and consumption smoothing and such economic objectives as reducing information asymmetry across markets.

Section 3 is mainly concerned with conceptual approaches to the study of pension schemes. In it are introduced the main mechanism of savings and benefits of old-age pension. These concepts are extended by a discussion of institutional setups, which further explain types of pension systems and the contexts in which they have been developed. Section 4 further explores the pension framework from a perspective that is relevant to the aims of this dissertation by identifying the pension schemes with the levels of funding and risks. For that purpose, we study the two popular pension schemes in the western world, namely, the DB scheme and defined contribution scheme. In Section 5, pension schemes are characterized by the nature of their sponsor—private/public. This is directly link to the structure studied earlier. As pension designs are complex products, Section 6 provides an extended conceptual framework and sums up the variations in its complex tiers and pillars design. Conclusions drawn from the study are presented in Section 7.

The next section focuses on the risks embedded in pension schemes. These risks apply to all pension schemes and relevant to all players in the pension market, which are, the working population, the retirees, the government from the point of view of budget sustainability, and financial institutions. The main assertion in this section is that the economic differences between pension schemes are mainly caused by their risk-sharing frameworks. Proving this assertion with evidence is an important motive for further continuation of this research in the following chapters.

2.2. Objectives of Pension and Social Security Systems

It is natural to expect that societies should, in some way, meet the needs of the people as they age and can no longer provide for themselves. The purpose of pension plans is to enable people to continue to avail themselves of the goods and services even after they have stopped working. Pensioners are not interested in financial accumulation but in consumption (Barr, 2002). Consumption comes from goods produced by younger workers (Blake, 2006). pension schemes and social security are simply financial mechanisms for organizing claims on that future output. Some of which will be reviewed in this section.

Rational policy of pension design starts with agreeing on objectives and then proceeds to the discussion of instruments for achieving them. Globally speaking, the objectives of all pension systems from an individual viewpoint can be described as following:

a. Consumption Smoothing and Insurance

According to the “life cycle model” of Ando & Modigliani (1963), People try to maximize their utility not at a single point in time, but over time. One who saves does so not because one desires to consume more today, but because one values extra consumption in the future more highly than extra consumption today. According to Barr (2002, p. 4), "A central purpose of retirement pensions is consumption smoothing—a process that enables one to postpone consumption from one’s productive middle years to one’s years of retired life, allowing one to choose one’s preferred time path of consumption over one’s working and retired life".

In case the worker dies before retirement, pension systems can also protect spouses and young children. Pension also ensures sustenance for a disabled worker.

b. Poverty Relief and Redistribution

The main economic objective of governments in the new world is, generally, to manage public finance relieving poverty, and redistribute income (Feldstein & Liebman, 2002). The government can address old-age poverty directly through social security plans and indirectly through designing and regulating pension system mechanisms (Day & Gay, 2020).

Poverty relief targets resources toward people who are unable to save enough because they are permanently poor. As a practical matter, poverty relief must also address transient poverty. Such programs target all the elderly or may concentrate on those who have contributed to the pension system. In that aspect, pension plans complement tested-means benefits and the government's social spending.

Ensuring basic security necessitates transfers between income groups. Income redistribution takes place between groups at risk in an insured population. Pension systems can redistribute incomes on a lifetime basis, by flat benefits and minimum incomes mechanisms. "Lifetime redistribution can be achieved by paying pensions to low earners at a higher percentage of their previous earnings (i.e., at a higher replacement rate), thus subsidizing the consumption smoothing for the low earners" (Hinrichs & Jessoula, 2012, p.4). Also, one can consider that the pension system results in subsidizing those who live shorter time on the expense of those who live longer. Redistribution across generation can be imposed by increasing the social security contribution rate, for example.

In recent years, not least since the financial market crash, the problems with the financial sustainability of pensions has made the social adequacy of pensions an important topic of discussion. Concerns over growing risks of poverty and increasing inequality in old age as consequences of pension marketization and privatization of funded pensions have mounted and have become subjects of academic and public debates (ILO, 2019; Ebbinghaus & Gronwald, 2011).

Ebbinghaus claimed: "The issue of old-age poverty and inequality has become more pressing because of the already enacted and further planned retrenchment of public pensions (marketization) and the shift toward private funded pensions (privatization), both supported by a financial sustainability rationale" (Ebbinghaus, 2015, p.4).

Old-age poverty and inequality will most likely increase as a result of welfare state retrenchment, labor market flexibility, and economic uncertainty (Hinrichs & Jessoula, 2012). Hence, one can assume that through the backdoor, this would then lead to an eventual rise in the need for social assistance (or minimum income) for older people. In the future, as seen previously after the 2008 crisis, challenges social conditions may lead to more political pressure to improve minimum income provisions.

Social insurance may appear to be a form of redistribution of income to the poor because benefits are paid to those who are temporarily poor because of the event that triggered the payment of benefits. The social security program appears to be redistributive because everyone pays tax at the same rate while the ratio of benefits to lifetime earnings is designed to fall as those earnings rise. "Naturally, labor force participation and, therefore, earnings, are limited for older people. Older adults face health problems, both physical and cognitive, that may limit their ability to participate in the labor force" (Herd et al. 2018, p.7).

The broader rationale for protecting vulnerable old adults is the recognition of such protection as a basic social right in a functioning democracy (Blake, 2006; Pestieau, 2006). Herd et al. observed "Social security has been successful at protecting older adults from economic insecurity and poverty" (Herd et al., 2018, p.5). They based this observation on the fact that, in the USA, poverty rates among the old-age cohort declined from nearly 40 percent in the 1950s to under 10 percent today. They claimed that this decline was a function of more generous income protection offered to successive generations by social security.

Here we argue that old-age poverty cannot be separated from another social problem—gender difference. Women’s earnings continue to lag behind men’s earnings because of their lower level of participation in the labor force and historically lower levels of earnings. "Although men of the current generation do more of the housework and childcare than in those of the previous generations, women still spend about twice as

much time on childcare activities as men do" (Day & Gay, 2020, p.35). The long-term implication for cumulative lifetime earnings and thus subsequent old-age benefits from the pension fund or social security is significant mainly because of the interest-accrued effect (Bravo & Herce, 2020).

c. Individual Decision-Making and Adverse Selection

According to Cremer & Pestieau (2003, p. 79, "In a world of certainty, individuals save during their working life to finance their retirement. In the case of pensions, people face a range of uncertainties, including how long they are going to live. Thus, a pension based on individual saving faces the person with the risk of outliving those savings, or of consuming very little to prevent that from happening". Thus Barr and Diamond argue that "In principle, the members of the group could agree to pool their pension savings, with each person drawing a pension based on (a) the group's life expectancy and (b) the total amount he or she had contributed to the pool". (Barr & Diamond, 2009, p. 12).

Also, the pension can help consumers to become better informed. People often fail to make choices that optimize their long-term well-being and often make no explicit choice at all. According to Barr & Diamond (2009), that is a common result of the number of alternatives to choose from, or the complexities of the alternatives become overwhelming. On the other hand, with simple theory, when the offerings are a restricted set of choices, it is critical to design good defaults for people who do not make an explicit choice.

Hence, according to Diamond, a primary reason both for pension schemes and social security is "That some individuals would not act in their own interest and save far too less for their retirement, for health care after they are no longer working, or for consumption when they are unemployed" (Diamond, 2006, p.4).

Cremer & Pestieau add "There are serious concerns about the ability of individuals to make the most of the market opportunities available to them" (Cremer & Pestieau, 2003, p.3). Even if the individual is assumed to be rational and avoid myopic decisions, the individual still faces the challenge of asymmetric information. Kotlikoff & Wise relate the pension system as selling 'used car' in the context of adverse selection: "Social insurance programs impose adverse selection costs that must be weighed against the benefits of overcoming market imperfections. If individuals can buy annuities on actuarially fair terms, they may increase their expected utility by annuitizing their assets

at retirement. However, if individuals differ in their life expectancy and know more about their mortality prospects than the insurance company can learn, those with shorter life expectancy will want to annuitize a smaller portion of their wealth. Insurance companies will recognize the resulting self-selection and offer annuities with premiums that reflect the mortality rates of long-lived individuals" (Kotlikoff & Wise, 1984, p.16).

Levi and Levy (2019), link the importance of government intervention to the population's behavior. According to their research from 2019, "The irrational attitudes towards retirement explain irrational pension savings behavior. They argue that people also tend to be more optimistic regarding their lives in the near future and regarding their expected financial status and they place more responsibility on the government to maintain a reasonable standard of living for them after retirement". They recommend that policymakers act to improve the effectiveness of individuals' pension savings by affecting individuals' attitudes. "In this manner, governments should act to make individuals acknowledge the need to retire at a certain age, and highlight their personal responsibility in maintaining for themselves a reasonable standard of leaving after retirement" (Levi & Levy, 2019, p.14),

2.2.1. Secondary Objectives

Here we mention another economist reason—deferred compensation. Kotlikoff & Wise argue that "Pension schemes can be used as a device for creating incentives in employment contracts. This is because pensions are deferred pay and can help achieve an efficient long-term relationship between the employer and the employee" Kotlikoff & Wise, p.5).

Additionally, according to Feldstein, "Pension policy may have secondary goals that may include economic development broadly and economic growth specifically. Badly designed pension schemes may create adverse labor market incentives. Excessive public pension spending contributes to high tax rates, putting growth at risk. Conversely, pension arrangements can assist the operation of labor and capital markets and may encourage saving" (Feldstein, 2002, p.10).

2.3. Pension System Typologies

2.3.1. The Classic Approaches

Otto Van Bismarck, the first Chancellor of the German Empire and the founder of the Prussian welfare state, created the world's first state pension in Germany in the 1880s. During the twentieth century, state and occupational pension schemes developed across Europe. In his book from 2006, Blake mentions: "Pensions and retirement are inventions of the late nineteenth and early twentieth centuries in developed economies. Before this, people in what are now developed economies did not retire. They continued working until the end of their days, or often ended their lives in the 'poor house'" (Blake, 2006, p.6)

Bismarckian social insurance systems aimed at maintaining the acquired living standard. This model generally provided generous support, often of a level that did not require individuals to make additional arrangements. This kind of pension system focuses on two main components:

The Bismarckian model fostered crowding out of complementary systems and means-tested benefits as income maintenance was already provided by the public system (Ebbinghaus & Gronwald, 2011). Pension entitlement was connected to an individual's previous earning and the derived benefits for survivors or partners took care of children or the elderly. In many western societies, major extensions were introduced in the 1950s, e.g., Germany, France, Italy, Israel, and Belgium. Among the outcomes of these extensions were high replacement rates.

On the other hand, several countries adopted the Beveridgean[3] idea of pension provision. This type of pension guaranteed only an absolute minimum flat-rate level of public benefits to prevent poverty, e.g., Canada, the United Kingdom, Denmark, Finland, the Netherlands, Sweden and Israel. Full entitlement can either be based on accumulated years of employment (the United Kingdom) or length of residency (e.g., Canada and Denmark).

A Beveridge-type system provides benefits for the only purpose of preventing poverty (also known as the first tier). In contrast to earning-related social insurance systems, the

[3] The "Beveridge pension" is named after William Henry Beveridge, a British economist and social reformer, known as one of the authors of post-World War II welfare state in Great Britain.

limited function of first-tier minimum pension schemes encouraged in the development of additional public and/or occupational schemes, e.g., the Netherlands, Sweden, Denmark, Finland, and the United Kingdom (Ebbinghaus & Gronwald, 2011).

Thus, the Beveridgean system provides just sufficient support to keep people off the breadline. In an extreme type of this approach, people are expected to make their own alternative arrangements. Since the 1995 reforms, Israel is an example of a pure Beveridgean social security system in which the social security benefits are fall too short of keeping the beneficiaries above the poverty line.

Cremer & Pestieau argue that: "In countries like France and Germany, the Bismarckian is solidly anchored in the tradition and influences not only the benefit rules of social insurance but also the working of the labor market. In the UK, on the other hand, the Beveridgean tradition is also a strong part of the political and social life" (Cremer & Pestieau, 2003, p.6).

Nowadays, pension schemes pursue two different goals, namely, poverty alleviation and status maintenance. The former leads to the broader development of flat-rate pensions, while the latter leads to a wider expansion of the social insurance model. Therefore, “Bismarckian” and “Beveridge” systems are interacting actively, and it is quite hard to find either system in its pure form.

2.3.2. Pillars and Tiers in Pension Systems

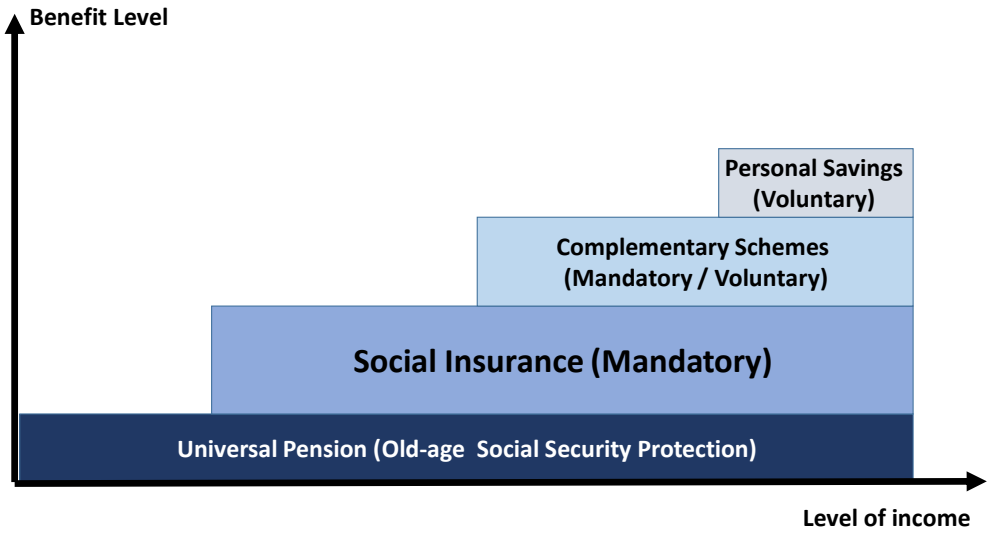
International experience shows that pension systems can be implemented in many variations. Pension designs are derived from different modes of risk-sharing (Rappaport, 2020). There are two ways of seeking economic security in old-age. One is to store current production for future use, which is expensive and cannot be applied to services from human capital. The alternative is to exchange current production when one is young for a claim on future production when one is old. One can do so by saving part of one’s wages and accumulate assets that can be exchanged for goods produced by younger people after one’s retirement. Another practical option is to obtain a promise from a third party that one would be given goods produced by younger workers after one’s retirement.

Two main ways of organizing pensions broadly parallel these two types of claims. Funded schemes are based on promises of accumulating financial assets, pay-as-you-go (PAYG). It is practical to classify pension funds by these two important definitions of funded and non-funded pension funds.

Based on these objectives, pension systems can be organized in different ways. The three-pillar model was first introduced by the WB Group in a seminal report in 1994. In that report, the components of pension systems were categorized into pillars based on different targets and ways of financing the benefits. The following diagram illustrates the main components of the multi-Pillar model as a function of coverage of the population:

The experience of low-income countries after the financial crisis in 2008, has brought into focus the need for a benefit floor to extend old-age security to all the elders (Herd et al. 2018; Pestieau, 2006). According to Blanc: "Lastly, and most culture-dependent is recognition of the importance of a fourth pillar for retirement consumption that consists of a mixture of access to informal support (such as family support), other formal social programs (such as health care), and yet another resource—individual financial and non-financial assets" (Blanc, 2016, p.2).

Figure. 2.1: Multi-Pillar Pension Model



The introduction to the pillars model follows:

a. The Zero Pillar

The International Labor Organization (ILO) (2019) defines this pillar as a non-contributory pillar, typically financed by the government "to deal explicitly with the poverty alleviation objective. This ensures that people with low lifetime income are provided with basic protection in old age and adequate levels of benefit for leading a decent and dignified life are received by those who participate only marginally in the formal economy" (ILO, 2019, p.35). Together with health protection, the zero pillar should ensure, at least, that all older persons in need have access to essential health care and basic income security at a national level. In this thesis, it will be shown that this pillar is considered as a significant condition to be met while imposing funded-capitalized pension schemes.

b. The 1st Pillar—Social Insurance

The responsibility to provide the pension first pillar is on the state shoulders, as part of its social security system. The first pillar addresses, among other things, the risk of individual myopia, low earnings, and difficulty in deciding the planning horizon due to the uncertainty of life experiences, and the lack of knowledge of the risks of the financial market. Most first pillar schemes are of a DB nature. These are non-funded schemes with a fixed contribution rate (Blake, 2006). Consequently, this pillar is subject to demographic and political risks.

The first pillar is financed in part by the social security tax that the government imposes on workers and pays out immediately to pensioners. It is an unfunded system because, for the tax-paying worker, there is no direct link between the contribution and benefits they do not accumulate any fund as a pension asset.

The first pillar is typically related to the years of employee's and employer's contributions to insurance during working phase. In some countries, the pillar contains stronger redistributive elements than in others. Most of the countries have a PAYG structure, wherein the amount is calculated according to the years of contribution and some state subsidies. The Italian Polish and Russian systems have recently introduced notional defined contribution (NDC) accounts in the first pillar.

Pillars 0 and 1 represent the fundamental components of any social security pension system. According to the ILO standards (2019), the 1st pillar should provide at least a minimum pension at 40% of pre-retirement insured income if contributions have been paid for 30 years and an adjusted minimum benefit may be paid for those who have contributed for at least 15 years.

In this context, it worth mention Barr and Diamond remark that: "Some countries combine PAYG and pre-funded schemes in the zero and first pillars to diversify financial, personal and economical variety of risks. Furthermore, full transition from PAYG to a pre-funded scheme suffers from an obvious flaw. PAYG systems were introduced to pay retirement benefits to individuals who did not contribute explicitly to the system and hence a buffer fund was not accumulated. This is commonly called the 'first-generation gift'. Indeed, in such a case, the current generation would have to pay twice: first to finance their own future pension through the pre-funded scheme, and again to finance PAYG liabilities to the current retirees" (Barr & Diamond, 2009, p.14).

c. The 2nd Pillar—Complimentary Pillar

According to the WB model and common experience in the West, the second pillar is provided by the private sector in the form of an occupational pension plan. It is typically an individually funded account (i.e., a defined contribution plan). Defined contribution plans establish a clear linkage between contributions, investment performance, and benefits. The pension is provided from the accrued fund after retirement. Although most occupational pension schemes are funded, the calculation of the pension benefit can differ widely among different types of schemes. One of the main features of the second-pillar schemes is that participating in it may be mandatory or voluntary.

d. The 3rd Pillar—Varieties of Voluntary Personal Pension Accounts

Blanc is well describing the third pillar as "Additional saving for retirement that the individual chooses above that provided by the state or the company that employs the individual. These savings will typically be held in deposit accounts or mutual funds invested in equities or bonds. If the individual chooses to do this via a formal pension

scheme, it will almost invariably be in the form of a DC scheme, which includes similar risks as the second pillar" (Blanc, 2016, p.7).

The third pillar is very often structured as a “normal” financial product purchased by individuals from a private provider. Providers are often insurance companies or dedicated pension fund management companies. Hence, it can be concluded that this pillar has a value chain that is akin to the sales of insurance products and includes reliance on a network of sales agents and tax exemptions.

e. The 4th Pillar—Voluntary, Non-financial Assets

The fourth pillar encompasses non-financial support used to provide income after retirement. The best example of this is the individual’s home. Individuals, when they retire, sometimes sell their expensive larger home and buy less expensive smaller one and use the remaining fund to increase their spending power in retirement. An alternative is to borrow against the equity in the home and allow the interest to roll up.

According to Herd et al. (2018), the availability and type of such support for the aged have a major bearing on the design and implementation of the other pillars, including their target benefit level.

Pedersen (1999) identified three main groups of opportunities for individuals to provide for retirement, namely, financial wealth, housing wealth, and life-insurance/pension annuities. While in Western European countries, the US, and Canada, personal pensions remain mostly a voluntary long-term savings plan, Latin American countries and Eastern European countries introduced mandated individual savings accounts during the 1990s (Bravo & Herce, 2020). One explanation for this can be seen in the mistrust of the government and the inefficiencies of the government in providing adequate pensions in the modern era (Pestieau & Ponthiere, 2012).

There are some examples of systems that are hybrids of the pillars: The Australian system is such a hybrid between occupational and personal pensions and consists of mandated contributions and voluntary contributions embedded in one account (OECD, 2019). The British and Japanese have out-sourced structures to secure mandatory contribution

payments to public or private second-tier pension schemes (Zaidi & Grech, 2007). The Swedish system has created a personalized investment account by mandatory deduction from the employees' salaries. However, individuals have the freedom to decide how their accumulated fund may be invested (Holzmann & Palmer, 2012).

2.3.3. Pension System Tiers

The pension framework is based on the role and objectives of each part of the system. In the literature, pension components are divided not only among pillars but also into tiers according to the level of the target of benefits (OECD, 2019). According to Blake (2006), Ebbinghaus and Gromwald (2011), pension pillars answer the question "who provides a pension?" while pension tiers answer the question "what function a pension serves in old-age income security?"

2.3.3.1. The First Tier

The first tier comprises programs designed to ensure pensioners achieve some absolute, minimum standard of living in old-age. Programs are aimed at preventing individuals from sliding into poverty in their old age. First-tier schemes are provided by the public sector. Basic pensions are usually paid to everyone irrespective of whether the beneficiary made any contributions, although beneficiaries might have to meet certain residence criteria and the amount of pension might be lowered due to insufficient contributions or credit. Social assistance plans pay a higher benefit to poorer pensioners compared to other cohorts. In these plans, the value of the benefit depends either on income from other sources or on other income and assets.

Minimum pension schemes are essentially similar to targeted schemes. Enhanced benefits are granted in the case accumulated earnings are less than a specified threshold. All these tools have in common a strong focus on redistributing income to the poor. Most of the European countries and the western countries, in general, have general social safety-nets of this type (Shoven & Slaviv, 2014; OECD, 2019).

2.3.3.2. The Second Tier

The second tier earning-related components are designed to achieve some target standard of living in retirement in comparison relation to that when working. The “equivalence” principle of paid contribution record and expected benefits is followed. The minimum pension can refer to either the minimum of a specific contributory scheme or all schemes combined. This tool is employed in 15 OECD countries and widely used in many European countries. Shoven and Slaviv remark: "The value of entitlements takes into account only the pension income. Unlike means-tested schemes, it is not affected by income from savings. Minimum pension credits in earnings-related second-tier schemes, such as those in France, also have a redistributive effect and benefit workers with very low earnings since the pension credits are calculated as if the worker had earned pension credits at a high level" (Shoven & Slaviv, 2014, p.7)

Nowadays, the income maintenance mechanism (second-tier provision) in Beveridgean systems is mostly complemented by additional mandatorily accumulated personal earning-related entitlements. In the Nordic countries, old-age income security is provided by accumulated contributions and citizenship, which is a kind of mix of the Bismarck and Beveridge types of pension systems (Cremer & Pestieau, 2003).

2.3.3.3. The Third Tier

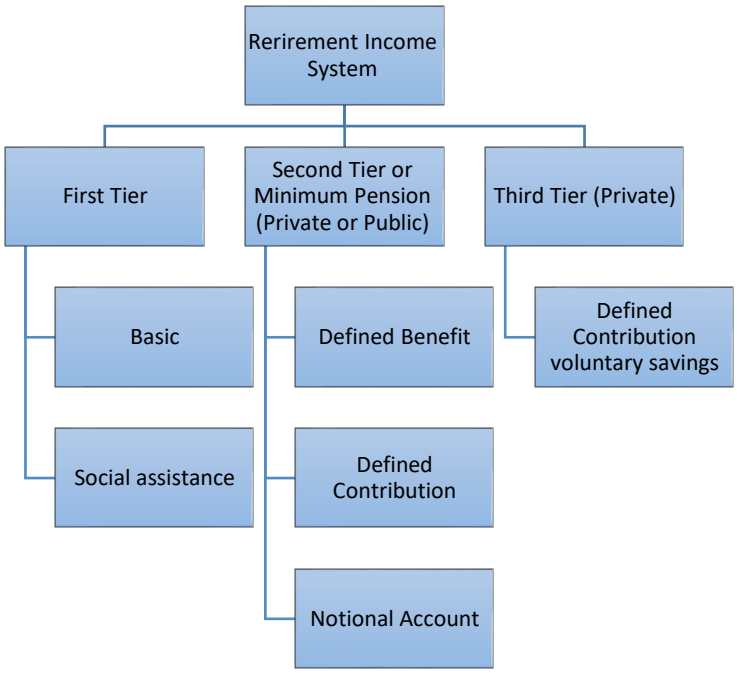
According to Ebbinghaus and Gronwald: "The final tier is only a topping-up of retirement income thanks to the expected returns on invested savings. For instance, a fringe benefit offered by an employer to high-skilled employees or a voluntary personal saving schemes offered by financial institutions" (Ebbinghaus & Gronwald, 2011, p.3).

Within these tires, schemes are classified further by the nature of the provider (public or private) and the way benefits are determined. In Figure 2.1, the OECD offers a combined taxonomy of tiers and types of pension systems as pillars.

Based on this model of tiers and pillars, pension systems vary across countries because of their historical and cultural legacies, their economic strength and long-run

macroeconomic indicators. The next section looks closer at the characteristics and elements of pension systems.

Figure 2.1: Summary of Pension Tiers Model



Source: OECD, 2017

2.4. Level of Funding of Pension Schemes

Economically, here are two broad ways to seek security in old age. One is by saving a part of one's earnings when young. This way, a worker can accumulate assets that the person, after retirement, may exchange for goods produced by younger people (Blake, 2006). Alternatively, he could obtain a promise—from a third part that the person would receive goods produced by younger workers after the person's retirement. The two main ways of organizing pensions broadly parallel these two mechanisms. "Funded schemes are based on accumulations of financial assets and PAYG schemes on promises" (Orszag & Stiglitz, 2001, p.7). Later on, in this thesis, for the above two modes of ensuring security in old age, the terms intra-generational risk-sharing and intergenerational risk-sharing are used in that order.

2.4.1. Funded Defined Contribution Plans

As Barr and Diamond describe in their composition 'The economics of Pensions': In a defined contribution (DC) scheme, each participant contribute into an account a fixed fraction of his earnings. These contributions are accumulated in the account as are the returns earned by those assets. When the pension payment starts, the assets in the account finance the retiree's post-retirement consumption through an annuity or in some other way" Barr and Diamond, 2006, p.17).

One may note that the DC scheme is a "fully-funded" scheme in which pensions are paid out of a fund built over years with its members' contributions or savings. Contributions are invested in financial assets.

If there is no redistribution across generations, a generation is constrained by its past savings and a member of a funded scheme gets out of it no more than what the member has put in. Also, "if there is no direct redistribution across individuals when an individual retires, the pension fund will be holding only his past contributions, together with the interest and dividends earned on them" (Ebbinghaus & Gronwald,, 2011, p.16).

DC pension plans tend to place greater responsibility on individuals for planning for retirement because these plans may require choices and decisions to be made about scheme participation, the amount of contribution, investment, and pension payout upon retirement.

2.4.2. Defined Benefit Plans

In a DB pension scheme, pensions are based on a person's wage during their final year or few final years. Alternatively, the pension can be based on a person's real or relative wages over an extended period, including the entire career.

A simple, generic DB scheme pays a constant accrual rate, a, for each year of service (typically 1.5%–2% per year). It is based on lifetime average revalued earnings. The pension benefit can, therefore, be written as:

$$P(DB) = \sum_{i=0}^{R} w_i (1+\mu)^{R-i} a \qquad (2.1)$$

Here, w_i is the individual annual earning, R is the year of retirement and μ is the factor by which earlier years' earnings are revalued.

DB schemes are still popular in some cases in the USA, Canada, Ireland, the Netherlands, South Africa, and the UK.

The DB scheme has a compensation role in the traditionally working market or differed wage mechanism. According to Cremer and Pestieau, "Corporations and governments use pensions to attract and retain workers. Historically, many schemes paid pensions at a standard retirement age that depended on the length of service and the worker's wage toward the end of their career. Such a structure makes it easy for workers to see the advantages of staying with the firm until retirement" (Cremer & Pestieau, 2003, p.12).

Most notional DB plans are primarily PAYG, with pensions paid out of employer's or government's current revenues with little or no funding (see Barr & Diamond 2009; Levi & Levy, 2019). Generally, pension systems set up by governments for public employees (civil servants) are, typically, DB systems (OECD, 2019). "A participant's claim to an old age benefit is based on a promise from the state that, if the worker pays contributions now, the worker will be given a pension in the future. PAYG schemes are usually run by the government. They are contractarian and based on the fact that the state can tax the working population to pay the pensions of the retired generation" (Barr, 2002, p.4).

From an aggregate viewpoint, the state is simply taxing one group of individuals and transferring the revenues or their part to another group. "State-run PAYG schemes, from this macroeconomic perspective, are little different from other income transfers, although the determinants of who pays and who receives, and the incentive structure can be very different from other income transfer systems" (Barr & Diamond, 2006, p.12).

Where a state scheme is financed from contributions, the risk of adverse outcomes falls on current contributors (i.e., through enhanced tax rates), risks are shared across contributions of the working generation. Where taxpayers subsidize the pension payments, the risk falls on taxpayers. In practice, governments change the benefits of DB social security schemes and contributions when revenue and expenditure do not balance.

Hence, in a system financed out of general revenue, the risks are shared across taxpayers and generations (Eckardt, 2005).

In a pure DB scheme, therefore, none of the risks fall directly on pensioners. Hence, a key difference between DB and DC pensions is how widely risks are shared. In a pure system of funded DC individual account, the risk of an unsatisfactory outcome is imposed on the individual worker. Alternatively, in a pure, employer-provided DB arrangement, the risk arising from paying the benefit amount is borne by the employer, unless there is bankruptcy.[4]

In a modern economy, the efficiency costs resulting from impediments in labor mobility are likely to be substantial. Every working place should keep to itself the option to hire suitable workers every time.

From the central planners' perspective, a connected problem relates to the distribution of pension incomes that favor the workers whose earnings rise more rapidly, particularly toward the end of their career. Since highly paid workers tend to have more rapidly rising earnings, the system favors those who already are best-off. This can be regarded as unfair, relative to one's career path.

2.4.3. Hybrid Pension Designs

Hybrid schemes have a mixture of DB and DC components. The main examples are Notional Defined Contribution (NDC) and Points.

According to Nelson, "An NDC system is one in which each individual has an account that is credited with his tax payments and with a notional rate of return on his accumulated balance but in which there is no actual investment in financial assets. The notional rate of return that is feasible in the long-term is the modified Samuelson return, i.e., the rate of growth of the tax base" (Nelson, 2019, p.13). This is a fairly recent innovation now used internationally (e.g., Italy, Poland, Estonia, and Sweden) and is gaining global popularity (Nelson et al. 2019). Despite being developed only recently, NDC schemes have been endorsed by the WB and have been included as part of the pension system in several

[4]This kind of pension arrangement is common in the United States as a part of the employee compensation package. In Europe, the state and/or insurance companies are the sponsor of pension funds.

countries (Guardiancich, 2009). Swedish experts, at the beginning of the 1990s, elaborated the very concept of NDC, though Sweden formally implemented the NDC scheme only in 1999.

Basically, Gurtovaya and Nisticio well define the NDC mechanism: "Since there is no real capital accumulation, the reduction in the present value of consumption is not changed. The distortion in labor supply and the form of compensation is reduced (but not eliminated) because individuals can more clearly see the link between their taxes and their future benefits" (Gurtovaya & Nisticio, 2018, p.5). "An NDC contribution system also reduces the distortion in retirement decisions as individuals reduce their future benefits if they retire early and increase them by delaying retirement" (Eckardt, 2005, p.6).

The NDC scheme mechanism is describes as the following:

- Each worker pays a contribution of x% of earnings, which is credited to a notional individual account, that is, the state “pretends” that there is an accumulation of financial assets. At any time, the present value of an individual’s lifetime benefit equals the individual’s account balance.
- The cumulative contents of the account are credited with a notional interest rate, specified by the government and chosen to reflect what can be afforded by the government. The account balance is for record-keeping only, because the scheme does not own matching funds invested in the financial market. This explains the term “notional.”
- At retirement, the value of the person’s notional accumulation is constructed as a life annuity depending upon the life expectancy of the employee at retirement.

"NDC pensions mimic funded DC schemes by paying an income stream whose present value over the person’s expected remaining lifetime equals his/her accumulation at retirement, but with an interest rate set by government rules, not market returns" (Gora & Palmer, 2019, p.14).

At retirement, the pension benefit can therefore be written as:

$$P(NDC) = \sum_{i=0}^{R} \frac{w_i c}{A} (1+n)^{R-i} \qquad (2.2)$$

where, w_i is the individual's earnings in a particular year, R is the year of retirement, c is notional accounts contribution rate, n is the notional interest rate and A is the notional annuity factor.

According to Holzmann and Palmer, "On the face of it, NDC schemes, where benefits depend on a history of contributions, are very different from standard DB schemes, where benefits depend on a history of earnings. If contribution rates do not change, however, this distinction is irrelevant, and an NDC scheme can be viewed as a DB scheme with a particular structure of automatic adjustments for demographic and economic realities" (Holzmann & Palmer, 2012, p.5).

Parameters used for defining notional account interest rates vary from country to country. Thus, in Latvia, the notional interest rate is set equal to the annual growth in wage bill (i.e., the nationwide total amount of insured wages). Valorization of notional interest in Poland is linked not only to the wage-bill index but also to the consumer price index (and in no case can be lower than inflation). In Sweden, the indexation ratio is linked to average wage growth (three-year sliding average) and in Italy to the Gross Domestic Product (GDP) growth (five-year sliding average).

From a risk management perspective, one can argue that NDC pension schemes avoid some of the risks that private pension faces, notably financial risks. They may also reduce annuities market risk if only because with a single, nationwide annuities pool, the law of large numbers will reduce the variance facing the insurer, which is the state (Gora & Palmer, 2019). However, this advantage is linked more to the fact that the fund is run by the state and not a private sector entity.

Another popular type of hybrid earning-related scheme is the point system (PP). Boulhol describes this scheme as: "Workers earn pension points based on their earnings each year. At retirement, the sum of pension points is multiplied by a pension-point value to convert them into a regular pension payment. Pension points are calculated by dividing earnings by the cost of the pension point (k), which can be equal, for instance, to an average nationwide wage. The pension benefit then depends on the value of a point at the time of retirement, v" (Boulhol, 2020, p.5)

Thus, the pension benefit can be written as:

$$P(PP) = \sum_{i=0}^{R} \frac{w_i v_R}{k_i} \qquad (2.3)$$

Where, w_i is an individual's earnings in a particular year and R is the year of retirement. A significant public-policy variable is the policy for up-rating the value of the pension point, which is shown by the parameter x. By writing the pension-point value at the time of retirement as a function of its contemporaneous value, the expression changes as follows:

$$P(PP) = \sum_{i=0}^{R} \frac{w_i v_i}{k_i} (1+x)^{R-i} a \qquad (2.4)$$

where a is a constant accrual rate, k is the value of the pension point, and v is the value of a point at the time of retirement.

This pension design was first implemented in France and Germany (Boulhol, 2020). One might argue that DB, NDC, and PP schemes are the same pension system with some valorization variations among them. Furthermore, if the policy for valorizing earlier years' earnings is the same as the up-rating of the pension point and the notional interest rate, then the structures of these equations are very similar. In this case, the DB accrual rate is equal to the ratio of the pension point value to its cost, and to the ratio of the notional accounts contribution rate to the annuity factor:

$$constant\ accrual\ rate\ (a) = \frac{v_i}{k_i} = \frac{c}{A} \qquad (2.5)$$

Hence, the effective accrual rate can be calculated for PP schemes (the ratio of point value to cost) and notional accounts schemes (the ratio of the contribution rate to the annuity factor). In addition, the valorization procedure in DB schemes, the up-rating policy for the pension point value and setting the notional interest rate are exactly parallel policies (Gurtovaya & Nistico, 2018).

2.5. Pension Systems and Social Security

2.5.1. Private Schemes

Private pensions are more likely to be funded pensions since a PAYG arrangement, such as book reserves, requires considerable trust in their future ability to meet such a commitment (Bravo & Herce, 2020). According to Guardiancich, "There is a second mechanism of marketization that introduces quasi-market principles in public pensions. It means that benefit calculations are more strictly tied to contributions (lifetime point systems), when benefit indexation is dependent on wage or price movements, or when actuarial principles are applied to non-funded PAYG benefits as if they were contributory saving schemes." (Guardiancich, 2009, p.14).

A private scheme might be a pension fund that is voluntarily established by an employer and not mandated by the government. For workers covered by the mandatory national system, such voluntary pensions can be thought of as a supplementary (the WB third-pillar pension designs). In many countries, workers can choose to make contributions to a voluntary individual plan, which typically receives a rebate in income tax.

2.5.2. Social Security and Public Schemes

Throughout the history of social security, public pension schemes have proved to be an effective instrument in ensuring income security of the older population and for combating poverty and social inequality. The key distinction between social and private insurance is that participation in social insurance programs is mandatory ex-ante or is induced by substantial fiscal subsidies. Social insurance programs are also very different from welfare programs. Welfare benefits are means-tested, i.e., they are paid only to those with incomes (and assets) below some level ex-post (Bravo & Herce, 2020).

The combination of contributory and non-contributory schemes is the most predominant form of organization of pension scheme: 102 countries feature both contributory and non-contributory pension schemes (ILO, 2019). In Europe, these means-tested programs include Medicaid, food stamps, subsidized housing, school lunches, and others.

To this day, social security is considered as the basic pension pillar (Blank, 2016). Social security is a PAYG program in which current old-age benefits are paid out of current tax revenue. Hence, unlike a private pension scheme, capital assets are not accumulated to pay future benefits. "The revenue received by the social security program is credited to a trust fund but any of the receipts that are not used to pay current benefits are loaned to the government to finance its expenditures" (Holzmann & Palmer, 2012, p.5). Thus, one can see social security contribution as a tax because there is no direct connection between the trust inflow and the actual cost of future benefits.

Bohn well relate to the government considerations in implementing social security: "Because the government's role is viewed as supplemental, a case for government reinsurance must rest on the argument that private pension funds cannot efficiently provide such insurance on their own. Therefore, the central question is under what conditions current pension arrangements are efficient, and under what condition additional government support may be appropriate or even necessary". (Bohn, 2010, p.12)

Some see social insurance in broad philosophical terms, reflecting their specific views of the appropriate role of government in society. According to Miles, "One such view, more common in Europe than in the United States, is that social insurance should be judged by its contribution to social solidarity, i.e., to the sense that all of the individuals in the nation are, in effect, viewed as a family and treated equally". (Miles, 2001, p.2).

Costs of social security benefits and health care for older residents rise proportionally with the number of older persons, implying that these costs will rise faster than GDP, as the population gets older and the number of younger people engaged in productivity activity declines (Ayuso et al. 2018; Diamond, 2006). The rising cost of pension and health care for the aged, directly increase the government's budget outlays when these programs are financed on a PAYG basis.

When annual benefits exceed the inflow into the program (excluding the interest received from the Treasury), the government will have to sell bonds to the public to raise funds to finance the benefits. Thus, on a sustained basis, these costs can only be financed by higher taxes.

Over the years, a debate has developed in the literature on social security (Shoven & Slavov, 2014). Some scholars asked to diminish social security and focus only on the

funded pillar. These classic economists and policy analysts reject any structural change of the program and would prefer to achieve solvency by a combination of tax increase and benefit reduction (see Barr & Diamond, 2009; Brown, 2014; Orszag & Stiglitz, 2001).

Consequently, in the past decades, some economic theories lead to revolutionary reforms in some countries (Feldstein & Leibman, 2002). Personal accounts invested in equities and bonds will tend to increase average retirement benefits for workers. This is one of the principal reasons that advocates favor personal account and capitalized schemes (Barr, 2002).

It is recognized that some changes are necessary to maintain the solvency of the pension systems and governmental social security. However, the conclusion that the funded program is always superior to a PAYG program in a steady-state is not valid when we take into account that returns on both PAYG and funded systems are stochastic. Critics charge that expected value analysis ignores risk. While people might think that they might do better by holding a personal account most of the time, which enhances contribution and savings, they could actually do worse (De Menil et al. 2006). This dissertation study this aspect in the second part.

From a risk perspective, social security brings added value to benefit accumulations from wage and market returns. According to the portfolio theory, whether an asset should be included in an investor's portfolio depends on the covariance with the return on the rest of the portfolio. Thus, from a coherent finance perspective, a low-yielding PAYG system can benefit if it contributes to hedge other risks (Markowitz, 1991).

On the other hand, social insurance programs generally involve a tradeoff between protection and distortion. According to Diamond, "Social insurance programs also may distort incentives in ways that cause inefficient use of resources due to low saving, unproductively long-job searches, and excessive consumption of welfare programs such as medical care" (Diamond, 2006, p.14) .

Hence, one should ask the question, what is the right level of social security? Over the past decade, there has accumulated a vast literature strand on the optimal mix of pension schemes, respectively, between social security and funded pension pillar. Optimization of the weights of social security and capitalized funds is needed to solve the problem of

achieving sustainability of pension schemes both for the government and the working populations (Wolf & Caridad, 2021; De Menil et al. 2006).

As will be discussed in the following chapters, this thesis further develops this strand of literature because social security is an important diversification asset both for the individual members and for the government itself.

2.6. Extended Conceptual Framework for Pension System Designs

Above review of the pension designs addressed the particular scheme as a silo subject to its own risks. Nonetheless, according to Barr (2002), pension schemes both funded and unfunded, face the risks of:

- "Macroeconomic/financial shocks that affect output or prices or both.
- Demographic shocks affect all pension schemes, by affecting market prices, quantities, and pension claims.
- Political risks affect all pension schemes because all depend critically—albeit in different ways—on effective government, mainly in the first pillar".

Table 2.2 summarizes the conceptual framework for pension system design in this study. This approach integrates the typology of Bismarckian vs. Beveridgean in the framework of pension pillars and tiers of elderly protection.

Bismarckian social insurance systems (for example, Germany, Spain, and Italy) can be referred to as an earnings-related pension scheme that secures the first and second-tier benefits for individuals in the low- to middle-income groups. The self-employed typically can either contribute voluntarily to earning-related schemes or invest/save in personal plans (Shoven & Slavov, 2014). Some contributory pension schemes incorporate minimum pensions also, e.g., in Spain, Greece, Poland, and Hungary. Full amounts of the minimum pension are typically only granted when a minimum number of years of working is reached.

Based on the pillar model described above, Pestieau (2006) describes the two poles typical social security regimes—the Bismarckian and the Chilean after the WB reforms (1994).

Table 2.2: Two polar typical social security regimes

Characteristics	Classic Bismarckian	Chilean
Financing Principle	PAYG	Funding
What is Defined	Mostly Defined benefits	Defined contributions
Financing Source	Mostly contributions	Wage-related contributions
Intergenerational Redistribution	Earning-linked benefits	Actuarial fairness
Universality	Universal coverage	Restricted coverage
Organizations	Unions and management	Private
Accounts	Collective	individual

Source: Own process and updating on Pestieau (2006), The Welfare State in the European Union: Economic and Social Perspective.

As mentioned above regarding a Beveridgean pension system, such a scheme might include two types: "The basic pension and/or targeted means-tested pension. Basic pensions aim at guaranteeing the first tier benefits of pension income for the entire elderly population" (Rappaport, 2020, p.3). Particularly for the low-income earners these benefits possibly will also guarantee the second tier of income when the level of the basic pension is rather high. In contrast, minimum pension schemes can also, in general, be targeted to the poor (for example, Spain, Italy, and Finland) or foresee a means-tested supplement to the basic pension (for example, the United Kingdom, Denmark, and Israel). "Depending on the generosity of the amount they might provide first and second-tier benefits for the low to middle-income earners. Such non-contributory schemes typically cover the resident population" (Rappaport, 2020, p.14).

Blanc argues, "When occupational pensions were mostly dependent on a voluntary decision by employees and individuals, this approach was frequently combined with a

Bismarckian and social insurance system (for example, the United States). In contrast, countries that designed their public pension scheme to protect the poor only by providing basic and/or targeted pensions, frequently introduced collective agreements between employers and employees" (Blanc, 2016, p.8).

The neo-liberal move toward a multi-pillar pension scheme is a response to the overburdening of the public welfare state (Eckardt, 2005).

Third-pillar pensions are, naturally, a more recent development that gained further importance in the course of reforming traditional schemes and the privatization wave in the pension markets. Before personal pensions were mostly voluntary tax-favored saving plans offered by financial institutions (Blanc, 2016).

Table 2.3: Metrix of Pension Pillars and Pension Income Tiers

<table>
<tr><th></th><th colspan="2">First Pillar - Public Pension</th><th colspan="2">Second Pillar - Occupational Private Pension</th><th>Third Pillar - Personal Savings and Pension</th></tr>
<tr><th></th><th>Bismarck (Social Insurance)</th><th>Beveridge (Minimum Pension)</th><th>Voluntary Pension Plan</th><th>Collective Agreement</th><th>Voluntary Pension Plan</th></tr>
<tr><td>Third Tier</td><td colspan="2"></td><td rowspan="2">Complementary status maintenance for medium and high earning cohorts.

Mostly in combination with social insurance</td><td></td><td rowspan="2">Voluntary inclusion based on personal preferences.
Complementary status maintenance to medium or high earning cohorts, in addition to compulsory pension scheme</td></tr>
<tr><td>Second Tier</td><td>NDC or earning-related public pension status maintenance for all cohorts</td><td>Means-tested minimun pension or supplemnets to the basic pension and poverty prevention</td><td>Compulsory inclusion for covering all earning cohorts.

status maintenance for medium and high earning cohorts</td><td></td></tr>
<tr><td>First Tier</td><td>Insurance based minimum pension for low income earners</td><td>Basic pension poverty prevention to all cohorts</td><td colspan="2"></td><td></td></tr>
</table>

2.7. Is there a Preferred Pension Scheme?

After introducing the main pension scheme, it is inventible to wonder if there is any preferred pension scheme. Saving for retirement, like any form of saving for the future, involves risks. Planning for retirement requires making assumptions about the value of several parameters going forward, such as GDP, productivity growth, wage growth, unemployment, inflation, return on investment, inters and discount rates, and life expectancy. The global unstable pension landscape pension reforms across the world (and particularly across Europe) have not proved yet preference of any kind of one scheme

over the other (Barr & Diamond, 2009). While this thesis focus on the risk dimension of the famous issue of pension preference design, the economic and the social considerations presented here are the fundamentals. The risk analysis is presented in the second part of this thesis.

2.7.1. The Economic Approach

Many scholars try to suggest the perfect pension system and social security design (Aaron, 1966; WB 1994, Miles, 2001; Feldstein 2002; De Menil et al. 2006). Some use variations of OLG economic models and calibrate them to a specific economy. We find that the central argument for a funded pension system in the literature is based on return comparisons. "The implicit rate of return of the unfunded system is equal to the growth rate of aggregate wage income, which is lower than the real rate of interest. Investment in funded systems would, ceteris paribus, yield higher returns than in unfunded systems. The rate of return argument is stronger in countries with lower population growth and aging population" (Feldstein, 1974, p.5). In these countries, the cost of unfunded pensions would unequally be borne by younger workers.

Feldstein (2002) argues that: "It is well known that the implicit return of the PAYG system is given by the natural rate of economic growth, i.e., the joint effect of productivity growth and growth in the labor supply. Since this implicit return is lower than the real interest rate is a dynamically efficient economy, deterministic models predict that a funded program is always superior to a PAYG program in a steady-state" (Feldstein, 2002, p.14). By that, Feldstein followed the WB approach (Holzmann, 2000; The World Bank, 1994)

These arguments are valid in a world without any risks or without considering the risks of private funded DC plans (Miles, 2001). Actually, economically, as Barr and Diamond (2009) claim, there is no long-run difference between these pension schemes. Canadian professor, Robert Brown (2014) defines a pension system as "a social contract that sets out a process to decide what proportion of a country's gross national product its elderly residents can consume without any need for them to be in the active workforce. That is its essence on a macroeconomic level. On a microeconomic level, it is a process to decide what proportions of each worker's output will be transferred to its non-active elderly population for their consumption".

Both funded and PAYG plans are claims on future outputs, and they are of no use to retirees if the economy is not producing enough goods and services to meet those claims (Blake, 2006). From sustainability's point of view, the central variable is the level of national output, not the specific method by which pensions are financed.

With PAYG, one can express the budget constraint as:

$$\tau wL = pN \qquad (2.6)$$

where τ is the social security contribution rate, w is the average real wage level, L is the number of workers and N is the number of pensioners.

$$p = \frac{\tau w}{d} \qquad (2.7)$$

where, d is the effective dependency rate (i.e., number of eligible pensioners to the working-age population), as it takes into account unemployment rate and effective retirement age (which normally is lower than the official pensionable age).

To meet the above constraint, when the old-age dependency ratio increases, some of the other variables must adjust in the same way as the adjustment in funded schemes when the rate of return fluctuates. The only difference is the auto-enrollment in the case of funded DC schemes.

There is an additional way to analyze demographic trends on pension schemes. If a working-age generation X in one period is replaced in the next period by working-age generations of less numerical strength, there will be relatively high wealth accumulation held by the older generation, while the labor force will decline. Naturally, the level of expenditures of this generation X will exceed the level of pension contributions of the younger and smaller generation of workers Y if production does not grow, two types of imbalance will occur.

- Demand for consumption for X will exceed the potential savings of workers and will lead to inflation, which will reduce the purchasing power of retired annuitants.
- Should pensioners (for a claim on future production) accumulate cash assets such as shares, the desired volume of assets sale by pensioners (X) will exceed the desired volume of purchase of these assets by workers (Y). Excess supply in the

capital market will reduce prices of pension assets; reduce pension accumulations and, consequently the amount of annuity.

In both cases, retirees shall not get the pension levels they were expecting. Hence, the solution to longevity risk or demographic trends, in general, cannot be a transition to funded schemes or reducing the sizes of PAYG social security plans, as the classic economists assert during the 1990s (Clements et al. 2018).

Based on the above, one can conclude that from an economic perspective, the difference between PAYG and funding schemes is secondary. The key variable cannot be the path of monetary streams—if by the tax system or by the markets, but an effective central planner. It is not possible to get the government out of the pension business. Most fundamentally, the government must manage the economy such that it facilitates the growth of output. Clements et al argue in that context that: "If pension systems are public, the government must inspire confidence that their promises will be kept. To the extent systems are private, the government must sustain a regulatory framework that ensures high industry standards and transparency in private capital markets" (Clements et al. 2018, p.7).

The PAYG growth depends on the tax base and the funded funds' growth depends on the capital markets. Hence, one can conclude based on the classic economics textbook rule that, in the long run, there is no definite preference for one scheme over the other because of longevity risk or demographic trends. In the end, the total value of funds flowing into a pension scheme must equal the total value of pension payments required to be made by the scheme.

2.7.2. Social Considerations

It is empirical regularity that income and consumption inequalities increase with age and a big part of this can be explained by redistributive properties of the pension system (Bravo & Herce, 2020; Shoven, & Slavov, 2014). Clearly, the structure of the pension system affects not only income and consumption inequalities but possibly more directly the wealth inequalities. While considering fiscal constraints and examining the pension scheme in the risk-return dimension, one has to remember that the pension scheme is a

device to meet the social value of an adequate standard of living in old age. Hence, the optimization of the investments of pension funds is not like the optimization of the investment portfolio because pension funds must consider also social values. From an economic perspective, redistribution, poverty alleviation, and adequate benefit should be weighted into the government's utility function.

Pension systems differ in how they link contribution with benefit. Some schemes may alleviate inequality and other expend gaps between cohorts. Final-salary DB or DB with the best average during last years at work favor working careers of white-collar employees with age-related earnings and more likely with fast grade promotion, while benefits based on working-life contribution record put more emphasis on longer working-life phase and average earnings. The Swedish pension reform (1994), for instance, found more support from blue-collar unions than the employers, given that the reform changed toward contributions made during entire working lives (Ebbinghaus, 2019; Nelson et al. 2019).

It is still too early to determine the long-run quality of the link between a specific pension scheme to poverty and inequality. In every scheme can be found a redistribution mechanism that may alleviate poverty and inequality. What is important is the pre-social conditions and the use of these mechanisms in each pension scheme according to the social policy.

We distinguish redistribution in three ways: from those who die young to those who live long, from one generation to another, and from people in one part of the income distribution to those in another. As a social insurance system, social security provides higher overall benefits to those who live longer (Ayuso et al. 2018). Social security systems also redistribute incomes between generations. For instance, a smaller generation in terms of participants may have to pay more to fund the retirement of older larger generation (Cremer & Pestieau, 2003). Typically, men also subsidize women in social security systems, as men tend to contribute more, and women tend to live longer in retirement.

The two pension schemes, funded and unfunded (PAYG) represent different poles in the social target of redistribution. When designing a mixed pension plan, one should consider the right balance of redistribution among cohorts and generations.

2.7.3. The Risk Perspective

From another perspective, this thesis argues that no scheme is better than another scheme, and suggests that pension schemes be investigated from the perspective of risks. That approach considers the variety of risks faced by various actors in the market: the individuals, the government as the central planner with some fiscal constraints, the employers and private insurance companies/sponsors.

Barr (2006, 2009) justified his judgment in his later works on the economic reason to prefer one scheme to the other. Barr co-authored some works with Diamond, the Nobel laureate in Economics. In their 2006 paper "The Economics of Pensions", they demonstrate that all pension schemes funded and unfunded are subject to risk and uncertainty. Funded schemes were exposed mainly to market and investment risk and PAYG to wage risk, longevity, and political risks.

Capturing the diversification and hedging properties of the PAYG system as a "quasi-asset" is extremely important in the era of small capital returns and low interest rates (Diamond, 2006). A PAYG plan, even with lower returns can be desirable to the individual, depending on risk/return profiles and levels of risk aversion. At the macro level, one can consider a financial asset as a pension scheme with risks and returns. In fact, the risk perspective lays the foundation for deciding the mix of a pension scheme. The risk angle enables treating of the individual's pension system as an investment portfolio, where one financial asset can hedge another. In part B, the dissertation further develops this risk approach to pension design.

2.8. Conclusion

This chapter summarizes the central schemes and frameworks of the global modern pension designs. The economic theory at the base of design variety is that the major objectives of individuals are consumption smoothing and insurance (Barr & Diamond, 2009). Governments have additional goals that include poverty relief and redistribution (Rappaport, 2020; Pestieau, 2006).

One should remember that a pension scheme is eventually a way of organizing savings and redistribute risks among individuals (Pestieau & Ponthiere, 2012). The difference between the ways is mainly between the public objectives and the government's motivation to intervene in the market.

What characterizes different retirement pension schemes is the allocation of risks between the actors. DB PAYG and funding are simply financial mechanisms for organizing claims on that future output. 'While in a pure DC plan, investment risk is borne by individuals rather than the plan sponsor, DB plan sponsors avoid this risk" (Orszag & Stiglitz, 2001, p.5). However, they are exposed to other risks, including those associated with salary and job changes, or credit risk, when the plan sponsor fails to meet their obligations. Through this thesis we repeat Barr and Diamond motive in this aspect that, "In macroeconomic terms, though there are differences between the two approaches, those differences should not be exaggerated" (Barr & Diamond, 2009, p.15).

At the base of this dissertation is the argument that the pension system is a risk-sharing mechanism. This thesis argues that a preferred pension scheme should consider risk, return, insurance, and social value. One should analyze pension benefit as a portfolio of financial assets. Each asset makes a unique contribution to the portfolio and its hedging characteristics.

Having social targets and considering fiscal constraints, it is most likely that the right pension design is neither pure DB nor pure DC but some kind of a hybrid or mix of the two pension systems. Mixed/hybrid plans are those where the plan has two separate DB and DC components that are treated as part of the same plan.

Chapter 2 - References

Aaron, H. J. (1966). The Social Insurance Paradox. *Canadian Journal of Economics, 32*(3): 371-374. https://doi.org/10.2307/139995

Ando, A., & Modigliani, F. (1963). The "Life Cycle" Hypothesis of Saving: Aggregate Implications and Tests. *The American Economic Review*, 53(1): 55-84. Retrieved February 23, 2021, from http://www.jstor.org/stable/1817129

Ayuso, M., Bravo, J.M. & Javorcik, B. (2018). Getting Life Expectancy Estimates Right for Pension Policy: Period versus Cohort Approach. *CESifo Working Paper No. 7349*, Available at SSRN https://ssrn.com/abstract=3338676

Barr, N. (2002). The pension puzzle: Prerequisites and Policy Choices in Pension Design. IMF, Economic Issue 29. Washington DC. ISBN 1-58-906111-X

Barr, N. (2006). Non-Financial Defined Contribution Pension: Mapping the Terrain. In R. Holzmann & E. Palmer (Eds.), *Pension Reform: Issues and Prospects for Non-Financial Defined (NDC) Contribution* (pp. 57-66). Washington, DC: The World Bank. Retrieved from http://eprints.lse.ac.uk/2659/

Barr N., Diamond, P., (2006), The Economics of Pensions, *Oxford Review of Economic Policy, 22(1): 15-39*, https://doi.org/10.1093/oxrep/grj002

Barr N., Diamond, P., (2009), Reforming Pensions: Principles, Analytical Errors and Policy Directions, *International Social security Review*, 62(2): 5-29. https://doi.org/10.1111/j.1468-246X.2009.01327.x

Blanc, J. (2016). The third pillar in Europe: Institutional Factors and Individual Decisions. *Bundesbank Series 1 Discussion Paper No. 2011,09.*

Blake, D. (2006), Pension Economics. John Wiley and Sons, England.

Boulhol, H. (2020). Towards a Universal Pension Points System in France. *Intereconomics*, 55: 82–87, https://doi.org/10.1007/s10272-020-0875-3

Bravo, J. M., & Herce, J. A. (2020). Career breaks, broken pensions? Long-run effects of early and late-career unemployment spells on pension entitlements. *Journal of Pension Economics and Finance.* Cambridge University Press, 1–27. https://doi.org/10.1017/S1474747220000189.

Brown, R. L. (2014). The Essence of Social Security: Debunked Myths, *Australian Journal of Actuarial Practice*, 2: 5-12.

Clements, B., Dybczak, K., Gaspar, V. et al. (2018). The Fiscal Consequences of Shrinking and Ageing Populations. *Ageing International*, 43: 391–414, https://doi.org/10.1007/s12126-017-9306-6

Cremer, H., & Pestieau, P. (2003). Social insurance competition between Bismarck and Beveridge. *Journal of Urban Economics*, *54* (1): 181-196. https://doi.org/10.1016/S0094-1190(03)00042-1

Day, C. & Day, G. (2020). Aging, Voters and Lower Income Tax: A Role For Pension Design. *Economic Modeling*, 94: 560-569, https://doi.org/10.1016/j.econmod.2020.02.002

Diamond, P. (2006). Conceptualization of non-financial defined contribution systems. (Holzmann, R., & Palmer, E., Eds.), *Pension Reform: Issues and Prospects for Non-Financial Defined Contribution (NDC) Schemes.* The World Bank, 76–80.

De Menil, G., Murtin, F., & Sheshinsky, E. (2006). Planning for the optimal mix of PAYGO tax and funded savings. *Journal of Pension Economics and Finance, 5* (1). Cambridge University Press (CUP), 1–25.

Ebbinghaus, B., & Gronwald, M. (2011). The Changing Public-Private Pension Mix in Europe: From path dependence to path departure. *In B. Ebbinghaus (Ed.), The Varieties of Pension Governance : Pension Privatization in Europe (pp. 23–53).* Oxford Univ. Press. https://madoc.bib.uni-mannheim.de/28826/

Ebbinghaus, B. (2019). Multi-Pillarisation Remodelled: the Role of Interest Organizations in British and German Pension Reforms, *Journal of European Public Policy*, 26(4): 521-539, http://10.1080/13501763.2019.1574875.

Eckardt, M. (2005). The Open Method of Coordination on Pensions: An Economic Analysis of its Effect on Pension Reforms. *Journal of European Social Policy*, 15(3): 247–267. https://doi.org/10.1177/0958928705054088

Feldstein, M. (1976). Perceived Wealth in Bonds and Social Security: A Comment. *Journal of Political Economy*. 84 (2): 331-336. https://doi.org/10.1086/260435

Feldstein, M., Liebman, J. (2002). Social security. *Handbook of Public Economy, 4*, pp. 2245–2324, https://doi.org/10.1016/S1573-4420(02)80011-8

Gora, M. & Palmer, E. (2019). NDC: The Generic Old-Age Pension Scheme. *In Holzmann, R. & Palmer, E. (eds). Progress and Challenges of Nonfinancial Defined Contribution Pension Schemes, The World Bank,* 1: 167-188

Grande, G., & Visco, I. (2010). A Public Guarantee of a Minimum Return to Defined Contribution Pension Scheme Members. *The Journal of Risk*, 13(3): 3–43. https://doi.org/10.21314/JOR.2011.226

Guardiancich, I. (2009). Pension Reforms in Central, Eastern and Southeastern Europe: Legislation, implementation and sustainability, Florence, European University Institute, Department of Political and Social Sciences http://hdl.handle.net/1814/13297

Gurtovaya, V. & Nisticio, S. (2018). The Notional Defined Contribution Pension Scheme and the German 'Point System': A Comparison. *German Economic Review*. 19 (4): 365-382. https://doi.org/10.1111/geer.12127

Herd, P., Favreault, M., Meyer, M. & Timothy M. (2018). A Targeted Minimum Benefit Plan: A New Proposal to Reduce Poverty among Older Social Security Recipients. RSF: *The Journal of the Social Sciences*, 4(2): 74-90. http://doi.org.10.7758/rsf.2018.4.2.04

Hinrichs, K. & Jessoula, M. (2012). Labour Market Flexibility and Pension Reforms: What Prospects for Security in Old Age? *In: Hinrichs K., Jessoula M. (eds) Labour Market Flexibility and Pension Reforms. Work and Welfare in Europe*. Palgrave Macmillan, London. https://doi.org/10.1057/9780230307605_1

Holzmann, R. (2000). The World Bank Approach to Pension Reform. *International Social Security Review*, 53: 11–35. https://doi.org/10.1111/1468-246X.00061

Holzmann, R., Palmer, E. (2012). NDC in the teens: Lessons and issues. In R. Holzmann, E. Palmer., & D. Robalino (Eds.), *Nonfinancial defined contribution pension schemes in a changing pension world*, Volume 1, *Progress, lessons and implementation.* The World Bank, 3–29.

ILO (2019), Social protection for older persons: Policy trends and statistics 2017–19. Social Protection Policy Papers–Paper 17. 9789221322429[ISBN]

Kotlikoff, K, & Wise, D, (1984). Labor Compensation and the Structure of Private Pension Plans: Evidence for Contractual Versus Spot Labor Markets, *NBER Working Papers 1290*, National Bureau of Economic Research, Inc.

Levi, R., & Levy, H., (2019). The Effect of Attitudes Regarding Retirement on Pension Savings, *Review of Economics & Finance*, Better Advances Press, Canada, 15: 1-13. Available at https://EconPapers.repec.org/RePEc:bap:journl:190101

Markowitz, H. (1991). Foundations of Portfolio Theory. *The Journal of Finance*, 46(2): 469-477. http://doi.org.10.2307/2328831

Miles, D. (2001). Funded and unfunded pension schemes: Risk, return and welfare. *CESifo Working Paper Series NO.239.* Munich. Available at https://www.cesifo.org/DocDL/WP239.PDF

Nelson, K., Nieuwenhuis, R., & Alm, S. (2019). Sweden: Adjoining the Guarantee Pension with NDC. *Social Protection Discussion Papers and Notes from The World Bank*. https://doi.org/10.1596/31626

OECD (2019). Pension at Glance 2019: OECD and G20 Indicators. OECD Publishing. https://doi.org/10.1787/b6d3dcfc-en

Orszag, P. R., & Stiglitz, J. E. (2001). Rethinking Pension Reform: Ten Myths about Social Security Systems. In Holzmann, R. & Stiglitz, J. E. (Eds.), *New Ideas about old age security: Toward sustainable pension systems in the 21st century*. World Bank, 17–56.

Pedersen, A.W. (1999). *The taming of inequality in retirement: A comparative study of pension policy outcomes*. [Doctoral thesis, Florence, European University Institute, Department of Political and Social Sciences] http://hdl.handle.net/1814/5347.

Pestieau, P. (2006). The Welfare state in the European Union: Economic and social perspective. *Oxford University Press*.

Pestieau, P. & Ponthiere, G. (2012). The Public Economics of Increasing Longevity. Hacienda Pública Española / Revista de Economía Pública, IEE, 200(1), 35–68. http://hdl.handle.net/2268/118991

Rappaport, A. M. (2020) Different Perspectives on Phased Retirement, Retirement Ages and Working in Retirement, *Benefits Quarterly Brookfield*, *36*(3): 31-43

Samuelson, P. A. (1958). Aspects of Public Expenditure Theories. *The Review of Economics and Statistics, 40*(4): 332-338. https://doi.org/10.2307/1926336

Shoven, J. B. & Slavov S. N. (2014). Recent Changes in the Gains from Delaying Social Security. *Journal of Financial Planning*, *27*(3): 32–41.

Williamson, J.B. & Williams, M. (2003). The Notional Defined Contribution Model: An Assessment of the Strength and Limitations of a New Approach to the Provision of Old Age Security, http://crr.bc.edu/wp-content/uploads/2003/10/wp_2003-181.pdf

Wolf, I., & Caridad, J.M. (2021). The Transition to a Multi-Pillar Pension System: The Inherent Socio-Economic Anomaly. *Journal of Financial Economic Policy*. http://doi.org/10.1108/JFEP-07-2020-0162

World Bank. (1994). Averting the Old Age Crisis: Policies to Protect the Old and Support Growth. New York: Oxford University Press. https://doi.org/10.1596/0-8213-2970-7

Zaidi, A. & Grech, A.G. (2007). Pension Policy in EU25 and its Impact on Pension Benefits. *The Journal of Poverty and Social Justice*. 15(3): 229–311. Available at https://mpra.ub.uni-muenchen.de/id/eprint/33669

III. The Recent Evolutions of Pension Design

"The state pension will be the primary source of retirement income for most Europeans. If this is inadequate, political pressure will be brought to bear on European governments. As old people form an increasingly large proportion of the population and have a higher propensity to vote in elections, this pressure will be difficult to resist".

(Aon, 2007, p.12)

3.1. Introduction

This chapter introduces an incentive to the wave of pension reforms and the beginning of the funded pension era. Part B of this dissertation following this chapter analyzes the funded scheme from the perspective of risk and contributes to the debate on optimal pension design. Within this chapter, it is interesting to understand the economic and political background of global reforms. As a repetitive motive in this chapter and before diving further into this dissertation, we claim that before answering the challenge of fiscal burden in unfunded pension designs, one has to be convinced about the essence of the problem.

The debate on pension reforms has become a prominent theme of public policy since the 1970s and implementation of pension reforms has been a frequent phenomenon (World Bank, 1994; Barr, 2006). Slowing economic growth rates, higher unemployment rates, and growing national debts gradually undermine the financial and government strength of public pension schemes. Due to fiscal deficits and projections to further actuarial deficits, governments initially proceeded to systematic reforms, reshaping the functions of public pension schemes.

From the 1980s, governments cut public pension pillars and helped to create new funded pension designs. The move towards DC plans was, driven by cautious efforts to reduce governments' long-term fiscal commitments (Hassel et al., 2019). Governments could also justify the promotion of pension financialisation by pointing out that it had the advantage of creating an inflow of capital and develop capital markets (Altiparmakov, 2018; Ebbinghaus, 2015). Yet, the market performance after the pension reforms were quiet disappointing, as will be discussed in the next chapter.

DC plans and personal pension accounts are gaining prominence at the expense of DB plans even in countries with a traditionally high proportion of assets in DB plans such as Germany, France and even the United States. For example, in Ireland, the number of assets in DB schemes declined by about 0.5 billion Euros from the year 2015 to 2016. In general, the proportion of assets in DC plans and personal plans is higher than in DB plans in most of Europe and the Western world.

This chapter will investigate further in the evolution of pension systems in Europe as a response to low fertility rates and longevity risk. The last reforms and their affection for

the individual, the society, and the state are the prefaces to the rest of this dissertation. The main aim of this overview is to determine the features of pension reforms and to mark the global evolution toward a mixed pension system. The study, in particular, seeks to identify major reform policies and discuss their consequences along with their economic influence.

It is highly important to redirect the interest of governments to a more balanced focus on the multipillar pension scheme. Such analytical focus may contribute towards designing a new policy that incorporates social targets, solidarity, and redistribution.

Section 3.2 provides an overview of the economic background of pension reforms. Section 3.3 completes this overview by discussing the pressure of economic institutes and scholars toward these funded pension reforms. Section 3.4 provides an overview of the new European landscape of pension designs and the common reforms during the last three decades. Section 3.5 studies the opposite trend, which emerged over the last decade, of re-reforms or pension reversals. We will deepen further in the reasons for the unstable landscape of the pension markets due to this global trend and how the financial crisis is connected to it. The following section deals with the role of the state in the era of privatization and capitalization of pension systems. It is argued that the state recently got a heavyweight in the retirement market due to the recent financial crisis. We conclude this part of the thesis with section 3.7.

3.2. Background to Pension Reforms – Population Growth and Fiscal Challenges

3.2.1. The Emergence of the Longevity Risk

The cross-country variation in pension system design can be explained by the political preferences prevailing in the late 1930s and early 1950s when most of the universal mandatory pensions in the developed countries were established. The severe economic shocks in the interwar period might have had an impact on the prevailing political preferences (Clements et al. 2015). Chai and Kim claim that, "Large inflationary shocks devastated the middle-class savings in several countries, among them typically the countries in Continental Europe with a large call on PAYG financing (Germany, France, Italy, and Belgium) currently. The political majority shifted support away from pension

savings and free markets to social insurance and a strong role for state intervention" (Chai & Kim, 2018, p.5).

According to Grech: "The sharp international recession of the 1980s had led to ballooning government deficits and significant balance of payments crisis in many economies. Given that pensions had become one of the largest government spending programs in most countries, reforming them was seen as a way to address these imbalances" (Grech, 2018, p.5).

Since the 1990s, Policymakers began to recognize the consequences of low fertility and longevity risk on future pension benefits. "This process was somewhat complicated by the intrusion of broader policy agendas related to the adoption of more neoliberal economic policies as a means to address the economic decline of the 1970s" (Amaglobeli et al. 2019, p.6).

The global population is undergoing a significant transition with decelerating population growth. A substantial literature has identified several factors responsible for the erosion of the pension system (e.g., Amaglobeli et al. 2019; Conesa & Kohoe, 2018; Orenstein, 2017).

According to global economic organizations, fertility is expected to stay below the population's replacement level even though there have been immigrant waves across Europe from developing countries in the last two decades (see Figure 3.1). At the same time, life expectancy at 65 years old is expected to increase by about one year per decade. As a result, the dependency ratio[5] is assumed to climb up (see Figure 3.2).

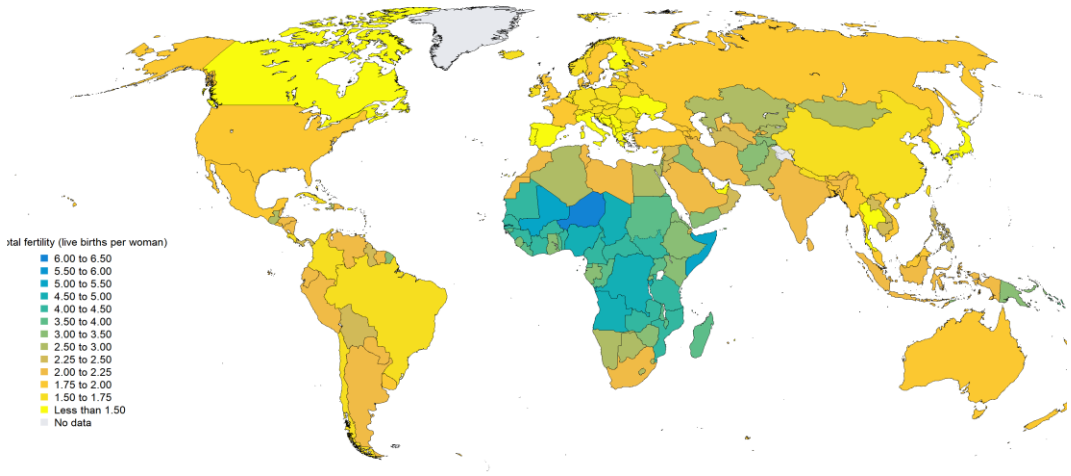
According to the U.N population report: "Countries that are facing a sharp increase in old-age dependency and, at the same time, have a low fertility rate already at present should expect far stronger increases in the TDR ratio. Clearly, in countries where fertility has already been low for several decades, like Germany and Japan the number of youths relative to that of working-age individuals will not decrease much further in the future" (U.N population report, p.41).

The pattern for the EU28 broadly follows the Organization for Economic Co-operation and Development (OECD) average. European countries are already slightly older than

[5] The ratio of the elderly population above 65 years old to the working age population (15-64 years).

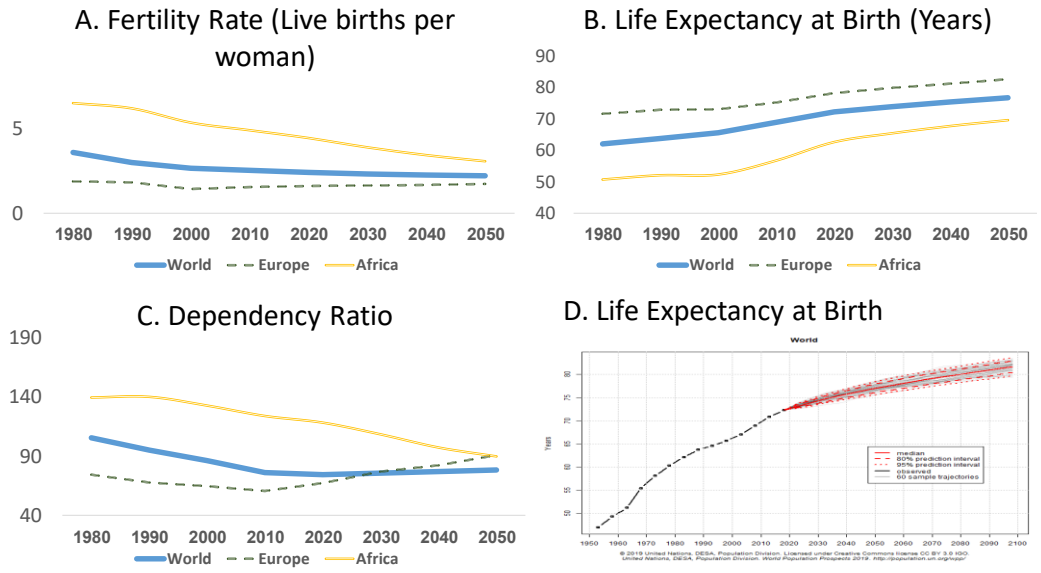
the OECD average. "A dependency ratio of 30 for the EU28 in 2015 compares with an OECD figure of 28. By 2075, the dependency ratio for the European Union is also projected to reach 58" (OECD, 2019).

Figure 3.1: Total fertility rates 2025-2030



e: UN World Population Prospect 2021

Figure 3.2: World Pension Longevity Risk Indicators



Source: UN World Population Prospect 2019

According to Amaglobeli et al. from the International Monetary Fund (IMF): "Other emerging and some developing countries are at an advanced stage of demographic

transition, having already enjoyed the bonus of a demographic dividend, a period during which the working-age population expands relative to the young and the old" (Amaglobeli et al. 2019, p.7). The population decline can become self-reinforcing with fertility rates going below 2.1, as the number of the woman of childbearing age falls by each generation. More workers provide better feasibility in terms of taking care of a relatively smaller pool of elderly people through intergenerational transfers and contribute to higher saving rates in some countries. This bonus has now ended in many countries in this group and will end shortly for the rest.

3.2.2. Ageing Influence

Both longevity and ageing harm economic growth, labour markets, pension benefits, state revenues, and redistribution of income (Kourtonas & Yew, 2017). Slowing economic growth rates, higher unemployment rates, and growing national debts gradually undermine the financial and government's strength of public pension schemes. "Social expenditures, such as health care expenditures have also been growing at a faster rate than average income, resulting in higher contribution rates or the curtailment of benefits" (Holzmann, 2017, p.12).

3.2.2.1. Labor Market

Ageing can affects the participation of the labour workforce, as the elderly tend to participate in the labour workforce at much lower rates (Conesa & Kehoe, 2018). This trend would weigh on the sustainability of social security systems by lowering the ratio of contributions, a trend that is exacerbated where the working-age population is expected to shrink (IMF, 2019). "The old-age dependency ratio will increase sharply placing additional burdens on the working-age population to finance pensions and health care for older people" (He et al., 2016, p.5).

From the technology influence, we count two contradictive trends. On one hand, Younger workers generally learn new skills more readily. When the labour force ages with time and so are prone to be less adaptable to technological change, thereby reducing productivity and economic growth (Amaglobeli et al. 2019). On the other hand, with the

advent of technological progress, the improved level of education, and the growth of GDP, we witness the fact that each generation of employees earns more than the previous generation.

3.2.2.2. Savings

The characteristics of the public pension system can influence workers' consumption-saving balance. The deceleration in the labour force will affect the future level of the total GDP growth. As Feldstein argues: "Slower population growth depresses the rate of saving and therefore reduces the volume of business investment in productivity" (Feldstein, 2006, p.10).

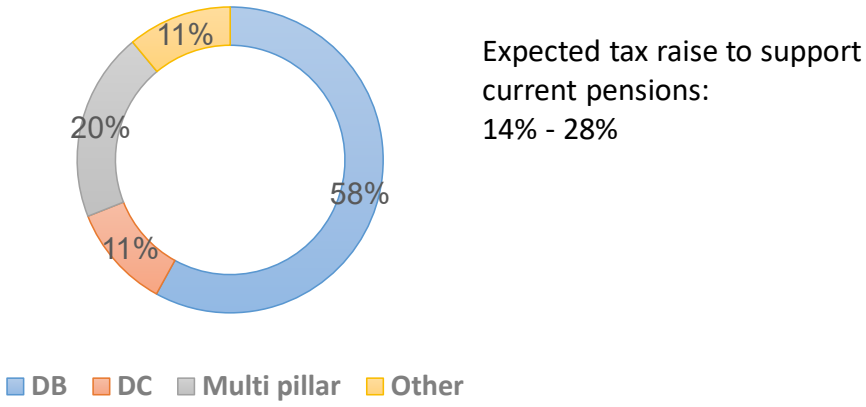
One can think that at any point in time there will always be households that are savers and other households that are borrowers. The savers are typically middle-aged employees who are preparing for retirement. The dis-savers are typically in their retirement years (He et al., 2016). In a growing economy, there are relatively more middle-aged savers than there are older dis-savers. That, together with rising per capita income, ensures the cumulative savings to be greater than that of older dis-savers. The faster the population growth rate, the higher will the nation's saving rate tend to be and create fiscal difficulties to finance unfunded plans like social security.

3.2.2.3. Reduction in Net Benefits in PAYG Pension Scheme

Due to fiscal deficits and projections to further actuarial deficits, governments initially proceeded to systematic reforms, reshaping the functions of public pension schemes. However, due to the decelerating growth rate of the population, the challenge of how to prolong the financial life of the existing pension system has remained (Orenstein, 2005).

As pointed in Figure 3.3, most countries still rely on defined benefit (DB) pension schemes, under which benefits depend on the number of years of contributions and the individual’s earning history, usually supplemented by an income-tested basic pension.

Figure 3.3: Pension System in advanced countries



Source: IMF calculation 2019

With a projected increase of 4.5 years by 2060-2065 to reach 22.8 years from retirement, many European countries increased or plan to increase their benefit withdrawal ages. "Other countries have introduced elements into their retirement-income provision that will automatically adjust the level of pensions as people live longer. Overall longevity gains are due to a rise in living standards, providing greater access to quality health services at the same time" (IMF report, 2019).

The expected increase in the number of pensioners per worker in the United States and relative to some OECD counties in the last decade meant that current social security tax rates will not be high enough to finance the benefits projected in the current law. Hence, the benefits must be reduced below their predicted levels or taxes must be increased. In either way, the net rate of return will be reduced. The long-term change in the ratio of retirees to the worker (as discussed above), reflects the permanent rise in life expectancy.

The payroll tax that is used to finance social security pension benefits would have to rise from about 12 percent in the USA to about 20 percent by the year 2030. "In Spain, a typical European country, the rise in tax would be even greater because of the greater generosity of the existing benefits and the greater increase in the ratio of the number of retirees to the number of working persons" (Feldstein, 2005, p.15).

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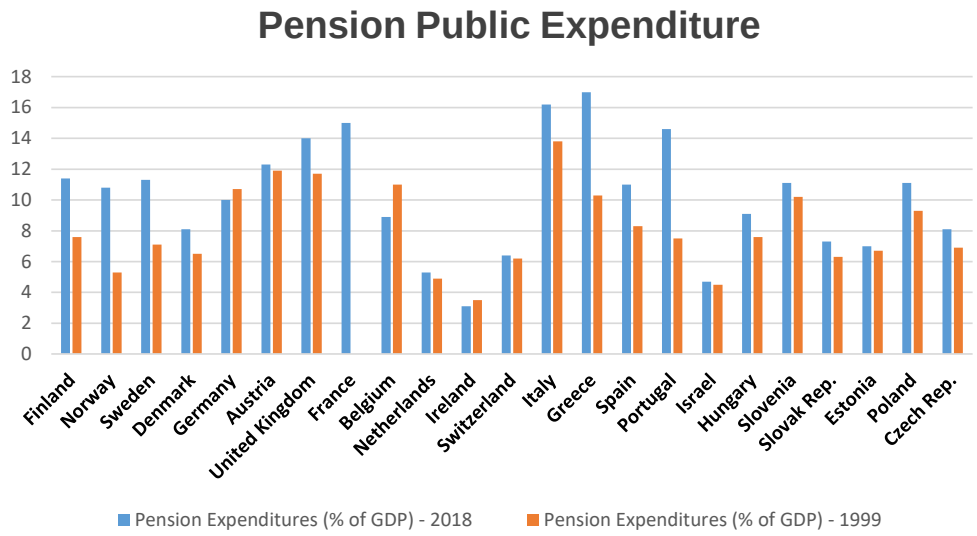
3.2.2.4. Pension and Social Spending

It has been broadly accepted in the literature that the retrenchment of public pensions could help 'crowd in' private plans (Ebbinghaus, 2015; Hassel et al., 2019). Although almost every affluent democracies have cut public pension entitlements over the last three decades (Domonskos & Simonovitz, 2017; He et al. 2016), public expenditure on pensions has continued to increase across most OECD countries (see Figure 3.4). That can be explained due to a change of policy priorities due to ageing population pressure, implementing minimum pension guarantees, or a lag between the enactment of pension cuts and their implementation (Bonoli and Palier, 2007).

It should be noted that the combined total amount of pensions paid to retirees can still be at least as generous after the reforms as before due to the increasing longevity. However, for this study, our interest lies in how annual pension incomes may be affected by the reforms, in particular poverty risk.

Figure 3.4: Pension public expenditure in 1999 and 2018



Source: OECD data, 2020

Because of the pension reductions, in the United Kingdom, the government ended up introducing a plethora of other benefits for the elderly, such as subsidies for energy, transport, and medical expenses. According to Grech: "This is an example of the growing consensus of the need to adopt a multifaceted approach to assess pension reform, based

on the realization that the underlying needs currently achieved by state pension systems cannot be simply swept away through reforms." (Grech, 2018, p.14).

The impact on private saving depends largely on pension system generosity. Greece and Cyprus, for instance, provide pension benefits that are about 65 percent of the average economy-wide wages. The corresponding numbers are less than 30 percent in Latvia and Ireland. According to the International Monetary Fund (IMF): "Even nowadays after a decade after the financial crash, advanced economies provide some type of public pension benefits to nearly all of their elderly citizens. In most emerging and developing economies, however, only one-third to two-thirds of the elderly are covered because of unique incentive plans for specific populations" (IMF Report, 2019, p.54).

The demographic developments alone without other influences, could cause a long-term downward trend in public savings worldwide. According to Clement et al. (2015), "Worldwide public pension spending pressure could depress public savings by just over two percentage points of the GDP by 2050, with a significant difference across countries." (Clement et al. 2015. P.13).

3.3. The Pressure of Academic Institute and World Economic Organizations Toward Pension Reforms

3.3.1. The Classic Literature Argument

An increasingly rich literature illustrates the ongoing privatization of pensions and the shift of responsibility for old-age social security from the state to participants and private actors (Grech, 2018; Ebbinghaus, 2015; Brown, 2014; Feldstein, 2005). The shift from the PAYG scheme to private pensions has been chiefly pushed by international organizations and economists, during the 1990s and early 2000s, who argue that ageing populations weaken the economical viability of welfare systems (Feldstein 1996, 2005).

During the 1990s, some economists (like Feldstein, Holzmann, and Samwick) argue that high rates of income tax reduces taxable income and create substantial deadweight losses. They, like the World Bank these days, regard the adverse effect of PAYG social security

on saving and capital accumulation as a deterrent to growth rather than as a favorable source of Keynesian demand (Heneghan & Orenstein, 2019).

The economic base of the argument toward privatization compared the capital market rate of return to tax rate. Samuelson's (1958) famous overlapping generation model explained that a pure PAYG social security plan with a constant tax rate can pay an implicit rate of return equal to the growth rate of the tax base. The reason is that each generation of retirees is supported by a larger tax base than the one on which it paid the tax when it was working.

As Pestieau points out, "The heavy reliance on the PAYG pensions provisions has been justified during decades of rapid growth in population and productivity. However, with the prospect of unprecedented ageing of the population, combined with a decline in productivity growth, one has the feeling that shifting to fully funded schemes would contribute to avoiding unbearable pressure on public finance" (Pestieau, 2006, p.14). Many other economists from the World Bank, such as Holzmann & Hinz (2005) believe in moving to funded financing and privatizations of pensions.

Chicago University leading by Friedman and Feldstein claims that: "For pensions to remain ‘sustainable’, only one reform direction—that of retrenchment—was envisaged" (Feldstein, 2006, p.5). This reflected the very negative change in opinion on the effectiveness of the PAYG approach to financing pensions.

The latter approach was increasingly depicted as a sort of Ponzi scheme whereby earlier generations of workers had lumbered future generations with a debt burden for expenditure outlays, that they would not benefit from. Feldstein (1974), also argued that the introduction of PAYG had contributed to lower long-term economic growth as it led to reduced saving and, in turn, to lower private investment. "Substantial pension reforms ended up being one of the main policy recommendations of international institutions, particularly moving emerging countries away from the ‘mistakes’ of retirement income provision systems prevalent in the developed world" (Zaidi & Grech, 2007, p.4).

3.3.2. The World-Bank effect toward Privatization

Pension reform which began in the 1980s and 1990s were triggered by exogenous demographic changes and the loss of control on the side of the state of fiscal policy and by endogenous welfare structure inefficiency. However, the continuous wave of pension reform across the globe and mainly in Europe and Latin America is because of the narrative of crisis that was led via the World Bank (1994) and in academic circles (Grech, 2018; Feldstein, 2005).

"International institutions, such as the World Bank, the OECD, and national policy-makers and their economic advisers have frequently pointed out public pensions as being a fundamental block towards achieving long-term fiscal sustainability" (Heneghan & Orenstein, 2019, p.14.. The World Bank, which represents the American liberal perspective, has proposed a model of reform that reduced the role of the state in retirement income provision and instead replaced it with private pensions, preferably mandatory (Heneghan & Orenstein, 2019).

The World Bank propagated its multi-pillar pension model in developing countries (World Bank, 1994), advocating the introduction of privately funded pensions by following the Swiss three-pillar model (Holzmann & Hinz, 2005). "The World Bank's influence was particularly strong among the countries which are under transition in Central and Eastern Europe (CEE), which moved from state-socialist to more market-compatible social protection. Indeed, several CEE countries introduced funded pensions as a result of low levels of trust in the state, the need to boost domestic financial markets, and the financial dependency from the International Monetary Fund (IMF)" (Ebbinghaus, 2015, p.8).

The World Bank in its propaganda during the 1990s linked pension-funded schemes to the developments of capital markets (Holzmann & Hinz, 2005). The received wisdom in the political economy literature is that the rise of pre-funded defined contribution plans has directly contributed to exposing households to the vagaries of financial markets. Yet it depends on the variation of pension plans.

While the European Union (EU) attached no pension model to its membership accession conditions, Central and Eastern Europe (CEE) policy reformers "out-liberalized" others

in adopting the World Bank model (Guardiancich, & Guidi, 2020). Since the late 1990s, the EU has become increasingly involved in discussing social protection issues.

In October 2006, the European Commission published a communication to the European Council and the European Parliament where it was mentioned that “in the coming decades, the size and age-structure of Europe’s population will undergo dramatic demographic changes ". . . this will make it difficult for the Member States to maintain sound and sustainable public finances in the long-term”. Similar statements have been made by entities like the World Bank, the International Monetary Fund, and the OECD.

3.4. The Wave of Pension Reforms

3.4.1. Structural and Parametric Reforms

Continuing the background and the literature review above, pension trends have led to a general shift toward individuals taking more responsibility for the provision of adequate pension income for their retirement.

The ILO (International Labor Organization) counts 105 occasions in 60 developing and 45 high-income countries are discussing changes that could be implied to their pension systems such as reducing employers' contribution rates, increasing eligibility periods, prolonging the retirement age, and lowering benefits. As a result of the implications, future pensioners will receive lower benefits.

According to data collected by the International Labor Organization (ILO) and the OECD, as described in Table 3.1, in seven years, between 2010 and 2016, 169 contraction measures in pension designs were exploits by governments from various regions. Out of these, 103 policy steps were related to delaying pension receipt.

Table 3.1: Government announcements of pension reforms, 2010-2016

	Type of Measure	No. of Cases
Transferring Longevity Risk	Raising retirement age (72 cases), introducing or increasing incentives for late retirement, introducing or increasing penalties on early retirement, eliminating early retirement, increasing eligibility period	103
Contracting Pension Adequacy	Increasing taxes on benefits, modifying calculation formula, reforming indexation method	36
Privatization	Increasing contribution rates (17 cases), increasing contribution ceiling, partial or total closure of a scheme,	37
Total		**176**

Source: Author's elaboration based on OECD 2019 and the ILO data 2019

The first two lines in Table 3.1 belong to the parametric reform definition in pension literature. "Parametric reforms involve systemic approaches to improve the sustainability of PAYG mechanism in an attempt to optimize the system's efficiency through either prolonging the productivity capacity of the elderly workforce or smoothening the fiscal costs of population ageing." (Mesa-Lago & Valero, 2020, p.5). In parametric reforms, longevity risk is still borne by the pension provider rather than the participant. Moreover, redistribution is still possible under a DB system, something that is relatively impossible to achieve under a pure DC framework. (Bonenkamp et al. 2017). Many countries in Continental Europe have turned to parametric reforms as shown in the next subsection.

Many of these parametric reforms have improved the long-term sustainability of the traditional DB PAYG schemes. In some countries, reforms are intended to protect existing pensioners, shifting most of the adjustment burden to the future generations of retirees (Hinrichs, 2021). One example of parametric reform is changing the contribution

rates. France, "Germany and Romania have increased the contribution rates from 1 to 4.5 percent over a period that varies from 1 to 20 years." (Mesa-Lago & Valero, 2020, p.7).

The last line in Table 3.1 signifies structural reforms and shifting from PAYG DB to DC pension scheme. Structural reforms of the pension system introduced mostly in Latin American countries, starting with Chile (in the early 1980s), Mexico, and several CEE countries such as Hungary, Poland, Slovakia, and Israel (OECD, 2019; Guardiancich & Guidi, 2020).

These reforms represent the extreme vision of privatization as per the World Bank's pure model, shifting from a PAYG pension scheme to a pre-funded financing logic (Arza, 2008). The system introduced in Chile, for example, requires that workers save for pensions without the employer's participation) and it does not play a part in the redistribution of income or in protecting insured individuals against longevity risk, death, and disability risk (Naczyk & Domonkos, 2016).

In essence, structural welfare reforms have become a panacea for many countries in the last two decades. Welfare reforms also involve changes in ownership. Privatization has become the cornerstone of economic-driven social protection policies, adopting dynamic asset allocation strategies with the highest expected average return.

The researches along this thesis in the next part point that the main difference between parametric and systemic reform lies not in the technical mechanism of benefit and contributions but the sharing of risk between the current generation and future ones or the State (the custodian of future generations in this respect). "Parametric reforms do not change public pension systems from a DB to a DC set-up. This has several important implications, such as the fact that longevity risk is still borne by the pension provider rather than the pensioner" (Zaidi & Grech, 2007, p.7). We will discuss that characteristic over the next chapter.

3.4.2. Pension Reforms in Europe

The pension landscape in Europe is continuously changing. Pension expenditure represents an economically large burden in Europe (currently about 12% of GDP). "Indeed, it is the largest social protection program (about 45% of social expenditure,

which amounts to 27% of GDP in EU-27 after the crash)" (Ebbinghaus, 2015, p.18). The demographic and economic challenges to the financial sustainability of pensions have been well known for decades. To make pensions more financially sustainable, policy experts, mainly from the European Monetary Union (EMU), recommended shifting the balance from the dominant public PAYG pensions to more private (pre)funded pension pillars (Armeanu, 2018).

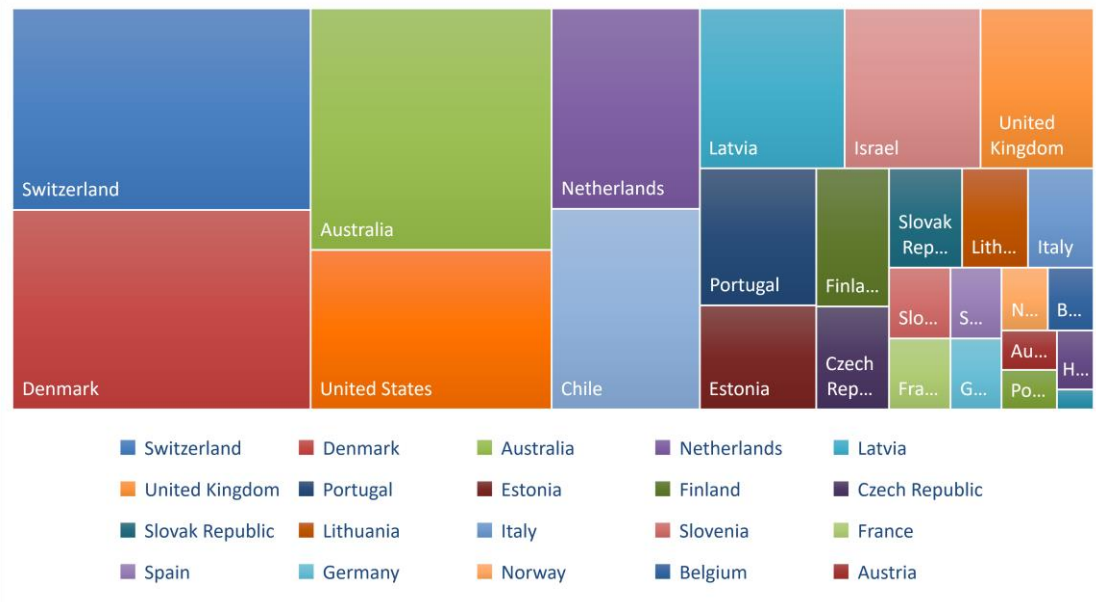
Before delving to overview specific countries or areas in Europe, we show in Figure 3.5 the contribution rates in Europe to funded pension schemes as percent form GDP. For comparison, we added to the analysis Australia, Chile, Israel, and the USA, which are OECD countries with high private contribution rates. It is easy to notice that after pension reforms and some reversals, which will be discussed in the following, Europe is still sticking to the dominant government pillar with low rates of contribution to funded/private pension funds.

While Anglo-Saxon countries usually allow implementation of individual accounts with financial exposure, many Continental European countries have introduced regulations to hedge against market risk, such as minimum pension guarantee instruments. Moreover, there is no clear link between DC developments and investments in risky assets (Altiparmakov, 2018).

In Western Europe, there seems also a trend of gradual replacement rate of DB pension schemes by DC. Another major development is the rise of mandatory private pension provision in countries such as Switzerland, the Netherlands, Denmark, Sweden, and the United Kingdom (Natali, 2015). Out of Europe, this wave includes Israel, Australia, and New Zealand.

Ebbinghaus is well describing the pension trend in Continental Europe: "In Continental Europe due to low female participation and early retirement is again in a more strained situation. The need for cost-cutting may not be immediately evident. Increased social contributions, higher taxes, or more borrowing could finance additional retirement costs. Indeed, many European countries have initially increased the revenue side as well as augmented public debt" (Ebbinghaus, 2015, p.8).

Figure 3.5: Pension contribution rates to funded or private funded pension scheme (% of GDP)



Source: Author's elaboration based on OECD 2019 data

The wave of reforms did not skip Beveridgean countries too. The classic Beveridgean countries - the U.K, Denmark, Ireland, the Netherlands, and Israel provide basic protection (with flat rate and/or means-tested benefits). The recent reform of the pension system in the UK aspired to rehabilitate and reinforce the social security pillar, which enables a basic pension after this had been eroded in the wake of Thatcher policy in the 1980s. One of the dramatic decisions in this system is the cancelation of the indexation of parameters of the first and second pillars of the national system to the average wage.

Scandinavian countries relied on a mix of public and private pension schemes. They introduced universal flat-rate pensions between the 1930s and 1960s. In the 1960s, Sweden, Norway, and Finland topped these schemes up with a second public earning-related to increase income smoothing. Occupational pensions plan's established by employers and unions, continued providing an important source of retirement income in Denmark, Norway, and Sweden, while in Finland they were all incorporated into the second public scheme. Sweden and Norway later introduced a NDC for its public second-tier pension and added a mandatory private DC personal` pension (Nelson et al. 2019). Finland and Iceland have a partially privately funded but mandatory DB scheme.

Southern and Continental European countries have not passed major reform measures on pre-funded schemes during the 1990s but reforms have taken place since the sovereign debt crisis. Some of these countries have legislated a cut in tax subsidies for contributions to voluntary pension funds (including Austria, Belgium, Greece, Italy, and Spain).

The majority of pension assets across Europe are still held in (largely legacy) DB arrangements, while at the same time there is a growing trend towards the establishment of DC pension plans for ongoing workplace pension provision[6].

Germany, after some reforms during the 1990s, changed its generous policy. As in the case of Sweden, Germany also introduced a DC pillar to encourage savings. In Germany, this second pillar is voluntary and private and the incentives for savings are direct subsidy or tax credits. On the other hand, these reforms have recognize the importance of imposing a universal floor to pension benefits and to preserve a minimum standard of living in old age.

In France, Belgium, Slovenia, and other Continental countries, recent innovations have aimed at bringing public spending under control (Natali, 2015). "The average old-age benefit is projected to decline" (Bonenkamp et al. 2017, p.2), while non-public schemes are expected to be more significant in the future. In these countries, traditionally the public pillar is more generous and expected to play a major role in old-age benefits. Moreover, supplementary schemes are not mandatory, which led to a much slower widening of their coverage.

Switzerland and the Netherland have mixed DB occupational pension funds. Their pension system now defines as Beveridge-multi pillar-systems.

Several eastern European countries opted to go for multi-pillar pension systems, often after assistance from the World Bank (Domonkos & Simonovitz, 2017). As Natali claimed: "The desire to join the EU (and therefore the implied adoption of the Maastricht criteria) meant that a full transition to a funded system was not possible as the transition costs would have been too high. Thus, countries tended to go for the World Bank multi-pillar model" (Natali, 2015, p.4).

[6] Eurostat data 2018

These reforms were inspired by similar motives of moving towards a funded system and increasing the share in the economy of the private pensions, like in Chile.

Across Europe, countries have enacted fewer pensions per year in the 2015-2018 period than between 2009-2015 (OECD, 2019). However, some countries have taken considerable steps toward a more financially sustainable pension system, while others have improved retirement income prospects. Beyond age measures, the majority of reforms involved either change in the benefits, contributions, or tax incentives. The Czech Republic, Finland, and Poland, in particular, took measures with a potentially large impact.

Many European countries' reforms have led to the increased complexity of the pension system, insofar as they now typically entail parallel action on the first public pillar and supplementary investment fund of the second and third pillars. The dual shift toward privatization and a multi-pillar paradigm has affected nearly all pension systems in Europe in one way or another. Pension systems, after the reforms, consist of new forms of interaction between market actors protecting against old-age risks. These reforms include the transition of pension provisions from DB type to DC type. Thus, future beneficiaries might expect old-age pensions to be more closely in line with previous contributions.

Across Europe, beyond age measures, the majority of reforms involved either changes in the benefits, contributions or tax incentives. Czech Republic, Finland and Poland, in particular, took measures with a potentially large impact.

3.4.3. The Shifting of the Notional Defined Contribution (NDC) Pension Scheme

Differences in the multi-pillar architecture in respect to access to particular schemes and their contribution-based benefit calculation are of importance for the reproduction of inequalities from working life to old age. The main difference is in respect to the PAYG pension system (most often with DB scheme) versus modern funded schemes. Among the funded systems, both DB and DC principles are common, though because of financial challenges there is a trend toward DC schemes. More recently and because of demographic challenges, more and more countries, especially in Europe, have been shifted to NDC schemes.

The shifting to the NDC design is an integral part of the pension reform wave. However, this trend signifies the effort to find a mixed pension system by the governments between the two poles of funded and unfunded pension scheme. In other words, from one side to reduce fiscal burden financing PAYG pensions and from the other side to retain the adequacy of pension benefits (Williamson & Williams, 2003).

Sweden, Norway, Poland, Estonia, and Italy introduced the NDC system based on PAYG financing in combination with notional accrual. In 2009, Norway announced the implementation of a pension plan with NDC features (Nelson et al. 2019). In 2010, many other countries followed also the NDC scheme (Holzmann, 2017). In Sweden (1994), the return on investment is equivalent to the per capita growth wage, and in Italy (1995), the return is equivalent to the nominal rate of GDP growth. The second pillar in Sweden constitutes compulsory DC with accrual accounts (Sunden, 2006). The individual's public benefits dependents on contributions during working life and the economic–demographic development, thus introducing marketization in the public pillar.

Germany has not officially adopted the NDC system, but they are focused on guaranteeing the long-term stability of the pension system without notably increasing the cost of labour. The reform there included increasing the government's participation (through VAT).

3.5. The Criticism on Pension Reforms and the Reversal Trend

3.5.1. Background

Over the years, the central topics of debate regarding social pension privatization and its reversals have been coverage extension, administration costs, inadequate benefits, fiscal impact, and governance (Barr & Diamond, 2009). Expectations were high when introducing reforms, and countries have hoped to improve both their pension system and their overall economic performance. According to Ortiz et al. from the ILO: "Coverage rates and benefit levels were expected to increase, inequality to decrease, administrative costs to decline through market competitions, governance of pension management to improve, and capital markets to deepen supporting new investments and economic growth" (Ortiz et al., 2018).

In practice, however, privatization process of pensions was disappointing. "While private pension fund administration was supposed to improve governance, it weakened instead, as in many cases, the regulatory and supervisory functions were captured by the same economic groups, creating a serious conflict of interest" (Ebbinghaus, 2015, p.7). Further, the pension industry intends toward concentration (Domonskos & Simonovitz, 2017). The added financial burden of rescuing the financial sector as a result of the 2008 financial crisis, reduced the incentive to decreasing public contributions. Consequently, one can expect another wave of pension re-reforms after the Corona-Virus crisis, as governments will tend to make borrowing cheaper through the transition of the pension system back into the hands of the state. Here we present the recent evolution of pension designs until these days of the COVID-19 pandemic crisis.

3.5.2. New Economical Voice

According to the literature, not all economists agreed with World Bank during the 1990s toward the privatization of pension funds. Several prominent scholars were not so enthusiastic about shifting to funded pension as a panacea (Barr, 2002). In 2001, a Nobel laureate in Economic Science, Stiglitz and Orszag, presented a paper, where they disproved the arguments of mandatory funded scheme proponents – not putting in question the very need for reforming pension systems (Orszag & Stiglitz, 2001). The paper consistently implies that the arguments of the World Bank, "most frequently used to promote individual retirement accounts, are often not substantiated in either theory or practice. It, therefore, concludes that policy-makers must adopt a much more nuanced approach to pension reform"(Orszag & Stiglitz, 2001, p.2). In their paper from 2001, they argued that the WB campaign was based on “ten myths” that needed to be debunked and raised questions about the practices of the Bank’s Social Protection and Labour sector.

In 1995, the ILO and the International Social security Association (ISSA), publishes the first report with an assessment of the World Bank's privatization strategy. They argued that "its strategy involving the replacement of social insurance pension schemes by mandatory individual savings schemes, would cause an unacceptably high degree of risk for workers and pensioners, further it would make old-age protection more expensive" (Heneghan & Orenstein, 2019, p.6).

In 2002, Nicholas Barr consistently debunked some of the World Bank thesis about funding (Barr, 2002), such as:

- Funding resolves adverse demographic;
- Funding reduces public pension spending;
- Funded pensions diversify risks;
- Funding does better if real returns exceed wage growth;

Years later, Barr & Diamond (2009) argue that these errors of the World Bank are not based on different value judgments or different views about empirical magnitudes, but examples of flawed analysis.

The voice of economists opposed to privatization rose sharply in the 2000s. This sudden shift in the ideational landscape changed the balance of debates within the World Bank and other international financial institutions concerning pension privatization. While a wide range of external critics (e.g. Brown, 2014; Barr & Diamond, 2009; Arza, 2008; Barr, 2002; Minns, 2001) had always opposed pension privatization, criticism within the World Bank and other international financial institutions had been muted during the 1990s and early 2000s. According to Kay and Sinha, "In 2006, an internal World Bank evaluation report chastised the Bank's pension privatization campaign for pursuing reform in countries that lacked necessary preconditions and failing to address issues of pension system coverage and adequacy. The World Bank consensus on pension privatization was beginning to fray even before the onset of the crisis" (Kay & Sinha, 2008, p. 6-7)

Another major setback to the pension privatization campaign came in Chile, an incredible admission for a country whose pension system was held up as an international model. "In her introduction to the report of the Pension Reform Commission, Bachelet announced that the privatized system had low coverage . . . very little competition and high commission charges . . . and discriminates against women" (Kay and Sinha, 2008, p. 7). According to Borzutzky and Hyde, "Her reforms dramatically increased benefits for the poor, women, and the lowest 60 percent of earners by replacing a previous minimum pension with a much more generous Solidarity pension). The Bachelet reforms proved highly popular and sent a strong signal worldwide that pension privatization had major drawbacks that needed to be addressed" (Borzutzky & Hyde, 2016, p.5)

After the crisis, an emphasis on minimum pensions allowed the WB to appear more sensitive to the plight of the poor, more in line with the times, and therefore more relevant as an advisory body. Further, in the second part of this thesis, we will develop the mutual incentives of the public and government to implement this risk-sharing mechanism. Holzmann who was the head of the pension department in the World Bank and who propagated during the 1990s to the three-pillar model, recognizes the importance nowadays of minimum pension guarantee (Holzmann, 2017). He defines the guarantee as a 'zero' pillar that aims to operate as a safety net providing basic support for everyone. A mandatory, public-managed, tax-financed program provides mean assistance to beneficiaries living at the subsistence level.

In marked contrast to the late 1990s, the World Bank and ILO now collaborate on pensions and social protection policy (Heneghan & Orenstein, 2019). The World Bank has adopted the ILO's language on national social protection floors. Social protection floors have been recognized as part of the UN Sustainable Development Goals.

When the IMF responded to fiscal distress in several countries in Central and Eastern Europe, that organization did not advice for any further efforts at pension privatization, even in countries' reform had stalled, as in Ukraine. Quite to the contrary, "The IMF approved plans to scale back private pension systems in countries such as Hungary and Latvia, for straight-forward fiscal reasons" (Datz & Dancsi, 2013, p.2).

It appears that the European Commission also has experienced a change in its declarative economic attitude toward pension schemes. In its 2006 report on long-term sustainability, the European Commission notes that while declining pension generosity can contribute positively to fiscal sustainability, such a decrease may raise concerns about the adequacy of old-age benefits. From the European experience, these concerns could be translated into pressure for higher public spending. The report also acknowledges that there is no great escape by simply reducing public responsibility and recognizes that risks to public finances will crucially depend on the reaction of individuals, regarding their future retirement arrangement[7].

A different economic voice also was heart from another angle, debating on the state role. That debate is not necessarily the recent one but it was wakening in parallel to the pension

[7] European Commission, DG for Economic and Financial Affairs (2006).

reforms. As studied above, there has been a common trend towards the individualization of old-age risks and the so-called ‘passive’ privatization of pension systems (Holzmann, 2017; Ebbinghaus, 2015). According to Amaglobeli et al.: "Passive privatization consists of the first and preliminary intervention by the legislator to cut public protection against social risks without the parallel launch of an effective alternative provision" (Amaglobeli et al. 2019, p.6). In other words, citizens are placed in the position of finding alternative social protection provisions (family, market, community), without intervention by the state in this field. Reforms are thus expected to lead to the residualization of the role of the state.

3.5.3. Reasons for Pensions Reversals

Pension reversals in CEE and Latin American countries cannot be disregard anymore. The significance of this phenomenon is not because of the countries which had been through these reversals over the last two decades, but because of the countries that have not been through it. In other words, those countries that kept a relatively stable pension design are those who avoided drastic capitalized pension reforms in the first place. This subsection contributes to the literature review toward the second part of this thesis and particularly the empirical part in chapter 4. The current literature counts several reasons for the reversal wave of pension designs. Some are financial, some economical and some focus on social interests. All of these reasons are detailed below. In chapter 4, we extend the following reasons for reversals, according to a new theory proposed.

a. The pressure of the First Generation

While shifting to funded pension scheme may reduce fiscal exposure, in the short-term, it might increases government debt. That is because, during the first generation, pension privatization requires governments to keep their commitments to pay current pensioners while allowing current contributors to divert funds to their accounts. In ageing Europe, the first generation has a considerable vote (Hassel et al. 2019).

b. The Need for Budgetary Flexibility

The financial crisis provided a new context, which dramatically changed the relative power of supporters and opponents of private accounts. A high public deficit posed a considerable problem for EU member states. Administrative actors were under pressure to comply with the European Union's (EU) Maastricht convergence criteria on government deficits (maximum 3% of GDP) and debt (maximum 60% of GDP). For example, between 2001 and 2010, the sovereign debt rate in Hungary increased from 53% to 81% of GDP and in Poland from 40% to 55.5% (Altiparmakov, 2018). Similar fiscal pressure led to retrenchments of private second pillar pension in Bulgaria, Croatia, Estonia, Latvia, North Macedonia, Romania, and Slovakia.

Bureaucrats' changing views and increased emphasis on sound public finances would in turn encourage traditional left-wing or right-wing opponents of private accounts actually to reverse pension privatization (Haverland, 2007).

c. Disappointment from Expectations

One of the pronounced promises of the funded scheme was the fast development of capital markets in countries, which will implement funded pension schemes (Barr, 2006).

Altiparmakov (2018) did not find a positive gap between the second pillar in CEE countries and the GDP per capita in the relevant years. Those findings are in line with Orgaszg & Stiglitz (2001) and Barr & Diamond (2009) who claimed that the Samuelson-Aaron Theorem is not valid in reality.

d. Sensitivity to Market Risk and Systemic Risk

According to Day and Gay, "The individualization of financial risks in DC pensions and the uncertainty about the future returns of funded pensions raise concerns about the social sustainability of the multi-pillar paradigm. The financial crisis seems to have led to a general decline in trust in funded pensions, thereby dampening individual efforts to save for old age income" (Day & Gay, 2020, p.3). The magnitude of the economic collapse may have changed attitudes towards the viability of financial markets as an alternative to state provision. The financial market crisis of 2007/2008, the sovereign debt crisis, and

recently the Corona-Virus crisis became the stress tests for pre-funded private pensions. Pension funds lost up to 25% of assets during the financial crisis in 2007/2008.

Here we mention Armenao, who claim, "Though equity markets have recovered since the nadir of 2008, such dramatic declines badly affected popular perceptions of the benefits of private pensions. This change of sentiment could be enduring, changing consumer and savings behavior over decades. Governments, regulators, and fund managers have faced pressure from their electorates and the public to meet their pension promises" (Armenao, 2018, p.2).

Governments have thus been under pressure to correct private pension markets to ensure stability in pension provision and to achieve social goals in old age. Market-correcting policies include several safeguards on investment regulation, such as minimum return guarantees (Grech, 2018), regulation enhancements on pension investments, and a process of de-risking of the investments of private funds (Holzmann & Hinz, 2005).

3.6. The New Debate on the State Role in the Pension Market

3.6.1. The 'Washington Consensus'

Privatization and capitalization of pension designs as studied in this chapter are generally analyzed as reducing the role of the state in allocating welfare benefits and regarding old-age security. Without distinguishing between Beveridgean or Bismarckian system, some scholars and world organizations (WB, the OECD, and the ILO) argue that the state has some social responsibility. In old-age it comes to poverty security and alleviation of inequality (Amaglobeli et al. 2019). Hence, pension privatization naturally challenges the state's role (Stiglitz, 2004).

These ideas are in line with the American original concept of “Washington Consensus”. This theory argues "markets can provide income-related pension benefits more effectively than governments and private enterprises are better pension fund managers than governments" (Williamson & Williams, 2003, p.4). This perspective argues that markets are always more efficient than governments and hence government intervention is necessarily distorting and should be kept to a minimum.

After the pension reforms during the 1990s and 2000s, the power and influence of non-governmental actors have strengthened. Grech claims "This involves the introduction or expansion of the importance of private pillars. This privatization is foremost a process of changing responsibility for retirement income from the state to non-state actors, these may include employers, social partners, and individuals" (Grech, 2018, p.3).

3.6.2. Back to the State

This analysis of pension privatization as the retreat of the welfare state is not without challenge. Several scholars have pointed out that focusing on public provisions obscures the important role state can play in shaping the allocation of private welfare benefits, by interfering actively in how private welfare provision is organized (Mabbett, 2020).

As studied above, there has been a common trend towards the individualization of old-age risks and the so-called 'passive' privatization of pension systems (Ebbinghaus, 2015). Passive privatization consists of the first and preliminary intervention by the legislator to cut public protection against social risks without the parallel launch of an effective alternative provision (Holzmann & Hinz, 2005). In other words, "Citizens are placed in the position of finding alternative social protection provisions (family, market, community), without intervention by the state in this field. Reforms are thus expected to lead to the revisualization of the role of the state" (Day & Gay, 2020, p.6).

The severity of the last financial crisis had the effect of convincing many people that the fundamental model of the free-market was flawed. Rather than being a path towards higher productivity and efficiency, more people now see free-market capitalism as crisis-prone and potentially dysfunctional (the demonstrations in France and Lebanon in 2019 are recently represented examples). The free-market model of capitalism is based on several factual and causal claims that suddenly appeared dubious to many people.

Orenstein mention that even "Alan Greenspan, Chairman of the Federal Reserve of the United States from 1987 to 2006 and the most prominent advocate of deregulated markets, was forced to admit that he was wrong about core parts of his belief system, particularly the ability of financial institutions to self-regulate. State regulation had to be strengthened. As a result, the crisis feels like the end of an era in Western finance. A wide

variety of voices from all parts of the world has questioned the relevance of free-market ideology in economic policy. This new ideological climate undoubtedly has made it harder to advocate or defend pension privatization in most countries" (Orenstein, 2011, p.70).

According to Stiglitz, "what is at issue then is not just the size of government, but its role—what activities should it undertake—and the balance between government and the market. The post 'Washington Consensus' recognizes that there is a role for a market. The question is to what extent the neoliberals recognize that there is a role for the state" (Stiglitz, 2004, p.5).

Merton & Bodie (2005) are one of the few who relate to the government role in modern private pension funds. They argue that the government's role in supporting the infrastructure of the financial system is fundamental. It includes establishing and enforcing property rights and other laws affecting contracts as well as regulating financial markets and intermediaries. They claim that the relations among all pension market institutions are typically both competitive and complementary. This specifically applies to the relations between private sector institutions and government.

The role of the state in protecting redistribution policy is expected to decline, while that of social private and business partners will increase. Still, the state has considerable authority over important parameters concerning supplementary schemes. It can influence the development of occupational and individual pension schemes by using regulatory frameworks, providing financial protection against risks, etc.

3.7. Conclusion

The pension changes have led to a general shift toward individuals absorbing more risks on their shoulders. We witness increasing reliance on funded pension schemes, in which individuals' retirement wealth depend on their performance of their investments in capital markets, as opposed to DB schemes, which guarantee a certain replacement at retirement.

This chapter has been concluded at the same spot where it begins, the pension landscape is unstable again. The COVID-19 pandemic crisis is a wake-up call for the government regarding the individual's risk burden and the necessary weight of the government in retirement, ensuring adequate benefits (Gerard et al. 2020). Here we introduced the pension reform wave during the last three decades and the recent reversal trend of pension reforms. That realizes in the emerging to mix pension designs. We identify two contradictive trends of pension evolutions. The 'traditional' trend starting from the early 1990s implies converging toward funded design. Due to fiscal risk stemmed from longevity risk, governments consider shifting from the traditional PAYG DB pension designs to individual accounts. Europe and Latin America are currently the main arenas in which structure or parametric reforms take place.

The second trend has evolved mainly during the last decade after the financial crisis and claims for ensuring adequate pension benefits to old age. That includes pension reversals and social mechanisms to alleviate poverty and income inequality in old age. Despite expectations of institutional inertia, countries succeeded in scaling back public pension promises.

The design and relationship of public and private pension systems characterize the financial well-being of seniors. It is interesting to notice a variety of pension designs across different countries with no convergence to a dominant pension scheme. According to Hassel et al., "The regulations for the individual pension scheme, such as contributions, coverage, eligibility, and benefit calculation, are essential sources of institutional differences that may explain cross-national differences in the income of the elderly. Historically, nation-specific pension systems have developed along various paths, redistributing income differently across the aged. Whereas some elements of pension systems, like earning-related social insurance systems, may have favoured reproduction of market inequality, other structures such as minimum benefit guarantees may have

redistributed income among the elderly in favour of the poor" (Hassel et al. 2019, p.5). In the next part of this thesis, we offer some more explanations to these variations stemmed from a risk perspective and financial relations among the players in the market.

In the following part of this dissertation, we explore the risk perspective of pension designs from the government and the public. This study aware of the difficulties to finance pension through PAYG DB pension schemes but finds value in mix pension system with an unfunded pillar. According to the global experience with different pension designs, the following, work explores other dimensions of pension design such as consumption, poverty prevention, risk-sharing, and managing pension portfolios in financial crisis periods.

Chapter 3 - References

Altiparmakov, N (2018). Another Look at Causes and Consequences of Pension Privatization Reform Reversals in Eastern Europe. *Journal of European Social Policy.* 28(3): 224–241. https://doi.org/10.1177/0958928717735053

Amaglobeli, M. D., Chai, H., Dabla-Norris, M. E., Dybczak, M. K., Soto, M., & Tieman, A. F. (2019). The Future of Saving: The Role of Pension System Design in an Aging World. International Monetary Fund.

Armeano, O, I. (2018). The Politics of Pension Reform in Central and Eastern Europe. *Palagrave Macmillan, USA.* https://doi.org/10.1007/978/-0-230-31371-2

Arza, K. (2008). Pension Reform in Latin America: Distributional Principles, Inequalities and Alternative Policy Options. *Journal of Latin American Studies,* 40(1):1–28. http://www.jstor.org/stable/40056624

Aubry, J.P. Munnell, A.H. & Wandrei, K., (2020). Update: State and Local Plans Issue in Brief, Chestnut Hill, Mass.: Center for Retirement Research at Boston College, May 2020. http://hdl.handle.net/2345/bc-ir:108910.

Barr, N., (2002a), Reforming Pensions: Myths, Truths, and Policy Choices, *International Social security Review*,55: 3-16

Barr N. (2006). Non-Financial Defined Contribution Pensions: Mapping the Terrain. In Pension Reform of Holzmann R. *The World Bank*. https://doi.org/10.1596/978-0-8213-6038-5

Barr, N. & Diamond, P. (2009). Reforming Pensions: Principles, Analytical Errors and Policy Directions. *International Social Security Review*, 62(2): 5–29. https://doi.org/10.1111/j.1468-246X.2009.01327

Bonenkamp, J., Meijdam, L. & Ponds, E. et al. (2017). Ageing-Driven Pension Reforms. *Journal of Population Economics*, 30: 953–976. https://doi.org/10.1007/s00148-017-0637-0

Bonoli, G. & Paller, B. (2007). When Past Reforms Open New Opportunities: Comparing Old-age Insurance Reforms in Bismarckian Welfare Systems. *Social policy Administration*. 41 (6): 555-573. https://doi.org/10.1111/j.1467-9515.2007.00572.x

Borzutzky & Hyde (2016). Chile's Private Pension System at 35: Impact and Lessons. *Journal of International and Comparative Social Policy*, *32*(1): 57–73, http://doi.org.10.1080/21699763.2016.1148623

Brown, R. L. (2014). The Essence of Social Security: Debunked Myths, *Australian Journal of Actuarial Practice,* 2: 5-12.

Clements, B., Dybczak, K., Gaspar, V. et al. (2018). The Fiscal Consequences of Shrinking and Ageing Populations. *Ageing International*, 43: 391–414, https://doi.org/10.1007/s12126-017-9306-6

Conesa, J.C. & Kehoe, T. (2018). An Introduction to the Macroeconomics of Aging. *The Journal of the Economics of Ageing*, 11:1-5. https://doi.org/10.1016/j.jeoa.2018.03.002

Datz, G. & Dancsi, K. (2013). The Politics of Pension Reform Reversal: a Comparative Analysis of Hungary and Argentina. *East European Politics*, 29: 1, 83-100, http://doi.org.10.1080/21599165.2012.759940

Day, C. & Day, G. (2020). Aging, Voters and Lower Income Tax: A Role for Pension Design. *Economic Modeling*, 94: 560-569, https://doi.org/10.1016/j.econmod.2020.02.002

Domonskos, S. & Simonovitz, A. (2017). Pension Reforms in EU11 Countries: An Evaluation of Post-Socialist Pension Policies. *International Social Security Review*: 70(2), 109-128, https://doi.org/10.1111/issr.12137

Ebbinghaus, B. (2015). The Privatization and Marketization of Pensions in Europe: A Double Transformation Facing the Crisis. *European Policy Analysis*, 1(1), 56-73. https://doi.org/10.18278/epa.1.1.5

Feldstein, M. (1976). Perceived Wealth in Bonds and Social Security: A Comment. *Journal of Political Economy*. 84 (2): 331-336. https://doi.org/10.1086/260435

Feldstein, M. (2005). Structural Reform of Social Security. *Journal of Economic Perspective.* 19(2): 33-55. http://doi.org.10.1257/0895330054048731

Gerard, F., Imbert, C. & Orkin, K. (2020). Social Protection Response to the COVID-19 Crisis: Options for Developing Countries, *Oxford Review of Economic Policy*, 36(1): 281–S296, https://doi.org/10.1093/oxrep/graa026

Grech, A. (2018). What Makes Pension Reforms Sustainable. *Sustainability*, 10(8). https://doi.org/10.3390/su10082891

Guardiancich, I. & Guidi, M. (2020). The Political Economy of Pension Reforms in Europe under Financial Stress, *Socio-Economic Review*; mwaa012, https://doi.org/10.1093/ser/mwaa012

Hassel, A., Naczyk, M. & Wib, T., (2019). The Political Economy of Pension Financialisation: Public Policy Responses to the Crisis. *Journal of European Public Policy*, 26(4): 483-500. https://doi.org/10.1080/13501763.2019.1575455

Haverland, M. (2007). When the Welfare State Meets the Regulatory State: EU Occupational Pension Policy, *Journal of European Public Policy*, 14:6: 886-904, http://doi.org.10.1080/13501760701497899

He, G., Goodkind, D. & Kowal, P. (2016). An Aging Word: 2015. International Population Reports. P95/16-1 U.S. Department of Commerce, Washington, DC.

Heneghan, M. & Orenstein, M. (2019). Organizing for impact: International organizations and global pension policy. *Global Social Policy*, 19(2), https://doi.org/10.1177/1468018119834730

Hinrichs, K. (2021). Recent pension reforms in Europe: More challenges, new directions. An overview. *Social Policy Administration*. https://doi.org/10.1111/spol.12712

Holzmann, R., & Hinz, R., (2005), Old-Age Income Support in the 21st Century: An International Perspective on Pension Systems and Reform, *World Bank*

Howse, K. (2004). What has Fairness got to do with it? Social Justice and Pension Reform. *Ageing Horizons*, 1: 3-16.

Holzmann, R, (2017), An Optimistic Perspective on Population Ageing and Old-Age Financial Protection. *Malaysian Journal of Economic Studies,* 50 (2): 107-137, 2017. ISSN 1511-4554

Kay, S. J., & Sinha, T. (Eds.). (2008). Lessons from Pension Reform in the Americas. Oxford University Press.

Kourtonas, E. & Yew., S., (2017), Considerations in Pension Reforms: A Review of the Challenges to Sustainability and Distributive Impartiality, *Malayan Journal of Economic Studies*, 54 (1): 159-177. https://doi.org/10.22452/MJES.vol54no1.8

Mabbett, D. (2020). Reckless Prudence: Financialisation in UK Pension Scheme Governance after the Crisis. *Review of International Political Economy*. https://doi.org/10.1080/09692290.2020.1758187

Mesa Lago, C. & Valero, D. (2020). The New Wave of Pension Reforms in Latin America. *In Peris-Ortiz M., Álvarez-García J., Domínguez-Fabián I., Devolder P. (eds) Economic Challenges of Pension Systems.* Springer, Cham. https://doi.org/10.1007/978-3-030-37912-4_12

Minns, R. (2001). The Cold War in Welfare: Stock Markets versus Pensions. Verso.

Naczyk, M. & Domonkos, S. (2016). The financial crisis and varieties of pension privatization reversals in Eastern Europe. *Governance, 29*(3): 167–184. https://research.upjohn.org/up_bookchapters

Natali, D. (2015). : Pension Reform in Europe: What Has Happened in the Wake of the Crisis?, CESifo DICE Report, ISSN 1613-6373, ifo Institut - Leibniz-Institut für Wirtschaftsforschung an der Universität München, München, 13 (2): 31-35

Nelson, K., Nieuwenhuis, R., & Alm, S. (2019). Sweden: Adjoining the guarantee pension with NDC. *Social Protection Discussion Papers and Notes from The World Bank.* https://doi.org/10.1596/31626.

Pestieau, P. (2006). The welfare state in the European Union: Economic and social perspectives. Oxford University Press.

Price, W.J. (2019), Developing Coherent Pension Systems : Design Issues for Private Pension Supplements to NDC Schemes, *The World Bank, Social Protection & Jobs Discussion Paper Series 2019.* http://documents.worldbank.org/curated/en/14895155 ... s-to-NDC-Schemes.pdf

Rein, M. & Turner, J. (2004). How Societies Mix Public and Private Spheres in their Pension Systems, *in: Martin Rein & Winfried Schmähl (ed.), Rethinking the Welfare State, chapter 9*, Edward Elgar Publishing.

Samuelson, P. A. (1958). Aspects of Public Expenditure Theories. *The Review of Economics and Statistics, 40*(4): 332-338. https://doi.org/10.2307/1926336

Sundén, A. (2006). The Swedish Experience with Pension Reform, *Oxford Review of Economic Policy*, 22 (1): 133–148. https://doi.org/10.1093/oxrep/grj009

Stiglitz, J. E. (2004). The Post Washington Consensus, The Initiative for Policy Dialogue. Columbia University, *available at: http://policydialogue. org/files/events/Stiglitz_Post_Washington_Consensus_Paper. pdf.*

OECD (2019). Pension at Glance 2019: OECD and G20 Indicators. OECD Publishing. https://doi.org/10.1787/b6d3dcfc-en

Orenstein, M.A. (2011). Pension privatization in crisis: Death or Rebirth of a Global policy Trend? *International Social Security Review*. 64(3): 65-80, https://doi.org/10.1111/j.1468-246X.2011.01403.x

Orszag, P. R., & Stiglitz, J. E. (2001). Rethinking pension reform: Ten myths about social security systems. *In R. Holzmann, & J. E. Stiglitz (Eds.), New Ideas about old age security: Toward sustainable pension systems in the 21st century.* World Bank, 17–56.

Williamson, J.B. & Williams, M. (2003). The Notional Defined Contribution Model: An Assessment of the Strengths and Limitations of a New Approach to the Provision of Old Age Security, Center for Retirement Research at Boston College 550 Fulton Hall. http://crr.bc.edu/wp-content/uploads/2003/10/wp_2003-181.pdf

World Bank. (1994). Averting the Old Age Crisis: Policies to Protect the Old and Support Growth. New York: Oxford University Press. https://doi.org/10.1596/0-8213-2970-7

Zaidi, A. & Grech, A.G. (2007). Pension policy in EU25 and its impact on pension benefits. *The Journal of Poverty and Social Justice*. 15(3): 229–311.

Part B:

Risk Sharing Perspective in Pension Designs and the Demand for Minimum Pension Guarantees

Chapter IV: Pension Reforms Reversals and Risk-Sharing Cycle

Chapter V: The Transition To a Mix Pension System: The Inherent Socio-Economic Anomaly

Chapter VI: The Demand for Minimum Pension Guarantee in Mix Pension Schemes: An Option Model Approach and Global Implementations

IV. Risk Sharing Cycle

"A key challenge to risk sharing in pension fund is the issue of limited commitment and market failures" (Bohn, 2011, p.3).

4.1. Introduction

This chapter opens the theoretical part of this dissertation. In this chapter, we explain the financial position of the players in the pension market, identify the risks and various interests. Continuing where Chapter 3 ended, here we provide another angle for the pension reversals in many countries that chose the funded-capitalized path during the 1990s. We suggest governments and central-planners alleviate some of the pension risks by imposing risk sharing mechanisms among the actors, which will be detailed in this chapter. We further process and develop these suggestions in the following chapters of this second part of the dissertation.

Since the 1990s, countries around the globe have introduced pension structural reforms, moving from the public pay-as you-go (PAYG) defined benefit (DB) model to individual accounts in a multi-pillar architecture (Ebbinghaus, 2015). As studied in the last chapter, the main reason for reforms is fiscal constriction as of low fertility and longeviety risk. Governments, particularly in aging Europe, could not oblige anymore to adequate pension level in PAYG DB schemes[8] without raising taxes (Holzmann & Hinz, 2008). This entailed diverting funds from the public pension system into individually funded accounts.

However, in many countries, these reforms were short-lived. At the onset of the global economic crisis, most countries that had adopted pension privatization reforms either halted them, drastically reduced the private element, or completely abandoned them (Arza, 2008; Naczyk & Domonkos, 2016; Orenstein, 2013; Sokhey, 2017). The financial market crash in 2008 has challenged the merits of private funded pensions as their assets experienced a substantial decline within a short time (Grech, 2018; Altiparmakov, 2018). Consequently, over the last decades, the trust in the sustainability of the new pension pillar system has been shattered (Ebbinghaus, 2015).

In practice, pension privatization did not deliver the expected results. Coverage rates decreased, pension benefits deteriorated, and gender and income inequality increased, making reforms unpopular (Grech, 2018; Guardiancich, 2009). The increased role of

[8] From a financial perspective, through the transition of pension design, the government financial position changes at the transition of pension system, as it cancels its obligation on specific replacement level. The government buys options on the former replacement level.

supplementary pension funds and the recent economic and financial downturn have led to new challenges in relation to both future financial sustainability and the adequacy of pension benefits. It is now clear that the direction of pension reforms appears to have changed again, with a considerable number of countries reversing the policies they adopted in the 1980s and 1990s (Mesa-Lago & Valero, 2020; Ebbinghaus, 2015; Arza, 2008).

This chapter includes theoretical model, which wonders if funded pension schemes entail a risk path from the public to the government in addition to the familiar shifting of risks from the government to the individual. We claim that the mutual expectations of risk sharing among the public and the government will eventually determine an equilibrium of pension pillars sizes, where each actor tries to shift to the other undiversifiable risks. In fact, we link the above-mentioned reasons of reversals in CEE and Latin America countries to a lack of risk-sharing mechanisms between the government and the public. The gap results in political pressure and eventually cyclical pension reforms.

We further argue that economic shocks, such as the financial crisis in 2008[9] and lately the COVID-19 pandemic crisis may foster this process and push the market to an equilibrium of risk sharing among the different actors. After developing the theory of risk sharing expectations between the government and the individual, in the second part of this paper, we demonstrate this theory on the experience of CEE countries pension reversals.

The literature on risk sharing in pension schemes has started to emerge with the privatization wave and the continuous debate on the balances pension design. Some papers are more analytical and examine the efficient allocation of funded pension fund and the individual savings (Goiller, 2008) and some papers focus on the government role and adequate benefits level (Natali, 2018; Zaidi, 2010). This strand of literature claims that the growing design of defined contribution (DC) funded pensions may leave individuals exposed to a wide variety of risks and threaten consumption in old age. The common individual cannot manage these risks by himself. The late examples for that are the financial crisis in 2008 and the COVID-19 pandemic crisis, in which governments have been obligated to provide enormous rescue and social plans for their citizens. Nobody expected the individual to manage these multitudes of risk alone with their

[9] It will be interesting to further investigate that phenomenon after the Corona-Virus financial crisis.

personal pension account. In most cases, the average individual is not even aware of these risks (Randle and Rudolph, 2014).

There is already quite a substantial amount of work that studies intergenerational risk-sharing within a funded pension scheme. Examples are Gollier (2008) and Cui et al. (2011), who show how a well-designed pension fund improves welfare. As in this work, these models allow for Pay-As-You-Go (PAYG) social security benefits as an additional source of retirement income, while more importantly it allows for the government's budget as an additional channel for intergenerational risk-sharing. We will argue below that the main insight from these papers, namely that a PAYG program leads to increased intergenerational income-risk sharing, hinges on specific stochastic properties of the income (or output) path over time.

Novy-Marx and Rauh (2009) investigate the mutual relationship between tax-payers and public funds. As a significant milestone in pension research area, they highlight the perils for policymakers of focusing only on average expected outcomes for invested pension fund assets. That is because distributions of the outcomes of state pension investments will not matter if households can systematically alter their own investment and consumption plans to offset government policy. They stress that lack of transparency of state pension fund system, make it difficult for taxpayers to optimize their own portfolios and consumption choices over the life cycle.

Another strand of literature has examined the pension systems processes across Eastern Europe and Latin-America, as countries in these regions started to roll back from DC pension scheme to a PYAG DB pension scheme with an unstable landscape. Many of them present a variety of reasons for the reversals—political, fiscal stress, and more (for example; Altiparmakov, 2018; Sokhey, 2017; Ebbinghaus, 2015).

This composition contributes to these two strands of literature by pointing to a bi-pathways flow of risks among the government and the public, while shifting to a more funded pension scheme. We ask if funded pension schemes entail a risk path from the public to the government in addition to the familiar shifting of risks from the government to the individual. We claim that the mutual expectations of risk sharing among the public and the government will eventually determine an equilibrium of pension pillars' sizes, where each actor tries to shift to the other undiversifiable risks. In fact, we link the above-mentioned reasons of reversals in CEE and Latin America countries to a lack of risk-

sharing mechanisms between the government and the public. The gap results in political pressure and eventually cyclical pension reforms.

We further argue that economic shocks, such as the financial crisis in 2008[10] and lately the COVID-19 pandemic crisis may foster this process and push the market to an equilibrium of risk sharing among the different actors. After developing the theory of risk sharing expectations between the government and the individual, in the second part of this paper, we demonstrate this theory on the experience of CEE countries pension reversals.

In the next section, we present the pension system as an investment portfolio, which includes asset allocation. We claim that diversifying risks creates the obligation to think about pension systems as mix designs. Section 4.3 overviews the main pension risks. Some of them are more relevant to DC or PAYG DB designs and some to both of them. In Section 4.4, we introduce the main idea of different expectations between the government and the participants. Here we discuss the opportunities of risk sharing in bi-path ways, from the government to the public, as used to be detailed in current literature, but also from the individual to the government.

In Section 4.5, we define the levels of government intervention in the market as risk sharing 'orders'. We argue that the probability for another pension reform depends on the efficiency of these orders. We review different risks, financial, personal and structural risks that are being diversified through risk-sharing orders. Section 4.6 demonstrates the implementation of risk sharing orders in pension systems reversals across CEE countries, as part of the converge process toward equilibrium among actors in the field. Section 4.7 discusses the linkage between the risk-sharing theories in this chapter to CEE countries' pension experience. Section 4.8 provides conclusions.

4.2. Pension System as a Portfolio

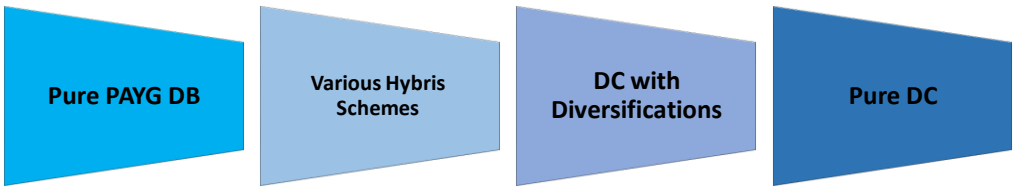
Perhaps the most reliable way to avoid future legislation that causes an unexpected reduction in retirement income and in parallel answering social targets of poverty alleviation of poverty and income inequality is by developing a mixed system like a

[10] It will be interesting to further investigate that phenomenon after the Corona-Virus financial crisis.

portfolio (Bouhakkou et al., 2020)[11]. The variety of risk on the different pension schemes and the correlation among them, make the pension schemes as 'quasi-assets' in an analogue financial portfolio (Markowitz, 1991). Feldstein (2005) claims that such a mix may avoid future rise in the payroll tax rate, due to pension-fiscal crisis.

In the context of risk, pension plan design varies in how the different risks can be allocated. The stylized pure DB and DC schemes can be regarded as two ends of a broad spectrum of risks (Figure 4.1). In between exist a variety of arrangements that differ in their allocations of risks, combining the DB and DC risk characteristics to different extents. The individual's ability to benefit from financial risk exposure to increase his accumulations, and at the same time hedge its exposures to career risks and longevity risk are the basic key for a successful and sustainable mix pension system.

Figure 4.1: Spectrum of Pension scheme structures



Classic PAYG DB Risks
- Longevity Risk on Government
- Fiscal Risk on Government
- Wage Path Risk
- Job Tenure Risk

Mutual Risks
- Labor Market Distortions
- Credit Risk

Classic DC Risks
- Market Risk
- Imperfect Information and Psychological Effect
- Market Efficiency Risk

Source: Author's Elaboration

In terms of the intergenerational consequences of pension fund asset allocation, a starting place is the idea that individuals may be able to balance government actions. Risk management of exposure in pension plans passes through to the taxpayers of the state. If taxpayers cannot fully undo government investment policy, then it can have real welfare

[11] This composition does not study asset allocation. However, from another angle, the mix of pension schemes can easily be translated to the portfolio theory. For example, equity investing inside of public pension funds can be viewed as equivalent to matching liabilities with bonds, while borrowing money from employees and investing in the stock market. Whether pensions should be invested in the market is a question of whether the state should be borrowing to invest in equities.

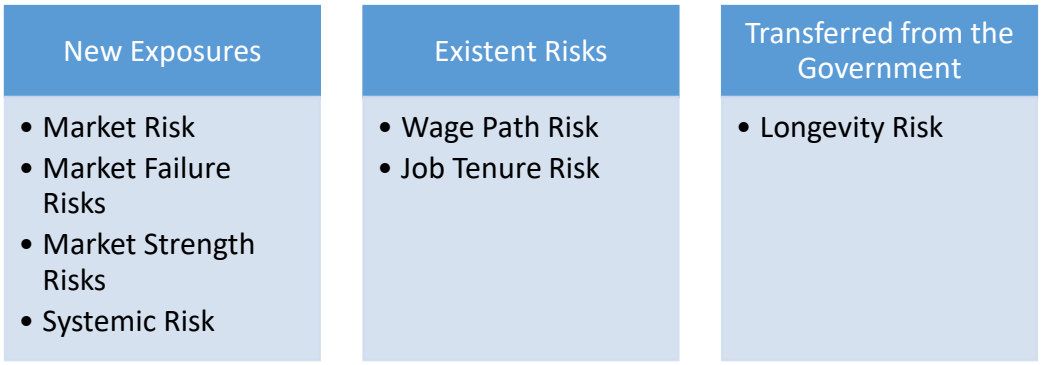
implications. Government policies that aid unlucky generations at the expense of luckier generations can increase overall welfare (Bohn, 2011).

When putting more weight in a funded pillar as part of a mix pension system, the participant has to handle new risk exposures. The variety of mixed models are a product of evolving risk shifting between the government and individual members. That shift may be translated to an insurance demand from the government or other pension field players, as will be discussed further in this thesis.

4.3. Main Pension Risks

In this section, we delve into the description of a variety of main pension risks. Some risks are typically linked to one or another scheme and some risks are mutual to both pension schemes poles. Some risks are more relevant to the DB pension scheme and some to the DC pension scheme. Consequently, during the transition to funded pension scheme, we identify in Figure 4.2, at least three different sources of risks in relate to the PAYG DB design. Below, we detail in these risks and their source from the individuals perspective.

Figure 4.2: Risks levied on the Individual in transition to funded capitalized DC pension scheme



A. Longevity and Fertility Risk

Longevity risk is post-retirement risk, resulting from differences in the level of population mortality and/or the risk that any particular individual will live longer than expected and will be left without resources. As studied in the last chapter of this dissertation, longevity risk is the main trigger for funded pension reforms around the globe, since the 1980s

through the 1990s and until the early 2000s. Longevity risk is translated to fiscal risk in DB PAYG pension schemes. As studied in Chapter 3, demographic changes entail a reduction in production that has a negative effect on PAYG pension systems through the narrowing of the base for collecting contributions and a respective reduction in available monetary resources for paying out pension benefits. In funded pension systems, this dependence is also inevitable, though more complicated. It manifests itself through the mechanism of supply and demand, on either the commodity market, or the securities market.

Though annuities may protect the individual against the risks associated with longevity, a pure DC scheme leaves the individual member facing a wide range of risks, associated with market and investment risks. In DC schemes, these risks are borne by the individual if there is no regulation on the financial product that provides some safeguards.

B. Fiscal Risk and Political Risk

The opposite picture of fiscal risk, which may result in reducing old age benefits in public schemes, is the political risk. In the previous chapter, fiscal risk is attributed mainly to the conservative PAYG DB pension scheme, both in DB and DC pension schemes there are substantial fiscal risks for the government but for different reasons. In PAYG DB pension scheme fiscal risk results form of longevity risk . This is, obviously, the main reason for the wave of pension reforms in the 1990s. However, in the DC pension scheme, the government might challenge fiscal and liquidity risk because of a lack of available financial resources (Mabbet, 2020; Feldstein, 2005). That problem is critical in times of financial crisis, when it is difficult and expensive for the government to raise capital for social and infrastructures expenses (Grech, 2018; Munnell & Quinby, 2009).

Political risks affect both funded and unfunded pension schemes. PAYG programs have realized the political risk that future taxpayers may not be willing to raise taxes when demographic or economic changes might make it necessary to do so. For example, nowadays, there is a public debate in Israel concerning the reduction of social security benefits and defined-benefits to the old pension scheme (before 1995). Demonstrations in this issue were observed also in France and Lebanon in 2019. Another example is that the United States enacted benefit cuts in 1983 by increasing the age for full benefits. There are further examples of pension political risk also from developed countries as recently

Germany, France, Italy and Japan have announced or enacted reductions in state pension benefits (OECD, 2019).

C. Market Risks

Market risk is defined as the risk that Return on Investment assets are different from what is expected. Hence, naturally this risk is the main risk of individual's accumulation in the DC pension scheme (private or public). Market risk is a complex pile of risks and includes among others:

- Interest-Rate Risk – Interest rate risk leads to changes in the value of pension liabilities, as well, as changes in annuity prices. Interest rate risk affects those people who need to buy life annuities from life insurance companies (or pension companies). Interest rates also influence fixed currency investments. Interest rates have been very low for the last several years. This has made immediate annuities and bonds more expensive and resulted in increasing DB obligations.
- Investment Risk – Private and public pension accumulations held in the stock market until retirement are vulnerable to market fluctuations. Financial and adequacy problems in relation to fully-funded schemes are increasingly evident after the recent economic and financial downturn.
- Inflation Risk – Inflation risk includes both pre- and post-retirement. Inflations affects any retirement arrangements. DB plans that use a final average earnings formula implicitly provides some coverage for pre-retirement inflation and places that risk on the plan sponsor.

When moving to a DC scheme, the portfolio risk is basically a burden on the participant's shoulders. Non-contributory private sector DB plans may not require any participant's choices until retirement. In contrast, DC plans require savings/investment choices. At the point of retirement, these plans require choices about how the benefits will be paid, and some of these choices are irrevocable. Prefunded private DC pension plans not only make retirement vulnerable to market volatility, they also put pressure on pension fund managers to achieve high yields, thereby potentially exacerbating market volatility.

As funded pensions have grown in economic importance, individuals' retirement income will be more and more dependent on long-term financial market performance (Rappaport

& Peterson, 2014). The post-crash experience has shown that financial risks largely depend on the scope and portfolio of asset investments, riskier investments can lead to high volatility, and more investment that is conservative may entail rather low long-term net returns (Altiparmakov, 2018).

During the financial crisis in 2008, funded pension schemes in OECD countries lost about 5.4 billion dollars in market value (21.4% in nominal terms). The impact of investments has been greatest among pension funds in the countries where equities represent over a third of the total assets invested (the case of the UK and Ireland). Both the sustainability of supplementary pension schemes and the adequacy of benefits have been placed in jeopardy (Chaon-Dominisczak, A., 2018).

D. Credit Risk

Credit/Solvency risk refers to the risk when an entity providing benefits becomes insolvent or unable to pay benefits, resulting in a default on benefits payments. This kind of risk is basically relevant to the sustainability of financial institutes and insurance companies. However, after the financial crisis and the debt crisis in Europe that was followed, it is appropriate to also include sovereign obligation for pensions under this risk. Hence, in the modern era, credit risk is most relevant both for DB PAYG and funded DC, but for different reasons.

For DB plan members, there is a risk of bankruptcy of the employer or plan sponsor, although funding requirements of DB schemes have been strengthened[12]. Historically, governments manage credit risk by heavy regulation on insurance companies and auditing it by special government agencies. Moreover, there are examples that the government stands as a guarantor to some of the private fund obligations.

The same risk over the range is political/fiscal risk in the case of PAYG DB, where the government is committed to high benefits level but parallel dealing with severe fiscal

[12] See for example the regulations of pension sponsors in Germany and the UK.

risks (like the case in Greece in 2011–2013). Then the government might reduce the benefits at once[13].

E. Asymmetric Information

Market failure risk includes insufficient regulatory and transparency, fiduciary risk, undeveloped financial infrastructure, or imperfect information regarding the labor market and the insurance companies. Many individuals do not have the motivation, knowledge, or skill to provide a satisfactory retirement income on their own (Adams et al., 2009). Many DC participants will not have adequate benefits at retirement because contributions are too little, or they have used the money too early or have not earned enough investment income due to overly conservative or poorly timed decisions. Member individuals did not manage these kinds of risks before pension reforms and need advisory and trust in the central planner (Bohn, 2011). Sunden (2006) argues that many people reach retirement with inadequate resources and as a consequence will need to postpone retirement or lower consumption in retirement. Sunden stresses that the complexity of funded private funds with the way benefits are calculated for the long-run and the vast number of parameters involved in these calculation have a burden on the individual level.

F. Systemic Risk

While shifting to a funded scheme, pension benefits are exposed to systemic risks, which includes buckets of correlated risks: market, credit, wage and career risks to be realized in the same direction[14]. Mostly, systemic risks are realized globally or nationally in times of recession, when there are strong risks' correlations. Recently, the COVID-19 pandemic crisis demonstrates high systemic risk with high rate of global unemployment due to continuous curfew with dramatic falls in capital markets.

The change in the correlation might cause severe damage to accumulations in funded pension that are exposed to capital markets. Moreover, there is a high probability that in

[13] During the last decades there have been many examples of reducing at once the level of benefits in PAYG DB schemes across Europe. Also, in Israel in the last 20 years the level of PAYG DB benefits to state service workers has been reduced twice.

[14] This represent the case during 2007–2008 and in 2020 during the Corona-Virus.

parallel, the individual will find himself in wage risk or even job tenure risk. When correlations between financial and personal risks are in the same direction, idiosyncratic risk turns to systematic risks. As a consequence, the individual will find it difficult to diversify his personal career risks.

G. Career Risk and Job Tenure Risk

This risk is connected to the individual's career along the working phase and stems from periods of low contributions to the fund. As the concept of lifetime employment becomes obsolete and job mobility increases, with individuals holding a greater number of jobs for shorter periods of time, the value of accruals in pension plans falls, as the first accrual dollar is much more expensive than the last one dollar. Hence, every period, even a short one when the individual does not work and does not contribute to the fund is very significant to the total accrual fund because of the compound influence (Rappaport & Peterson, 2014). The tenure risk means that for the same contributions, individuals with lower than expected final salaries and intensive job mobility will tend to receive fewer benefits than another member with the same total contributions, who stays in the same job.

4.4. The Cycle Scheme

After reviewing the literature and the risks connected to pension designs and making the analogue of pension schemes to market portfolio, we turn to gradually present the theory of risk sharing among the actors. The novelty of this composition is pointing to a bi-pathway of risk sharing, including from the individual to the government in funded pension schemes.

During pension transition to a more funded, capitalized one, the government transfers undiversified fiscal risks to individuals. This fiscal risk translates to a variety of risks on the individual's pension portfolio and triggers a risk-sharing cycle.

4.4.1. The Government's Expectations

The main difference between DB and DC schemes comes from the exposure to different types of risks and how these risks are allocated between employer, employee, plan sponsor and the government (Rappaport & Peterson 2014). Any change in the pension system affects the risk-sharing framework and bears a balance of risk ensemble among actors.

In pension schemes, the government is considered as a mediator among different participants' generations and different field actors (Hardy, 2020). However, since the government has other public spending every year (G) and fiscal constraints, it desires to lower pension spending and minimize its risks. Transitioning to funded pension scheme enables the government to lower the first pillar size (social security) and to redirect taxes to finance other public needs (Espin-Andersen, 1990).

4.4.2. The Individual's Expectations

The individual expects to be able to retain his standard of living in old age in any pension scheme and to be able to avoid poverty (Kuitto & Kuivalainen, 2020). Ideally, the pre-retirement sacrifice will combine with post-retirement benefits so that the living standards will be the same in both periods. If too little is given up prior to retirement, living standards will drop in retirement.

From the individual perspective, the fiscal risk transition translated to a bucket of risk for families, such as longevity risk, market risk, solvency risk, asymmetric information risk, career risk, and systemic risk. Some of the risks have been transferred directly from the government, such as longevity risk and some from the system change, such as market risk. From the individual's point of view, the source of the risk is not as important as their ability to diversify it.

In the analogue to the capital asset pricing model (Markowitz, 1991), the individual expects a risk premium for the risks he cannot diversify. The market risks are the most intuitive example. The individual benefits from the opportunity to gain from market exposure (Goiller, 2008). However, what is the risk premium for exposure to longevity risk or asymmetric information risk?

Based on the global experience, as will be discussed in the second part, we argue that expectations for risk premium evolves to political pressure and pension reversals or structural changes (Altiparmakov, 2018). If a system is not seen as beneficial by the electoral majority, namely if it does not help them maintain their pre-retirement living standards, it could be voted out (Bradley et al. 2016; Grech, 2018).

After this process, the risk premium can address many forms, including increasing the social security financial transfers, imposing minimum pension guarantee, and even government obligation to an adequate benefit level (Mabbett, 2020; Altiparmakov, 2018; Mesa-Lago & Valero, 2020).

The benchmark for individual benefit expectation is not clear. According to Sokhey, "Each adjacent generation desires to enjoy similar living standards in retirement. If a generation of soon-to-be pensioners believes its preceding generation had much larger pension transfers; it might pressure governments to reverse reforms that have lowered its benefits and instead push cuts to subsequent generations" (Sokhey, 2017, p.4).

We assume that the former PAYG DB benefit level is only a theoretical reference point. The expectations depend on a personal and general variety of variables, such as risk appetite and the peer group pension benefits at retirement. Political pressure can arise due to disappointing pension benefits, or if the performances are relative to the previous generations or compares to previous market conditions (for example, the streets demonstrations in Greece in 2012, in Lebanon in 2019, and France in 2019).

4.4.3. Pension Market in Equilibrium

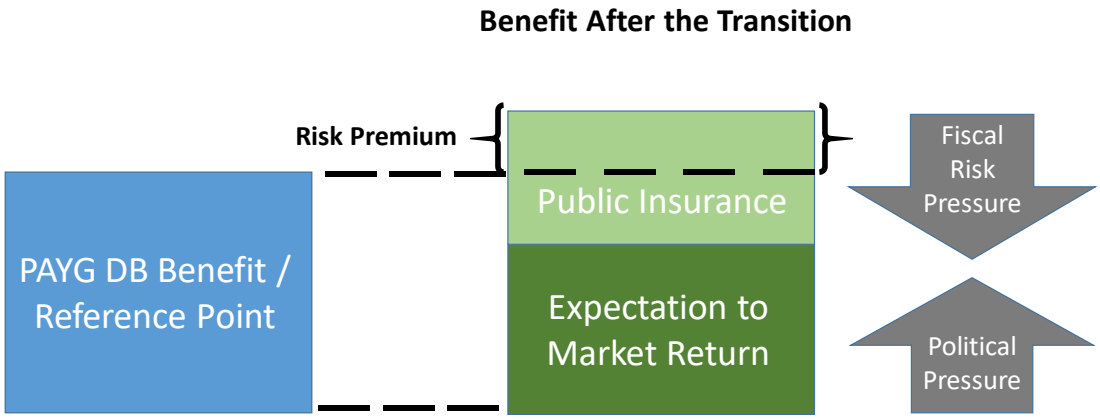
Summing up the balance of interests in the pension market:

- The individual expects a risk premium in addition to the expected benefit from the funded fund scheme. The individual uses political pressure to increase the risk premium to a satisfactory level.
- The government wishes to decrease its fiscal obligations and its future fiscal risks.

Figure 4.3 demonstrates the balance mechanism toward an equilibrium of pension benefit. From one side, the government transfers fiscal risk and changes the pension system to a funded capitalized one. In the same line, the government tries to cut fiscal transfers to the individual. From the other side, the public expects risk premium on the excess of risks

they could not diversify or transfer on their behalf. This risk sharing process converges to an equilibrium of benefits and risks.

Figure 4.3: The individual's expectation of funded pension benefit



Source: Authors' Elaborations

These expectations are not equal among the public cohort. The importance of diversification is most significant for low and middle earning cohorts. While high-earning cohorts usually have other sources of assets and savings apart from the pension scheme, low and middle earning cohorts are leaning heavily on old-age pension benefits (Munnel & Quinby, 2009). Additionally, low earning cohorts have fewer resources to diversify risks. These cohorts are vulnerable and will be hit hard in situations of recessions when the systematic risk may be realized and when the compensations of market returns are not high enough to cover economical theoretical loss from periods without significant contributions during the career phase (Arza, 2008).

Here, we claim that the income inequality level in the market affects the pension equilibrium above. Since the government transfers the risks to the individual, the opposite risk sharing depends on the actor's strength. As more individuals are in close financial situation, the individual becomes stronger against the government and the probability for a pension reversal increases.

4.5. Risk-Management Processes

This section studies the risk-sharing method, in which each side transfers undiversifiable risks to the other party. Pension plan designs range from those that place virtually all of the risk on the plan, such as traditional PAYG DB design to those that place nearly all the risk on the individual covered by the plan DC scheme. Neither is ideal (Rappaport & Peterson, 2015) and no model is superior (Barr, 2006).

Over the next subsection, pension risks overview is provided. Next, this composition refers to three levels of government intervention in the market, or 'orders'. These orders can be considered as an opposite pathway of risks from the individual back to the government.

4.5.1. The First Order: Pension Risk Sharing by Market Design

The first order points to the importance in designing mix pension system, avoiding leaning on one specific pension scheme and in parallel ensuring an efficient pension system. As Bohn (2011) argues, a pre-condition to pension reform is having well-established financial markets, as well as adequate public and government understanding and mutual trust.

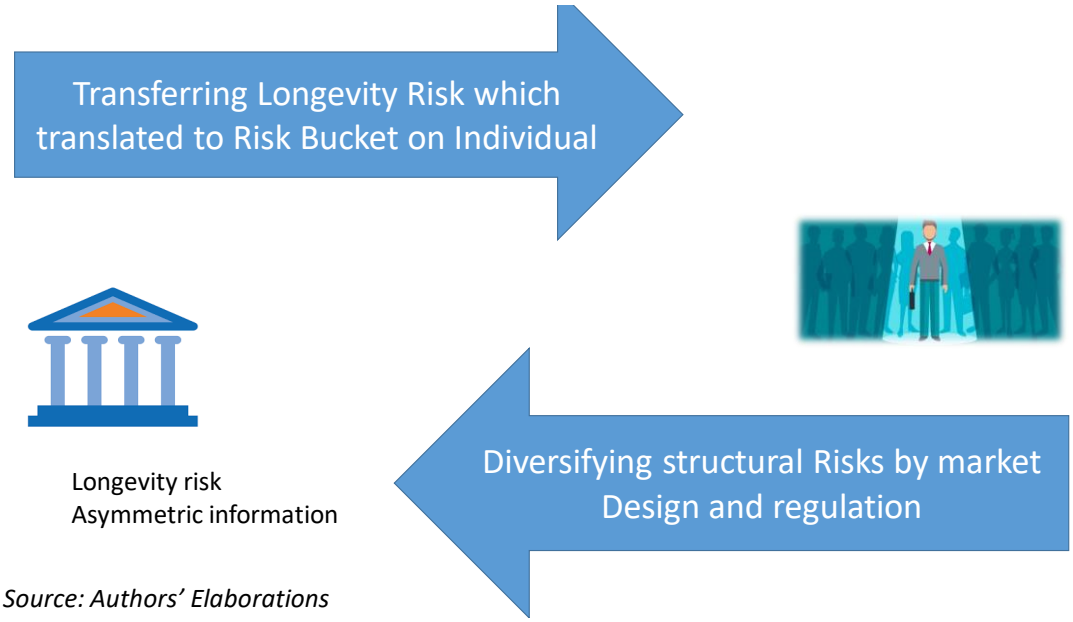
Governments must be able to enforce compliance with contribution conditions, to protect asset accumulations, maintain the macroeconomic stability and to ensure effective supervision on annuities and insurance markets. Such regulation is vital to protect individuals in complex financial areas. More generally, private markets function best when government has put in place clear good rules and enforcement is even-handed and non-corrupt. As noted by Ebbinghaus & Neugschwender (2011), "while the state partially retreated from its responsibilities to finance adequate state pension, the scope of public regulation and control of private pensions increased (…) This is called 'paradox of privatization', let to more state intervention."

From one side, the government transfers fiscal risk and longevity risk to the public and changes the pension system (Leisering, 2003). On the other side, the government is obligated for operations in market design, which enables efficient capitalized pension accumulations in personal portfolios. Naturally, the first order can alleviate, or at least diversify in some level risks that stem from weak market design (Grech, 2018). As Figure

4.4 points, the first order is a bi-pathways of risks, managing by health market design, longevity risk, asymmetric information, and fiscal risks.

Here, in this aspect the discussion is deepen in longevity risk, career risk and asymmetric information, as follows.

Figure 4.4: The first risk sharing order – Risk pathway



Source: Authors' Elaborations

- Longevity Risk – The first order enables risk pooling for longevity risk[15]. One of the transition outcomes is sensitivity to low fertility and average life expansion in the form of higher contributions and lower old age benefits[16]. An annuity creates a redistribution ex-post, as some individuals die early and forfeit their resources to those who die later (Reichling & Smetters, 2015). With longevity insurance, the policyholder pays for these additional biometric returns when the policyholder passes away by leaving the remaining capital in the account to the insurer rather than to heirs. This insurance contract allows policyholders to consume more during their lifetime and to insure themselves against the risk of living longer than average. In that form, individuals, through plan sponsors, can manage idiosyncratic mortality risk; additionally, by enabling annuity market, the individual shares this risk with his same age cohort.

[15] Longevity risk can be further addressed from time to time by automatic benefits' adjustments or by periodically raising retirement ages.

[16] In other words, by buying annuities, individuals absorb the longevity risk as a group with the same age cohort.

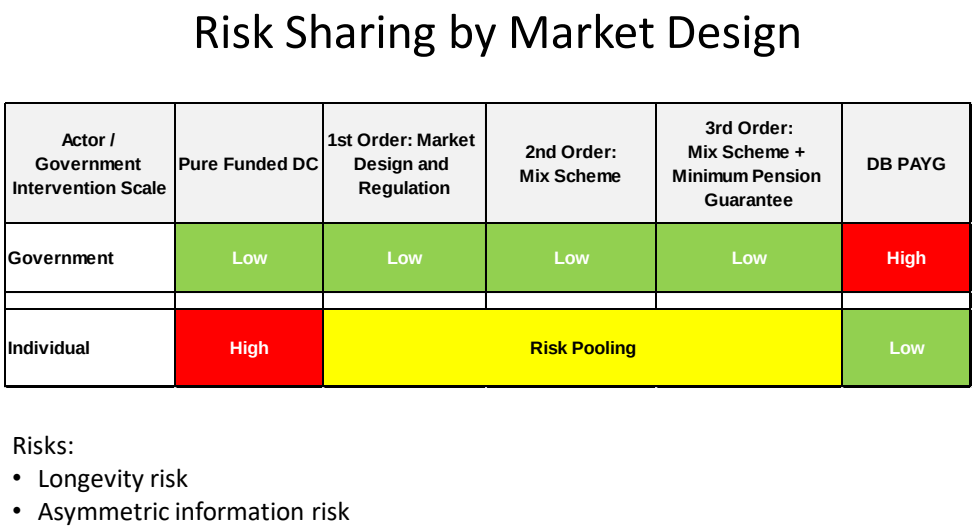
- Asymmetric Information – Naturally, the transition of the pension system depends on sustainable market infrastructure, which can offer the individual the opportunity to pool these risks with others and to make rational decisions (Leisering, 2003). Clearly, only the government is capable of managing these kinds of infrastructure risks and increasing transparency (Einav et al., 2010; Adams et al., 2010).

  Regulatory amendments ensure welfare benefits to all individuals, as well as fair treatment for 'financially-unsophisticated' individuals. Transparency in investment management and effective communication management are imperative directives for the governing bodies to set out a prudential framework for pension funds, which have a fiduciary duty to its members to act in their best interest. The regulatory framework for privately managed pension funds should also comply with the prudent person principle and portfolio restrictions.

With no efficient capital market and regulated pension field, there will be no pension transition and the government would have no opportunity to shift the fiscal/longevity risk. That condition requires tightly drawn up regulatory procedures and a body of people with the capacity to enforce these procedures. This task is particularly difficult as pensions are complex instruments, requiring highly skilled regulators whose abilities command a high price in the private sector. Hence, this task would not be suitable for new liberal markets, such as East Europe in the 1990s, or new states, such as the Balkan states in the 1990s. Hence, there is a great importance to choose the right timing for any reform or change in pension schemes (Grech, 2018).

Figure 4.5 describes the risk spectrum as a function of the government/individual's risk bearing. This risk-sharing scheme is most relevant for the longevity risk and asymmetric information risks discussed above. The red color signifies high risk bearing, whereas the green color indicates the possibility for diversification of risk to the respective actor. Yellow color indicates risk bearing on some level. Respectively, when the pension design moves from the pure DC scheme with actively central planner market design, the individual's risk bearing changes to yellow instead of red.

Figure 4.5: Risk sharing of longevity risk and asymmetric information risk by market design



The first order of market design comes to realization by the emerging and the popularity of the Notional Defined Contribution (NDC) scheme. NDC is an example of a mutual risk sharing design between the government and the individual. NDC asserts the challenges of asymmetric information, fiscal risk, and diversifies wage and market influences. This pension design mimics PAYG scheme, while maintaining the contributions-to-benefits ratio, where the level of benefits varies with life expectancy.

Similar to DC schemes, with the NDC system, the financial risk of changing economic and demographic factors is shifted from the state to current and future pensioners. The rate of return faced under that kind of scheme is centrally determined and reflects the formulas chosen, whereas under the personal accounts system the return depends on the investment choices and the markets performances. Hence, this has significant implications of income distribution, in that all people face the same risks under the NDC scheme. There are no income inequality of pension benefits resulting from high earners taking better investment choices in their pension portfolios. NDC schemes, as opposed to DC scheme, do not place lower income cohorts at a relative disadvantage arising from their relatively lower of financial education and experience in investment choice.

In the NDC scheme, the market risk is shared among the government and the individual, which relates to any fluctuations in the notional rate of return. That feature is clearly

differing from flat return under the PAYG DB scheme, which amounts to the annual accrual of entitlements (Sunden, 2006).

4.5.2. The Second and the Third Orders: Intergenerational and Intra-generational Risk-Sharing

We define the second order as the implementation of PAYG social security and the third order as public social transfers, such as means-tested programs and implementation of minimum pension guarantee. These mechanisms are socio-economic transfers from the government to the individual and ways the individual can diversify financial risks. We claim that these government operations are necessary when the market does not provide sufficient returns ensuring adequate pension benefits and/or in cases where the first order is weak.

For the individual, the diversification of the social security mechanism is held by redistribution among adjacent generations as part of the unfunded PAYG feature (Hardy, 2020). To keep the second order relevant, in any design of social security pillar, the government should keep the administrative mechanism transparent, where individuals should see the link between their taxes and the resulting benefits. Otherwise, employees may simply regard their social security payroll tax as similar to the income tax, thereby increasing the perceived marginal tax rate and raising the deadweight loss of the tax.

The third order augments and intensifies the second order's risks diversification effect. This order includes implementation of target pension, means-tested or minimum pension guarantee. The third order involves a mix of intergenerational and intra-generational risk-sharing mechanisms (Guardiancich,, 2009). Learning from global experience, governments around the world with funded schemes make efforts to impose automatic modifications of these mechanisms (Natali, 2018).

The low correlations between individual accumulation and public transfers make this socio-economic mechanism efficient in diversifying market risk, solvency risk, and career risk, at least up to some level (see Figure 4.6). The individual cannot manage these risk families by himself, or at least not low-earners, as they do not have enough resources to diversify or manage realizations of these risks (Mabbett, 2020). Figure 4.6 demonstrates a 'mirror' risk sharing position between the individual and the government. As studied

above, the government's fiscal spending diversifies the above risks on some levels. Practically, the government as a mediator, participates in risk bearing through the instruments of social security and minimum pension guarantee. The effectiveness of these orders is higher with low correlations between government transfers and wage (Grande and Visco, 2010). That is essential in times of realizing tail risk and for the weak earning cohorts who do not have enough wealth and knowledge to diversify that risk with their own portfolios (Arza, 2008).

To alleviate market risk, many countries operate 'rate of return' minimum pension guarantee in funded pension schemes for that reason (Bielawska, 2015). In times of financial crisis, such as in 2008 and the COVID-19 pandemic crisis, which includes realizations of correlations between risks—financial, personal, or systemic risk, we witnessed a significant rise in the government transfers.

Minimum pension guarantee is relevant also against systemic risk and career risk. Imposing minimum pension guarantee, as part of the third order, deepens diversification of personal and financial risks, which can be realized due to incorrect decisions along the individual's career path, economic shocks, or systemic risk. Meaning, it may provide a safety cushion in times of recession when a strong correlation between wage reduction and unemployment are realized with capital market fall (Antolin et al. 2011).

The minimum pension guarantee is unique by its risk sharing effect. It can be financed by the state budget (intergenerational risk sharing) or with differentiation on the first pillar benefits allocation (intergenerational + intra-generational risk sharing).

This means retirees cannot receive higher benefits than the contributions collected and fair value accumulation (Grande & Visco, 2010). However, this is all true to the sum-up level. The intergenerational diversification between young and old and intra-generational diversification entail that there is not always a direct bond between contributions and benefits.

Figure 4.6: Risk sharing hit map between the government and the individual

Risk Sharing by Public Transfers (2nd+3rd Orders)

Actor / Government Intervention Scale	Pure Funded DC	1st Order: Market Design and Regulation	2nd Order: Mix Scheme	3rd Order: Mix Scheme + Minimum Pension Guarantee	DB PAYG
Government	Low				High
Individual	High				Low

Risks:
- Market risk
- Solvency risk
- Systemic risk
- Career risk

4.6. Global Experience

Although each country has a different socio-economy history and tradition, among the countries that have been through funded transition, a convergence process toward balanced market design including the three orders implementation can be observed. In this section, the process toward an equilibrium of efficient risk-sharing is demonstrated by the popularity of the NDC pension scheme and by the re-reforms of CEE countries over the last two decades.

4.6.1. The NDC Experience as a Global Demand for Pensions' Orders

This pension scheme gains popularity especially across Europe. In the mid-1990s, Sweden, Poland, Italy, and Latvia launched NDC schemes. The Australian, Dutch, and United States pension systems considered hybrid plans without deviating from their traditional schemes (Barr, 2006). In 2009, Norway announced the implementation of a pension plan with NDC features. In 2010, many other countries also followed the NDC scheme (Holzmann et al., 2012).

Literature recognizes that this scheme provides risk sharing only on a limited level (in our terminology—first order). Moreover, many scholars suggest strengthening this scheme

with public transfers (second and third orders). The American researchers, Williamson and Williams (2003) argue that NDC systems could actually end up redistributing from the poor to the rich. They explained that though pensions are calculated using a uniform actuarial formula that does not take into account lifetime income or longevity risk classes, the rich tend to live longer than the poor do, which means that the rich will often end up reaping disproportionately more from the system. They pointed out that in the absence of a generous guaranteed minimum pension there will generally be greater income inequality among retirees. The pension expert, N. Barr, in a special book of the WB about NDC scheme[17] (2006), stresses that the NDC scheme is not the best solution for poor countries, as the poverty line is relatively close to average earnings. Hence, there is little gain from an earning-related pension in general and NDC pensions in particular. In the same book, Lindeman, Robalino and Rrutkowski add that the most effective mechanism to achieve redistribution in an NDC system "is a complementary non-contributory pension that is reduced as the contributory pension increases".

Moreover, the NDC schemes attempt to make the PAYG schemes automatically stabilized and fiscally balanced. By that, we attribute this design as an attempt to implement the first order risk sharing. For instance, in Sweden through the operation of the new pension program, the government annually reviews the system and if the calculations reveal an unfunded liability then the notional interest is reduced. Thus, changes in the size of the contributing labour force are immediately reflected in the rate of return earned on funds.

Although, the individual avoids solvency risk and asymmetric information from private players, because of the full dependency by the government regarding the rate of return, there is room for government opportunistic behavior toward budget balancing. In this kind of pension system, there might be pressure on governments to frequently adjust the rate of return. Furthermore, as noted in Zaidi (2010) the NDC system leads to a securitization of pension claims, making individual's benefit level difficult to modify, whereas under the DB system, benefits were determined at the end of the carrier; it was easier for governments to fiddle with the formula and lower benefits. In total, there is still

[17] The book: "Pension Reform: Issues and Prospects for Non-Financial Defined Contribution (NDC) schemes".

a difference of opinion in the literature about the efficiency of the NDC scheme regarding inequality alleviation (Orenstein et al., 2012).

Another important feature of the NDC schemes is that they are less expensive to administrator than multi-pillar pension system. This is not to say that multi-pillar systems cannot be organized in a way that reduces the administrative charges faced by contributors.

4.6.2. The Risk Sharing Theory and the Reforms in CEE Countries

In this section, the converging process to risk-sharing equilibrium in funded pension schemes is demonstrated. A large number of pension reforms were designed and driven by the World Bank, based on the argument of the impending crisis of aging and its impact on the sustainability of pension systems (e.g., World Bank, 1994). While Western European countries with matured public PAYG systems have dismissed pension privatization initiatives. Most profound and extensive pension reforms took place in the 1990s in Latin America and Eastern Europe (Bielawska, 2015; Mesa-Lago & Valero, 2020). In addition to parametric changes, CEE countries have been through radical systematic pension reforms during the 1990s, after exiting the Soviet regime. These reforms were set in immature markets nor experienced government in providing liberal principles that are so critical to mutual trust in pension markets, such as transparency, free competition, governance and regulation to solve market distortions. Consequently, after years of pension privatizations with no sufficient risk-sharing mechanism in neither of the orders, they have performed re-designs in their pension system, which in their essence insert more risk-sharing mechanisms (Domonkos & Simonovitz, 2017). One of the common features of these re-reforms across the sampled countries is that they were accompanied with substantial political pressure from the public pushing the government to intervene more in the market sharing the burden of risks with the individual (see also Natali, 2018).

Between 1981 and 2018, 29 countries undertook pension reforms, introducing either partial privatization or full privatization with individual accounts and private administrations (Altiparmakov, 2018). However, 19 countries, 13 in Eastern Europe and six in Latin America reversed privatization, that is 60% of the countries that had

privatized pension reversed privatization. Five other countries in Latin America have strengthened the zero pillar of minimum pension guarantee (Mesa Lago & Valero 2020).

Here, we focus on CEE countries reversals from risk sharing orders perspective. While every country case is specific and needs to be assessed in its context, the implementation of risk-sharing mechanisms has common elements in the configuration of the new pension systems during pensions the re-reforms wave. Specifically, the literature finds common characteristics in the following CEE countries history of cyclical pension reforms: Russia, Latvia, Estonia, Bulgaria, Croatia, Latvia, Lithuania, Kazakhstan, North Macedonia, Poland, Hungary, Czechia, Romania, Slovakia, and Slovenia (Natali, 2018).

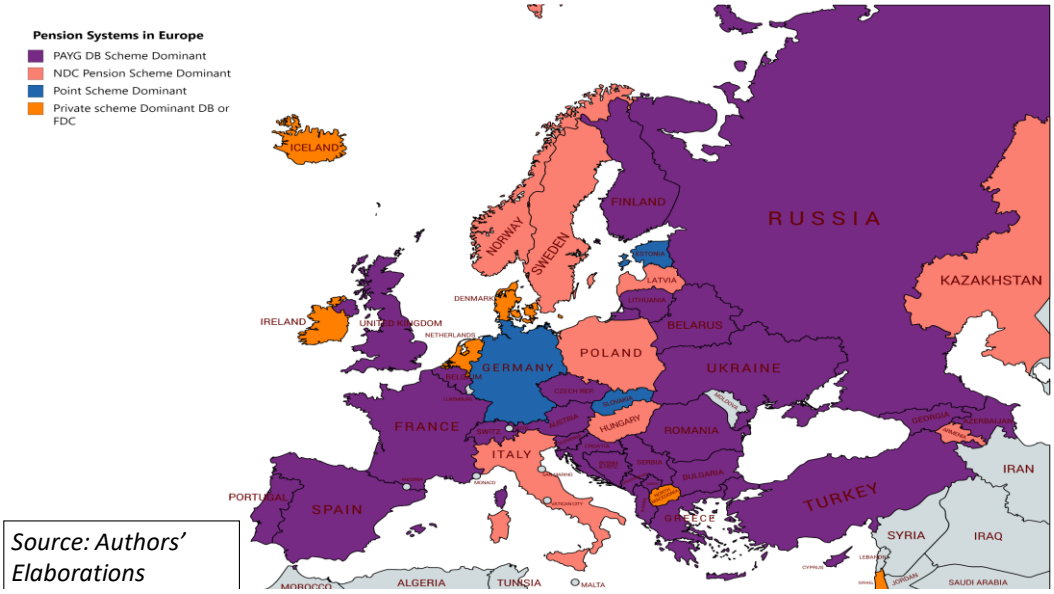
Empirical evidence shows that these reforms failed to deliver the improvements that were initially propagated by the World Bank (1994). Coverage rates stagnated or decreased, pension benefits deteriorated, and gender and income inequality increased (Fultz & Hirose, 2019). The financial crisis severely affected the financial and capital markets, significantly reducing the real value of private pension assets and, consequently, causing popular outrage with the results of the private system. The risk of financial market fluctuations was left to pensioners. Many pensioners had to rely on social support as the value of their pension benefits had fallen to very low levels, often below the poverty line[18]. Moreover, administrative costs further reduced pension benefits and workers' participation in management was eliminated (Ebbinghaus, 2015). In Section 4.3, we explain the lack of risk-distributions mechanisms. Consequently, political risks push decision takers to reverse back to PAYG schemes.

However, when compared to CEE countries, reforms to funded pension designs, most Western high earning countries in Europe still implement dominant first pillar in the form of DB PAYG pension scheme (see Figure 4.7). According to the OECD annual report (OECD 2019), most of the pension reforms in advanced countries can be summed up in parametric changes, such as consistently raising the retirement age and adapting contribution rated with no drastic reforms or reversals. The relative stable pension

[18] A study by the Inter-American Development Bank (IADB) highlighted the decline in replacement rates in a pure funded DC scheme—the Chilean Model from 1990 to 2000, when half the private system participants received a declining minimum pension (Crabbe, 2015). Drop in replacement rates was also in Argentina. Further, Cichon (2004) concluded that average pension amounts were likely to gravitate toward the minimum levels.

landscape in advanced countries is due to a balance between fiscal needs and the system's generosity (Fultz & Hirose, 2019) that are realized through liberal markets; competitive, as well as sophisticated financial private sector and high government regulation. These inherent mechanisms may diversify asymmetric information, market distortions, and provide available and efficient instruments hedging financial risks through capital markets (Zaidi, 2010).

Figure 4.7: Dominant pension schemes across Europe[19]



Source: Authors' Elaborations

4.6.3. The Experience of the First Order

This subsection discuss several points, demonstrating the problems of risk sharing after the privatization process and the improvement in risk sharing after risk reversals. CEE countries' experience clear changes in the first order in the improving market design, regulation, governance and stabilization of the pension system.

4.6.3.1. Improving Market Design

Many European governments maintained a "voluntarist approach" to organizing private welfare provisions until well into the 1990s. This implies that the allocation of

[19] Most of the countries across Europe have hybrid or mix pension schemes. We choose to mark the dominant pension schemes in these countries.

occupational and personal welfare benefits was left to “private initiative” (Esping-Andersen, 1990). Lack of governance in designing pension reforms was realized when many CEE governments (Croatia, Estonia, Latvia, North Macedonia, Poland, and Slovakia) launched their second pillar before they defined the benefit package that workers could expect to receive (Fultz & Hirose, 2019). Guardiancich (2009) claims that in Poland, for instance, private fund supervision went through continuous organizational changes and took almost ten years to develop but remained riddled with inefficiency and excessive politicization. Inadequate consulting and marketing practices, early withdrawal penalties and low tax incentives, as well as crowding out by the first pillar, prevented voluntary pensions from expanding. Undeveloped markets cause inefficient investments and high volatility and risk for participants (Munnell & Quinby, 2009).

Over the years, government intervention created trust among actors after the soviet regime with more transparency and efficiency in the private funds’ operations (Natali, 2018). The major design problems in most of the privatization reforms have been replaced by a centralized public administration (Sokhey, 2017). Governments improve adequate policy formulation and related decision-making processes. The re-reforms reinforced the government role in the administration, regulation, and supervision of the pension systems. Most of the countries after re-reforms, such as Poland, Hungary, and Kazakhstan created autonomous bodies for the regulation and supervision of private pensions (Mesa-Lago & Valero, 2020).

For example, in Poland, the participatory character of the governance framework was improved, as representatives of trade unions and employers are members of the supervision board of the ZUS (Bielawsks, 2015). The private individual accounts and public pension funds are both regulated by the Financial Supervision Authority, which is overseeing the entire financial activities. After restoring the public pension system, Hungary created in 2010 the Economic and Social Council, a national tripartite consultation body, which includes the participation of workers’, employers’, and social civil society representatives. The supervisory and regulatory functions are now under the Ministry of Human Resources and Hungarian National Bank. In other schemes, simply the government took more responsibility. In Kazakhstan, the government significantly increased its executive powers over the pension systems and gave national banks more authority to supervise the pension activities.

4.6.3.2. Fiscal stress after the Transition

According to the evidence, the reforms during the 1990s failed to deliver an improvement in fiscal and financing terms and financing the transition toward individual accounts exacerbated pre-existing fiscal pressure in most CEE countries (Altiparmakov, 2018).

Many reformers have been predominantly covering the transitional deficits by borrowing from second pillar pension funds, whose inception created the transitional deficit in the first place. These circular transactions are rather a "fake" funding[20]. For example, domestic bonds used to be a dominant investment in Hungary, North Macedonia and Poland, reaching 60% of pension portfolio, before these countries cancelled the second pillar. In Croatia and Romania this share reached 65% of portfolios in 2018. The reversals operations eliminated this suboptimal asset allocation arrangement.

The transition costs associated with moving from a DB to a private DC were vastly underestimated in all countries (ISSA report, 2019). In Poland, during the period 1999–2012, the cumulated costs of transfers to the second pillar were estimated to be 14.4% of 2012 GDP, accompanied by approximately 6.8% of GDP consumed by servicing additional public debt.

The mix of pillars ease fiscal stress for enough time to foster economic activity and to socially ease low earning cohorts during deep recession and decrease overall debt. Governments were able to invest part of the nationalized funds in public developments projects (e.g., nuclear power electricity plants, roads, trains, public housing etc.). The target was to create positive multiplier effects with regard to public revenues, such as taxes and social security contributions (Hujo & Rulli, 2014).

In Hungary, the nationalization of pension assets contributed to an initial decrease of sovereign debt. Hungary's fiscal deficit dropped following the re-reform from 5.8% annually from 2005–2010 to 2.75% annually from 2011–2016. Likewise, public sector debt decreased from 81.8% to 79% of GDP between 2010 and 2012 (Datz & Dancsi, 2013). Consequently, one can determine that the pension re-reform enabled Hungary to be removed from the European Union's list of Excessive Deficit Procedures.

[20] That funding method was very popular in Israel in its DB scheme until 1995. Today, across the private DC this funding method is about 30%-60% depending on the individual age.

In Poland, the pension re-reform improves also the government short-term position by the transition of 33 billion USD to the ZUS. The state insurance plan (ZUS) decreased its deficit from 3.52% to 2.73% of GDP. Hence, the government's fiscal position improved, dropping its fiscal deficit from an average of 4.78% annually from 2006–2011 to 3.72% between 2012–2017. General government debt levels also decreased from 56.2% in 2011 to 50.2% in 2014 (Polakowski & Hagemejer, 2018). Here we mention also the fiscal improvement in Kazakhstan after the reversal. Kazakhstan's pension system reversals enabled the government implicitly extended its fiscal space and increased its room to manage its sovereign debt and invest in national developments projects (Chaon-Dominszcak, 2018).

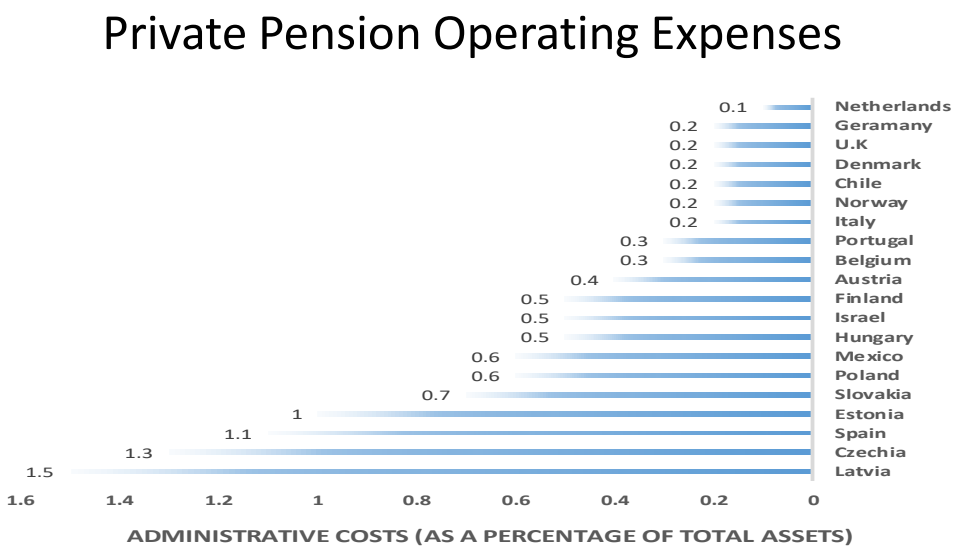
4.6.3.3. Administrative Costs

High administrative costs are a clear symptom of immature markets and lack of regulation operations in private markets (Spivak et al., 2017). In this composition taxonomy, administrative cost are an indicator to the lack of first order. In many countries, after the first period of light regulation, the state has increased its intervention on the pensions market, allowing increased efficiency and effectiveness. Szikra claim that "Reducing the number of funds also increased transparency and allowed for greater risk pooling overall bringing the pension systems more in compliance with the principle of transparent, accountable and sound financial management and administration" (Szikra, 2018, p.3).

After the 1990s reforms, costs have soared well above the pre-existing levels in the old public systems. High administrative costs posed a serious financial and political problems and, in many cases, spurred the re-reform process because of its direct influence on population (Bielawska, 2015). In the next figure, one can impress that even after reversals, operating costs are still high in some of the investigated countries. In Poland, fee levels remained unregulated until 2004 and some pension and managers charged as much as 10% of the contribution value.

Commissions were effectively abolished in accounts funds in Hungary. In Kazakhstan, commission fees were halved. In Poland, administrative fees remained unregulated until 2014 and are expected to further decrease under the public fund – ZUS (Polakowski & Hagemejer, 2018).

Figure 4.8: Administrative costs in private markets across Europe



Source: OECD, 2018

4.6.4. Lack of the Second and the Third Risk-Sharing Orders

Similar to the last subsection, here the study discusses the indications of ill market as the absence of risk sharing mechanism and the improvement in these aspects after reversals.

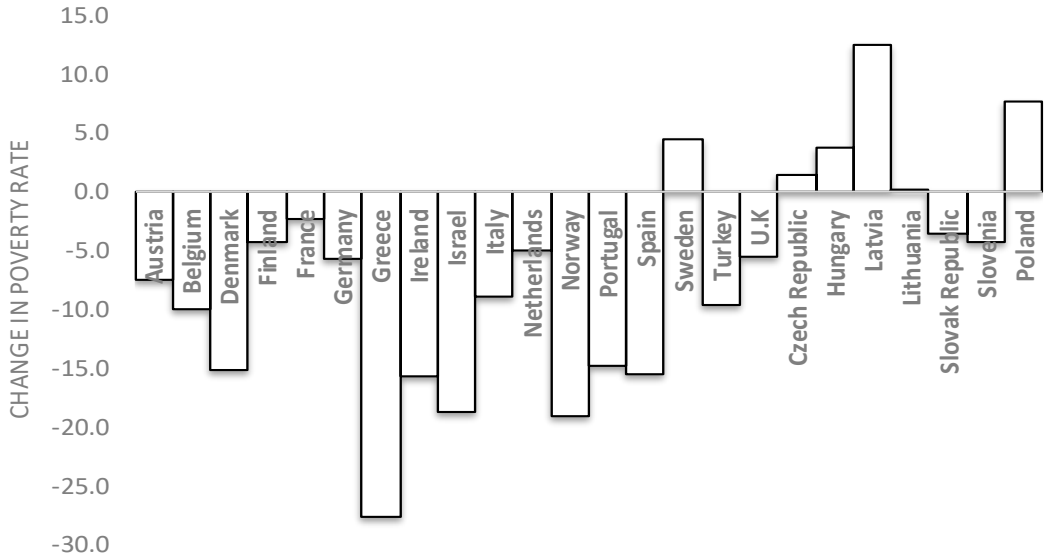
4.6.4.1. Redistribution Level

An interesting indicator of healthy intergenerational risk sharing in pension is the transition of the poverty rate from the old to the young. Between the mid-1990s and until the end of 2016, most of the European countries improved the poverty rate in old-age with regard to the entire population across Europe (see Figure 4.9). Here, we indicate that in some of the CEE countries, however, the trend is the exact opposite as old-age poverty has increased. That may indicates of insufficient risk-sharing mechanisms inherent in pension systems and one of the reasons of political pressure to conduct re-reforms.

A large variety of improvement rates in old-age poverty in the sample countries stem from the timing and the intensive rate of imposing pension privatization reforms and reversals (Chaon et al., 2018). For example, the improvement of relative old-age poverty rate in Slovenia may be attributed to the abolishing of the second pillar as part of the re-reforms. Similarly, the improvement in Slovakia to imposing late partial privatization-

capitalization pillar with a small second pillar, which has operated for only three years until the reversal (Altiparmakov, 2018). In both of the cases, the third order might have played an important role.

Figure 4.9: Poverty shift in Europe: Aged over 65 vs. 18–25 -



Source: Based on OECD/Pension at Glance, 2019

According to the Ortiz et al. (2018), with the reversals of private pension systems, the diversification of benefits by social security and minimum pension guarantees (the second and the third orders) improved replacement rates in most of CEE countries. Moreover, according to this encompassing review, in most of the cases, the replacement rates exceed the requirement of the ILO convention No. 102.

4.6.4.2. Implementing Risk Sharing Mechanisms

Figure 4.10 points to a convergence process of implementing minimum pension guarantee or target pension after pension reform reversals. In red color, we have the CEE countries that have been through pension reform during the 1990s and made reversal in the pension design. These revised pension schemes include reassurance of pension benefits. These countries are compared to Western countries in Europe, colored in yellow, which implement target or minimum pension guarantee. To complete the picture of risk sharing experience through public transfers, the appendix provides an overview of the main

reversal of CEE countries according to the definitions of the risk sharing orders. All analyzed countries have been re-balancing their radical reforms since the 1990s and early 2000s by implementing second and third risk-sharing orders and recognizing public social insurance. Furthermore, they redesigned social security based on the principles of social solidarity, redistribution, and shared responsibility for pension provision among actors (Fultz & Hirose, 2019).

Pension systems' re-balancing was done by various methods:

- Increasing first pillar contributions in the expense of the second pillar—Poland, Bulgaria, Latvia, Lithuania, Czechia;
- Providing individuals the option to reverse back to the first pillar of public pension and social security from the second pillar (private funded funds)—Bulgaria, Croatia, Hungary and Slovakia;
- Imposing minimum pension guarantees and intergenerational diversifications—Hungary, Poland, Czechia, Slovakia, Latvia, Slovenia and Kazakhstan.

Figure 4.10: Implementation of minimum pension guarantee in Europe

The sampled countries turned toward Keynesian measures in the immediate aftermath of the crisis, reducing/diminishing private capitalized pension pillar and expanding public redistributions mechanisms (European Commission, 2010).

4.7. Discussion

There is little doubt that successfully "averting the old-age crisis" in Eastern Europe will need to involve private pension funds. However, their funding, operations and interactions with other public pension pillars will need to resemble successful practices in developed countries instead of relying on the radical World Bank (1994) reform blueprint.

Eastern European countries still face fiscal and economic challenges related to demographic aging, and averting the old-age crisis (World Bank, 1994) seems more challenging today than a couple of decades ago. Through the reversals, not only has time been lost on pursuing an incoherent reform approach, but also the political appetite for dealing with pension issues seems diminished after the recognition that multi-pillar reforms are not a panacea they were initially perceived to be. Nonetheless, political elites will need to explicitly recognize pension system's failure and deal with them decisively. Going for short-term compromises, such as allowing second pillar members to return to the PAYG model in case their portfolio's investments turn sour does not solve structural problems but is only postponing and amplifying them for the future.

The comparison between Western countries and CEE countries experience demonstrates that when the pension market is pre-mature and unregulated, the public seek other financial risk mechanisms, which may lead to political pressure focus on governmental transfers, such as increasing social security and imposing minimum pension guarantee. This process explains the deviation in market designs among the different countries that choose funded-capitalized pension scheme, dealing with the same challenges of low fertility, longevity, and fiscal risks.

The reversal process continues even a decade after the financial crisis, such as in Romania (2018) and Croatia (2019). These transitions include the learning process, which is reflected in the comprehensive pension design that includes risk-sharing mechanisms to improve and sustain their pension systems.

It is argued that political pressure is the main engine that enables the cyclical orders of risk sharing between actors and earning cohorts. This composition examines the relationship between the political economic factors behind the shift away from voluntarism in private pension provisions and those driving public retreat.

According to Munnell and Quinby, "Given the political economy of reforms, the large voting power of people nearing or beyond retirement age might mount again to recalibrate public pensions and to regulate private pensions" (Munnell & Quinby, 2009, p.6). Indeed, literature recognizes that imposing a minimum pension guarantee is an important condition to any transition to a more funded-capitalized scheme, in order to assure sustainability of pension schemes and make them politically acceptable (Marx, 2016). Almost all actual reform proposals have guaranteed current law scheduled benefits (Antolin et al., 2011). Pension guarantee is becoming more and more mandatory in volatile markets.

According to the above, it is not surprising to notice a global shifting trend in implementing mechanisms of minimum pension guarantee (Arza, 2008). Guarantees in DC schemes have recently become more common, especially in Latin America, which has been at the forefront of pension privatizations (Mesa-Lago & Valero, 2020). Those countries join stable pension economies across Europe, which implement minimum pension guarantees, such as Finland, Germany, Italy, Switzerland, Greece, Spain and Portugal.

This suggests that policymakers are moving somewhat beyond the narrow interpretation of pension system sustainability that was adopted in previous decades.

4.8. Conclusion

The aim of this chapter is to discuss the bi-path ways of risks in funded pension schemes. Here, the composition illuminates a hidden risk shifting that was less studied, from the individual back to the government.

This composition has stressed key dimensions of the complex public/private relationships and has drawn attention to aspects of risk sharing between different periods and among different earning cohorts; in all of which, the government plays a significant role as a central planner and as a mediator.

Each pension scheme and each way of funding pension has a unique risk package. Hence, in order to achieve a sustainable and adequate pension system, the central planner should treat the pension system as a portfolio with different risks and properties. From the portfolio theory, this thesis researches pension risks. Naturally, mix pension pillars

consist of personal pensions with risk-sharing mechanisms. Individuals can benefit from both financial risk premia and additional biometric returns associated with longevity insurance, tailored to their specific circumstances.

Consequently, financial torments strengthened the position of domestic opponents of pension privatization by highlighting private pension funds' disputed macroeconomic effects and their volatile returns. After re-reforms of pension schemes in the last 15 years, more governments understand that the 1990s reforms were not coherent enough (Natali, 2018; Ebbinghaus, 2015). Over the last three decades, the experience in CEE and Latin America countries have demonstrated convergence to an equilibrium pension design. In those pension designs, the government recognizes its responsibilities in the risk-sharing framework and acts to diversify some of the traditional individual's risks. The recent financial crisis due to the COVID-19 pandemic confirms this process, as we are witness to large bailout governmental programs due to political pressure. The global public assistance to the pension market and labor markets emphasize the individual's inability to bear high fluctuations in the market for long, mainly during old age or when close to retirement.

Policy analysis that focuses on a single objective, such as fiscal strength will be flawed. One should understand that there is no single perfect design, and the solution depends mostly on the policy objectives and the underline economy.

The implication of this study is the continuity of this trend of cyclical reforms in other countries that have base their pension systems on funded benefits, such as in USA, Great Britain, Israel, or Iceland. Financial crisis will probably foster this breathing process as the public expects the government to participate on the risk. In this context, it is worthwhile to implement the above "Risk-Sharing Orders Model" on Notional Defined Contribution (NDC) pension scheme, which was adapted by several countries, such as Poland, Latvia, and Kazakhstan (Bielawska, 2015). High poverty and inequality rates in these countries imply insufficient risk-sharing mechanisms[21] (Barr, 2006) that might

[21] In Poland, benefit levels have not improved as the public pension continues to be based on a defined contribution system (NDC), which reduced the diversification effect and replacement rates remained low (39% for men with 45 years of contributions and 34% for women with 40 years of contributions). In Kazakhstan, also the implementation of NDC has very low replacement rates of 40% with 45 years of contribution. In Latvia, old-age poverty rate is the highest among OECD countries after Korea. The poverty rate is very volatile and highly connected to market fluctuations (OECD report on Latvia pension system.

cause another wave of pension re-reforms in these countries. In comparison to Norway, Sweden, and Italy, which implement the NDC scheme, there is a need for strong and mature markets and governance that is much more sophisticated and regulations to implement NDC schemes (Barr, 2006). Hence, perhaps the timing of implementing NDC scheme in these countries is too early, where these countries are still undergoing major structural transition toward the market economy. Additionally, as financial and systemic shocks are accelerating public reaction, it will be interesting to examine the pension systems design sometime after the Corona-Virus crisis.

The pension scheme is expected to deliver replacement rates of 48% for the average worker with full career (for comparison, the average in the OECD is 53% and Italy is 80%).

Chapter 4 - Reference

Adams, W., Einav L. & Levin, J. (2009). Liquidity Constraints and Imperfect Information in Subprime Lending. *American Economic Review*. 99:49–84. https://doi.org/10.1257/aer.99.1.49

Altiparmakov, N. (2018). Another Look at Causes and Consequences of Pension Privatization Reform Reversals in Eastern Europe. *Journal of European Social Policy.* 28(3): 224–241. https://doi.org/10.1177/0958928717735053

Antolín, P., Stephany, P. Whitehouse, E. & Yermo, J (2011). The Role of Guarantees in Defined Contribution Pensions, *OECD Working Papers on Finance, Insurance and Private Pensions,* No. 11, OECD Publishing, Paris, https://doi.org/10.1787/5kg52k5b0v9s-en.

Arza, K. (2008). Pension reform in Latin America: Distributional principles, inequalities and alternative policy options. *Journal of Latin American Studies,* 40(1):1–28. http://www.jstor.org/stable/40056624

Barr, N. (2006). Non-Financial Defined Contribution Pension: Mapping the Terrain. *In R. Holzmann & E. Palmer (Eds.), Pension Reform: Issues and Prospects for Non-Financial Defined (NDC) Contribution (pp. 57-66).* Washington, DC: The World Bank. Retrieved from http://eprints.lse.ac.uk/2659/

Barr, N. & Diamond, P. (2009). Reforming pensions: Principles, Analytical Errors and Policy Directions. *International Social Security Review,* 62(2):5–29. https://doi.org/10.1111/j.1468-246X.2009.01327

Bielawska, K. (2015). Pension Reforms and Long-Term Sustainability of Public Finances of the Central Eastern European Countries. *In M Szczepański, M Szczepański (Ed), Social security systems in the light of demographic, economic and technological challenges* : monograph (21–32). Publishing House of Poznan University of Technology.

Bohn, H. (2011). Should Public Retirement Plans be Fully Funded? J*ournal of Pension Economics and Finance*, 10(2), 195–219. http://doi.org/10.1017/S1474747211000096

Bouhakkou, L., Coën, A. & Folus, D. (2020). A Portfolio Approach to the Optimal Mix of Funded and Unfunded Pensions. *Applied Economics, 52*(16): 1733-1744. https://doi.org/10.1080/00036846.2019.1678728

Bradley, D., Pantzalis, C. & Yuan, X. (2016). The Influence of Political Bias in State Pension Funds. *Journal of Financial Economics,* 119(1): 69-91, https://doi.org/10.1016/j.jfineco.2015.08.017

Chaon-Dominisczak, A., (2018). Impact of Changes in Multi-Pillar Pension Systems in CEE Countries on Individual Pension Wealth. Journal of Pension Economics & Finance; Cambridge 17(1): 110-120 . http://doi:10.1017/S1474747216000238

Cui. I, J., Jong & Ponds, E. (2011). Intergenerational Risk Sharing within Funded Pension Schemes. *Journal of Pension Economics and Finance*, 10(1): 1–29. http://doi.org/10.1017/S1474747210000065

Datz, G. & Dancsi, K. (2013). The politics of pension reform reversal: a comparative analysis of Hungary and Argentina. *East European Politics*, 29:1, 83-100, http://doi.org.10.1080/21599165.2012.759940

Domonskos, S. & Simonovitz, A. (2017). Pension reforms in EU11 countries: An evaluation of post-socialist pension policies. *International Social Security Review*: 70(2), 109-128, https://doi.org/10.1111/issr.12137

Ebbinghaus, B. (2015). The Privatization and Marketization of Pensions in Europe: A Double Transformation Facing the Crisis. European Policy Analysis, 1(1):56–73. https://doi.org/10.18278/epa.1.1.5.

Ebbinghaus, B., & Neugschwender, J. (2011). The Public-Private Pension Mix and Old Age Income Inequality in Europe. *In B. Ebbinghaus (Ed.), The Varieties of Pension Governance : Pension Privatization in Europe* (pp. 384–422). Oxford Univ. Press. https://doi.org/10.1093/acprof:oso/9780199586028.001.0001

Einav, L., Finkelstein, A. & Schrimpf, P. (2010). Optimal Mandates and the Welfare Cost of Asymmetric Information: Evidence from the U.K. Annuity Market. Econometrica 78(3). https://doi.org/10.3982/ECTA7245

European Commission. (2010). Progress and Key Challenges in the Delivery of Adequate and Sustainable Pension in Europe. European Economy 71. Brussels: DG Economic and Financial Affairs.

Esping-Andersen, G. (1990). Three Worlds of Welfare Capitalism. Princeton, NJ: Princeton University Press. (ed) *in Welfare States in Transition: National Adaptations in Global Economies.* London: Sage.

Feldstein, M, (2005). Structural reform of social security. *Journal of Economic Perspective.* 19(2): 33-55. http://doi.org.10.1257/0895330054048731

Fultz, E. & Hirose, K. (2019). Second-pillar pensions in central and eastern Europe: Payment constraints and exit options. *International Social Security Review* 72(2019).

Goillier, C. (2008). Intergenerational Risk Sharing and Risk Taking of a Pension Fund. *Journal of Public Economics*, 92:1463–1485.

Grande, G., & Visco, I. (2010). A Public Guarantee of a Minimum Return to Defined Contribution Pension Scheme Members. *The Journal of Risk*, 13(3): 3–43. https://doi.org/10.21314/JOR.2011.226

Grech, A. (2018). What Makes Pension Reforms Sustainable. *Sustainability*, 10(8). https://doi.org/10.3390/su10082891

Guardiancich, I. (2009). Pension Reforms in Central, Eastern and Southeastern Europe: Legislation, implementation and sustainability, Florence, European University

Institute, Department of Political and Social Sciences http://hdl.handle.net/1814/13297

Hardy, M. (2020). Diversification in Retirement Inequality, *The Journals of Gerontology*, Series B 75 (4, May 2020): 823–826. https://doi.org/10.1093/geronb/gbz147

Holzmann, R. & Hinz, R.P. (2005). Old Income Support in the 21st Century: An International Perspective on Pension Systems and Reforms. *Washington, D.C: The World Bank.*

Holzmann, R., Palmer, E. & Robalino, D. (2012). Nonfinancial Defined Contribution Pension Schemes in a Changing Pension World, *Politics, and Financial Stability*, 2, https://doi.org/10.1596/978-0-8213-9478-6

Hujo K. & Rulli M. (2014). Towards More Inclusive Protection: A Comparative Analysis of the Political Process and Socio-Economic Impact of Pension Re-Reforms in Argentina and Chile. *In: Hujo K. (eds) Reforming Pensions in Developing and Transition Countries. Social Policy in a Development Context*. Palgrave Macmillan, London. https://doi.org/10.1057/9781137396112_10

Kuitto K. & Kuivalainen, S. (2020). Pension, *In the Handbook on Society and Social Policy, pp 279–290*. https://doi.org/10.4337/9781788113526.00029

Leisering, L. (2003). From Redistribution to Regulation—Regulating Private Provisions for Old-Age as a New Challenge for the Welfare State in Aging Societies. Paper presented at the 4th International Research Conference on Social Security, Antwerp, 5–7 May 2003.

Mabbett, D. (2020). Reckless Prudence: Financialisation in UK Pension Scheme Governance after the Crisis. *Review of International Political Economy*. https://doi.org/10.1080/09692290.2020.1758187

Markowitz, H. (1991). Foundations of Portfolio Theory. *The Journal of Finance*, 46(2): 469-477. http://doi.org.10.2307/2328831

Marx, I. (2016). Raising Minimum Income Floors: Incrementalism and Innovative Pathways. *Paper presented at the RC 19 Expansion and Retrenchment in Social Policy*: North-South Dialogues Conference, San Jose.

Mesa-Lago C. & Valero, D. (2020). The New Wave of Pension Reforms in Latin America. *In Peris-Ortiz M., Álvarez-García J., Domínguez-Fabián I., Devolder P. (eds) Economic Challenges of Pension Systems.* Springer, Cham. https://doi.org/10.1007/978-3-030-37912-4_12

Munnell, A. & Quinby, L. (2009). Pension Coverage and Retirement Security. *Issues in Brief ib2009-9-26,* Center for Retirement Research, revised Dec 2009.

Naczyk, M. & Domonkos, S. (2016). The financial crisis and varieties of pension privatization reversals in Eastern Europe. *Governance, 29*(3), 167–184. https://research.upjohn.org/up_bookchapters

Natali, D. (2018). Recasting Pensions in Europe: Policy Challenges and Political Strategies to Pass Reforms. *Swiss Political Science Review*, 24 (1). https://doi.org/10.1111/spsr.12297

Novy-Marx, R. & and Rauh, J., (2009). The Liabilities and Risks of State-Sponsored Pension Plans. *Journal of Economic Perspectives*, 23 (4): 191-210. https://doi.org/10.1257/jep.23.4.191

Orenstein, M. (2013). Pension Privatization: Evolution of a Paradigm, *Governance*, 26(2): 259-281, https://doi.org/10.1111/gove.12024

Ortiz, I., Durán-Valverde, F., Urban, S., & Wodsak, V. (2018). Reversing Pension Privatizations: Rebuilding public pension systems in Eastern Europe and Latin America. Geneva: International Labour Organization. http://dx.doi.org/10.2139/ssrn.3275228

Polakowski, M. & Hagemejer, K. (2018). Reversing Pension Privatization the Case of Polish Pension Reform and Re- reforms. *ILO Working Papers 995005392802676*, International Labour Organization.

Randle, P. & Rudolph, H.P. (2016). Pension Risk and Risk-Based Supervision in Defined Contribution Pension Funds, World Bank Policy Research Working Paper No. 6813, Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2414170

Rappaport, A. M. & Peterson, A. (2014). Risk-sharing Alternatives for Pension Plan Design: An Overview and Case Studies. *Wharton Pension Research Council Working Papers. 92.* https://repository.upenn.edu/prc_papers/92

Reichling F. & Smetters K. (2015). Optimal Annuitization with Stochastic Mortality and Correlated Medical Costs. *American Economic Review,* 105(11): 3273–3320. http://doi.org.10.1257/aer.20131584

Republic of Bulgaria Report (2017). Country Fiche on Pension Projections. Sofia, November 2017.

Sokhey, S. W. (2017). The Political Economy of Pension Policy Reversal in Post-Communist Countries. Cambridge University Press

Spivak, A., Tzemah, S., & Carmel, E. (2017). *Israel Pension Reform*. Van-Leer Institute, Jerusalem.

Sunden, A. (2006). How Much Do People Need to Know about Their Pensions and What Do They Know. *In Pension Reform: Issues and Prospects for Non-Financial Defined Contribution NDC Schemes.* World Bank

Szikra, D. (2018). Reversing Privatization and Re-Nationalizing Pensions in Hungary, *ILO Working Papers 995005393002676,* International Labour Organization.

Williamson, J.B. & Williams, M. (2003). The Notional Defined Contribution Model: An Assessment of the Strengths and Limitations of a New Approach to the Provision of Old Age Security, Center for Retirement Research at Boston College 550 Fulton Hall.

World Bank. (1994). Averting the Old Age Crisis: Policies to Protect the Old and Support Growth. New York: Oxford University Press. https://doi.org/10.1596/0-8213-2970-7

Zaidi, A. (2010). Fiscal and Pension Sustainability: Present and Future Issues in EU Countries. European Center. Belgian EU Presidency. https://core.ac.uk/download/pdf/11867528.pdf

Appendix – CEE countries' pension reforms

Country		Reform	Reversal	2nd Order	3rd Order
1	**Bulgaria**	2002	2007	2014 – 2nd pillar account holders were allowed to return to the 1st pillar, while refunding their account balances to the government (this option is available until 5 years before retirement);	2014 - Minimum income support for the elderly is provided through the state; The minimum old-age pension amount is set every year by the Public Social Insurance Budget Law;
2	**Croatia**	2002	2011	Retrenchments of private second pillar mandatory pensions; Mandatory individual account contribution reduced from 10 per cent to 5 per cent	Relative rate of return guarantee for the snd pillar.
3	**Czechia**	2004	2016	2016 - Terminating individuals' accounts.1st pillar dominant.	Pension fund managers must guarantee the nominal value of contribution made by plan members every year. Contributions cannot receive a negative rate of return;
4	**Estonia**	2002	2009	The government suspend its contribution to the second pillar; Universal benefit component as part of the first pillar; Transition to a NDC pension scheme	
5	**Hungary**	1998	2011 - Terminating individuals' accounts	2011 – Nationalized private pension assets individual and closed the 2nd private pillar; Transition to the treasury PAYG DB mandatory scheme from the age of 63.5+;	Minimum pensnion guarantee finances from the state budget; Mandatory pension funds must ensure that the investments return is not less than 15% less than the yield on Hungarian government bonds; pension-tested benefit around 103 USD per month (2018) and 80 USD means-tested (2013);
6	**Kazakhstan**	1998	2004	2013 – Consolidation of 10 private pension funds into the public pension fund (UPF); • Implementing PAYG DB financed by state's budget and managed by the National Bank of Kazakhstan;	2013 - Reversal of privatization and intriduction of 0 Pillar: Basic Social Pension (BPP) (unconditional, universal pension payment). The zero pillar consists of the basic social pension (BSP). All citizens who have reached retirement age receive a BSP. The BSP is an equal amount for all, regardless of work experience and salaries.
7	**Latvia**	2001	2009	• 2009 - Individual account contribution reduced from 5.5% to 1.5%; • In 2016 after stabilizing - gradual increase to 6%; 1st pillar diminant - NDC scheme.	2014 – minimum income level of 40% of the median income 71 – 109 EUR depends in contribution period; 2017 – basic pension guarantee of 64 EUR a month;
8	**Lithuania**	2004	2009	2009-2019 Downsizing of ondividual accounts; 1st pullar dominant - point scheme.	Insurance as part of the point system by contributions;
9	**Macedonia**	2006	2011	Contributions to mandatory individual accounts reduced from 7.42 per cent to 5.25 per cent and strengthening the first pillar.	
10	**Poland**	1999	2014	2014 - Terminating indivudal accounts and transfer to ZUS;Transfer all individual accounts back to social security PAYG and mandatory public NDC; Option to voluntary contributions to private funds;	Pension funds must ensure that returns fall within a band that is defined as the greatest of 4 percent points below the weighted-average real rate of return over the previous 12 months and 50% of the weighted-average return; Available for men 65+ and for women 60+. In addition, a means and pension-tested benefit is provided; Financed from public funds;
11	**Romania**	2004	2009	2009-2017 2017 - government reduced and froze contribution rates to 2nd individual account pillar.	2012 -a guarantee fund to protect the second and the third pillar savings was created;
12	**Ruusia Federation**	2002	2012	Contributions to individual accounts are diverted to social insurance 1st pillar dominant - NDC scheme	Basic pension indexed to average wage.
13	**Slovakia**	2005	2008	2008-2015 Downsizing of individual accounts. 2013 - Contribution rates were reduced from 9% to 4%, since 2017 increase by 0.25% up to 6% in 2024;	2009 - Pension fund management companies are required to guarantee a zero percent rate of return every six months;
14	**Slovenia**	1999	2012	Implement PAYG DB pension system. No mandatory 2nd pillar;	2012 - Social redistribution laws. Solidarity and minimum pension

Source: Author's elaborations based on: ILO (2019); OECD, 2019; ISSA country reforms database (2019); Nacyk and Domonkos (2016), European Commission (2015,2018), Marcinkiewicz, 2016.

V. The Transition to a Mix Pension System: The Inherent Socio-Economic Anomaly

"...the social effects of transforming a mature pension system into a system of individual accounts may be substantially different than the social effects of the initial choice between a public defined benefit system and individual accounts, and the differences between a transformation and an introduction must be taken into account."

(Orszag and Stiglitz, 2001)

5.1. Introduction and Literature Review

As studied in the previous chapter, the privatization wave of pension systems during the 1990s and early 2000s met the outbreak of the financial crisis in 2008. The financial and economic crisis was a wake-up call in that it highlights the uncertainty of retirement income derived from private-capitalized pension plans (Bohn, 2011). Indeed, some people with defined contribution (DC) pension plans saw their accumulated pension saving dwindle because they were heavily exposed to risky assets (Chen et al., 2014). Negative accumulation in capitalized pension funds have been recorded in these days on global markets due to the Covid-19 pandemic financial crisis. Consequently, financial risks and systemic shocks may diminish the apparent advantage of high return in modern funded-capitalized pension systems. According to recent literature, there is doubt about the ability to preserve adequate benefit levels in old age based on the capitalized scheme (Ebbinghaus, 2019; Grech, 2018).

DC plans and funded retirement schemes are already the main source to finance retirement in Latin America and Central East Europe (CEE) countries and they are rapidly expanding in other countries (Grech, 2018; OECD, 2019). On one hand, that trend was encouraged by the World Bank and other financial institutions, advocating transition toward funded design of pension system (The World Bank, 1994). On the other hand, that process is accompanied by continuing literature debate on the optimal mix pillar design (Barr & Diamond, 2009; Fultz & Hirose, 2019; Miles, 2001).

This chapter belongs to this emerging strand, which follows in the footsteps of Merton (1983). Merton (1983) initially addressed the unfunded pillar as a 'quasi-asset', which has diversification effect on pension system.

This composition departs from the literature by capturing life cycle risk sharing process among different pension participants. While optimizing pension pillar's sizes, we take into consideration the balance between providing adequate pension benefits in old age and the contribution burden during the working phase. At the same time, the constraint of keeping pension system design actuarially balanced is valid. In particular, one may wonder how low-earning cohorts can benefit from stable and adequate old age benefits while, in parallel, participants from high-earning cohorts can benefit from the same pension system from high exposure to the capital market.

The main argument for funded pension system in the literature comes from the inefficiency of PAYG schemes in aging environment. The implicit rate of return of the unfunded PAYG pension system is equal to the growth rate of aggregate wage income, which is lower than the real rate of interest (Aaron, 1966). Investment in funded systems would ceteris paribus yield higher returns than in unfunded systems. The economic cost of unfunded pensions would unequally be borne by younger workers.

The academic literature has already focused on mixing pension systems in the past years. Merton (1983) initiated the illuminating insight that a mix of funded and unfunded pension pillars may be complementary due to diversification. By that, Merton (1983) was the first to address the unfunded pension system as a 'quasi-asset', whose implicit return equals the growth of the wage base or GDP per capita. According to finance theory, exposure to such an asset can be welfare depending on the correlations between its return and the market (Markowitz, 1991).

Persson (2000) provides a brief and verbal discussion of this idea and presents a simple numerical illustration based on Swedish data, which indicates that the PAYG system may indeed hedge parts of the risk on a portfolio of stocks and/or bonds. Persson does not offer any formal analysis. However, Dutta et al. (2000) offer a simplified formal portfolio choice approach using a static mean variance framework. They show that in that framework mix pillars of funded and unfunded pensions is desirable because it enables risk diversification. They complement the analysis by considering the desirable combinations of bonds and equities in the funded pillar. Masten & Thorgesen (2004) and De Menil et al., (2006) further investigate analytically the optimal pillars size of unfunded PAYG, funded pillar, utilizing over-lapping-generation (OLG) model with two periods, and identify conditions under which a mix of funded and unfunded pension systems is optimal. Knell (2010) derives the optimal portfolio mix with an OLG model, when people care about their consumption relative to a reference group. According to these papers, risk considerations might change the relative attractiveness of funded and unfunded systems. In other words, more funding will result in an efficiency loss when individuals cannot insure themselves against wage shocks.

Masten & Thorgensen (2004) derive analytical formulas for the optimal size of the PAYG and the optimal magnitude of the funded pillar in the stock market. They investigate the optimal split between a PAYG pillar and a DC funded pillar in the context of two OLG

model with wage income, the population size and the equity return as the risk factors. Unlike Dutta et al., they do not consider a static but rather a dynamic setting with a two period model and analyze distinct risk concepts.

De-Menil et al. (2006) and Knell (2010) are most closely related to this research's approach. They use a two-period OLG model with exogenous interest rates and wage, where individuals are assumed to take optimal saving decisions and where there exist a purely PAYG public pension system. The authors analyze the determinants of the optimal saving rate (into the funded pillar) and the optimal contribution rate (to the unfunded pillar) in the framework of the theoretical model.

Bohn (2011) relates optimal funding to the comparison of taxpayers' costs of funds with the return on pension assets. He finds zero funding is optimal as taxpayers' borrowing costs are larger than the pension funds' return on their assets. The presence of legal ambiguities and defaults risks may warrant some funding.

Using a numerical model, Miles (2001) considers the optimal split between funded and PAYG programs. Contrary to our paper, he focuses on intergenerational redistribution of various individual risks and disregards risks to aggregate labour income and population growth. Shiller (2003) discusses intra-generational risk sharing as well as international risk sharing by means of social security and alternative institutions. He does not focus on the split between funded and PAYG program, however.

Ebbinghaus & Neugschwender (2011) analyze the public-private mix and income inequality of current pensioners in a cross-national setting. Study of European countries focused on recipient rates of private pension income along the income distribution, and the importance of an income mix – private and public. It shown that in a multi-pillar system, where private pension income was quite relevant in the income mix as a result of the limited role of the public first-pillar scheme, market inequalities were similarly reproduced like in purely Bismarckian contribution-based systems.

Other papers quantify the welfare gains from intergenerational risk sharing using a technical variation of OLG models and calibrate them to a specific economy (De Jong & Ponds, 2011; Boelaars & Mehlkopf, 2018). Alonso-Garcia & Devolder (2016) study the cohort's optimal mix between funded and unfunded pension schemes and whether there are diversification benefits for the specific context of a notional defined contribution scheme with a constant contribution rate. Bouhakkou et al. (2020) derive the optimal sizes

of pension pillars while considering a mean-variance approach for a sample of eight OECD countries. These papers point that welfare gains are sensitive to risk sharing potential between different age cohorts, labor market and risk aversion. In most cases, a mix system is desirable with a large magnitude of the PAYG pillar.

In contrast to other papers, here the model does not attribute the individual as a represented agent of the pension system. The analysis allows differentiation in wage levels across earning cohorts while optimizing the sizes of pension system's pillars and attribute the financial relations among earning cohorts in the pension system.

The study constructs an OLG model with three times periods, in which the pension system is assumed to collect contributions that are used for a dominant funded pillar and an PAYG unfunded public pillar. By considering the individual's risk appetite and his consumption preferences across his life cycle, we compute by Monte-Carlo simulations the optimal contribution rate to the pension system and the percentage of total contribution that should be invested into the funded pillar. Such a model enables exploring combined solutions in the first and second pillars for adequate old age benefits under fiscal constraint.

The model is calibrated to the Israeli pension system as a representative of a small open developed OECD country. Israel is a unique case study in the pension landscape because it implements a nearly pure DC pension scheme with continuous trends of pension market capitalization (Giorno & Adda, 2016; Spivak et al. 2017).

This study innovates by revealing a socio-economic anomaly in the design of mixed pension systems in favor of high-earning cohorts at the expense of economic loss of low-earning cohorts. This shows that though the level of total contribution rates and funded share are generally optimal for high-earning cohorts, this level does not optimal for low-earning cohorts. It is identified that the anomaly's effect is most significant in a market characterized with high income-inequality level.

It is found that for risk-averse individuals, the optimal degree of funding is negatively correlated to asset returns' volatility and positive correlated to earning decile level. The neglect of risk and individual's current earning levels will thus overstate the contribution level and funded percentage from the total contributions. Moreover, even in an economy

with highly developed private pension market and with high average of rate of return, it is optimal that the pension system contains a sizeable unfunded pillar.

Because the anomaly revealed is based on intra-generational balance, we find the minimum pension guarantee, as a risk-sharing instrument, that may re-balance the pension system. Such conclusion will be find in the continues of this dissertation in other angels. Here it is shown that implementing minimum pension guarantee, financed by intra-generational method, may improves utility values to all earning cohorts, while finding the path where different earning cohorts can benefit from the same mix pension system. We mention here the minimum pension guarantee wave in many Continental Europe's countries (OECD, 2019). According to Ebbinghaus (2019), minimum pension guarantees are an integral part of the sustainability components for adequate pension system in the era of funded pension schemes.

One area of research that is particularly relevant in this context concerns the issue of alleviating poverty and income inequality. The prevention of old age poverty is among the central targets of a well-designed pension system (Barr, 2006; Grech, 2018). The conceptualization of minimum pension guarantee used in this composition clearly captures the notion of such a poverty and social targets as an integral part of the pension system rolls.

The chapter is structured as follows. In the next section, an OLG model is introduced and derive solutions for the optimal design of the pension system in this framework. Section 5.3 contains the calibrated version of the model. Section 5.4 estimates the optimal contribution rate and the optimal share of funding, using Monte Carlo Simulation on the model's results. Section 5.5 discusses the practical consequences of the transition to a more funded pension scheme and reveals the socio-economic anomaly of capitalized pension design. We argue that a minimum pension guarantee implemented in the form of intra-generational risk sharing stabilizes the mix pension system and the different interests of earning deciles with no fiscal expenses. Section 5.6 concludes and makes suggestions for further research.

5.2. Model Set-Up

The economy follows the World Bank (1994) pension model and includes two main pension pillar[22]. The first pillar pays a pay-as-you-go (PAYG) social-security benefit and a second pillar formed by privately capitalized and fully funded fund that provides retirement benefits. The model employs a simple overlapping generations (OLG) model to characterize optimal pension pillars sizes. In each period, a new generation of unity mass is borne. The model includes three major life periods cycle frameworks as in Knell (2010) and Chen et al. (2014). Individuals work during the first two parts of their life while they are retired during the third part.

5.2.1. Consumers

We consider an economy populated by consumers who start working at the age of 21 ($s = 0$). The individual works during two period of 23 years each one, retire at the age of 67 ($s = T_R$), live in the third period another 23 years and die at the age of 90 ($s = T_D$). This may address the common path of modern working life at developed countries (The U.N: World Population Aging Report, 2019).

During the first 46 years, consumers work and earn a real labor income, W_t[23]. We allow for differentiation in wage levels across earning deciles. From this wage, the individual contributes social security tax and contributes to funded pension fund. All individual's savings channeled to a private pension fund. This assumption is not unrealistic, as it may seem as in countries with large funded pension pillars, like the Netherlands and Sweden, we tend to see relatively little free savings outside those pillars (OECD, 2019).

During retirement period ($T_R \leq s < T_D$), the individual does not work anymore and his consumption, C_{t,T_R}, is given by the benefits both from public PAYG social security and

[22] The third pillar is voluntary savings in funded funds. For simplicity, we assume that the second pillar includes the third one.

[23] All variables throughout this paper are expressed in real terms. It is assumed that wage inflation is identical to price inflation.

revenues from his private defined-contribution fund, these benefits together denoted by P_t. The consumption of generation t in time s can be described as:

$$c_{t,s} = \begin{cases} W_{t,s}(1-\tau), & during\ work\ period \\ p_{T_R}^{U} + p_{T_R}^{F}, & during\ retirement \end{cases} \qquad (5.1)$$

Individuals have constant relative risk aversion (CRRA[24]) utility function defined over a single nondurable consumption good. Let us define δ as the discount factor, α measures the curvature of the utility function or risk aversion level, then the individual's preferences are defined by[25]:

$$U_t = \sum_{s=1}^{T_D} \delta^{s-1} \frac{1}{1-a} (C_{t,t+s-1})^{1-\alpha} \qquad (5.2)$$

Where $C_{t,s}$ is the consumption level of generation t in period s.

Analyzing the relative attractiveness of funded and unfunded pensions systems, we compute the optimal size of the pension system contribution (τ^*) and the optimal share of the funded pillar (γ^*). Specifically, the individual maximizes the utility function:

$$U_t = \sum_{s=1}^{s=2} \delta^{s-1} \frac{1}{1-a} \left(c_{t,t+s-1}\right)^{1-a} + \delta^2 \frac{1}{1-a} \left(c_{t,T_R} - mbp_{t,T_R}\right)^{1-a} \qquad (5.3)$$

Where $mbp_{t,s}$ is the level of government guarantee for generation t in period s, if implemented. Generally, the guarantee can dress many forms, such as relative rate benefit or constant benefit. This model attributes to the general case of old age target income. In other words, the guarantee benefits if the individual's total old age benefits summed to less than a specified social threshold. here this threshold is defined at the poverty line (60% of median income, by the definition of the U.N.

[24] In the literature it is common to use the coefficient of relative risk aversion $RRA \equiv \frac{U''(c)}{U'(c)} * c$ for the utility function of the form

[25] For α=1, the utility function becomes $U_t = \ln c_t^y + \delta \ln c_{t+1}^o$

5.2.2. The Government

The government faces an exogenous and constant amount of primary spending $\bar{G} > 0$. It is assumed that a benevolent planner takes both the optimal portfolio perspective into account and weights the interests of current and next-period tax payers, when deciding on the size of each pillar. The social planner preferences, as described by the social welfare function capture the individual preferences, so that taxpayers have no incentive to undo the impact of the decisions taken by the planner.

We constraint the model by avoiding fiscal expenditures or tax rate increase to finance social security benefits. Additionally, it is assumed that government keeps debt/GDP ratio fixed and unchanged.

5.2.3. Pension and Wage

We calculate expected utility under the assumptions that all rates of returns are uncertain (ex-ante expected utility).[26]The parameter - g_t describes the evolution of the wage, W, which follows a Brownian motion, in the form:

$$\frac{dW(t)}{W(t)} = dg_t = \mu_g dt + \sigma_g dB^W(t) \qquad (5.4)$$

Where μ_g stands for the constant expectation of the instantaneous variation rate in the wage, σ_g its constant standard deviation and B^W a standard Brownian motion. g_{t+1} is the growth of labour income or the return on human capital. The first phrase is a constant drift and second phrase is the volatility drift, respectively.

The individual pays a fixed contribution rate, τ. From that contribution, a share of γ is being invested in private funded pillar and a share of $(1-\gamma)$ finances the unfunded pillar or the public social security. The pension benefit for generation t in the retirement period is denoted by:

$$p_{T_R} = p^F_{T_R} + p^U_{T_R} \qquad (5.5)$$

[26] See Hassler and lindbeck, 1997.

Here, p_{t+2}^{F}, p_{t+2}^{U} represent the funded fund and social security, PAYG, respectively.

We allow correlation between GDP per capita and the fund asset return rate, thus:

$$dB^{W}(t)dB^{A}(t) = \rho_{w,A}dt \qquad (5.6)$$

With the condition $1 \geq \rho_{w,A} \geq -1$.

We do not distinguish between the sources of contributions. We assume that employers' pension and social security contributions are imposed on employees' wage (differed wage).

We assumed a constant social security benefit base on residency and time of contributions. In each period, the working population's contributions are equal to total benefit payments to retirees. Consequently, the public un-funded pension benefit is determined by the balance budget condition of:

$$\varphi\tau^{U}\{\bar{W}_{t+1}N_{t+1} + \bar{W}_{t+2}N_{t+2}\} = p_{t}^{U}N_{t} \qquad (5.7)$$

Here, τ^{U} is the contribution rate to social security, N_t is the size of the generation born in period t, p_t^U is the unfunded pension benefits paid to generation t in the period of T_R. Term φ is the constant social security's old-age benefits/contribution ratio. The residual share $(1-\varphi)$ of contributions finance other social expenses such as Medicare, means-tested, minimum pension guarantee, disability benefits, unemployment benefits and other social expenses.

Under the assumption of a constant population growth, ni_t, the contribution $\tau^{U}\, w_{t,s}$ paid by generation t in time s, thus, have a return of: $g_{s+1} = (W_{t,s+1}/W_{t,s})$-1.

We assume that the real PAYG rate of return, g_{s+1}, is equal to the growth rate of wages or the change in the GDP per capita. In addition we assume the economic principle of Aaron-Samuelson (Aaron, 1966; Samuelson, 1956)) that notional interest rate or the population growth rate is set equal to the growth rate of wages: $ni_t = g_t$. Hence, the unfunded benefit at retirement can be describes in the reduced form of:

$$P_t^U = 2\varphi(1-\gamma)\tau\overline{W}_{t+2} \qquad (5.8)$$

The funded-capitalized pillar is a private collective defined-contribution (DC) system with a fixed contribution rate. Individuals start with zero initial asset holdings. The individual adds the fraction of γw_t to his accumulations during the working phase, which is invested in a constant portfolio mix of financial assets (equities, bonds, etc.). This accumulation earns an average annual rate of return of: r_t. This rate of return also follows a Brownian motion in form of:

$$dr_s = \mu_r dt + \sigma_r B^A dt \qquad (5.9)$$

Here, r_t denotes the continuous rate expectation of the asset instantaneous return rate, σ_r its constant standard deviation, and B^A standard Brownian motion. The first phrase from the left is a constant drift and second phrase is the volatility drift.

The funded pillar is equal to the accumulated capital from the contributions to the private collective defined-contribution fund in every working period until retirement (T_R). The real capital is given by:

$$p_t^F = T^f \tau^F \sum_{s=t}^{T_R} W_{t,s} r_t^{T_R - t} \qquad (5.10)$$

Here, T^f is the effective tax rate on old-age funded fund's benefits. Funded fund's liabilities are based on current and future retiree's benefit payments. The funded benefit can be described more specifically as:

$$p_t^F = \gamma\tau W_t r_{s+1} r_{s+2} + \gamma\tau W_{t+1} r_{s+2} \qquad (5.11)$$

Due to the assumption that there is only one period of retirement, it is not necessary to specify how the pension capital of the funded pillar is annuitized, i.e. transformed into annual pension installments.

5.2.4. Minimum Pension Guarantee

As the necessity of the guaranty will be analyzed in the next sections, here the minimum pension guarantee is considered as integrated part of the pension system. The question of financing the guarantee is a risk-sharing aspect, as it can be financed in variety of ways, reflecting different risk-sharing approach (Grande & Visco, 2010). The guarantee cost for the individual from generation t at retirement is summed to:

$$Gurantte\ Cost = F.V\ (poverty\ line) - (p_t^F + p_t^U) \qquad (5.12)$$

Naturally, one can suggest to finance the guarantee by the residual of contributions to social security (derived from phrase 5.7).

$$Social\ Security's\ Other\ Utilizations = 2(1-\varphi)\big(\tau(1-\gamma)\big)\overline{w}_{t+2} \qquad (5.13)$$

Indeed, in relate to the definition above, the minimum pension guarantee can be considered as a substitute for social means-testing and other social plans in old age. However, this residual finance other social utilization such as unemployment compensation, child-breaks benefits, disability compensation, etc. is according to the state social policy. Hence, it might not be adequate to finance the pension guarantee. Regardless, the solutions for the guarantee finance varies from intergenerational risk sharing, such as increasing contributions to social security, to intra-generational redistribution or to any mix between these poles.

5.3. Model Calibration and Simulation

5.3.1. Model Calibration

The model market's parameters are calibrated according to the Israeli pension market. Israel is as a representative OECD country with a highly developed private pension market (Giorno & Adda, 2016). Israel has implemented several radical pension reforms since the 1990s and is one of the few countries to globally implement a nearly pure liberal

DC pension scheme across the second pillar (Spivak and Troitzky, 2013; Spivak et al. 2017; Swirsky et al. 2020).

The aggregate wage income and the PAYG asset return are approximately set by the GDP per capita growth rate. For calibration, we make use of a geometric average of GDP per capita in Israel from 1994 to 2019. Here, $\bar{g}_t = 1.6\%$ and $\sigma_g = 2\%$; these values correspond also to the average OECD countries (OECD, 2019).

Calibrating the second pillar, let us set the gross annual rate of return in private pension to be 4.24%. That rate is common to the actuarial calculation for the private pension funds in Israel (Spivak & Troitzky, 2013). The Israeli portfolio is very close to the average OECD members' portfolio, which includes 40% debt and 30% equities. Administrative costs are considered to be an integrated part from the rate of return and unignorably. This study reports the private funded fund rate of return in net values. It is common to valuate these costs as 0.5% of accumulated assets in private funded funds while assuming that the costs for running the unfunded system are negligible (see OECD report, 2019; Spivak et al., 2017). Accordingly, the net second pillar's annual average rate of return is summed to 3.74%.

Another factor that could influence the results is the correlation between average funded pension return and GDP growth rate. The estimations of coefficient of correlation are not very reliable. Masten & Thorgensen (2004) quote a number of papers that have studied the correlation between domestic stock market returns and GDP growth—they have come to rather mixed and inconclusive results. According to the World Bank (2019), for 19 developed countries between the years 1900-2011 there is a correlation between real returns on equities and growth of real per capita GDP of -0.32. Consistent with Knell (2010), we calibrate this value in the stochastic model.

When investigating pension scheme with minimum pension guarantee, we define level of guarantee, $mbp_{t,t+s-1}$ as the level of the poverty line. The poverty line is determined as 60% of the median income, as accepted by the WB definition. According to Swirsky et al. (2020), we consider a lag of 0.6% between GDP per capita and poverty line index, as the poverty line is affected from the median income and developed income inequality. Israel is considered one of the most unequal economy in the Western World (OECD,

2019), hence the median income and the poverty line are relative low. Base on the statistical bureau report, we set the poverty line at 19,307$ a year.

We set $a = 3$ for the curvature of the utility function. This is close to the values chosen in related literature (Masten & Thogensen, 2004; Knell, 2010; Chen et. al., 2014). Based on the last 2 decades in Israel, we calibrate the time preference coefficient as $\delta = 0.63$, which corresponds to an annual discount rate of 2% (CBS, 2020; OECD, 2019).

Integrating social targets to the pension system, we define the guarantee at the poverty line. The poverty line is defined as the minimum level of income that is deemed necessary to in order to achieve an adequate standard of living. Institutions like the OECD and the EU specify poverty as a threshold of 60% of national median equalized household income. Table 5.1 summarizes parameters calibrated in the simulation. The effect of the guarantee on replacement rates, utility change and calculating the guarantee cost we calibrate the simulations with different earning deciles according to the Israeli market in 2020 (CBS, 2020).

Table 5.1: Parameters calibration in the simulation.

Description	Symbol	Value
Risk aversion coefficient	a	3
Time preference (periodically)	δ	0.63
Wage bill poverty line discount rate		1 %
Net real funded pension return (annually)	r_t	3.74%
Unfunded pension return (annually)	g_t	1.6 %
Unfunded pension return S.D (annually)	σ_g	2%
Correlation between GDP per capita and funded fund rate of return	$\rho_{g.r}$	-0.32
Funded fund tax rate	T	20%
Social security Benefit / Contribution ratio	φ	60%

Annual Poverty line in current price	19,307$

5.3.2. The Simulation Methodology

In the first part of the simulation, we derive the optimal shares of the contribution rate, τ and the funded share from contribution, γ by optimizing the individual's utility function for a wide variety of wage levels. We assume ex-ante risk sharing (Hassler & Lindbeck, 1997) in which the initial wage is fixed and all other returns are uncertain while calculating the expected utility. The model includes two variables of uncertainty: the private pension fund's rate of return and GDP per capita growth rate. We model the joint distribution of outcomes between the returns of the two pillars[27] (see the appendix for a detailed calculation). In order to assess the relative attractiveness of funded and unfunded pension pillars, we use the measure $V_t \equiv \frac{U_t}{w_t^{1-a}}$ across the simulations (method taken from Knell, 2010). This normalized measure is independent of initial wage level of generation t; it only depends on the stochastic properties of the growth rates of wages and asset prices.

For each simulation run, three random data points are drawn for each pension pillar and for each time period along the individual life cycle. For a given set of simulated data points, we evaluate the lifetime utility (or more precisely-V_t) for various values of τ and γ. The optimal values of τ and γ set the utility function to a maximum level. The reported results are based on 2,100 Monte-Carlo simulations. For γ^* and τ^* that maximize V_t, we seek values between 0 and 1 with a step length of 1/100.

After calculating variety values of optimal pension pillars sizes for different wage levels, in the second part of the simulation, we fix the optimal values of the pension's pillar sizes for the median income individual. We then simulating the OLG model with minimum pension guarantee, while calibrating wage levels according to current Israeli earning deciles (CBS, 2020). The simulation enables us to evaluate the guarantee's influence on

[27] Real equity market returns tend to be negatively correlated with real per capita GDP growth. This result goes against simple intuition, but as explored in detail in Ritter (2012), there are in fact sound reasons for that result

both the financing deciles and benefiting deciles in terms of the change in utilities level and average replacement rates.

5.4. Main Findings

5.4.1. Optimal Pension Pillar Sizes

Figure 5.1 describes the optimal contribution rate and the funded share from contributions as function of annual income level, in a model of mix pension pillars with no minimum pension guarantee.

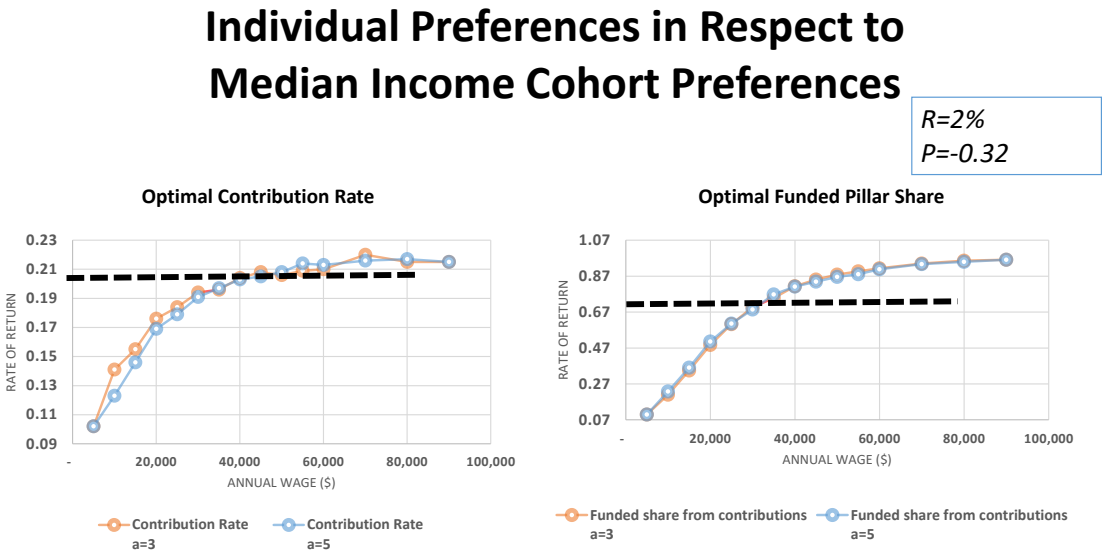
The simulation results confirm that the optimal pillars share depend on wage level and sensitivity to capital markets (Boelaars & Mehlkopf, 2018; Beetsma, Romp & Vos, 2013). While income increases, the individual's contribution preference converges with a concave path to a ceiling. In our example, the optimal contribution rate converged to 22% from income. The disposable income's influence during the working phase results in low earners' preference for low contributions rates. The contribution rates for the middle-earning cohorts reflect the balance between present consumption and saving for old age. The high-earning cohorts prefer large savings because they have enough resources for present consumption and prefer to enjoy the second pillar's rates of return. Figure 5.1 shows the changing risk aversion parameter,a, with a negligible change in optimal values. The results confirm Bauhakkou et al., (2020), Knell (2010), De Menil et al., (2006) where a larger PAYG pillar is preferred in case of more risk aversion. In contrast to Bauhakkou et al., (2020) which calibrate their model with other OECD countries for longer periods, here the results are not sensitive to a change in the correlation value. However, in the case of calibrating the correlation coefficient with +0.32, there is a slight preference for the funded fund because the diversification effect of the PAYG is weaker.

The optimal funding share is more volatile, as function of income, than the contribution rate. The results confirm Knell (2010) as for any risk aversion level, there is a positive correlation between the individual's income and his funding rate preference. Naturally, high-earning cohorts would prefer to save more for retirement and benefit from high returns. In this aspect, we note that high-earning cohorts could diversify their funded funds' financial risk within their own private portfolios. The unfunded pillar has less volatile returns and consequently higher insurance value when the participant's risk

aversion level is higher or the income level is lower. This effect of diversification also demonstrated in Masten & Thorgesen (2004).

When designing a pension system, the central planner determines a single value of contribution rate and single value of funded share from contribution. When choosing the median income as a reference point, the optimal values[28] are 0.2 for τ^* and 0.77 for γ^* (marked in black line in Figure 5.1). These values are closer to the higher earning cohorts' optimal values than for the lower earning cohorts' optimal values. In other words, by participating in funded pension system, low earning cohorts pay higher economic cost than high earning cohorts do. Choosing the average income as a reference point leads to a larger gap in relation to low earners' optimal values (τ^*=0.2, γ^*=0.81).

Figure 5.1:



Source: Author's Elaborations

5.4.2. Minimum Pension Guarantee

We next explore the implementation of a re-balance mechanism among earning cohorts' interests in the form of a minimum pension guarantee. We fix the contribution rate and

[28] Actually, these results are quiet close to the rates in reality on the Israeli pension system (27% contribution rate and 72% funded fund proportion).

the funded share at the optimal values for the median income participant. We impose a minimum pension guarantee and re-calculate the utility change and the replacement of different earning deciles.

Table 5.2 reports the guarantee's effect on old-age benefits. For simplicity, the income of each earning decile is normalized to unity and translate the guarantee's costs to a percentage of the average wage. In general, the replacement rates in lower deciles are relatively high with or without implementing minimum pension guarantee (see column C). The reason for this is that at low wage levels, the first pillar's universal benefit has a higher weight in the total pension allowances.

According to column C, the pension guarantee is paid to the first four deciles. Naturally, lowest decile has the significant portion of the guarantee with 31% of average wage (AW) at retirement and the fourth decile with only 5%. Based on pension pillars' expected returns, the total cost of guarantee benefits to entitled cohorts is summed at retirement to 64% from average periodic wage. The respective guarantee cost in period 1 from working phase summed to 20% from average periodical wage after discounting the total benefits by the expected funded return (see column D).

We next explore the implementation of a re-balance mechanism among earning cohorts' interests in the form of a minimum pension guarantee. We fix the contribution rate and the funded share at the optimal values for the median income participant. We impose a minimum pension guarantee and re-calculate the utility change and the replacement of different earning deciles.

Alternatively, this dissertation suggests financing the guarantee from an intra-generational perspective. We treat the guarantee as a 'collar' (Grande & Visco, 2010; Feldstein & Rangueleva, 2001). However, we expand the expression 'collar' to the socio-economic meaning considering both pension pillars in absolute monetary terms. Practically, high-earning cohorts with high pension benefits finance the guarantee for low-earning cohorts from the same generation. We explain the economic logic via the 'compensation' that low-earning cohorts received from high-earning cohorts for extensive risk taking and lower consumption during the working phase. That comes to realize in the simulation's results with sub-optimal contribution rates and funded shares.

Here, we define high earners as individual whose wage is above the average wage. Our economy is calibrated to the Israeli data and we refer to the three highest deciles. We distribute the cost unequally on the three highest deciles so that the designated contribution in period 1 will be progressive by decile: There are higher contribution rates for the higher decile (column E). These designated contributions are reduced from the accumulation/entitlement for the public pension pillar so that high earners meet the guarantee cost by reduced old age benefit from the first pillar at retirement. The central planner might choose different burden distributions according to income dispersion or social policy (Feldstein & Ranguelva, 2001; Gale et al., 2016). Obviously, part of the guarantee's cost can be financed through the residual contributions for social utilizations (see phrase 5.10 above).

Table 5.2:

Minimum Pension Guarantee: Benefits and Costs

A	B	C	D	E
Earning Decile	**Income dispersion (% from AW)**	**Guarantee Value at retirement (% from expected AW)**	**Guarantee Cost at period 1 (% from AW)**	**Contribution at period 1 to finance the guarantee**
1	15%	30%	Cost Burden Distribution	
2	34%	18%	8: 10%	
3	46%	10%	9: 30%	
4	56%	4%	10: 60%	
5	66%			
6	79%			
7	98%			
8	131%		2%	1%
9	188%		6%	3%
10	286%		12%	4%
Total		**62%**	**20%**	

Wage and guarantee cost are normalized to unity in each earning cohort

Source: Author's Elaborations

Table 5.3 summarizes the main effects on earning deciles while implementing a minimum pension guarantee. Low earning replacement rates improve significantly with a parallel moderate decrease within this rate for the high-earning cohort (see columns B and C). The average economy's replacement is improved by 35% (see column D).

We also analyze the guarantee's significance from the individual's perspective. Column E in Table 5.3 reports the change of utility per earning decile. While implementing a minimum pension guarantee, we report an improvement in the normalized utility in every

decile. This also includes high earning deciles. This implies that the insurance effect is higher than the effect of total benefit reduction in old age for the high earning deciles. According to the sensitive analysis in Figure 5.2, when the volatility increases in the funded rate of returns, the significance of the guarantee increases respectively (the level of blue line in contrast to the green line).

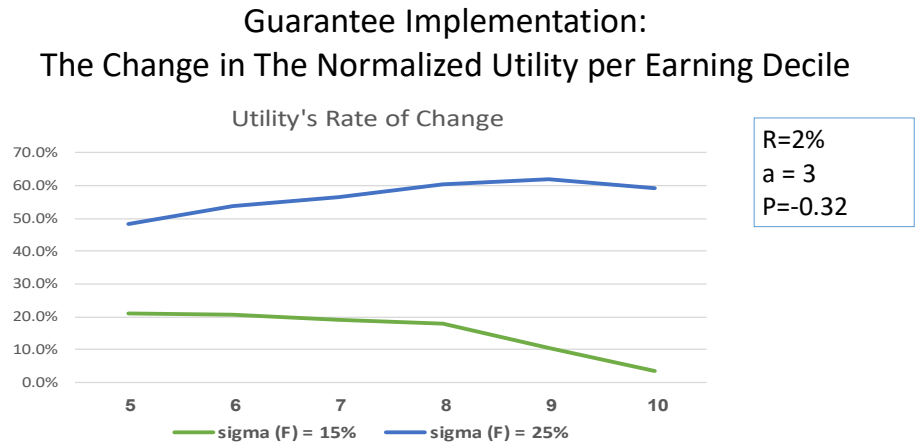
Table 5.3:

Minimum Pension Guarantee: Effect on Old-Age Income

A	B	C	D	E
Earning Decile	Replacement Rate Before Inposing the Guarantee	Replacement Rate After Imposing the Guarantee	Rate of Change in Replacement Rate	Rate of Change in Utility Level
1	86%	238%	176%	10%
2	67%	107%	61%	18%
3	63%	79%	27%	20%
4	61%	66%	9%	21%
5	59%	59%	0%	21%
6	58%	58%	0%	21%
7	56%	56%	0%	19%
8	55%	53%	-2%	18%
9	54%	52%	-4%	10%
10	53%	51%	-3%	3%
Average	72%	77%	7%	16%

Source: Author's Elaborations

Figure 5.2:



Source: Author's Calculations

5.5. Discussion

These results analyzed the optimal pension system's pillar sizes and reveal an inherent social-economic anomaly, in favor of high-earning cohorts at the expense of low-earning cohorts. This anomaly is realized by the unequal economic costs paid by the different cohorts to sustain the mixed pension system via the following reasons:

- The curvature of optimal values graph - The optimal values corresponding to the median income[29] are much closer to the preferences of high-earning cohorts than for low-earning cohorts. We find convergence of optimal funding fund portions and the contribution rates to a cap (see Figure 5.1), due to the participant's financial risk aversion in both unfunded and funded pillars. With higher income inequality level in the market, a larger portion of participants finds themselves with sub-optimal contribution rates and unwanted risk bearing.
- The tradeoff price - The importance of tradeoff between present consumption to saving is not equal among earning cohorts. For low-earning cohorts, the tradeoff might affect substantial consumption during working phase and retirement. Hence, the central planner should put more weight on considerations regarding the suboptimal values gap for pillar sizes for low-earning cohorts.
- Financial risk management ability - The economic cost of low earners is higher because they have lower abilities, resources, and knowledge to diversify financial risks in their personal portfolios than high-earning cohorts do. This is true even if the reference income point is determined at a lower level, which corresponds equally to high earning and low earning. For instance, high-earning cohorts can save through the third pillar, which generally includes tax reliefs and capital liquidity.

Confirming the conclusion regarding the risk sharing direction between workers and retires in Boelaars & Mehlkopf (2018) and Bohn (2011), we suggest an intra-generational minimum pension guarantee as a risk sharing mechanism to re-balance the pension system. In fact, one might link the anomaly discussed above to the 'externalities' theory (Arrow, 1970). In other words, strong earners who benefit from optimal contribution rates

[29] Clearly, the anomaly effect gets worsen when choosing higher values than the median income – such as the average values.

through the lifecycle can do risk management to his personal portfolio. By saving in the third pillar, such people 'compensate' the weaker participants. Those participants were obligated to those contribution rates, which is a consequence of suboptimal consumption/savings balance through their lifecycle. The compensation is in fact earning the entitlement to socio-economic benefit insurance at retirement.

The central planner might consider different financing methods for the minimum pension guarantee as a function of pension system design and social re-distribution considerations. For instance, if the first pillar is designed as a Notional Defined Contribution (NDC) style (such as in Italy, Poland and Sweden), then early contributions to finance the guarantee can be deducted also from the funded fund (2^{nd} pillar) or any mix between both pillars (Alonso-Garcia et al., 2016). The reason is that the NDC is close on its re-distributive mechanism to the funded fund (Barr, 2006) and has less redistributive roll; thus, one can consider both pillars to be a finance source.

Anyway, governments should consider early capitalizing financial resources for an adequate guarantee, utilizing the long period of working phase. Obviously, there is a need to lean on assumptions regarding poverty, returns, income dispersion etc. Naturally, the model will be more accurate when inequality level is relatively constant and the market is characterized with moderate market volatility of returns.

5.6. Conclusion

Pension capitalization reforms shift fiscal risk from governments toward the public in the form of financial and structural risk buckets (Barr, 2006; Ebbinghaus et al. 2019). Based on a simple OLG model, we map a socio-economic anomaly during the pension transition to a more capitalized one in which risks are not distributed equally across earning cohorts during pension transition. It is found that the optimal values of the median income are closer to the high-earning cohorts than low-earning cohorts.

This anomaly is practically realized in the market by obligating low-earning cohorts to a sub-optimal contribution rate and riskier investments that they would rather avoid. This composition shows how implementing a minimum pension guarantee can rebalance the multi-pillar pension system via an intra-generational risk-sharing mechanism. Low earning cohorts' replacement rates improve in tens of percent compares to negligible

effect on benefits and replacement rates of high earners, who finance the guarantee. Furthermore, when analyzing the earning cohorts' utilities, we point to a general utility level improvement due to the insurance component along the pension system. Surprisingly, this includes utility improvement also for high-earning cohorts, who finance the guarantee. Because of the 'put' option characteristic of the guarantee (Pennachi, 1999), the level of improvement increases when the volatility of returns across the funded fund is higher.

There is a vast literature on the issue of financing the guarantee (for e.g. Pennachi, 1999; Grande & Visco, 2010; Alonso-Garcia & Devolder 2016). Most of the literature recommends increasing the contribution during the working phase or imposing a rate of return collar (Feldstein and Ranguelova, 2001; Gale et al. 2016). However, considering the anomaly of optimal pillar sizes as revealed in the mix pension system, we suggest avoiding imposing higher contribution rates because it might prejudice private consumptions on low-earning cohorts. In the model introduced above, we levy the burden of the guarantee's cost on high-earning cohorts by reducing entitlements to the public pillar. We argue that this kind of financing compensates low-earning cohorts due to extensive risk taking and suboptimal pension design.

The model presented in this chapter could be implemented in countries with mix pension systems, as an alternative to public social transfers or means-tested, alleviating poverty and inequality in old age. Additionally, our model could raise the public awareness of the financial sustainability of the unfunded PAYG pillar to diversify financial risk in pension systems, especially for low earning cohort in society.

Further research is needed to demonstrate the conclusions in this composition to other market designs. For example, we could calibrate the OLG model to other economies with different pillar mixes. Alternatively, according to reforms in some European countries, such as Sweden, Poland and Italy, one should investigate risk sharing between earning cohorts within notional-defined-contribution (NDC) pension schemes. Another direction would be to study risk-sharing solutions to the contribution anomaly presented above, under different scenarios of Value at Risk and Stress Tests measures.

Appendix: Calculation of Multivariate Lognormal Distribution

For the simulation of return data, it is assumed that:

- $R \equiv 1 + r$
- $G \equiv 1 + g$

Which are jointly lognormal distributed with the following:

- $E(R) = 1 + \bar{r}$, $Var(R) = \sigma_r^2$
- $E(G) = 1 + \bar{g}$, $Var(G) = \sigma_g^2$

Given this information, one knows that the two variables

The procedure for simulating data points that possess these stochastic properties is the following:

a. We define random normally distribute points data for funded fund rate of return (r_t) and GDP per capita (g_t): ${r'}_t \sim N(0,1)$ and ${g'}_t \sim N(0,1)$.

b. We adjust g_t to correlation with r_t:

$$g_t'(corr.adj.) = {r'}_t * \rho_{g.r}^2 + {g'}_t \sqrt{1 - \rho_{g.r}^2} \qquad (4.17)$$

c. The bivariate lognormal distribution variables are specified as:

$$\tilde{R} = exp\left[\left(\bar{r} - \frac{\sigma_r^2}{2}\right) * T + \sigma_r {r'}_t \sqrt{T}\right] \qquad (4.18)$$

$$\tilde{G} = exp\left[\left(\bar{g} - \frac{\sigma_g^2}{2}\right) * T + \sigma_g * g_t^{\prime(corr.adj.)} * \sqrt{T}\right] \qquad (4.19)$$

d. From these, we calculate periodical stochastic rates if return:

- $r_t = \exp(\tilde{R}_t) - 1$
- $g_t = \exp(\tilde{G}_t) - 1$

Chapter 5 - References

Aaron, H. J. (1966). The Social Insurance Paradox. *Canadian Journal of Economics, 32*(3), 371-374. https://doi.org/10.2307/139995

Alonso-Garcia, J., & Devolder, P. (2016). Guarantee Valuation in Notional Defined Contribution Pension Systems. *ASTIN Bulletin, 46*(3), 677-707. https://doi.org/10.1017/asb.2016.21

Arrow, K. (1970). Political and Economic Evaluation of Social Effects and Externalities. In J. Margolis (Ed.), *The Analysis of Public Output* (pp. 1-30). National Bureau of Economic Research. Retrieved from https://www.nber.org/system/files/chapters/c3349/c3349.pdf

Barr, N. (2006). Non-Financial Defined Contribution Pension: Mapping the Terrain. In R. Holzmann & E. Palmer (Eds.), *Pension Reform: Issues and Prospects for Non-Financial Defined (NDC) Contribution* (pp. 57-66). Washington, DC: The World Bank. Retrieved from http://eprints.lse.ac.uk/2659/

Barr, N., & Diamond, P. (2009). Reforming pensions. *International Social Security Review, 62*(2), 5-29. https://doi.org/10.1111/j.1468-246X.2009.01327.x

Been, J., Caminada, K., Goudswaard, k. & Van-Vliet, O., (2016), Public/Private Pension Mix, Income Inequality and Poverty among the Eldery in Europe: An Empirical Analysis Using New and Revised OECD Data", Social Policy Administration, 51 (7)

Beetsma, R., Romp, W., & Vos, S. (2013). Intergenerational Risk Sharing, Pensions, and Endogenous Labour Supply in General Equilibrium. *The Scandinavian Journal of Economics, 115*(1): 141-154. https://doi.org/10.1111/j.1467-9442.2012.01732.x.

Boelaars, I., & Mehlkopf, R. (2018). *Optimal Risk-Sharing in Pension Funds When Stock and Labor Markets are Co-Integrated* (De Nederlandsche Bank Working Paper No. 595). http://dx.doi.org/10.2139/ssrn.3191817

Bohn, H. (2011). Should Public Retirement Plans be Fully Funded? J*ournal of Pension Economics and Finance*, 10(2), 195–219. http://doi.org/10.1017/S1474747211000096

Bouhakkou, L., Coën, A., & Folus, D. (2020). A Portfolio Approach to the Optimal Mix of Funded and Unfunded Pensions. *Applied Economics, 52*(16): 1733-1744. https://doi.org/10.1080/00036846.2019.1678728

Central Bureau of Statistics (CBS). (2020). Official site. Retrieved from https://www.cbs.gov.il/EN/pages/default.aspx

Chapman, C. (2020). How the COVID-19 Pandemic Exposes the Frailty of Social Protection in the US. *ORF Issue Brief, 352*. Retrieved from https://www.orfonline.org/wp-content/uploads/2020/04/ORF_IssueBrief_352_Pandemic-USSocialSecurityad.pdf

Chen, D., Beetsma, R., Ponds, E., & Romp, W. (2014). Intergenerational Risk-Sharing Through Funded Pensions and Public Debt. *Journal of Pension Economics and Finance, 15*(2): 127-159. https://doi.org/10.1017/S1474747214000365

Cui, J., Jong & Ponds, E. (2011). Intergenerational Risk Sharing within Funded Pension Schemes. *Journal of Pension Economics and Finance*, 10(1): 1–29. http://doi.org/10.1017/S1474747210000065

De Menil, G., Murtin, F., & Sheshinsky, E. (2006). Planning for the Optimal Mix of Paygo Tax and Funded Savings. *Journal of Pension Economics and Finance, 5*(1), 1-25. https://doi.org/10.1017/S1474747205002283

Dutta, J., Kapur, S., & Orszag, J. M. (2000). A Portfolio Approach to the Optimal Funding of Pensions. *Economic Letters, 69*(2): 201-206. https://doi.org/10.1016/S0165-1765(00)00271-8

Ebbinghaus, B., Nelson, K., & Nieuwenhuis, R. (2019). Poverty in Old Age. In *Routledge International Handbook of Poverty* (pp. 257-267). Routledge. Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:su:diva-175454

Ebbinghaus, B., & Neugschwender, J. (2011). The public-private pension mix and old age income inequality in Europe. *In B. Ebbinghaus (Ed.), The Varieties of Pension Governance : Pension Privatization in Europe* (pp. 384–422). Oxford Univ. Press. https://doi.org/10.1093/acprof:oso/9780199586028.001.0001

Feldstein, M. & Ranguelova, E. (2001). Individual Risk in an Investment-Based Social Security System. *American Economic Review*, 91 (4): 1116-1125. http://doi.org/ 10.1257/aer.91.4.1116

Fultz, E., & Hirose, K. (2019). Second-pillar pensions in Central and Eastern Europe: Payment constraints and exit options. *International Social Security Review, 72*(2): 3-22. https://doi.org/10.1111/issr.12201

Gale, w. & John, D., Kim, B., (2016), You Get What You Pay For: Guaranteed Returns in Retirement Savings Accounts, *Economic Studies.* The Brooking Institution.

Giorno, C., & Adda, J. (2016). *Improving the Pension System and the Welfare of Retirees in Israel* (OECD Working Paper No.1288). Paris: OECD Publishing. https://doi.org/10.1787/5jm0xf1fsqvf-en

Grande, G., & Visco, I. (2010). A Public Guarantee of a Minimum Return to Defined Contribution Pension Scheme Members. *The Journal of Risk*, 13(3): 3–43. https://doi.org/10.21314/JOR.2011.226

Grech, A. G. (2018). What Makes Pension Reforms Sustainable? *Sustainability*, *10*(8), 2891. Retrieved from https://ideas.repec.org/a/gam/jsusta/v10y2018i8p2891-d163868.html

Hassler, J., & Lindbeck, A. (1997). *Intergenerational Risk Sharing, Stability and Optimality of Alternative Pension Systems* (Working Paper Series No. 493). Research Institute of Industrial Economics. Retrieved from https://ideas.repec.org/p/hhs/iuiwop/0493.html

Knell, M. (2010). The Optimal Mix Between Funded and Unfunded Pension Systems when People Care About Relative Consumption. *Economica, 77*(308): 710-733. https://doi.org/10.1111/j.1468-0335.2009.00797.x

Markowitz, H. (1991). Foundations of Portfolio Theory. *The Journal of Finance*, 46(2): 469-477. http://doi.org.10.2307/2328831

Masten, E., & Thorgesen, O. (2004). Designing Social Security – A Portfolio Choice Approach. *European Economic Review, 48*(4): 883-904. https://doi.org/10.1016/j.euroecorev.2003.09.006

Merton, R. C. (1983). On Consumption-Indexed Public Pension Plans. *In Z. Bodie & J. B. Shoven (Eds.), Financial Aspects of the United States Pension System (pp. 259-290*). Chicago: University of Chicago Press. Retrieved from https://www.nber.org/system/files/chapters/c6035/c6035.pdf

Miles, D. (2001). Funded and Unfunded Pension Schemes: Risk, Return and Welfare. *CESifo Working Paper Series NO.239.* Munich. Available at SSRN: https://ssrn.com/abstract=260011.

OECD. (2019). Pensions at a Glance 2019: OECD and G20 Indicators. *Paris: OECD Publishing*. https://doi.org/10.1787/b6d3dcfc-en

Orszag, P. R., & Stiglitz, J. E. (2001 Rethinking Pension Reform: Ten Myths about Social security Systems. *In R. Holzmann, & J. E. Stiglitz (Eds.), New Ideas about old age security: Toward sustainable pension systems in the 21st century.* World Bank, 17–56.

Pennachi, G. G. (1999). The Value of Guarantees on Pension Fund Returns. *Journal of Risk and Insurance*, 66 (2): 219–237. https://doi.org/10.2307/253610.

Persson, M. (2000). The reform of the Swedish pension system. *In E. Balacci and F. Peracchi (eds) , Reforming Social Security : An International Perspective , ISTAT* , Rome , 213-48

Samuelson, P. A. (1958). Aspects of Public Expenditure Theories. *The Review of Economics and Statistics, 40*(4): 332-338. https://doi.org/10.2307/1926336

Shiller, R.J. (2003). Social Security and Individual Accounts as Elements of Overall Risk-Sharing. *American Economic Review,* 93 (2): 343-347. https://doi.org/10.1257/000282803321947326

Spivak, A., & Troitsky, R. (2013). Pension reform in Israel. *Public and Municipal Finance*, 2(1), 26-45.

Spivak, A., Tzemah, S., & Carmel, E. (2017). *Israel Pension Reform*. Van-Leer Institute, Jerusalem.

Swirsky, S., Attias, E., & Liberman, A. (2020). *Israel Social Report 2020*. Adva Center. Retrieved from https://adva.org/wp-content/uploads/2020/02/social-2020-ENG.pdf

United Nation (2019). World Population Aging 2019. https://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2019-Report.pdf

Wolf, I., & Caridad, J.M. (2021). The Transition to a Multi-Pillar Pension System: The Inherent Socio-Economic Anomaly. *Journal of Financial Economic Policy*. http://doi.org/10.1108/JFEP-07-2020-0162

World Bank. (1994). Averting the Old Age Crisis: Policies to Protect the Old and Support Growth. New York: Oxford University Press. https://doi.org/10.1596/0-8213-2970-7

VI. The Demand for Minimum Pension Guarantee in Funded Pension Funds and its Global Application

"With risk the potential outcomes is known and estimable, with uncertainty it is not. The distinction is critical, among other reasons, because actuarial insurance can generally cope with risk but not with uncertainty" (Barr N., 2002, p.3)

6.1. Introduction

After analyzing risk sharing mechanisms and the need to minimum pension guarantee from the economic dimension, here the dissertation provides another angel on the transition to funded pension scheme. In this chapter, there is an analogue between the pension scheme and the financial position of exchange options.

The last financial crisis, including the current COVID-19 pandemic, highlighted the uncertainty of retirement income derived from funded pension plans. Risk protection for retirees has become one of the centerpieces of the debate how to organize retirement system (Orenstein, 2013; Barr & Diamond, 2009). Defined contribution (DC) plans are already the main source to finance retirement in Latin America and Central and Eastern Europe (CEE) countries and they are rapidly expanding in other countries, where they are still voluntary, such as in Western Europe (Grech, 2015).

The current study shows that during the transition toward funded pension scheme, the financial position of low earners is worsened, compared to high-earning cohorts. That consequence is the lack of ability to hedge or diversify these risks, compared to high-earning cohorts. The present study thus claims that high earners ‘buy’ their superior financial position through an 'externalities' payment to low earners. Specifically, the benefit guarantee, financed by intra-generational risk sharing, is highlighted as the most efficient way to solve the anomaly in funded schemes. Lack of guarantee implementation might create system instability and political pressure, leading to cyclical pension reforms. In the second part of the paper, reforms in the global experience of pension scheme evolution are discussed.

As seen in this study, most of the countries that have made drastic privatization and capitalization reforms have recently imposed risk-sharing instruments in the form of minimum pension guarantee. In fact, nowadays, after numerous global experience and debates, implementing minimum pension guarantee has become a key recommendation of global economic organizations as part of the funded modern scheme (Heneghan & Orenstein, 2019). Chile’s pension reform, especially reversal experience, is discussed. Chile was a pioneer among more than 30 countries, between the mid-1990s and early 2000s, predominantly in CEE and Latin America, which partly replaced their public pension systems with mandatory private retirement accounts (Guardiancich, 2011;

Orenstein, 2013). Hence, the change in Chile signals to other countries' future process in the funded transition process. The experience of Chile and most of the countries that made radical reforms in 1980–1990s is correlated to this paper's argument regarding the need of insurance instrument of funded-capitalized scheme.

In the next section, the literature review is discussed, followed by different pension systems characterized by the financial instrument of options. Through this model, we point to a socio-economic anomaly in favor of the high-earning cohorts. In the following section, we suggest minimum pension guarantee as a re-balancing instrument that increases the probabilities to avoid cyclical pension reforms. We also investigate the guarantee in option perspective and define it as a "collar" strategy. This definition helps in understanding its boundaries and constraints. An overview of the implementation of minimum pension guarantee in funded pension schemes is discussed and the phenomenon is further linked to the above-mentioned anomaly, before finally concluding the study in the last section.

6.2. Literature Review

A vast literature observes the pressure toward reversals and government insurance in countries that have been through radical funded reform (Guardiancich, 2011; Orenstein, 2013; Altiparmakov, 2018; Naczyk & Domonkos, 2016). In particular, reversals and unstable pension systems have been recorded in CEE countries and South America (Grech, 2018; Ortiz et al, 2018). Over the last two decades, many other countries, developed and undeveloped, have changed their pension system to define, once again, the state as a central actor.

Grech (2015) emphasizes that changes in Eastern Europe reflect the role of political parties, their ideological orientation and social protection. According to Grech: "Many hypotheses have been put forward as to what the fundamental drivers of the pension reform process are, particularly how these might have changed since the 2008 financial crisis. In many cases, the emphasis has been on the political process involved. For instance" (Grech, 2015, p.5). Datz and Dancsi (2013), on the other hand, conclude that "political dynamics and institutional considerations alone do not explain the timing of certain decisions and that short-term fiscal considerations played a key role" (Datz &

Dancsi, 2013, p.14). Hassel et al. (2019) suggest that pension reforms reflect changes in social arrangements and response to macroeconomic fluctuations. Further, Vis, et al. note that "In advanced countries, despite a severe fiscal and economic shock, the standard reaction has been to boost social programs, rather than to cut back" (Vis, et al, 2011, p.6). In the same argument, some scholars claim that the unstable pension landscape is due to lack of risk-sharing mechanisms in these countries, compared to developed countries (Fultz & Hirose, 2019; Ebbinghaus, 2015; Grech, 2018).

The present study in this chapter offers an analytical explanation to one of the main motives in pension reversals, which is the implementation of minimum pension guarantee and increasing the weight of unfunded pillars (Orenstein, 2013). In relate to the last two chapters, which study the mix pension system, this composition contributes to this strand of literature and continues Barr and Diamond (2009), regarding the proper balance between pension pillars and pension risk alleviation.

The paper specifically offers a different perspective to examine pension schemes, using exchange options benefits and financial positions of the field's actor. This perspective enables considering inter-cohort financial position, in contrast with attributing the economy as a single unit. The option pricing theory and its appliances to pension systems study enables this paper to depart from the classic return/fertility consideration in conducting pension transition (Aaron, 1966) and contributing to the existing literature of risks in pension schemes (Chen et al. 2014; Biggs, 2010; Romaniuk, 2009)

This composition suggests imposing intra-generational risk sharing mechanism, and study deeply the characteristics of the minimum pension guarantee as a put option and common solution to such a mechanism.

Grande and Visco (2010) are one of the pioneers who analyze minimum pension guarantees costs. They calculate the cost of the 0% nominal return guarantee as less than 0.1% of the asset invested, while the guarantee of a return equal to the economy's nominal growth rate would have a cost of 0.93% to 1.2%, depending on the period of investment.

Little analysis devoted to guarantees on DC pension plan (Grande & Visco, 2010; Lachance et al. 2003; Smattes, 2002). However, with the growing popularity of individual accounts and their critical role in many recent pension reforms including this thesis, research analyzing the guarantee with the new pension model is clearly needed. Feldstein

et al. (2001) proposed a generous design which "involves a "real principal guarantee", under which participants would be guaranteed their lifetime contributions adjusted according to an inflation index. They, in fact, described a "mixed" system, which guarantees the participants benefits at least as great as under the present law formula" Feldstein et al. (2001, p.14).

Pennachi (1999) presents an important essay in estimating the cost of government guarantee in order to gauge the implicit subsidy or the guarantee cost associated with a particular pension reform.

The novelty of this study in this chapter lies in its ability to explain global pension evolution process in funded pension schemes by a simple option model and to determine the minimum pension guarantee as an economic instrument, rather than only as a social one.

6.3. Pension Systems and Exchange Options

6.3.1. The Difference Between DC Pension Scheme and DB Pension Scheme

In this section, the financial position of different pension schemes is investigated using the exchange option benefit theory.

Along the defined contribution plan, the pension's value is equal to the individual's accumulations at the time of retirement. The final amount of the funded capitalized pension fund can be expressed as function of the funded asset accumulations (A_T) along the participant's career, during working phase, capitalized until death.

$$DC(T_R) = \tau A_T = \sum_{t=1}^{T_R-1} \tau w_t \prod_{t=1}^{T_D-1} (1 + r_t) \qquad (6.1a)$$

Where r_t is the average rate of return earned by the DC plan on its portfolio of financial assets at time t, T_R is the participant's retirement year, $t = 1$ is the time of enrolment in the pension fund, T_d is age of death and w_t is gross earnings. τ is the contribution rate from wage for pension.

The defined benefit (DB) scheme, however, is a function of the participant's wage, working period and age. The individual member is paid at the level of the fund obligations independently from market (asset) performance. Hence, intuitively:

$$DB(T_R) = \tau L_T(T_R) \qquad (6.1b)$$

Here, L_T is the fund's liabilities and. Notably, C_L and P_L denote the call and put exchange options, respectively, whose payoffs at retirement are as follows:

$$C_{T_R} = \max(\tau A(T) - L(T), 0) \qquad (6.2a)$$

$$P_{T_R} = \max(L(T) - \tau A(T), 0) \qquad (6.2b)$$

The European put option on the fund assets includes liabilities as the strike price and a maturity corresponding to the retirement date. The put-call parity in future terms is defined as follows:

$$C_{T_R} - P_{T_R} = \tau A(T) - L(T) \qquad (6.3)$$

Hence, one can describe the DB scheme as:

$$DB(T) = L(T) \; = \; \tau A(T) + (\, P_{T_R} - C_{T_R}) \qquad (6.4)$$

The investment in a defined benefit scheme, thus, can be replicated by a position composed of three elements: long position in the fund assets, A, long put position, P_L, and a short call position, C_L, at the same strike price.

Systematically, defined contribution's benefits equal to investment in a defined benefit fund, buying call option C_L and selling put option, P_L, at the same strike price.

$$DC(T) = \; DB + (C_{T_R} - P_{T_R}) \qquad (6.5)$$

One can note that for high-earning cohorts or, more precisely, those who their total old-age pension accumulation exceeds the former strike price or the average replacement level ($\overline{W} * RR$) are expected, in average, to benefit from the transition, as there is no more cap for their old-age benefits. In contrast, those whose accumulations are expected to be below this level will be worse off as they are no longer insured by a put option up to a higher benefit level.

6.3.2. Mix Pension Scheme

In this section, a mix/hybrid pension scheme with two pension pillars is defined: Pay-as-you-go (DB PAYG) and funded DC scheme. Let τ be the total contribution rate from the participant's wage. the contribution rate is divided to two components: γ as the portion of funded DC from the pension contributions and $(1-\gamma)$ as the contribution share, which finance the DB PAYG.

At retirement, the individual has a benefit position of a hybrid scheme ($PN_{T_R}^{hy}$):

$$PN_{T_R}^{hy} = \tau\{\gamma A(T_R) + (1-\gamma)L(T)\} \tag{6.6}$$

Integrating (6.6) with (6.5), gives:

$$PN_{T_R}^{hy} = \tau\{\gamma A(T_R) + (1-\gamma)(A(T_R) + P_{T_R} - C_{T_R}\} \tag{6.7}$$

That can be reduced to:

$$PN_{T_R}^{hy} = \tau\{A(T_R) + (1-\gamma)(P_{T_R} - C_{T_R})\} \tag{6.8}$$

From (6.8), it can be seen that when the unfunded pillar's contributions are positive, the participant member is willing to pay an insurance premium of $\tau(1-\gamma)C_L(T))$ against adverse accumulation outcomes in a level of $\tau(1-\gamma)P_L(T)$. Hence, efficient insurance effect in hybrid pension scheme, relative to DC scheme, accrues when:

$$0 < \tau(1-\gamma) < 1 \tag{6.9}$$

After transition, social security benefits, $L'(T)$, are not correlated anymore to the former liabilities level, $L(T)$, but to the new social security contributions level, which is a function of wage level, wage growth rate (marked by g) and the contribution rate to the 1st pillar. equation (6.10) describes the difference between the two unfunded types of pillars' benefits, before and after the pension transition:

$$L(T) = \sum_{i=1}^{N}\sum_{t=1}^{T} \tau w_{i,t}(1+g)^{t-1} * RR \qquad (6.10a)$$

$$L'(T) = \sum_{i=1}^{N}\sum_{t=1}^{T} \tau(1-\gamma) w_{i,t}(1+g)^{t-1}(1+n)^{t-1} \qquad (6.10b)$$

Here, RR represents the average replacement rate level of the DB pension scheme. The actual old age benefit in a mix scheme with the new social security level can be described as follows:

$$PN_{T_R}^{hy'} = \tau\gamma A(T_R) + L'(T) \qquad (6.11)$$

This multi-pillar scheme is in line with the World Bank model (1994). The difference between actual benefit after the transition (6.11) and the individual's benefit expectation as noted in (6.8) creates an expectation gap, leading to an anomaly for pension benefits for low-earning cohorts. This theory is discussed in the next subsection.

Continuing to analyze the transition from an individual perspective, the change in the pension benefit at retirement is as follows:

$$\Delta(Pension\ Financial\ Position) = PN_{T_R}^{hy'} - DB \qquad (6.12)$$

$$\Delta(Pension\ Financial\ Position) = \tau\gamma A(T_R) + L'(T) - L(T) \qquad (6.13)$$

In the macro-economic level, the government's net flow old-age social transfers to the public is summed to:

$$\Delta(Gov.Net\ Flow) = Expenditures - Revenues \qquad (6.14)$$

- The change in the government's revenues from the transition is: $-\gamma\tau\sum_{i,}^{n+1} w_{t+1}$

- The change in the government's expenditures from the transition is:

$$L'(T) - L(T)$$

Hence, if the contribution rate is constant during the transition, one can determine that:

$$\Delta(Gov.\ Net\ Flow) = L'(T) - L(T) + \gamma\tau \sum_{i,}^{n+1} w_{t+1} \qquad (6.15)$$

During the pension reform toward funded-capitalized design, one can assume that the individuals' total benefit from the transition (as described in equation (6.13)) are higher than the government fiscal savings (as described in equation (6.15)). Otherwise, the central planner would not reform the pension system in the first place, due to political pressure (Grech, 2015; Holzmann & Hinz, 2005):

$$\Delta(Pension\ Position) \geq \Delta(Gov.net\ Expenditures\ Flow) \qquad (6.16)$$

Hence, according to (6.13) and (6.15):

$$A(T_R) > \sum_{i,}^{n+1} w_{t+1} \qquad (6.17)$$

$$\sum_{i=1}^{N}\sum_{t=1}^{T} w_{i,t}\,(1+r)^{t-1} \geq \sum_{i}^{n}\sum_{t=1}^{T} w_{i,t}(1+n)^{t-1}(1+g)^{t-1} \qquad (6.18)$$

From the central planner perspective, the transition is worth if:

$$\sum_{i=1}^{T}(1+r)^{t-1} \geq \sum_{i=1}^{T}(1+n)^{t-1}(1+g)^{t-1} \qquad (6.19)$$

Equation (6.19) represents the rationale of pension transitions from the economy level and is similar to Aaron's (1966) condition considering transitioning to funded scheme from PAYG ($r > n$). According to the analysis above, the rule is true also for the transition to a mix/hybrid scheme as the condition does not depend on pension pillars' contribution rates.

6.3.3. The Government Perspective

Similarly to the previous two chapters, The government considers two separate interests. Fiscally, as an active actor in the field, the transition is worth as it liberates the government

from fiscal and longevity risks burden. These risks are transferred to participants as either a pool or as individuals.

From a public perspective or the government as a central planner, the transition is worth only if the condition in equation (6.19) is valid. In addition, the public perspective might include some social targets such as income redistribution and reduction of the income-inequality level. These considerations might push for changes in the transition.

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6.3.4. The Individual's Perspective

The above analyzing treats the population as one single cohort. Phrase (6.19) corresponds to the former World Bank view (2004) and early macro-economic literature on pension reforms in aging economies (Feldstein & Ranguelova, 2001, Feldstein et al. 2001; Disney, 2000) while ignoring risk and individual's preference. There is no distinction between the financial position/expectations of different earning cohorts (Wolf & Caridad, 2021b).

The individual's financial position after the transition is given by equation (6.12). The individual benefits from the transition if:

$$\tau\gamma A(T_R) + L'(T_R) - \left(\tau A(T_R) + P_{T_R} - C_{T_R}\right) > 0 \qquad (6.20)$$

By reducing total population, one can determine that in average the individual participant gains from the transition if the following is valid:

$$\tau(1-\gamma)w_{i,t}\{(1+g_t)^{t-1}(1+n_t)^{t-1} - (1+r_t)^{t-1}\} + C_{T_R} - P_{T_R} > 0 \qquad (6.21)$$

The phrase in the large brackets is negative but should be very close to zero as in the long-term: $(1+r_t)^{t-1} = (1+g_t)^{t-1}(1+n_t)^{t-1}$. Consequently, one can determine that the individual benefits from the transition if:

$$C_{T_R} - P_{T_R} > 0 \qquad (6.22)$$

In that case, only those whose long call option is 'in the money' and their short put option position is 'out of the money' will gain from the transition. Put it differently and in absolute terms, those whose pension accumulation are above the average threshold level ($\bar{W} * RR$), may gain in average from the transition. Hence, the question if the individual gains from the transition depends both on his wage level along his career and the market yield. If the individual's wage is relatively low, in order to gain from the transition, he must be exposed to market risk extensively. Although the compensation to market risk provides an expected higher yield than the GDP per capita, risk avert participants might avoid high exposure to market fluctuations (Wolf & Caridad, 2021b). That tendency is crucial when the individuals' accumulations are not high. Even if it is assumed that all participants share the same risk aversion coefficient, the total risk appetite depends in total accumulations (Rappaport, 2016; Knell, 2010; De Menil et al., 2006; Masten & Thogensen, 2004).

For the continuous discussion, let us define low and high earners according to the absolute strike price. It can be determined that the pension transition is biased in favor of high earners, compared to low earners. The extent of the bias depends on the dispersion of benefits above and beneath the former strike price. As the individual's accumulation is lower, his financial position from the transition is worse, and vice versa.

The literature includes extensive studies on the market risk exposure in pension funds but mostly avoids the insurance dimension. The option model reveals dimension by attributing to different earning cohorts. Although the compensation to market risk provides an expected higher yield than the GDP per capita, risk avert participants might avoid high exposure to market fluctuations. That tendency is crucial when the individuals' accumulations are not high. Even if it is assumed that all participants share the same risk aversion coefficient, according to the previous chapter, the total risk appetite depends in total accumulations.

6.3.5. The System Sustainability

The current study points out a clear fiscal interest pushing toward the funded-capitalized transition. If the average market's yield is high enough, according to (6.19), there is a chance of actual transition. However, the sustainability of the transition depends on the political pressure. In case most of the people benefit from the transition, according to the condition described in (6.21-6.22), the new system can be sustainable. Alternatively, if critical mass of participants are worse off the transition, a political pressure might emerge toward pension reversals (Grech, 2018; Orenstein, 2013). Here, we mention the re-reforms pension wave in the last two decades back toward PAYG scheme mainly in CEE and Latin American countries. Examples of these processes are given in the second part of this composition.

Trying to reduce the probability to pension reversal, the government has an incentive to increase pension accumulations to the low tail of the society accumulation distribution. The more the people benefit from the transition, the higher the probability of keeping the transition sustainable (Grech, 2018; Zaidi, 2010). To this consideration, we add public social targets of poverty alleviation and income redistribution. In reality, the government as a central planner and mediator enables financial transactions by implementing minimum pension guarantee (some call it the "Zero Pillar").

6.4. Minimum Pension Guarantee

The model presented above allows us to imply further characteristics of the minimum pension guarantee mechanism, including studying its cost and effectiveness conditions.

6.4.1. The Guarantee as a Put Option

We attribute to the guarantee as a long put option on behalf of the individual. By holding this position, the lower pension accumulation the higher the insurance effect. Consequently, the guarantee's cost is simply the discounted value of benefits from the option, discounting at the government's risk-free rate (Grande & Visco, 2010).

After the transition, both pillars, the social security and the funded pillar substitute the former DB PAYG pension scheme. Hence, the underlying asset changes from wage level to total pension accumulations from both pillars. Consequently, any insurance must be examined related to the overall benefits and in absolute terms. An example of this kind of guarantee relative to total pension accumulation is implemented, for example, in Denmark (Jensen et al., 2019). The relative rate of return guarantees, which are implemented widely (Antolin et al. 2011), might provide sufficient protection for some periods of time but not against risks such as market risk of GDP per capita, labor risk and systemic risk.[30] The capitalized return is only a part of total accumulation. Still, as part of the guarantee mechanism the central planner can impose minimum rate guarantee if it complies with social/economic targets.

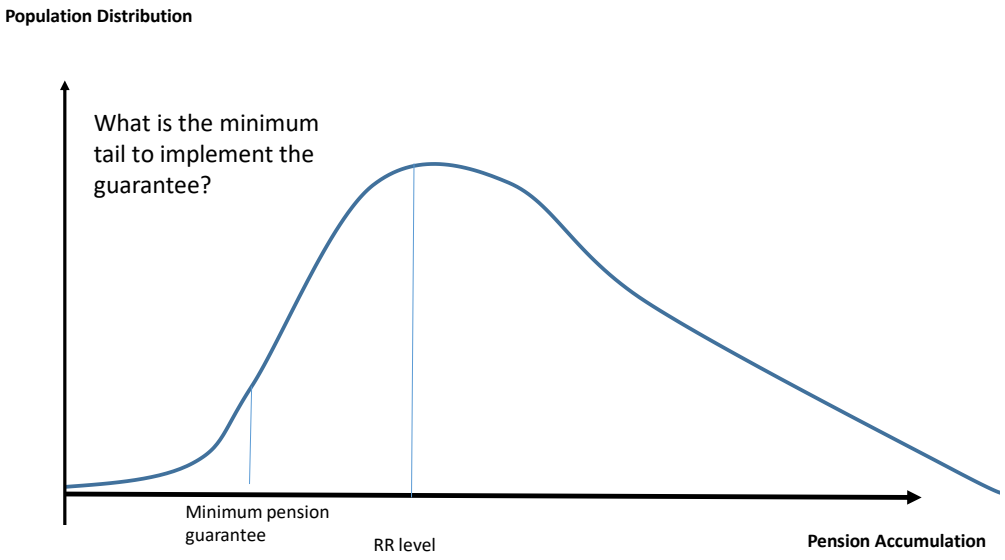
6.4.2. The Guarantee Line

As discussed above, the guarantee economic rational serves the condition in which enough participants must gain from the transition to avoid political pressure toward another pension reform (Orenstein, 2013). Similar to a put option, when the exercise price is higher, the guarantee cost increases (Antolin et al. 2011; Lachance & Mitchell, 2003). At the edge case, when the guarantee line is determined at the average RR level, the pension system is practically back to the DB pension scheme. Hence, it is assumed that the guarantee's exercise price cannot pass that line (see Figure 6.1).

Obviously, finding the minimum effective strike price is challenging as it depends on a variety of parameters. Due to social concerns, some countries may mark the poverty line as a floor that ensures proper standard of living in old age (Grande & Visco, 2010; Pennachi, 1999). The poverty line might be high enough to keep the transition sustainable, but it also depends in other variables that change from time to time, such as the dispersion level and the market's yield, as mentioned above. Hence, we claim that the government must react to macro-economic changes. For example, permanent reduction in the average rate of return should lead to consideration on increasing the guarantee's strike price.

[30] During the Coronavirus crisis, a global systemic risk was witnessed which includes high unemployment rate and financial turmoil.

Figure 6.1: Finding the critical mass tail



One of the claims discussed in the literature (Feldstein, 2005; Feldstein & Rangueleva, 2001) is whether means tested programs can be a substitute to the minimum pension. The claim that "The primary reason for not doing that is that some rational and far-sighted individuals would be induced by a means tested system to act in a way that allows them to qualify for benefits. Doing so would impose tax costs on the rest of the population that could make overall well-being lower than in a universal (i.e., not means tested) program" (Feldstein 2005, p.17). Preventing moral hazard by implementing the guarantee, eligibility requirements may include income, residency, work history and citizenship tests.

6.4.3. Pension Pillars' Sizes

While increasing the funded pillar's weight within the pension system, the individual's exposure to financial risk increases. Consequently, two contradictory factors influence the guarantee cost – return and risk:

- Funded Pension's Rate of Return: Naturally, as the average pension return is higher, there is more probability that the individual's old age benefit exceeds the guarantee threshold and less chance that the put option would be exercised. Hence, intuitively, when the average return is higher, the expected guarantee cost is lower.
- The Volatility Influence: With higher funded pillar weight, the portfolio accumulation of pension benefits and the standard deviation increases as $\sigma_A > \sigma_W$.

Following Black-Scholes option pricing model, higher pension portfolio's volatility increases the guarantee cost. Hence, the "financial" position of the state, as the writer of the option, is in more stress.

Naturally, the above conclusions are opposite if increasing the unfunded pillar's weight. Summing the return and the volatility influences, there is no a clear conclusion whether the guarantee cost increase when increasing the funded scheme. This is in line with Barr and Diamond (2009), who argued against the pension literature strand during the 1990s, which pushed to implement funded pension funds to decrease fiscal burdens.

6.4.4. Market's Yields

Higher market's rate of return increases the pension accumulation's value or the underlying asset's value in terms of options. Respectively, the higher yield reduces the put-option value. Analytically, a higher market return reduces the guarantee need and the probability of exercising the embedded European put option. Hence, in total, there is negative correlation between the market return, r, and the guarantee cost.

On the other hand, the GDP per capita has no influence on the guarantee cost. Both the option's strike price and the underlying asset are indexed to the GDP per capita.

6.4.5. Income Dispersion

With high-income inequality, statistically, there is higher probability of individuals' put options to be exercised at retirement. As a consequence, the total guarantee's cost in the market will be higher. In a theoretical case where there is a flat dispersion of accumulation around the RR level, flows from high-earning cohorts to low-earning cohorts can imitate the DB pension scheme, bringing all participants to the 'RR' average point in absolute financial terms. In the common case with income inequality, the burden of the guarantee cost is distributed among fewer participants and naturally, its exercise price is lower than the average 'RR' level.

In order to ensure sustainability of funded pension design, the tail under the minimum guarantee should be larger. In a market with high income dispersion, the size of the tail is naturally larger.

6.4.6. Average Age

In line with Black-Scholes pricing model, put-option's value decreases when the exercise date approaches. Hence, it can be determined that there is negative correlation between the average dependency ratio in society to the total guarantee cost, at a given point of time.

Table 6.1 summarizes the correlation between the guarantee cost and the above parameters.

Table 6.1: The Guarantee Cost

Parameter	Influence Direction
The guarantee line	+
The funded pillar's size	?
The unfunded pillar's size	?
The market's rate of return	+
GDP per capita	=
Income dispersion	+
Dependency ratio	−

6.4.7. The Guarantee Cost

The government is a “synthetic” counterparty to the option transaction as it functions as a mediator. The actual transaction is among participants on the same generation and/or among different generations.

In any case, we map two general constraints. The 'RR' level is a cap, as the strike price is closer to the 'RR' level, the guarantee is more expensive. If the income inequality level is relatively low, more people’s accumulations are above the RR level, the guarantee’s cost distributes among larger amount of participants and the strike price can be closer to the RR level. Furthermore, in all cases, in order to avoid a situation where the guarantee overlaps the funded pillar and causes an anomaly in the pension system, the guarantee must not be index higher than the GDP per capita (see also Smetters, 2002).

The guarantee can be financed across a variety of mix possibilities between two different risk-sharing poles, intergenerational and intra-generational risk sharing:

6.4.7.1. Intra-Generational Risk Sharing

Intra-generational risk sharing is beneficial to redistribution mechanism among the same earning cohort in parallel to the existence of pension pillars. Through this method, the central planner avoids financial burdens on other generations in the form of increasing contributions. If the transition creates an anomaly that favors high earners at the expense of low earners, naturally, the most obvious way to finance the guarantee is by intra-generational risk sharing with an opposite financial flow than the transition. That particular way of finance is interpreted as a compensation to low-earning cohorts from those who benefit from the transition. In other words, high earners finance the guarantee by selling some of their upside benefits and creates a position of long put + short call (Feldstein and Ranguelova, 2001a; Smetters, 2002). In the edge case, if the collar strike price equals to the RR level, the pension system is synthetically in DB type.

As the strike price is closer to the 'RR' level, the guarantee is more expensive. If the income inequality level is relatively low, more people's accumulations are above the 'RR'

level, the guarantee's cost distributes among larger amount of participants and the strike price can be closer to the 'RR' level.

6.4.7.2. Intergenerational Risk Sharing

Alternatively, the guarantee can be financed from working cohorts' contributions in a PAYG or a tax scheme. However, this way of financing entails three major restrictions. First, if the central planner chooses to increase contribution rate, τ, low earners absorb a share of the finance burden to correct the anomaly that discriminates against them. Hence, the anomaly discussed above which is in favor of high earners could not be solved completely. Second, as discussed in chapter 5 to this dissertation, the contribution rate in mix-pension system is not suitable for low earners but is optimal for high earners (Wolf & Caridad, 2021). Hence, increasing the contribution rate might substitute one socio-economic anomaly in another. The third constraints stems from government intervention. Risk sharing among generations requires government intermediation and hence exposure to fiscal risks. If the guarantee is financed completely from unfunded pillar's contributions, there is a pure intergenerational risk sharing. If the government participates in the financing guarantee on the expense of other public or social expenses (G), there is a mix of inter- and intra-generational risk-sharing mechanism in financing the guarantee.

Besides, the total participation budget cannot pass the former fiscal expenses before the transition as this cost is one of the main motives to the transition in the first place (Holzmann & Hinz, 2005). According to the model above, this cap is summed to $L'(T) - L(T)$ in future value terms. In order to control social budget expenses, one should check eligibility rules for other programs and reduce the automatic passport to implement other programs.

A combination of risk-sharing mechanisms to implement the guarantee can be used to increase, to an extent, the unfunded contribution rate, redirecting fiscal expenses and differentiation in social security benefits among earning cohorts. Table 6.2 summarizes the guarantee finance principles.

Table 6.2: Risk sharing methods to finance minimum pension guarantee

Risk-Sharing	Solution of Finance	Constraints
Intra-generational risk sharing	• selling some of the upside potential returns[31] of the funded pension fund • On the expense on social programs or means-tested to retires	• Guarantee cap – RR level • Indexed < GDP per capita
Intergenerational risk sharing	• Increasing social security contributions • On the expense on public programs fiscal costs	• Guarantee cap – RR level • Un optimal contribution rate for low earners • Fiscal Cost < $L'(T) - L(T)$ • Indexed < GDP per capita

6.4.8. Types of Different Guarantees – Is It Really Matter?

In any of these finance options, the government can capitalize early contributions to create a separate fund to finance the minimum guarantee.

The global experience also provide a wide range of minimum pension guarantees types. Grande and Visco (2010) consider a compulsory government guarantee of a minimum return to DC pension scheme members in a level of capital protection or the nominal growth with a cost of 0.1% - 1.2% from assets. "In Denmark, the DC operator must provide a minimum return guarantee of member's contribution. However, the operator

[31] See Feldstein and Ranguelova, 2001a; Smetters, 2002

itself fixed the level of the guarantee. In 2009, they changed to relative return guarantee, where the minimum is reset regularly in line with long-term interest rates" (Antolin et al., 2011, p.12). In Hungary and Slovenia, the guarantee is linked according to the government bond performances. In Germany the new 'Riester' reform must guarantee the accumulate savings plus a fix interest rate. Other countries, mainly OECD countries, define a minimum guarantee as % of minimum wage such as Austria, Belgium, Chile, France, Portugal, Spain, Czechia, Mexico and Luxemburg.

According to model described above, the participants attribute to the entire pension benefits as the underlying asset. Hence, we argue that any insurance must be examined in relate to overall benefits. Relative rate of return guarantees, which are implemented widely (Antolin et al. 2011) might provide sufficient protection for some periods of time but not against relevant risks such as: market risk of GDP per capita, labor risk and systemic risk[32]. The capitalized return is only a part of total accumulation. Here we mention that the model assume financial flows and not wealth and assets test is not trivial to include for the eligibility tests. The Canadian model does not include asset tests, as it negatively affects saving. Second, it would substantially increase the administrative cost and complexity of managing the plan.

6.4.9. Minimum Pension Guarantee Negative Affect

Alongside the stabilizing effect of the minimum pension guarantee, they can cause substantial distortions in the incentives to work and to contribute to the system as individual get older. This mechanism may reduce incentive to keep working or saving and thereby reducing wealth accumulation (Jimenez-Martin & Sanchez-Martin, 2007). "The strength of the effect depends on both the eligibility conditions and the generosity of the guaranteed minimum pension relative to the average wage. Recent research for Ukraine found large reductions in the labor supply following a tripling of the minimum pension benefit" (Jimenez-Martin, 2014, p.5).

[32] In these days, during the Corona-Virus Crisis we witness of a global systemic risk, which includes high unemployment rate and financial turmoil.

Naturally, reducing the downside of risky bets, the guarantee fosters riskier behavior. Consequently, this scheme can have an additional impact on saving behavior and extra demand to financial assets. To alleviate the above risks and to avoid opportunistic behavior, central planners should limit the guarantee to retirement age with no possibilities to early retirement.

6.5. The Demand for Pension Guarantee in Funded Pension Schemes

6.5.1. Global Perspective

This section argues that the pension insurance expectation theory, mentioned above, can explain some of the characteristics of pension reforms across the globe in funded pension designs. In particular, in line with Dominczak & Strzelecki, (2013). Jimenez-Martin, (2014) the demand for minimum pension guarantee is attributed as one of the main reasons for cyclical pension reforms in CEE and Latin American countries. It is further shown as the trend of implementing significant benefit redistribution mechanism in other developed countries that have reformed their pension system to a funded and capitalized pension scheme.

After Chile's funded reform in 1981, between the mid-1990s and early 2000s, 37 countries, predominantly in CEE and Latin American countries, partly replaced their public pension systems with mandatory private retirement accounts managed by the financial industry. The mapping of these countries was mainly attributed to CEE and Latin America. Also, other OECD countries have been related to which are marked as DC pension systems or countries with dominant funded pillar (OECD, 2019). Additionally, two countries privatized their public pension system in Africa, Nigeria (2004) and Ghana (2010), while most pf the countries have opted not to privatize (Ortiz et al. 2018; Fultz & Hirose, 2019).

Years after completing their first reform, 19 of the countries that made radical pension reforms have conducted a reversal in their pension design in various levels, rolling back to PAYG scheme with intense public pillar (Naczyk & Domonkos, 2016; Natali, 2015). Other have preserved their pension system but strengthened the guarantee pillar and the safety nets based on the principles of social solidarity and shared responsibility for

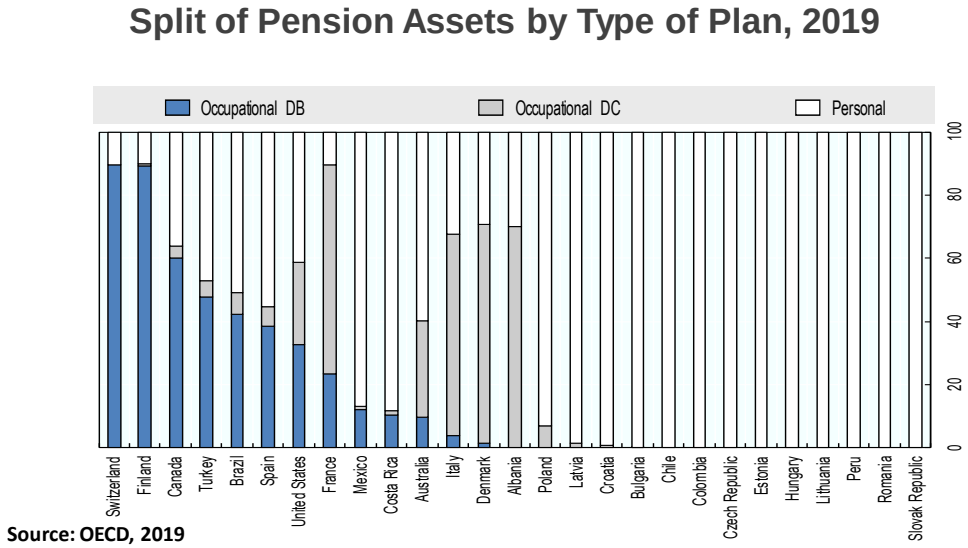
pension provision (Altiparmakov, 2018). Table 6.3 reports this trend around the globe and the Appendix details it by global region and country.

According to Ortiz et al from the ILO, "Fifteen CEE and former Soviet Union countries embarked on the experiment to privatize pensions: Hungary and Kazakhstan (1998), Croatia and Poland (1999), Latvia (2001), Bulgaria, Estonia and the Russian Federation (2002), Lithuania and Romania (2004), Slovakia (2005), Macedonia (2006), Czech Republic (2013) and Armenia (2014)." (Ortiz et al. 2018, p.6). Also see Figure 6.2. All countries except for Armenia and Kosovo reversed their pension system back to more government intervention and dominant PAYG public pillar and strength their safety nets.

Among the 14 Latin Americas countries that have been through extensive pension reform, 11 have been identified as having rolled back to a dominant public pillar, implementing significant safety net to retired or both. These countries include Argentina, Colombia, Uruguay, Bolivia, Mexico, Venezuela, El Salvador, Nicaragua, Costa Rica and Ecuador. In Peru, the debate on pension reversals is continuing (Ortiz et al. 2018), while there have not been any major reforms in the Dominican Republic and Panama.

The OECD (2019) considers in its reports six other countries to implement the funded pension scheme. According to the appendix, four of them are Australia, Denmark, Norway and Sweden, which have implemented strong redistribution mechanisms and keep strengthening it as part of their socio-economic policy (Nelson et al. 2019). In fact, according to the Mercer report (2018), these countries have stronger and the most sustainable pension systems across the world. Another country, Italy, implement a mix of Notional Defined Contribution (NDC) and small funded pension scheme with low poverty rate of the elderly (Franco & Tommasino, 2020). Finally, Israel has not implemented any major redistribution mechanisms yet. The reason for this might be that only a small group retired from the last reform in 1995 and the market returns are quite high so far (OECD, 2019).

Figure 6.2:



Source: OECD, 2019

Ortiz et al. (2018) differentiate between re-reforms that weakened the individual accounts of a pension system and ones that terminated them. Argentina, Bolivia, Hungary and Poland carried out re-reforms in greater depth by either terminating the mandatory private pillar or closing it to new entrants. From the other pole, some countries downsized the funded pillar such as Slovakia, Chile and the Baltic countries, while others are still re-reforming their pension systems such as Kazakhstan and Peru. The lasts now have a transitory first-public pensions pillar on PAYG basis while also keeping the individual accounts. As shown in (6.20), Aaron's argument is valid only as long as the second pillar's investment returns are favorable, that is, exceeding the growth rate of GDP.[33] This condition does not apply to all countries at all times. Some Latin Americas and CEE countries' second-pillar rates of return have been chronically low and often negative (Altiparmakov, 2018; Borzutzky & Hyde, 2016). However, the literature does not solely attribute the pension reforms and evolution to the market yields. Some scholars link CEE countries' reversals with fiscal stress after the financial crisis (Gora, 2016) and the need to comply with the Maastricht rules (Naczyk & Domonkos, 2016). Others links Latin American countries' reversals to inadequate benefits and high transition costs (Ortiz et al. 2018). According to Altiparmakov (2018), other reasons might include low coverage and disappointment from capitalized rates of returns. Moreover, according to the above-mentioned literature, the key reason for the reversal trend in CEE and Latin American

[33] GDP growth is assumed to be a proxy for wage growth.

countries could be the political pressure stemming from unfulfilled insurance expectations and inadequate benefits (Ortiz et al. 2018).

Table 6.3: Global experience in funded reforms

The Cyclical Pension Reforms				
	CEE	**Latin America**	**Other OECD Countries**	**Africa**
Total Funded scheme	**15**	**14**	**6**	**2**
Rolled Back to Dominant Public Pillar + Implementing Minimum Pension Guarantee	13	6		
Preserving Pension Scheme + Strengthening Guarantee and Saftey Nets		5	4	

Source: Author's elaboration based on OECD (2019) Fultz and Hirose (2019) and Ortiz et al. (2018).

At first, some critics, including the World Bank, have called this type of reform short sighted, and assert that it eases pension finance now at the cost of jeopardizing it in the future (the so-called Aaron (1966) condition). However, as shown by above in phrase (6.20), this argument applies only as long as the second-pillar's investment returns are favorable, that is, exceed the growth rate of GDP. This condition does not apply to all countries all the time. Some Latin America and CEE countries' second-pillar rates of return have been chronically low and often negative (Altiparmakov, 2018; Borzutzky and Hyde, 2016).

The common pension configuration in countries, which reversed their pension systems, and countries, which still function in privatizes pension schemes is the implementation of redistribution benefit mechanisms (see the Appendix). These mechanisms can include pension top-ups like in Argentina and Poland or for instance a zero pillar like in Chile, Hungary and Kazakhstan. The literature confirms that most countries with funded schemes or funded components in their pension systems public have strengthen social insurance, which is based on the principles of social solidarity and shared responsibility for pension provision, among different earning cohorts (Ebbinghaus, 2021; Barr & Diamond, 2016; Orenstein, 2013).

6.5.2. The Evolution of Minimum Pension Guarantee in Chile – A Study Case

In that context, it is worth to expand the discussion on Chile pension system, the pioneer of the global funded pension reforms. In table 6.3, Chile is among the five countries to preserve its system while imposing greater weight in the guarantee pillar. Vast literature and documentation of global economic organizations describe the cyclical pension process of pension system in Chile as a global representative case (Fajnzylber, 2019; Mesa-Lago & Bertranou, 2016; Barr & Diamond, 2016; Borzutsky & Hyde, 2016).

According to Fajnzylber, "In 1981, Chile was the first country to replace a traditional DB PAYG scheme with a contributory pillar, based entirely on individual savings accounts, managed by private fund managers. Prior to 2008, individuals with little or no pension rights could apply for an Assistance Pension (PASIS) or a Minimum Pension Guarantee (MPG)." (Fajnzylber, 2019, p.6). The non-contributory pension PASIS program was targeted at poor individuals with no pension entitlements, providing a sub-poverty benefit (as of 2008, US$110 per month – 75% of the minimum wage) and was subject to budget availability.

However, the MPG established a floor (equivalent to a monthly payment of US$222 of 2008 – 62% of minimum wage) for individuals with at least 20 years of contributions and personal income (wages or pensions) below the guaranteed level. "The MPG has combined restriction of minimum density and maximum income led to low coverage[34] and a very limited poverty reduction effect" (Mesa Lago & Bertranou, 2016, p.32). Contributory pensions were automatically indexed to the UF[35].

Some insured lacked both the right to a minimum pension (falling short of the required contribution years) and to a non-contributory pension (failing the means test, or due to a lack of public funds).

Following the disappointment from privatization reform, in 2008, Chile enacted a new comprehensive pension reform. According to the commission's report presented to President Bachelet in July 2006, its main overall goals were to augment the pension system's replacement ratio from 45% to the OECD average, which is 60%, and increase

[34] In fact, only 35% of entitled men and 60% of women would eventually receive it.
[35] UF (Unidad de Fomento) is a monetary unit automatically adjusted to CPI.

its coverage among the public, especially among lower-income groups (see also Barr & Diamond, 2016).

In 2008, Chile enacted a new comprehensive pension reform that, among other changes, introduced a new poverty prevention pillar known as the New Solidarity Pillar (NSP). This unique pillar enable guarantee basic pension regardless of their contribution history. This new program provides old age and disability subsidies financed by general revenues. Particularly, the re-reform created two state-financed guarantees:

- A “basic solidarity pension” (PBS) for old age and disability, for affiliates without the right to a minimum pension or to PASIS. The PBS was initially granted to 40 per cent and later to 60 per cent of the poorest homes, without any pension, aged 65+, and living in the country for 20 years. Most favored by the PBS are workers who have been in and out of the labor market temporary, independent workers and women.

  The monthly PBS in 2015 was 132$, which is 79 per cent higher than the PASIS and is annually adjusted to the consumer price index (CPI).
- A “solidarity contribution to pensions” (APS) replaces gradually the minimum pension and supplements low contributory pensions for those aged 65+.

"The 2008 law also favors middle-income groups through the creation of voluntary savings options through tax benefits. The goal here is to incentivize savings, allow the individual a wide variety of both institutional, and risk options (Superintendencia de Pensiones, El Sistema" (Chileno de Pensiones, 2014, p. 99).

In 2008, Chile introduced a new social security pillar name as: "New Solidarity Pillar" (NSP), represents a relatively novel design for noncontributory benefits that tries to balance the tension between extending universal coverage while maintaining an affordable fiscal cost. Indeed, it has been reported "In six years, labour force coverage rose from 62.8% to 64.8%, coverage of the self-employed rose from 4% to 20%, and coverage of the elderly population rose from 79% to 83.5%. That increase has favored most of the lowest income beneficiaries" (Mesa-Lago & Bertranou, 2016, p.5). "In 2015, on average, the value of the APS represented 79 per cent of total old-age pension income, and 92 per cent of disability benefit income (the cap was USD 428 a month)". (Borzutzky & Hyde, 2016, p.5).

Furthermore, minimum pension guarantee with the two legs (PBS and APS) reduced poverty by 2.7 percentage points (Fajnzylber, 2019), doubled the number of beneficiaries in the period 2014-2018 reaching 1.24 million, improved pension levels and had progressive effects on distribution. Chile's 2008 reform improved the chances that future lower income retirees have to obtain higher pensions and higher replacement rates without increasing the state's fiscal burden (Muir & Turner, 2011).

In relation to the theory described in the first section, two reasons were identified for the pension reversals in Chile. First, the economic principle of pension transition above (see phrase (6.19)). The transition to capitalized scheme was questionable in the first place due to low returns and sub-optimal performances (Acuña & Iglesias, 2001). That in itself awakened political pressure to re-reform the pension scheme back to more intensive role of the state (Hessel et al. 2019). Second, low accessibility to redistribution mechanisms in the funded scheme which pushes to low coverage in the new pension scheme (Borzutzky & Hyde, 2016). Lack of insurance with risks shifted from the government to the public, pushing for political pressure toward pension reversal.

6.6. Discussion

As there are different reasons for pension evolution in each country, we find the demand for redistribution mechanisms or minimum pension guarantee as a common motive in the late design of pension reforms around the globe. These mechanisms can address the form of pension top-ups such as in Argentina and Poland or, for instance, a zero-pillar such as Chile, Hungary and Kazakhstan (Mesa-Lago & Bertranou, 2016).

The theory introduced above continues the classic literature strand of consideration between funded and unfunded pension schemes, adding dimension of risks and expectation for insurance as key in sustainable scheme. The global experience confirms the expectation theory above regarding the demand for balance mechanisms in funded pension designs. Implementing pension guarantee signals low-earning cohorts to trust the pension system despite various financial and labor risks with small capacity to diversify them. From another perspective, the pension guarantee can be identified as a non-formal "agreement" between low earners and high earners. On one hand, by the transition, participants are more exposed to financial risks than the former pension system. High-

earning participants gain from the reform as there is no cap to their benefits in old age and they can manage financial risks and hedge them by wider pension portfolios. On the other hand, high-earning cohorts insure low-earning cohorts' pension benefits to a threshold.

The present study argues that the most appropriate guarantee schemes in funded pension schemes are those that are based on intra-generational risk sharing. The reason for this is that these schemes directly alleviate the anomaly, which favors high earners at the expense of low earners during the transition. This kind of guarantee financing is attributed as a collar strategy wherein the underlying asset is the total pension benefits. Moreover, the cost to the insurer in providing a collar is lower than the cost of providing the same guarantee without a ceiling. In addition, the demand of minimum pension or target pension is also mentioned among countries that have not made drastic pension changes but have mainly conducted parametric reforms. In most developed countries, the income-dependent stratum of the pension system is publicly managed using the defined-benefit method, which is funded via PAYG, with parametric changes. Generally, Western European countries have avoided radical pension reform and have been through parametric reform of age eligibility and social security generosity. Even so, many of these countries have imposed minimum pension guarantee to encourage personal savings accounts and strengthen adequate benefits for low-earning cohorts (OECD, 2019).

6.7. Conclusion

In line with Barr & Diamond (2009), the present chapter argues that the validity considerations of pension transition as a function of aging and return are limited. The pension market transition from inter-cohorts' perspective is analyzed, avoiding attributing the pension system's participants as a single actor, in a similar way like the previous two chapters. Using a simple option exchange benefit model, the study demonstrates that the transition is beneficial mainly for high-earning cohorts at the expense of low-earning cohorts. Moreover, as a complement to the emerging literature strand on pension reforms and re-reforms, the study puts forth that in funded pension scheme, the central planner has an incentive to implement minimum pension guarantee, avoiding cyclical pension reforms and fiscal risks while leaning on unfunded pillars. From this perspective, implementing the guarantee by intra-generational risk sharing can efficiently alleviate the

anomaly mentioned previously. That kind of guarantee can be considered a collar transaction, wherein the underlying asset is the total old age benefit at retirement. Economically, that transaction compensates low earners for the lack of insurance for low benefits and high exposure to financial risks with low ability to diversify them.

The theory discussed above explains the cyclical process of pension reforms in many countries that have performed radical reforms in the last 30 years. It was found that the common characteristic of many pension reversals is the implementation to minimum pension guarantee in a public PAYG pillar. Studying the experience of the Chilean reforms as a representative pioneer country, it is clear that poverty-prevention pillars are a fundamental part of any modern pension system that include dominant funded pillar (Fajnzylber, 2019). Indeed, noncontributory benefits have proven to be an effective tool in extending social protection to the elderly population and hence to complete private accounts savings scheme (Holzmann & Hinz, 2005).

The application of the present study and the experience of most of the countries with respect to social protection suggest pension reforms in the future in countries that have imposed funded scheme with no sufficient social protection, such as Israel, Ireland and Denmark (OECD, 2019; Giorno & Adda, 2016). According to the insurance expectation theory described earlier, the timing for the expected re-reforms in such countries is correlated to the timing of the first waves of retirees under the new pension scheme. The last financial crisis, including the ongoing COVID-19 pandemic, and the poor performance of funded pension funds might foster new pension reforms.

Therefore, it is recommended that the present research be further expanded by analyzing the implementation of minimum guarantees in additional countries with different kinds of pension schemes. It would be especially interesting to examine the inter-cohort balance in NDC form that exceedingly popular across Europe. Socio-economic studies can also prove to be complementary to the current research, investigating the utility function of different cohorts while imposing minimum pension guarantee.

Appendix

	Country	Reform	Reversal	Influence on Benefit Adequacy and Insurance
CEE Countries				
1	Bulgaria	2002	2007	Funded pillar with 5% contribution rate. 2014 - Minimum income support for the elderly is provided through the state; The minimum old-age pension amount is set every year by the Public Social Insurance Budget Law;
2	Croatia	1999	2011	Retrenchments of private second pillar mandatory pensions; Mandatory individual account contribution reduced from 10 per cent to 5 per cent;
3	Czechia	2004	2016 - Terminating individuals' accounts	Pension fund managers must guarantee the nominal value of contribution made by plan members every year. Contributions cannot receive a negative rate of return;
4	Estonia	2002	2009	The government suspend its contribution to the second pillar; Universal benefit component as part of the first pillar;
5	Hungary	1998	2011 - Terminating individuals' accounts	Minimum pensnion guarantee finances from the state budget; Mandatory pension funds must ensure that the investments return is not less than 15% less than the yield on Hungarian government bonds; pension-tested benefit around 103 USD per month (2018) and 80 USD means-tested (2013);

Country		Reform	Reversal	Influence on Benefit Adequacy and Insurance
6	Kazakhstan	1998	2004	2013 - Reversal of privatization and introduction of 0 Pillar: Basic Social Pension (BPP) (unconditional, universal pension payment). The zero pillar consists of the basic social pension (BSP). All citizens who have reached retirement age receive a BSP. The BSP is an equal amount for all, regardless of work experience and salaries. 2018 - minimum pension of 45$, corresponding to 54 per cent of the minimum subsistence level (MSL). Since 1 July 2018, the BSP also increases with years of employment, for a maximum of 100 per cent of the MSL;
7	Latvia	2001	2009	2014 – minimum income level of 40% of the median income 71 – 109 EUR depends in contribution period; 2017 – basic pension guarantee of 64 EUR a month;
8	Lithuania	2004	2009-2019 Downsizing of individual accounts;	Insurance as part of the point system by contributions;
9	Macedonia	2006	2011	Contributions to mandatory individual accounts reduced from 7.42 per cent to 5.25 per cent and strengthening the first pillar.
10	Poland	1999	2014, 2017 2014 - Terminating indivudal accounts and transfer to ZUS;	Pension funds must ensure that returns fall within a band that is defined as the greatest of 4 percent points below the weighted-average real rate of return over the previous 12 months and 50% of the weighted-average return; Available for men 65+ and for women 60+. In addition, a means and pension-tested benefit is

Country		Reform	Reversal	Influence on Benefit Adequacy and Insurance
				provided; Financed from public funds;
11	Romania	2004	2009-2017 2017 - government reduced and froze contribution rates to 2nd individual account pillar.	2012 -a guarantee fund to protect the second and the third pillar savings was created;
12	Russia Federation	2002	2012	Contributions to individual accounts are diverted to social insurance;
13	Slovakia	2005	2008-2015 Downsizing of individual accounts.	2013 - Contribution rates were reduced from 9% to 4%, since 2017 increase by 0.25% up to 6% in 2024; 2009 - Pension fund management companies are required to guarantee a zero percent rate of return every six months;

	Country	Reform	Reversal	Influence on Benefit Adequacy and Insurance
Latin America Countries				
1	Argentina	1994	2008 Government ends individual accounts and transfers funds to PAYG system	Non-contributory universal and basic pension-tested benefit to person aged 65+ not receiving any other pension corresponding to 80% of the minimum PAYG pension; Extended by 'Moratorium' program – allowed workers of retirement age to receive a pension regardless of whether they had completed the full 30 years of required social security contributions through formal employment; Means-tested benefit is provided to person aged 70+ without any other income corresponding to 70% of the minimum PAYG pension;
2	Uruguay	1996		Complementary pension scheme where the pay-as-you-go system provides a universal benefit, but workers with higher income are required to contribute to the individual capitalization system;
3	Mexico	1997		2009 - Guaranteed minimum pension equal in the social security pillar to “one minimum wage” for those who hav e contributed long enough to qualify;
4	Bolivia	1996	2009 Closing individual accounts system.	Non-contributory Zero pillar, 'Renta Dignidad' is granted to all the population aged 60+ from stste budget; 2010 - Solidarity pension – minimum pension scheme which provide income protection for older persons and guarantee replacement rate of 70% with 30 years of contribution from the age of 60;

				Financed by contributions of workers (0.5%-10%) and the employer (3%);
5	Chile	1981		2008 - Launching a zero pillar solidarity supplement that integrated with the existing funded pillar and serves as pension supplement to pensioners in the lowest 60 percent of the income distribution. This reform is seen as a benchmark; 2018 - President Pinera announced that he would undertake a pension reform to increase the solidarity pillar and to create a special benefit supplement for women and the middle-class who are near or past retirement age;
6	Colombia	1994		2003 - Fondo de Solidaridad Pensional – to subsidize pension contributions of workers with low earning; 2013 - The labor ministry announced a proposed pension reform bill aimed at reducing inequality and poverty and ensuring financial sustainability.
7	Costa Rica	2001		adopted private individual retirement savings as a complement to the defined benefit public system. Include a minimum pension guarantee with large coverage by means tested.
8	Ecuador	2001	2002	Foundation of the 'Fondo Solidario' - Semi-contributory scheme for low pension levels;
9	El Salvador	1998	2017	Solidarity Guarantee Account, aimed at paying a guaranteed minimum supplementary pension; Financed by increasing conteribution rates from 13% to 15% and channeling 2 percentage points to finance;

10	Nicaragua	2000	2005 Terminating individual accounts	Declaring private pensions unconstitutional;
11	Venezuela	1997	2000 Terminating individual accounts	2002 - New Social Security Framework Law: Average-premium public and solidarity program. Defined benefit and public administration. Decision to standardize retirement programmers and establish new institutions.
Other OECD Countries				
1	Australia	1992		FDC with three pension pillars. The first pillar includes Minimum pension guarantee of 27.8% from average wage indexed to the cost of living. The coverage is means-tested against income and assets. Financed from the state budget.
2	Denmark	1994		Public pillar and FDC. The FDC is one of the big in the OECD in assets and coverage. Minimum pension guarantee of 2800$ a month, compares to both pillars and depends on citizenships.
3	Norway	2011		NDC + Supplementary funded pensions. The minimum pension has not been changed during the reform - 33% of average wage, exempt from taxes. The guaranteed pension will be income tested by 80 percent of the income pension. In other words, people with a low income pension who receive a guaranteed pension will keep 20 percent of their income pension and will thus receive a total pension above the minimum level.

4	Sweden	1994	Mix pension system of NDC and small pillar of FDC. Implementation of minimum pension guarantee and housing from the state budget and is being indexed. The parliamentary review group on the Swedish pension system ('Pensionsgruppen') recently suggested several reforms to improve the lowest pensions, including increases in the Sweden guaranteed minimum pension and in housing supplements (Social Ministry 2018)

Source: Author's elaboration based on OECD report (2019); Ortiz et al. (2018); Naczys and Domonkos (2016); Natali (2015);

Chapter 6 - References

Aaron, H. (1966). The Social Insurance Paradox. *Canadian Journal of Economics and Political Science, 32*(3): 371-374, https://doi.org/10.2307/139995.

Acuña, R. & Iglesias, A. (2001). Chile's Pension Reform after 20 Years. *Working paper 0129. Washington, DC*: The World Bank.

Altiparmakov, N. (2018). Another Look at Causes and Consequences of Pension Privatization Reform Reversals in Eastern Europe. *Journal of European Social Policy, 28*(3), 224–241.

Antolín, P., Stephany, P. Whitehouse, E. & Yermo, J (2011). The Role of Guarantees in Defined Contribution Pensions, *OECD Working Papers on Finance, Insurance and Private Pensions,* No. 11, OECD Publishing, Paris, https://doi.org/10.1787/5kg52k5b0v9s-en.

Barr, N. & Diamond, P. (2009). Reforming pensions: Principles, analytical errors and policy directions. *International Social Security Review*, *62*(2), 5–29, https://doi.org/10.1093/oxrep/grj002

Barr, N. & Diamond, P. (2016). Reforming Pension in Chile. *Polityka Społeczna*, *Social Policy, 1(12):* 4–8.

Biggs, A. (2010). Option Pricing Method for Calculating the Market Price of Public Sector Pension Liabilities. *American Enterprise Institute*. Working Paper No. 164.

Borzutzky, S. & Hyde, M. (2016). Chile's private pension system at 35: Impact and lessons. *Journal of International and Comparative Social Policy, 32*(1): 57–73, http://doi.org.10.1080/21699763.2016.1148623

Datz, G. & Dancsi, K. (2013) The Politics of Pension Reform Reversal: A Comparative Analysis of Hungary and Argentina, *East European Politics*, 29:1, 83-100, http://doi.org.10.1080/21599165.2012.759940

Disney, R. (2000). Crises in Public Pension Programs in OECD: What are the Reform Options? *The Economic Journal*, 110(461), 1-23, https://doi.org/10.1111/1468-0297.00505

Dominczak, A. & Strzelecki, P. (2013). The Minimum Pension as an Instrument of Poverty Protection in the Defined Contribution pension system – an Example of Poland. *Journal of Pension Economics and Finance*, 12(3): 326–350. http://doi.org/10.1017/S1474747212000418

Ebbinghaus, B. (2021). Inequalities and Poverty Risks in Old Age across Europe: The Double-Edged Income Effect of Pension Systems. *Social Policy Administration*. https://doi.org/10.1111/spol.12683

Fajnzylber, E. (2019). Chile's Solidarity Pillar: A Benchmark for Adjoining a Zero Pillar with Defined Contribution Schemes. *Progress and Challenges of Nonfinancial Defined Contribution Pension Schemes*, 1. Addressing Marginalization, Polarization, and the Labor Market, 241–258.

Feldstein, M. (2005). Structural Reform of Social Security. *Journal of Economic Perspectives*, 19 (2): 33-55. Http://doi.org.10.1257/0895330054048731

Feldstein, M. & Ranguelova, E. (2001). Individual Risk in an Investment-Based Social Security System. *The American Economic Review*, 91(4): 1116–1125. http;//doi.org.10.1257/aer.91.4.1116

Feldstein, M., Ranguelova, E. & Samwick, A., (2001). The Transition to Investment-Based Social Security When Portfolio Returns and Capital Profitability Are Uncertain, *NBER Chapters, in: Risk Aspects of Investment-Based Social Security Reform*, pages 41-90, National Bureau of Economic Research, Inc.

Franco, D. & Tommasino, P. (2020). Lessons From Italy: A Good Pension System Needs an Effective Broader Social Policy Framework. *Intereconomics* 55: 73–81. https://doi.org/10.1007/s10272-020-0874-4

Fultz, E. & Hirose, K. (2019). Second-Pillar Pensions in Central and Eastern Europe: Payment Constraints and Exit Options. *International Social Security Review*. 72 (2): 3-22. https://doi.org/10.1111/issr.12201

Giorno, C & Adda, J. (2016). Improving the pension system and the welfare of retirees in Israel, *OECD Economics Department Working Papers, No. 1288*, OECD Publishing, Paris, https://doi.org/10.1787/5jm0xf1fsqvf-en.

Gora, J., (2016). Evolution of supplementary old-age pension systems in selected CEE countries. *Journal of Management and Finance*. 14(4). 169-162.

Guardiancich, I. (2011). Pan-European pension funds: Current situation and future prospects. *International Social Security Review*, 64(1): 15–36. https://doi.org/10.1111/j.1468-246X.2010.01382.x

Grande, G. & Visco, I. (2010). A public guarantee of a minimum return to defined contribution pension scheme members. *The Journal of Risk*, 13(3), 3–43.

Grech, A. (2015). Convergence or divergence? How the financial crisis affected European pensioners. *International Social Security Review*, 68(2): 43–62. https://doi.org/10.1111/issr.12065

Grech, A., (2018). What Makes Pension Reforms Sustainable? *Sustainability*. 10(8). https://doi.org/10.3390/su10082891

Hassel, A., Naczyk, M. & Wib, T., (2019). The Political Economy of Pension Financialisation: Public Policy responses to the Crisis. *Journal of European Public Policy*, 26(4): 483-500, https://doi.org/10.1080/13501763.2019.1575455

Heneghan, M. & Orenstein, M. (2019). Organizing for Impact: International Organizations and Global Pension Policy. *Global Social Policy*, 19(2), https://doi.org/10.1177/1468018119834730

Holzmann, R. (2013). Global Pension Systems and their Reform: Worldwide Drivers, Trends and Challenges. *International Social Security Review*, 66 (2), 1–29. https://doi.org/10.1111/issr.12007

Holzmann, R. & Hinz, R. (2005). Old-Age Income Support in the 21st Century: An International Perspective on Pension Systems and Reform. *The World Bank*. https://doi.org/10.1596/0-8213-6040-X

Hujo K. & Rulli M. (2014). Towards More Inclusive Protection: A Comparative Analysis of the Political Process and Socio-Economic Impact of Pension Re-Reforms in Argentina and Chile. *In: Hujo K. (eds) Reforming Pensions in Developing and Transition Countries. Social Policy in a Development Context*. Palgrave Macmillan, London. https://doi.org/10.1057/9781137396112_10

Jensen, S., Pedersen, T. & Foxman T. (2019). Experiences with Occupational Pensions in Denmark. *Quarterly Journal of Economic Research*, 88 (1): 11–30. http://doi.org.10.3790/vjh.88.1.11

Jimenez-Martin, S. (2014). The Incentive Effect of Minimum Pension Guarantee. *IZA World of Labor*. 2014:84 https://doi.org/10.15185/izawol.84

Jimenez-Martin, S. & Sanchez-Martin, A.R. (2007). An Evaluation of the Life-Cycle Effects of Minimum Pensions on Retirement Behavior. *Journal of Applied Economics* 22: 923-950. https://doi.org/10.1002/jae.956

Lachance, Marie-Eve, & Olivia S. Mitchell. (2003). Guaranteeing Individual Accounts .*American Economic Review*, 93 (2): 257-260. http://doi.org.10.1257/000282803321947155

McCarthy, D. (2009). Shaping Returns in DC Pension Accounts: The Question of Rate of Return Guarantees. *SSRN Papers.* http://dx.doi.org/10.2139/ssrn.1424482

Mesa-Lago, C. & Bertranou, F. (2016). Pension reform in Chile and Social Security Principles 1981–2015, *International Social Security Review*, 69(1), 25–45. https://doi.org/10.1111/issr.12093

Mesa-Lago, C. & Valero, D. (2020). The New Wave of Pension Reforms in Latin America. *In: Peris-Ortiz M., Álvarez-García J., Domínguez-Fabián I., Devolder P. (eds) Economic Challenges of Pension Systems*. Springer, Cham. https://doi.org/10.1007/978-3-030-37912-4_12

Muir, D. & Turner, A. (2011). Constructing the Ideal Pension System: The Visions of Ten Country Experts. *In Imaging the Ideal Pension System: International Perspectives, Dana M. Muir and John A. Turner, eds. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research*, 1-17.

Naczyk, M. & Domonkos, S. (2016). The financial crisis and varieties of pension privatization reversals in Eastern Europe. *Governance, 29*(3): 167–184. https://research.upjohn.org/up_bookchapters.

Natali, D. (2015). Pension Reform in Europe: What Has Happened in the Wake of the Crisis?, *CESifo DICE Report, ISSN 1613-6373*, ifo Institut - Leibniz-Institut für Wirtschaftsforschung an der Universität München, München, 13(2): 31-35

Nelson, K., Nieuwenhuis, R., & Alm, S. (2019). Sweden: Adjoining the Guarantee Pension with NDC. *Social Protection Discussion Papers and Notes from The World Bank.* https://doi.org/10.1596/31626

OECD. (2019). *Pensions at a Glance 2019: OECD and G20 Indicators*. OECD Publishing: Paris. https://doi.org/10.1787/b6d3dcfc-en.

Orenstein M. A. (2013). Pension Privatization: Evolution of a Paradigm. *Governance*, 26(2): 259–281, https://doi.org/10.1111/gove.12024

Ortiz, I. & Duran, F. & Urban, S. & Wodsak, V. 7 Yu, Z. (2018). Reversing Pension Privatization: Rebuilding Public Pension Systems in Eastern European and Latin American Countries (2000-18). Available at SSRN: https://ssrn.com/abstract=3275228 or http://dx.doi.org/10.2139/ssrn.3275228

Pennachi, G. G. (1999). The Value of Guarantees on Pension Fund Returns. *Journal of Risk and Insurance*, 66 (2): 219–237. https://doi.org/10.2307/253610.

Romaniuk, K. (2009). The Options Embedded within Pension Plans: Types, Valuation Principles and Effects on Optimal Investment Policies. Bankers, Markets & Investors, Forthcoming, Available at SSRN: https://ssrn.com/abstract=1618324

Smetters, K. (2002). Controlling the Cost of Minimum Benefit Guarantees in Public Pension Conversions. *Journal of Pension Economics and Finance*, Cambridge University Press, 1(1): 9–33. http://doi.org.10.1017/S1474747202001014.

Schwarz, A., Guven, U., Hinz, R., Holzmann, R., Rudolph, H., & Zviniene, A. (2009). Pensions in crisis: Europe and Central Asia Regional Policy Note. The World Bank.

Vis, B., Kersbergen, K. & Hylands, T. (2011). To What Extent Did the Financial Crisis Intensify the Pressure to Reform the Welfare State? *Social Policy Administration*. 45(4): 338-353. https://doi.org/10.1111/j.1467-9515.2011.00778.x

Wolf, I. & Caridad, L. (2021). Pension Reforms and Risk Sharing Cycle: A Theory and Global Experience, International Journal of Economics and Business Administration. 9(1): 225-242, http://doi.org.10.35808/ijeba/669.

World Bank. (1994) Averting the Old-Age Crisis: Policies to Protect the Old and Promote Growth; Oxford University Press: Oxford, UNITED KINGDOM

Zaidi, A. (2010). Fiscal and Pension Sustainability: Present and Future Issues in EU Countries. European Center. Belgian EU Presidency. https://core.ac.uk/download/pdf/11867528.pdf

VII. The Adequacy of Funded Pension Benefits and the Influence of Systemic Shock: Micro Simulation of the Israeli Pension Market

> "Powerful states (notably the USA), powerful organizations (such as the IMF) and even powerful disciplines (economics) exercise their power largely by 'framing': which serves to limit the power of potentially radical ideas to achieve change." (Bøås and McNeill, 2004, p. 1).

7.1. Introduction

This chapter is the last theoretical composition in this dissertation and continues logically the study the transition to funded pension design from risk perspective. In the previous chapters, we study the significant of the government role in ensuring sustainability of funded pension designs. Here, this chapter enables another analyzing dimension of pension funds and refer to the adequacy of benefits in funded pension fund. It is shown again the major implications of unfunded pillar by diversifying financial risks and the significant of minimum pension guarantee. If in chapters 4-6 it is claim that intra-generational risk sharing is the most efficient way to finance the guarantee, in this chapter we seek solutions in that kind for the analyzed market. For analyzing empirically funded pension system, Israel is the most suitable. Israel market is a unique playground to explore almost pure defined contribution pension system with continuous trend toward capitalization and liberalization.

7.1.1. The Relevancy of Empirical Study

Concerns about the consequences of funded pensions, such as the growing risks of poverty and the increasing in inequality during old age, have mounted in academic and public debates (Grech, 2018).

The financial crisis of 2008 and the recent coronavirus financial crisis have demonstrated the sensitivity of old age expected benefits not only to the capital market (Lever and Michielsen 2016) but also to continuous working and savings. "As a result, people's trust in the expected long-term returns of funded pensions has been shattered at a time when saving for retirement has become more important. The privatization of the responsibility for old-age income and the shift toward more funded pensions thus raises important issues that warrant examination" (Bonizzi, & Churchill, 2017, p.8).

Varying approaches to pension regulation induce manifold redistributive and well-being effects (Boelaars & Broeders, 2019). Particularly, the effect of private pension income on income inequalities, as the mass of workers that may benefit under the new reforms are expected to retire only in the next 5–10 years across the many Western countries that have implemented funded pension schemes (Aubry et al. 2020).

Contributing to this strand of pension scheme investigation, this chapter aims to understand the long-term economic consequences of funded pension's benefits in the future and recognize the wide variety of financial, labor, and systemic risks. The question that arises subsequently is how to manage these risks efficiently on the central planner level. Here, we empirically investigate the adequacy of pension benefits and the probability of people falling into poverty during their old age. Following the COVID-19 pandemic in 2020, the realization of financial risks associated with frictions in the labor markets and global systemic risk provided the opportunity to investigate correlated shocks on pension benefits and contributions.

This study is conducted on the Israeli pension system, which considered as a representative platform for small open-funded pension systems. Israel has undergone a radical transition from a dominant PAYG defined benefit (DB) scheme to an almost purely capital-funded scheme with little government intervention. Most of the countries that had undertaken pension reforms wave over the 1990s scaled them back over the last decade (Ortiz et al. 2018). However, the pension system in Israel is stable with the same consistent capitalization trend (Giorno & Adda 2016). We examine in both conceptual and quantitative terms the development of the two pillars of Israel's pension system and project its future projected benefits.

To this day, the Israeli pension system is considered a "black box." As opposed to Germany and Ireland and similar to other countries, the first significant wave of participants who were affected by the radical pension transition has not yet retired and will do so in the coming years. Only a few studies have been conducted on the Israeli pension system. Most of them such as Benish et al. (2016), Kimhi and Carmi (2018), and Spivak & Troitsky (2013) have dealt with the influence of management fees on savings and accumulations. Now that these fee rates are very close to the Organization for Economic Co-operation and Development (OECD) average value, it is surprising to see that there is no sufficient debate on pension system design. We hope to reveal in this work some of the future consequences of the radical funded pension fund and contribute to the debate on the proper balance of government intervention in the pension market.

In the first part, the composition has described the unique evolution of the Israeli pension system toward capitalization and minimum government intervention. "This policy appears to be consistent with a wider global trend supporting privatization and the

reduction of government involvement." (Manor & Ratajczak, 2020, p.14). The rest of this part discusses the socioeconomic challenges that have developed over the years due to this policy. These current challenges are an integral part of any pension targets.

The second part of this chapter introduces simulation of the expected pension benefits of the first and second pension pillars according to real sample data, which is based on the by-laws of pension funds and the insurance companies in Israel. In fact, to the best of our knowledge, for the first time in pension research in Israel, a study introduces a unique database from the largest pension fund in Israel with more than 15,000 records of wages and savings accumulations. Simulating future benefits, I consider the effect of financial crises on pension benefits from time to time and the realization of financial shocks.

Based on the sample and the simulation results, we determined that adequate pension benefits are applicable only when actuarial assumptions are realized with no fluctuations along the individual's career. We pointed out the system's vulnerability to financial and systemic shocks. These may include: unemployment periods, low market returns, wage cuts, and early withdraws from pension accumulation. Moreover, we show that the pension system in Israel provides less room for redistribution and leaves individuals exposed to substantial income inequality and market fluctuations.

Based on the results, this composition suggests the implementation of a common instrument of minimum pension guarantee for two motives: economically, to strengthen the individual's ability to absorb financial risks and socially, to alleviate poverty and inequality. Based on the experience of CEE and Latin America countries, as discussed in chapters 5-6, this tool can increase the system's sustainability. (See also Wolf & Caridad, 2021; Grech, 2018; Orenstein, 2011).

For avoiding tax raise or increasing in contribution rates, and consistently with chapters 5-6, the paper recommends the use of on internal finance sources and intra-generational risk sharing financing this guarantee. Here, I suggest financing the guarantee by intra-generational risk sharing of means tested and canceling the issuing of designated bonds by the government to the funded funds. Since these bonds are unique to the Israeli market, in global perspective, this suggestion is analogue to re-utilizations of rate of return guarantee to flat benefit. I also find a financial source in the declining of the budgetary pension's cost to public servants in the coming years.

After discussing the Israeli pension system and its characteristics in the first two sections, in section 7.3, this chapter describes the sample and the simulation for both the first and the second pillars. In section 7.4, we explain the calibration and set the proper assumptions to run the model simulation for future benefits. Section 7.5 reports the main results of the simulations. In section 7.6, we discuss the results and suggest certain ways to improve sustainability of the pension scheme. Section 7.7 concludes this chapter.

7.2. Israel's Pension System Evolution toward Capitalization and Minimum Government Intervention

7.2.1. Pension System Evolution

Over the last 30 years, Israel has faced intensive pension reforms, as part of broader economic reforms. “East European Jewish immigrants to Israel viewed the Zionist and the socialist revolution as complementary and inseparable goals and sought to create an economy in which market forces were controlled for the benefit of society as a whole.” (Kay, 2012, p. 101).

Until 1985, the Israeli economy was centralized and controlled by the government and by an umbrella organization of all labor unions in Israel “Histadrut,” both ruled by the Labor Party (Spivak 2013). In 1973, when the war and the oil crisis broke out, the government gradually lost control over the economy: The budget deficit in 1980–1984 was 13.2% of the GDP, and annual inflation stood around 400% ((Eckstein & Ramot-Nyska, 2008).

In 1985, a national unity government in cooperation with employers, Histadrut, and the Bank of Israel (BOI), introduced an economic stabilization program. As one of the economist involved in the reform, Ben-Bassat reports: "The program included a price freeze and a sharp reduction in the government deficit. In the following years inflation plummeted and the deficit shrank to 0.6%–3.6%." (Ben-Bassat, 2002, p. 6). GDP per capita increased from USD 12.5K in 1990 to USD 42K in 2019 (Country Economy, 2019) and the debt to GDP ratio declined from 1.38 in 1990 to 0.61 in 2018 (Bank of Israel, 2019a).

Alongside governmental efforts to stabilize the economy, the government initiated pension reforms, designed according to the American agenda and aiming to reduce government involvement (Spivak, 2013). The bottom line of the reform was to transform

the pension scheme from a PAYG DB scheme with low coverage to a defined contribution (DC) scheme with automatic actuarial balance, thus avoiding governmental intervention and fiscal burden. "The reasons for the reforms were not strictly economic but based on neoliberal economic beliefs, political motives, and international relations. The major powerful forces that drove the reforms were the Ministry of Finance (MOF) seniors, the BOI, and the academic community, mostly educated at American universities." (Kay, 2012, p.8).

Assistance came from politicians of both parties and from the USA, Israel's main ally against the Arab countries, supported by the USSR (Eckstein & Ramot-Nyska, 2008; Kay, 2012). "In parallel, The USA feared Israel's possible economic collapse and requested that the Israelis execute reforms designed according to Milton Friedman's neoliberal principles in order to gain American economic support" (Manor and Ratajczak, 2020, p. 92).

The continuation of pension reforms in the 1990s was led by the 'Likud' party, from the right wing of the parliament, which has been in power most of the time since 1977. "It was an opportunity to weaken the organizations that were affiliated with the Labor Party, mainly the Histadrut" (Paz-Fuchs et al., 2018, p.7).

Alongside impressive macroeconomic results in the Israeli market in the past 30 years, the pension market has completely changed from 'social' to 'liberal' (Bleikh, 2016). Israel has made major steps toward minimizing government intervention in the pension market and basing pension benefits on individual contributions and accumulations.

As noted in this thesis, one can determined that, In fact, Israel's pension reform can be compared to those introduced in several Latin American countries. For example, starting with Chile (in the early 1980s), Mexico, and several CEE countries, such as Hungary and Slovakia—which had the extreme view of privatizing national pensions according to a pure DC model (Manor and Ratajczak, 2020). The difference is that Israel continues with the line of capitalization, while most of these countries have rolled back their pension system toward more to favor greater governmental intervention and institute a minimum pension guarantee. Indeed, Israel's public expenditure on pension has decreased constantly and is now one of the lowest among the OECD members, with 4.8% compared to the average OECD of 10% (see Figure 1/Panel B).

7.2.2. The First Pillar

The first pillar aims to provide every elderly citizen with a uniform and basic income with the aim of reducing elderly poverty (Eckstein & Ramot-Nyska, 2008). To this end, the National Insurance Institute (NII) provide them old-age allowances and income support. Israel has no target pension and its basic pension (first pillar) is low, only 14%, on average from the average monthly wage ("NII Report" 2020), compared to 28% in other OECD members (OECD, 2019).

Israel's basic pension combines the criteria of residency and years of insurance. According to the NII report: "The residency component is applied when individuals reach retirement age and is contingent on the condition that the retirees have no additional income (aside from pension income) in excess of a pre-determined amount. After the age of 70 (for men) or 65–70 (for women, depending on their year of birth), the additional income stipulation is dropped, and all retirees receive an old-age allowance regardless of additional revenues." (NII report, 2020, p.45). The basic allowance in 2018 was NIS 1,535 per month. Those who do not receive an allowance from retirement age until age 70 due to income from work or other sources receive an increase of 5% for every deferred year.

In addition to the residency-based old age allowance, a "seniority supplement" is based on 2% of the old age allowance per full insurance year after the first 10 insurance years and can reach a cap of 50% for individuals who have paid to National Insurance for at least 35 years.

The full seniority supplement awards recipients with an additional 7% of their average salary. The total average contribution rate stands at 5.3% from GDP, while the average OECD rate stands at 9.1% (NII Report 2020).

Inspired by the American economic policy, the government consistently acts to erode its share in the social expenses, including benefits to the first pillar (Taub Center, 2019) and avoiding minimum pension guarantee schemes. (Carmi & Kimhi, 2018). In 2004, linkage of the old age social security allowance to the average wage was shifted to the Consumer Price Index, thus halting the creeping increase in the real value of the allowance. By that step, Israel failed to learn from Britain's experience, which renew the indexation to the average wage change in 2012. According to Benish et al. (2017) and Spivak and Troitsky

(2013), the British experience proved that weakening the basic pillar only serves to increase poverty among the elderly, making it necessary to raise the income supplement.

About one in five elderlies, qualifies for additional income support from NII, which is provided to lower-income households who also meet asset test requirements based on vehicle ownership, land ownership, and savings. With receipt of income support, elderly households are raised to near the poverty line.

7.2.3. The Second Pillar

Most of the benefits' weight for old age pensions is planned to derive from the second and the third pillars. The funded – capitalized pillar is a private collective occupational defined-contribution (DC) system with a fixed contribution rate. Nowadays, Israel's pension system is considered as an example of radical reform of privatization and capitalization (Giorno and Adda, 2016). According to the OECD (2019), Israel's total assets in private funds is nearly 60% of the GDP - One of the highest in the West. In addition, over the last decade 30% of total assets value has been shifted from occupational DB fund to personal funds (OECD, 2019).

The second pillar is occupational pension, in which contributions and the overall savings are derived from past income. In some OECD countries, this pillar is managed by the public system, while in other countries, such as in Israel, it has been privatized and is managed by for-profit financial bodies. "The main purpose of the occupational pension pillar is ensuring savings at a level that provides pensioners with a reasonable standard of living comparable to the one they had during their working years" (Eckstein & Ramot-Nyska, 2008, p.7).

Prior to the reforms, the occupational pension pillar included the PAYG DB scheme, a tax-financed lifetime annuity plan for soldiers and public servants. Pension savings were not obligatory, as only public sector workers and employees under sectorial agreements were enrolled automatically (Eckstein & Ramot-Nyska, 2008). In these schemes, upon retirement, the individual received a guaranteed monthly pension equal to a predetermined percentage of his salary. All funded instruments were invested solely in designated governmental bonds. Consequently, around 43% of the Israeli population did

not have any pension arrangement until 2008, when a mandatory private pension scheme was introduced (Galnoor, 2018). Besides the low coverage, another problem in the old scheme was deep actuarial benefits. The pension scheme gave generous benefits and lacked a mechanism for adjusting to demographic changes. This system has a history of suffering from large actuarial deficits during the 1980s and 1990s, and in the mid-1990s, Israel introduced a major reform to stabilize its pension system.

In 1995, as part of the pension reform, the 'old' pension funds were closed to new participants[36]. Instead, new members were offered new public DC funds and, later on, only private pension funds. The new pension funds are private DC funds, in which, upon retirement, the individual's benefit is determined by the amount of money accumulated in his fund. Recently it was reported that more than 90% of the Israeli workforce contribute to the capitalized funded pension funds (Bowers and Fuchs, 2016). The residual still insured in the old DB public-sector funds. (see Figure 7.1, panel A)

In a way, the reform of the budgetary pensions in Israel parallels the reforms in Germany, Italy, and Sweden. These mainly included reduction of rights and raising the retirement age. In Israel as well as in those countries, the old deficit pension funds were nationalized, and the government supported their balancing through the state budget (Ahdut and Spivak, 2010). "The reform altered the public-private ratio of the pension system because it replaced the public system of the 'Histadrut' with the new, private pension funds and cancelled the budgetary pension." (Spivak et al. 2017, p.17).

Since the 1970s, the government has been issuing designated bonds with an insured annual real return of 4.86%. In the past, this instrument was efficient for issuing debt from the public in the days of hyperinflation. Most of the pension portfolio was mandatorily invested in those bonds.

In the same year, as another step toward pension market capitalization, the coverage rate of designated bonds was reduced to 30% of pension-accrued portfolios. This reform led pension funds to direct a large portion of savings into the capital market. Since 2017, the allocation of these bonds ("Arad") has been raised to 60% for savers above the age of 60,

30% for savers in the range of 50–60 years, while the allocation to savers under 50 years of age is being gradually reduced to zero (Spivak et al. 2017).

The economic cost of the subsidy of designated bonds has been estimated to be nine billion NIS in 2020 (“General Accountant Report” 2020). In the last three years, the issuing cost has been risen in one billion NIS per year. Consequently, there is a growing debate over reducing the issuance of designated bonds in order to benefit from the high performance of the capital markets and to provide fiscal relief (Swirsky et al. 2020; Giorno & Adda, 2016). Some have suggested issuing designated bonds according to people’s ages to ensure stability of return close to retirement, and others have suggested that they be issued as per the wage level of the participant. In the following section, we suggest altering the use of designated bonds as the main financial source to expand public expense on the pension system.

"Since 2005, funds and provident funds were sold to insurance companies and investment houses, which immediately raised management fees." ((Rubinstein & Levy 2019, p.10). However, nowadays, after years of regulator's actions and public pressure, nowadays, the management fees stand with the average of OECD members' countries.

The Israeli government instituted a mandatory pension law aimed at increasing the rate of pension savers in the population, effective since January 1, 2008. The mandatory pension implemented in Israel is related to one's income -related (this is also the case in Austria, Belgium, France, Germany, Italy, Norway, Sweden, and the United Kingdom). "The Israeli mandatory pension is not expected to bring about a significant improvement in the state of all retired citizens. Instead, it is expected to merely reduce government expenditure on support payments for retirees" (Gavious et al. 2009, p.8). Nevertheless, as of 2015, approximately 40% of individuals have no pension savings at all, primarily due to poor enforcement of the law (Rubinstein & Levy 2019). In addition to the mandatory contribution requirements, the Israeli tax policy also incentivizes private pension savings through generous tax credits for the second and the third pillars.

In this year (2015), Israel significantly decreased its public expenditures on public pension (see Figure 7.1). "Israel resembles Ireland in this aspect: Its social securities are not the main component of the pension system, and it guarantees only a basic pillar" (Spiovak & Tritzky, 2013, p.24).

In 2017, pension contributions also became compulsory for the self-employed. The application of the mandatory pension law attests to the government assumptions that individuals do not plan sufficiently well for their future[37].

We study the consequences of the 2008 reform from the central bank and the OECD: "The mandatory pension law increased coverage from 35% in 2009 to 78.2% in 2018. Allowing almost 43% of the population to have a future annuity and, thus, reducing future poverty" (OECD, 2019, p. 207). "Major institutions in the capital markets became pension providers, with total assets of 1.2 trillion NIS (which almost equals the annual GDP of Israel), and the growth of accumulation continues with annual contributions of 90 billion NIS and high returns). Most of the pension accumulation has been placed on the local capital market, while the government's involvement in pension finance has dropped from 100% to around 45%" (Bank of Israel, 2019b, p.47).

The pension field in Israel after the reform does not expose the government to longevity risk. This total risk is levied on participants (Spivak, 2013). The system is not supposed to face actuarial challenges or unfunded liabilities that many other OECD countries face. Private pensions in Israel offer a type of insurance on life expectancy, as monthly payments continue until death. An individual's longevity risk is shared among all recipients. Those who live longer than expected receive more than they contributed. The opposite is true for those who pass away early. These schemes, thus, include built-in automatic mechanisms that adjust pension levels to life expectancy.

In addition to systemic reform, Israel has also conducted parametric reforms in line with other Western countries, addressing the increase in life expectancy. In 2003, the retirement age for men was raised from 65 to 67 and from 60 to 62 for women, and the latter is supposed to be raised further to 64 in the coming months. Assessing the parametric reform, Israel had implemented very fast changes.

[37] In this thesis, we investigate the suboptimal contribution rates mainly levied on poor earning cohorts who struggle for their present consumptions.

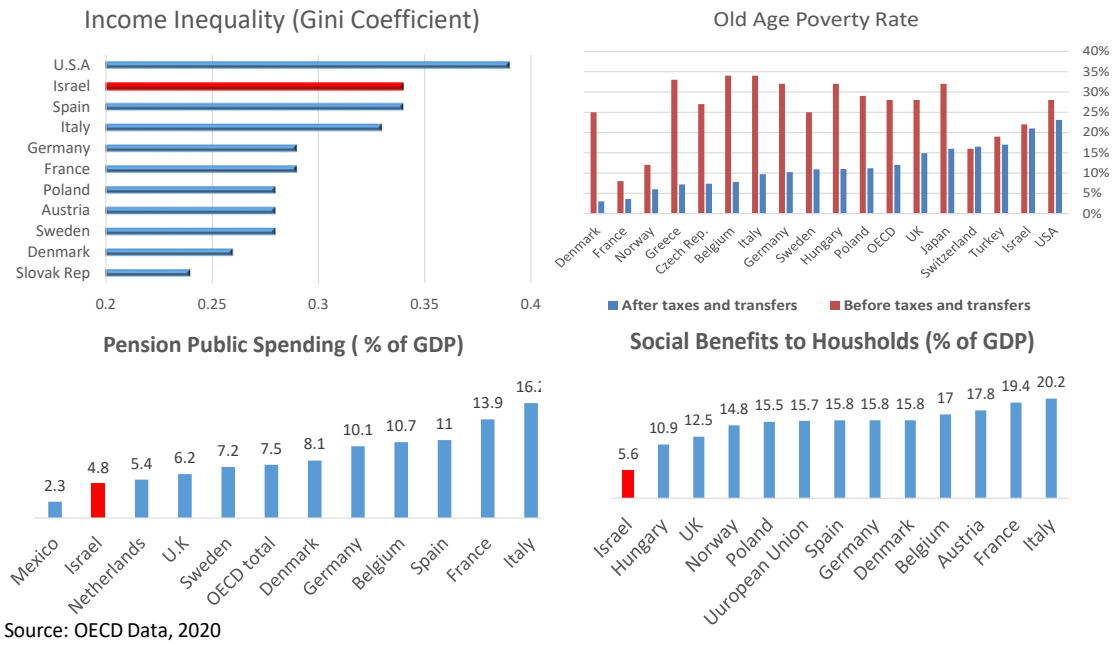
7.2.4. Social Considerations

A highly capitalized pension system intensifies economic gaps among earning cohorts. The twofold reasons are the heavy accumulation-accrued effects and, from the other side, differences in the ability to hedge risks among earning cohorts. Hence, the socioeconomic starting point of the market is important to ensure benefits adequacy (Barr and Diamond 2009).

Nowadays, on the eve of the retirement wave in the new pension scheme, one should ask if the current scheme serves social targets and, if not, how it can serve them. Consequently, it was realized that there existed social gaps in several dimensions:

- Current Poverty and Income Inequality: Nowadays, Israel is considered one of the most unequal economies by the Western world with a high poverty rate (see Figure 7.1). Israel's tax system intensifies income inequality gaps (Kimhi & Kyrill, 2013). This is illustrated by the spectacular reversal of Israel's international ranking in senior poverty, rated after taking account of taxes and benefits (see Figure 7.1).
- Internal Labor Issues: The pension system also suffers from some internal labor issues among the Haredim and Arabs communities who have relatively lower incomes. Positive changes have been observed in these groups lately. Other challenges for the pension system are the current, relatively high poverty rate among pensioners and the absence of sufficient working years for accumulation for Jewish immigrants from Europe, especially from former Soviet Union countries.
- Government Subsidy Anomaly: The issuing of the designated bonds according to the pension portfolio give subsidize to the higher-earning cohorts, as they are issued in correlation with the portfolio size.
- Gender's Wage Gap: Given the lower average earnings of women and their greater reliance on NII allowances, the growing importance of the second pillar over time relative to the first pillar may cause pension gender gaps in Israel to widen, in a way similar to the high inequality between subcohort (Bowers and Fuchs 2018).

Figure 7.1:



Source: OECD Data, 2020

7.3. The Model

7.3.1. Data and Methodology

This subsection describes the process to calculate expected pension benefits from both pension systems' pillars. This research is based on a unique database obtained from the largest private pension fund in Israel ('Menora' Insurance and Pension Company'[38]).

We obtained 15,000 random real records of wage and informative data, such as participants' ages, genders, and family statuses. Furthermore, each record includes their financial information: current insured wage, contribution rates, current accumulation, and private pension coefficient. All the financial data are in 2019 currency level. From a single point in time in 2019, we managed to draw a future wage path for each participant until retirement, based on predetermined assumptions of wage development. From that, we derived the future contributions, pension accumulations, and future benefits for each sample participant. Accordingly, we analyzed these future benefits according to age cohorts and earning deciles.

[38] Menora is the largest pension fund in Israel with more than one third of the participants market.

Table 7.1 compares the sample data to the population data as obtained from the central bureau of statistics.

Table 7.1: The sample vs. total population

	Working Population	**Sample**
Participants (Thousands)	3,320	15
Average covered wage[39]	10,500 NIS	12,000 NIS
Working population Average Age	40	42
Marriage (%)	48%	50%

As implemented in the OLG model in chapter 4, this model considers two-correlated risk variable affecting wage path and pension's benefits: GDP per capita and annual private pension return. The model linked the participants' wages and social security allowances to GDP per capita and their capitalized pension returns to a stochastic pension rate of return.

In addition, the model considered cyclical financial crisis such as the 2007/2008 crisis, the debt crisis in Europe and the recent Corona-Virus pandemic influences. The assumed systemic shock affects wage path, contributions by labor market effect and accumulations and is base on specific assumptions taken from the recent data and economic expectation of the Corona-Virus affect in Israel.

The model also investigates the influence on future benefits with minimum pension guarantee. The guarantee actually increases the level of governmental intervention in the market and can be considered as a redistributive top-up to the public pillar. Mix pension system designs are implemented in many Western countries such as Sweden, Switzerland,

[39] We assume that the covered wage is a 75% from total wage.

France, Germany, Italy, Spain and Portugal. We calculate guarantee effect on the market in two dimensions. From one hand, calculating the expected improvements in benefits to assuming different social lines. On the other hand, mapping the guarantee burden on the market and its economic cost. The guarantee cost is calculated using of 5,000 repeaters Monte-Carlo simulation on the two stochastic variables.

7.3.2. Wage Path

In order to calculate pension accumulation at retirement, wage development through the individual career was required. Some scholars have conducted wage simulations based on statistical regression for different cohorts in Israeli society (Carmi and Kimhi 2018; Manor & Ratajczak, 2020; Spivak et al. 2017). Here, on the other hand, the model is based on real wage records from a private pension fund. We obtained 15,000 participants' sample wages and pension accumulations in terms of 2019 currency level. In order to draw their future wage paths until retirement, we indexed each wage to record the annual change of GDP per capita, as a function of their earning decile. A participant's wage in the year $t+1$ can be described as follows:

$$W_{i,t+1} = W_{i,t} * (E_t a_i)\, g_t \qquad (7.1)$$

Where $W_{i,t+1}$ represents the i participant's wage in the year $t+1$. E_i stands for the earning decile indexing from the GDP per capita annual rate of change, g_t. a_i represents the age indexing factor. We expressed differentiation in earning cohorts by recognizing the distribution of GDP growth according to earning cohorts (E_i). We assumed there is no shift in earning decile along a participant's career; thus the decile-indexing coefficient for each participant is constant. For this assumption, we relied on Carmi and Kimhi (2018); Lurie, (2015) and Gavious et al. (2009) who investigated the labor market in Israel.

7.3.3. The First Pillar

Using the same OLG model, we published in the time of this thesis writing and as part of the doctoral assignments, (Wolf and Caridad, p.9): "Each period, the working

population's contributions are equal to total benefit payments to retirees. Consequently, the public unfunded pension benefit is determined by the balance budget condition, which is as follows:

$$\tau^U \bar{W}_{t+1} N_{t+1} = p^U_{t,T_R} N_t \qquad (7.2)$$

Here, τ^U is the contribution rate to unfunded social security, N_t represents the size of the generation born in the period, and p^U_{t,T_R} is the unfunded pension benefits paid to generation t in the period of T_R. Due to the assumption of a constant debt ratio, the PAYG pillar has a balanced budget mechanism in every period.

Under the assumption of constant population growth, the contribution $\tau^U w_{t,s}$ is paid by the generation t in time s. We indexed the real PAYG annual rate of return to the annual growth of the GDP per capita with a specified lag".

7.3.4. The Second Pillar

The expected pension benefit from the funded fund depends on a participant's accrued balance throughout their working phase. The employee and the employer contribute the fraction $\gamma\tau w_t$ from the insured salary. Pension accumulations are invested in securities in the free market and in designated bonds (30% of the portfolio). The fund deducts insurance premiums of $\emptyset$ from contributions for spousal benefits and disability risk. Likewise, the fund charges a management fee of M from the contributions.

The accumulations earn, on average, the annual rate of return r_t. This rate of return also follows "Brownian motion" in the following way:

$$dr_t = \mu_r dt + \sigma_r B^A dt \qquad (7.3)$$

Here, σ_r is a constant standard deviation and B^A the standard Brownian motion. The first phrase from the left is a constant drift, and the second phrase is the volatility drift, respectively. The funded pillar is equal to the accumulated capital from the contributions to the private collective DC fund in every working period until retirement (T_R):

$$p_{t+1}^{F} = \tau^{f}\left[A_t^F + (1-\emptyset)\gamma\tau\sum_{s=t}^{T_R} W_{t,s}(1+r_t-M)^{T_R-t} - \varepsilon_t\right]\Big/_{\theta} \qquad (7.4)$$

Where, A_t^F is an individual's pension accumulation at time t, and τ^f is the effective tax rate on old-age funded fund's benefits. ε_t is the personal withdrawal amount from the severance pay component in year t. Based on trend reports from the pension fund, we assumed that some of this compensation payment is withdrawn for private consumption until the early 40s.

The funded pension allowance upon retirement is determined by dividing the accrued balance on retirement day by a coefficient θ, which is determined by the pension fund. This coefficient generally represents the average number of months left from retirement until death and is a function of a participant's gender and retirement age. The pension funds occasionally update these coefficients to maintain actuarial balance.

Here, it should be mentioned that private pensions in Israel offer a type of insurance on life expectancy as monthly payments continue until death. Those who live longer than the average life expectancy receive more than they contribute, and the opposite is applicable for those who pass away early.

Private pension allowances are taxed as regular income at the time of collection with an exemption up to NIS 800,000 on discounted accumulations at retirement age. This exemption is reduced for every withdrawals, for compensation accrues in the fund during the working phase. Due to the high diversity in these withdrawals, we found it impossible to consider the net benefits through this model, and hence, we provided the benefits in gross terms.

The economic crisis due to the 2020 pandemic provided us with an opportunity to examine the influence of correlated risks on old-age benefits in the labor market and capital markets. We implement a unique stress scenario as per 2020 data based on the Ministry of Finance's (MOF) economic forecast:

- Reduction in pension returns to (-4%) in the year 2020;
- Wage reduction by 30% in 2020, 20% in 2021, and 10% in 2022 with respect to the 2019 wage level with a floor of the minimum wage level;
- Period of unemployment for 6 months in 2020.

7.3.5. Pension Minimum Guarantee

Due to the prevalence of the socioeconomic challenges of high poverty and income inequality in the Israeli market, we considered the potential effect of incorporating a universal minimum benefit guarantee. The guarantee increases the level of governmental intervention in the market as a redistributive top-up to the public pillar (Huyse et al., 2017). Mixed pension system designs have been implemented in many Western countries, such as Sweden, Switzerland, France, Germany, Italy, Spain, and Portugal (OECD, 2019; Ortiz et al. 2018) to meet the European Commission's target (Bonizzi & Churchil, 2017).

The poverty line as the guarantee strike price stands in line with the constraint of Grande & Visco (2010). They claim that in order to ensure the sustainability of the public insurance scheme, the guarantee should not be greater than the nominal growth rate of GDP. Since the poverty line and/or the minimum wage are indexed with a lag the GDP per capita (in most of the Western countries), these kind of guarantees follow this constraint.

Alongside simulating the effect of the minimum pension guarantee on expected benefits, we mapped the burden of the guarantee on the market and its economic cost. Financing the guarantee is a risk-sharing concept and needs to be consider particularly to market's financial and social conditions (Grande & Visco, 2010). The plain-vanilla way to finance the guarantee is by raising contributions (Smetters, 2002). However, it might be an economic burden on private consumption where large share of population earn below the average wage (Wolf & Caridad, 2021). Furthermore, it may widen economic gaps between earning cohorts in old-age. From another angel, leaning exclusively on working cohorts' contributions ('intergenerational risk sharing') does not hedge against systemic risk or market risks, which are the reason for the guarantee implementation in the first place. One may suggest balancing between pension pillars by shifting contributions from the second pillar to the first one. This step will have a redistributive effect among earning cohorts but might reduce total benefits level in old age as the second pillar has significantly higher yield compares to public social security.

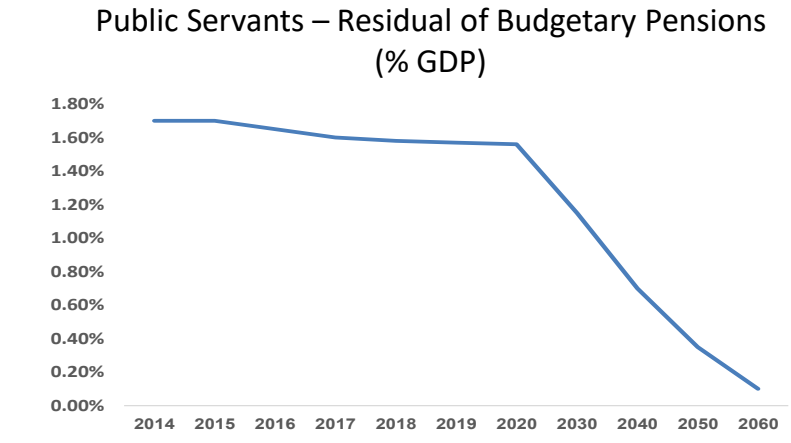
Considering the financial sources for the guarantee, we referred to some social public programs. The major fiscal burden that may be considered as a substitute to the guarantee is the issuance of designated bonds. The government is capable of raising a fortune at

lower prices in the open market. From an individual angle, these bonds would no longer be relevant if the government ensured benefits adequacy through the minimum pension guarantee. Moreover, the rate of return guarantee, provided by the designated bonds, is ineffective when there are insufficient contributions due to labor market fluctuations and systemic risks due to correlations between returns and the labor market (De Menil et al., 2016). "From a social point of view, similar to tax incentives, the benefit is mainly embodied in earmarked bonds and reduced risks and smoother returns over time are regressive up to relatively higher income levels. The reason is that the benefit is extended proportionally; thus, high-wage earners benefit more" (Ahdut & Spivak, 2010, p.15).

The second source for financing the guarantee is the expected available budget from the reduction in budgetary pensions spending for public servants and soldiers in the coming years (see Figure 7.2). These population cohorts were the last to shift to the new pension model. Nominally, the peak of the budgetary cost is expected in the year 2039 with a 38.21 billion NIS budgetary expense and fiscal relief after that (MOF, 2020).

The third source is special social security benefits for low-income families with an elderly population in addition to the flat universal benefit. According to the NII report, this amount comes to almost 1.9 billion NIS in 2020. To keep our number conservative, we indexed this amount to the GDP per capita with a lag.

Figure 7.2:



Source: MOF estimates, financial statement, 2018

7.4. Calibration

The simulation is calibrated based on the Israeli market. Informative data is drawn from the statistical public agency (CBS), the regulator (Ministry of Finance) or the OECD data bank.

7.4.1. The First Pillar

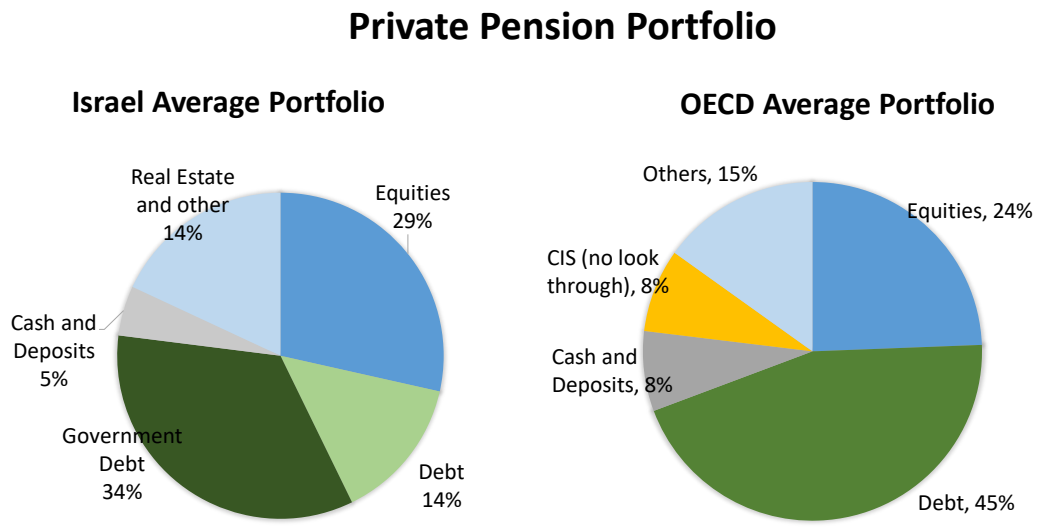
Based on the NII rules described above, the maximum amount for an individual in 2020 stood at NIS 2,300 a month. For comparison's sake, the poverty line is about NIS 3,800 per month. Due to the low variety of different benefits and for simplicity, we assumed a basic average benefit of NIS 1,800 (in 2020 prices) indexed to the stochastic annual GDP per capita with a lag of 0.5% (Manor & Rajaczak, 2020).

7.4.2. The Second Pillar

Israel funded system can be representative to other development countries as the pension portfolio is quiet similar to the OECD average portfolio (see Figure 7.3). The average real return on private funds between 2005 and 2014 amounted to 4.5%. According to research performed for this paper based on MOF data, the annual real average return in 2001–2019 was 6.04%. For the sake of comparison, the average OECD return in those years stands at 2.5% (Giorno & Adda, 2016, p. 32). The standard deviation of returns has risen, from 10.26% in 2010 to 14% in 2020. Some of this has been because of the reduction in the issuance of designated bonds to no more than 30%.

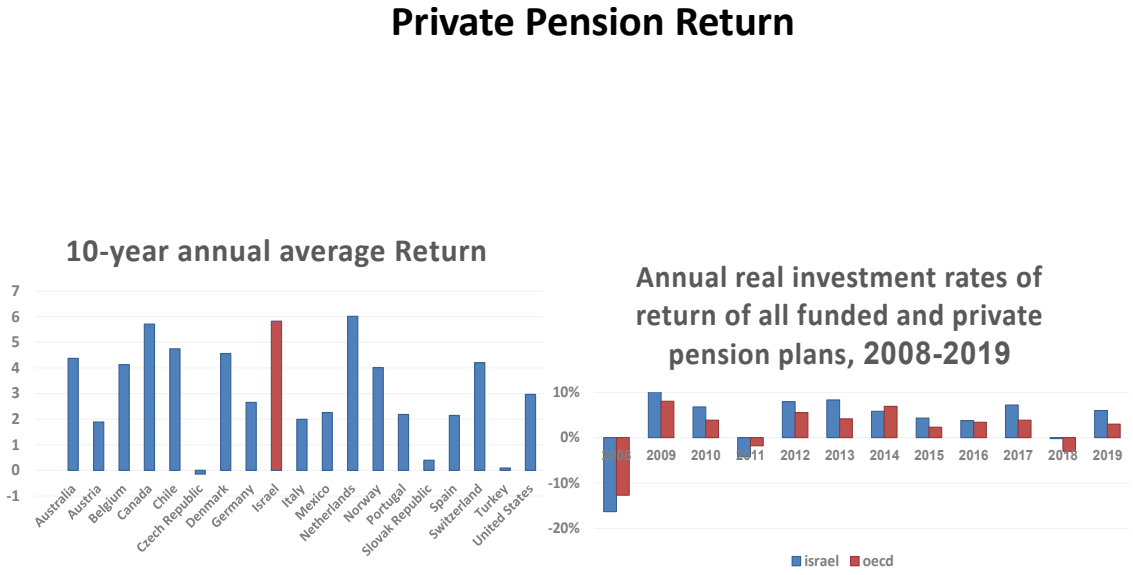
The gross return was calibrated as per the actuarial regulator instructions (to private funds). Accordingly, we set an average annual gross private pension fund return of 4.25%. As we did not obtain data on administration fees, we assumed an average fee of 0.5% from total accumulation for all records. One may feel comfortable with this assumption, as administrative fees have been reduced significantly over the last decade to the average levels of OECD countries.

Figure 7.3: Annual average private pensions' portfolios and real returns



Source: Author's Elaborations based on Ministry of Finance and the OECD Data, 2020

Figure 7.4: Private pension funds return



Source: OECD, 2020

Pension contribution rates to the second pillar vary between 20.83% and 22.83% of salary, depending on the workplace, including an employer contribution rate of 6–8.33% for severance pay (Ministry of Finance, 2020; Paz-Fuchs et al. 2018). The total contribution level in Israel is located in the middle, relative to other OECD countries,

with about 2% of GDP (OECD, 2019). Severance pays constituted 40% of the accumulation but can be withdrawn free of tax if one is laid off.

While making the simulation for an individual's full career, we considered cyclical difficulties in the labor market from time to time. For example, around 40% of the severance pay is withdrawn for different reasons such as housing, marriage, and consumption between jobs (Spivak et al. 2017). Those who are young or have a low salary tend to fully withdraw their severance pay. Accordingly, we assumed two liquidation times for severance pay along the participants' career as follows:

a. Liquidation rate of 20% from accumulation at the age of 35;
b. Liquidation rate of 20% from accumulation at the age of 42.

While making simulation for full career, we consider difficulties in the labor market. According to the CBS, the unemployment rate in 2019, before the eruption of the Corona-Virus crisis, stood at about 4%. Out of the jobless, 53% were over the age of 45. Without analyzing gender cohort, education and religious cohorts, according to the Israeli Employment-Service, "50.4% of the unemployed aged 45 and older found a new job in three months, compared to 59.6% of the younger unemployed. Additionally. From that age cohorts, 20.2% found a new job within 4-12 months, and for 29.5% of them it took more than a year" (Hakohen, 2014, p.7). Here we assume three month of unemployment below the age of 45. Additionally, based on CBS and the NII, we assumed two unemployment periods of three months each at the ages of 35 and 45 and another six-month unemployment period at the age of 55.

The numeric assumptions for the calibrations have been summed in Table 7.1.

Table 7.1:

Model Calibration

Wage indexing to GDP per Capita		Social levels	
Decile 1	0.75 GDP per capita	Average wage (2020 prices)	10,948 NIS
Decile 2	0.85 GDP per capita	Minimum wage (2020 prices)	5,300 NIS
Decile 3	0.95 GDP per capita	Minimum wage indexing	(1-0.5%) GDP per capita
Decile 4-7	1 GDP per capita	Poverty line (2020 prices)	3,800 NIS
Decile 8	1.05 GDP per capita	Poverty line indexing	(1-0.5%) GDP per capita
Decile 9	1.15 GDP per capita	Social swcurity benefit	(1-0.5%) GDP per capita
Decile 10	1.25 GDP per capita	**Sytemic Shock - 2020**	
Funded capitalized fund		Private pension return	-4%
Average gross rate of return	4.24%	Wage cut 2020	-30%
Average net rate of return	3.74%	Wage cut 2021	-20%
Average insurance premiums fro	15%	Accumulation withdraw 2020	-20%
Average Contribution rate	21.83%	Unemplyment period 2020	6 month

Calibration based on the Israeli pension market, CBS 2020.

7.5. Main Insights

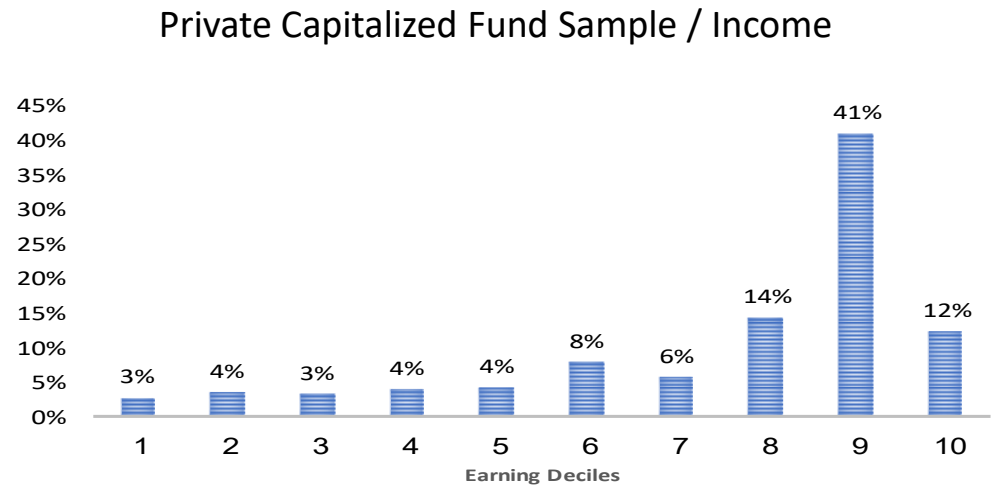
7.5.1. Coverage Rate and Late Enrollment

The sample data points to a higher coverage rate for the second pillar among high-earning cohorts than low-earning cohorts (see Figure 7.5). Due to the 2008 expansion order, one may believe that the coverage rate will improve gradually in the near future.

According to Giorno and Adda (2016), the stubbornly high elderly poverty rate is associated with the low level of first pillar pensions combined with the enrollment to the second pillar. "Around half of the elderly people do not receive income from the second pillar pensions and probably receive little or no private pension even though many of them have housing wealth" (Bleikh, 2016, p.12). According to the sample, 30% of the workforce, who belong to low earning cohorts, are not covered by private pension plans (see Figure 7.5). First, the total contribution rates to the two pillars are sub-optimal for low earning cohorts (Wolf & Caridad, 2021). Hence, a low-income earner might prefer current consumption to future savings. Another explanation might be a “black economy,” as in for low-earning cohorts, some incomes are not declared or taxed (Spivak et al. 2017; Gavious et al. 2009). The third explanation is linked specifically to the Israeli market. During the 1990s, more than a million Jews immigrated to Israel from Eastern European

countries after the collapse of the USSR with no pension accumulations. Many of them still do not have a pension balance (Spivak & Troitsky, 2013).

Figure 7.5: Sample coverage per earning decile



Source: Author's Calculations on 'Menora' DB Sample, August 2019

7.5.2. Benefit Adequacy

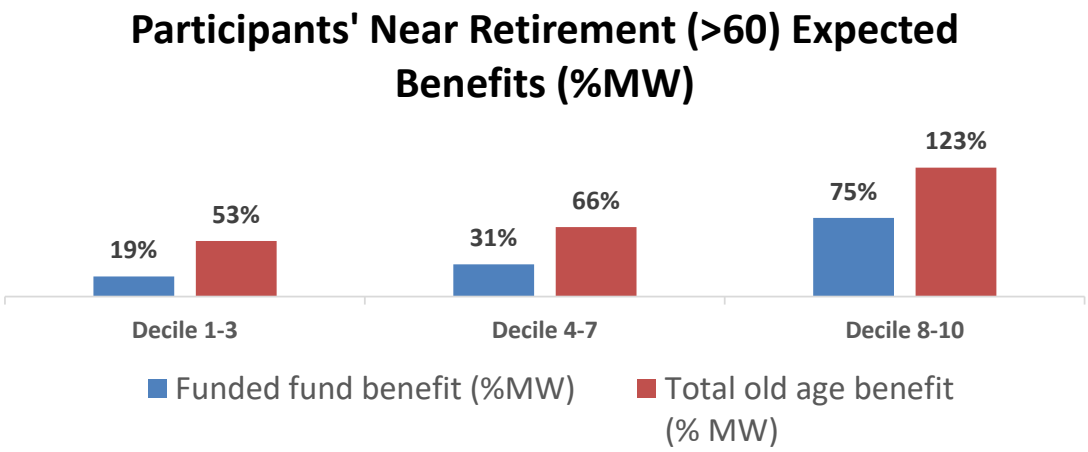
We divide the results analyzing to the older population cohort and the younger, as was seen above have different characteristics of savings to the funded pension scheme.

Reviewing the utility from the reforms, Bleikh states, "The main beneficiaries from occupational pensions today are those who worked in the public sector and are entitled to a budgetary pension or to those who had pension arrangements as part of collective agreements in the private sector" (Bleikh, 2016, p.15). Participants above the age of 55 who were not entitled to DB or budgetary pensions (soldiers and former public servants) have enrolled for the funded pension fund late and will mainly benefit from the low social security allowances. Spivak & Troisky (2013) also observed this trend. According to Figure 7.6, even in the three higher-earning deciles, workers near retirement will be entitled, on average, to only 71% of the minimum wage.

Due to their late enrolment, we cannot track other savings of the transition generation. Obviously, not all of these people are poor, as some of them have accumulated other savings, have housing, and are entitled to capital as per the third pillar. However, some

of these veterans do not have sufficient resources in old age for an adequate standard of living.

Figure 7.6:

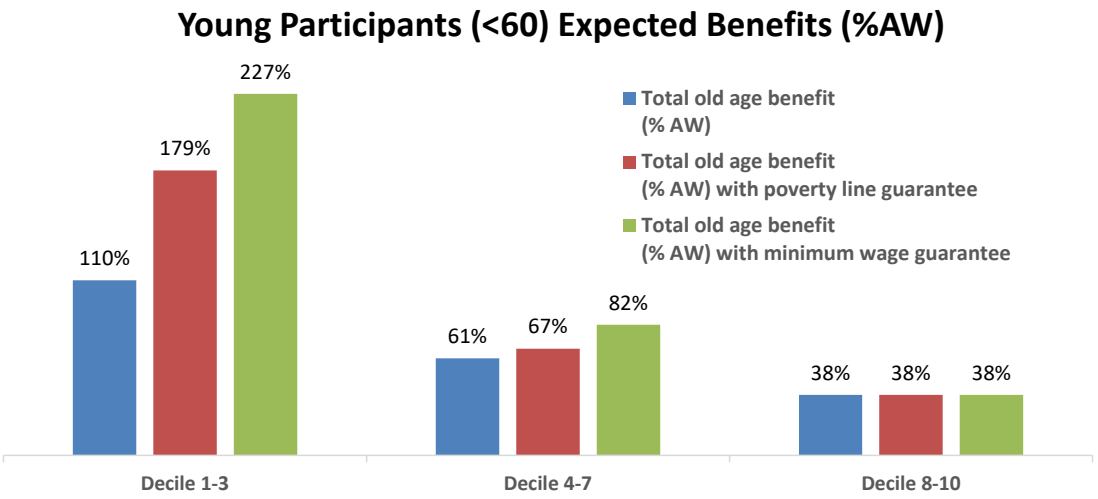


Additionally, Due to the late enrollment of the transition generation, one may consider the expected benefits of the current younger workers (who are under the age of 60) as being representative of the pension system. Most of these participants have been contributing to the second pillar from the early stages of their careers. The left bars in Figure 7.7 represent the average replacement rates with no minimum guarantee relative to the average wage along the career. For low-earning deciles, the replacement level is high because of their extreme poverty during the working phase and their heavy reliance on the flat universal social security benefits at retirement. For the middle-earning deciles (4–7), it was observed that the replacement rates are reasonable and close to the average replacement rates in OECD countries (OECD, 2019). For example, the replacement rate for the middle-earning cohorts with no guarantee (54%) is close to the parallel replacement rate in the US (55%), Switzerland (57%), Canada (49%), and the UK (50%). The high earning deciles' replacement rates are close to those in Belgium (35%) and Germany (28%).

Putting aside the relative measure of the replacement rate, we argue that base on the simulation large portion of workers population that earn close to poverty line will find itself at retirement beneath that social line. According to Figure 7.7 the results indicate that, in average, the expected benefits of earning deciles 1-7 are beneath the poverty line

(where the middle bar is higher than the left bar). The expected benefits at earning decile 8, 9, 10 will be 100%, 150% and 300% of the minimum wage level respectively.

Figure 7.7:



7.5.3. Sensitivity Analysis

The mix between the dominant funded pillar and low social security allowances results in high sensitivity of pension benefits to fluctuations in the market. It was observed that a 1% increase in the funded pension pillar's annual return increases accumulation by about 20% and average replacement rates by 5%.

Table 7.2 summarizes the 2020 systematic shock's influence and its components on expected benefits, as function of age cohort. One may find that even short systemic shock has long-term traces on future expected benefit levels, even for the young generation. Although the time is expected to correct some of the return fall but the financial crisis leave footsteps on accumulations.

Table 7.2 summarizes the 2020 systemic shock's influence and its components on expected benefits, as a function of age cohort. For any age cohort, even a substantially low first pillar (less than half from the poverty line) provides diversification effects to some extent. This gets realized in 3-8% of benefit levels as the difference between the change rates in Table 7.2 / Panels A and B. The reason is the PAYG social security's

weak correlation to funded accumulation (Barr and Diamond, 2009; Holzmann et al. 2009). As pointed in Table 7.2, the hedge in the mix system is more effective in old age compares to younger age.

Furthermore, according to the simulation, even short systemic shocks leave traces on future expected benefit levels. Although when participant is younger the shock is less significant than an individual close to retirement is, it does not disappear. From Panel A we study that the systemic shock in 2020 is expected to influence in 13% on average on participants that have more than 25 years until retirement.

Isolating the risk components may contribute to an understanding of long-term influences. By analyzing the different age cohorts, we determined that time differently influences the risks. The market risk's standard deviation smoothens the return over the years; thus, losses at a singular point in time may be compensated in the future (Goecke 2013). However, the lag in contributions due to periods of wage reductions, unemployment, or capital withdrawal increases over time because of the interest-accrued effect. It can determine that the last financial crisis increases the odds to many individuals to find themselves at retirement below the poverty line, without further governmental assistance.

Table 7.2: Expected benefits level by age cohort

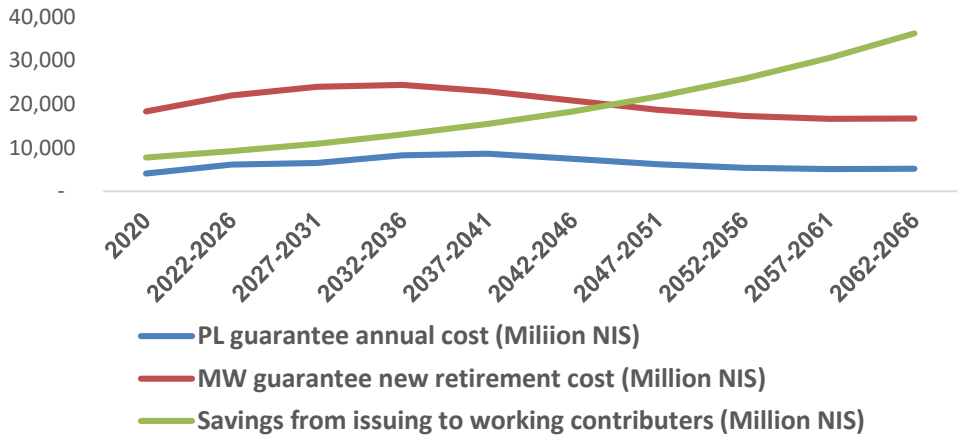
Panel A: Funded Pillar Benefits (Current prices, NIS)			
Age cohort	**No Systemic Shock in 2020**	**With Systemic shock in 2020**	**Change**
<40	8,375	7,276	-13%
40-55	6,626	5,476	-17%
>55	3,322	2,637	-21%
Panel B: Total Benefits (Current prices, NIS)			
Age cohort	**No Systemic Shock in 2020**	**With Systemic shock in 2020**	**Change**
<40	10,911	9,813	-10%
40-55	8,765	7,615	-13%
>55	5,161	4,476	-13%

7.5.4. Minimum Pension Guarantee

On the previous chapters, minimum pension guarantee has been revealed to be highly effective for the purpose of benefit redistribution and avoiding poverty in old age (see also Wolf & Caridad, 2021). Figure 7.7 reports that a poverty line guarantee is effective for the first seven earning deciles under the age of 60. As seen in Figure 7.8, we calculated the expected guarantee cost based on the expected levels of minimum wage and the poverty line. In the next fifteen years, the guarantee cost will be relatively high due to lack of coverage as per the second pillar as described above.

Considering finance sources for the guarantee, we refer to substitutions public programs to the guarantee. The major fiscal burden that may consider as a substitute to the guarantee is the designated bonds issuing. These bonds are no more relevant if the government ensures benefits adequacy through the minimum pension guarantee. The debt for it self is also redundant due to the high interest rate, which impose high fiscal burden. Through this solution, the government can achieve the target of improving pension benefits adequacy at a lower cost than by issuing these bonds. Furthermore, this solution can also provide adequate pension benefits to the transition generation, which includes new immigrants with low accumulations and participants who enrolled late to the second pillar.

Figure 7.7: The guarantee cost (million NIS)



The second source is the expected availability of budgetary pensions to retired of soldiers and teachers. These population groups were the last to shift to the new pension model. In the coming years, along with retirement waves from these cohorts, the MOF expects a

fiscal relief (see Figure 7.2). The third source is the social security special benefits for low-income families with old population in addition to the flat universal benefit. According to the NII report this amount sums to almost 1.9B NIS in 2020. To keep conservative we index this amount to the GDP per capita with a lag.

According to Table 7.3, which summarized the guarantee finance options, by redirecting the subsidy inherent in the bonds issuing, the government, from day 1, can finance the guarantee at the poverty line level[40]. By that solution, the government can achieve the target of improving pension benefits adequacy with a lower cost than issuing these bonds. Furthermore, that solution can also provide adequate pension benefits to the transition generation, which includes new immigrants with low accumulations, and participants who enrolled late to the second pillar.

Table 7.3 points that in about 22 years, the government could afford financing a minimum pension guarantee at the minimum wage level ("Mix Pension Design"). The reason for that is the realization of two trends:

- The retirement of the transition generation whose total benefits are relatively low and will need governmental supplements in the coming years, which will reduce gradually along the years;
- The expected increase in the alternative cost of the designated bonds.

Table 7.3: The guarantee finance (Million NIS)

Financing the Guarantee (Millions NIS)						
Year	PL guarantee annual cost	MW guarantee new retirement cost	Savings from issuing to working contributers	Saving from budgetary pensions*	Saving from means-teted	Total savings
2020	4,069	18,305	7,740	-	1,884	9,624
2022-2026	6,138	22,000	9,210	-	1,999	11,209
2027-2031	6,525	23,999	10,954	-	2,122	13,076
2032-2036	8,286	24,393	13,019	-	2,252	15,271
2037-2041	8,669	22,967	15,464	-	2,391	17,855
2042-2046	7,469	20,804	18,357	2,500	2,537	23,394
2047-2051	6,230	18,671	21,776	5,000	2,693	29,469
2052-2056	5,389	17,296	25,812	7,500	2,858	36,170
2057-2061	5,100	16,645	30,573	10,000	3,034	43,607
2062-2066	5,227	16,715	36,182	12,500	3,220	51,902
(*) The savings from budgetary pensions is presented relative to the state obligations and by estimation of the Ministry of Finance, 2019						

[40] We still assume designated bonds issuing to retires

7.6. Discussion

Reforms of specific pension schemes affect particular groups at different points in their career. Poverty is expected to increase among those who lack an adequate second pillar pension arrangement, with the limited social security allowance being their sole income.

Our research confirm Murthi, who claimed: "Younger birth cohorts could receive higher income from strengthened occupational schemes than older birth cohorts. Thus, as soon as policies change, combined pension entitlement from the various pension schemes also change, and birth cohorts are differently affected. This situation is an example how it difficult for policy evaluators to measure the various effects of reform package independently" (Murthi, 2014, p.25).

Special attention has to be given by the central planner to the first generation of retirees from the new pension model. Many have enrolled late to the mandatory pension system, and their benefits are relatively low. Some of them are surely new Jewish immigrants from Europe and Russia, from the large immigration wave during the 1990s.

The results confirm Boelaars and Broeders' (2019) argument that market risk depends on the residual time of pension contribution. Individuals near retirement are more exposed to capital market fluctuations. We also determined a high correlation between an individual's career path and pension accumulation. Job tenure risk, other labor risks, and systemic risks leave traces for years until retirement. Furthermore, the results indicate that a systemic shock, even in the preliminary stages of an individual's career, might have consequences in a large share of the old age population below the poverty line.

According to Giorno and Adda, "Reducing the elderly poverty rate will require a rebalancing of the pension system and additional budgetary resources for the first pillar" (Giorno & Adda, 2016, p.12). The state strategy to avoid its redistributive role is consistent with a particular economic rational.

The results further imply on high effectivity of total minimum pension guarantee. The guarantee improves significantly low earning replacement rates, increase redistribution and may avoid poverty at old age. For example, poverty line guarantee is effective for the first seventh deciles.

The debate on issuing the designated bonds seems to be relevant than ever in these days of financial crisis. Putting aside the fiscal burden, the rate of return guarantee, provided by the designated bonds is ineffective to labor and / or systemic risks. Correlated risks in systemic shock demonstrate benefit reduction not only due to market performance but also to continuing contributions from early stage (see Aubry et al., 2020). The simulation shows the long-term effect of benefit reduction toward the poverty line after a systemic shock.

Implementing social target guarantee, the hedged underlying asset is not the saving portion exposed to market fluctuations but the total retiree's old age benefit. Based on the Israel's socio-economic challenges reviewed above and the high portion of old age poverty, the central planner has to find value in focusing on total benefit and less on the funded fund's return.

7.7. Conclusion

The objective of this chapter is to determine the long-term effect of the Israeli pension system, as almost pure DC funded scheme and to study the risk effect on future pension benefits in dominant funded fund. We find Israel as a unique playground to examine the global trend consequences of less government interventions and capitalization in the pension markets. Base on real pension records and pension simulator, we could calculate expected pension benefits and allowances in old age.

The simulation results indicate that younger workers, even from lower earning cohorts, who keep consistently contribute to pension funds, will most likely move away from the poverty line at retirement. However, even short periods, along the entire career, of contribution reductions and systemic risk jeopardizes the benefits adequacy at retirement. Moreover, we find it is challenging to ensure adequate benefits for the transition generation who enrolled late to the pension system. Most likely, the government will have to find one-time solution for their low benefits.

In the funded pension scheme, one may find significant vulnerability to systemic risk, due to heavy reliance on capital markets' performance along the career and its correlation to labor market. The individual might find himself unemployed with no contributions and

with reduction in his cumulative pension balance due to low market returns. Here it is suggested considering more weight on public pillar by implementing minimum pension guarantee. While implementing minimum pension guarantee, we report on a significant improvement in replacement rates and in total benefits. This finding consistent with the results provided in chapter 4.

We demonstrate the irrelevance of the claim that the capital market would balance out over the course of decades of retirement savings. This claim, which was the basis of the agenda of the World Bank in 1994 and the Israel Ministry of Finance until the present, ignores the risks and fluctuations in both the financial and the labor markets (Carmi and Kimhi 2018). The simulation in this study confirmed Barr and Diamond (2009) that relying solely on the funded pillar meant neglecting the possibility of risks, such as volatility of returns, fluctuations in the labor market, and the existence of systemic risks from time to time. Recently, the COVID-19 pandemic has demonstrated individuals' susceptibility to volatile market fluctuations. Pension schemes with high market exposures are expected to suffer the most from these crises.

Further research is needed for the micro-examination of the expected pension benefits, such as gender gaps, sub-cohorts in society, etc. Additionally, one might choose to further delve into the consequences of different systematic shocks and realizations on pension benefits in this era of financial crises and labor market challenges. Such studies will enrich the discussion of the right ways to implement modern funded pension schemes for achieving social targets.

Chapter 7 - References

Aubry, J.P. Munnell, A.H. & Wandrei, K., (2020). Update: State and Local Plans Issue in Brief, Chestnut Hill, Mass.: Center for Retirement Research at Boston College, May 2020. http://hdl.handle.net/2345/bc-ir:108910.

Ahdut L. & Spivak, A. (2010). The pension system in Israel after 15 years of reforms. Van Leer Institute, Jerusalem.

Bank of Israel. (2019a). The deficit and public debt 1980-2018. Information & Statistics Department. https://www.boi.org.il/en/DataAndStatistics/Pages/MainPage.aspx?Level=2&Sid=19&SubjectType=2

Bank of Israel. (2019b). Public assets September 2019. Information & Statistics Department. https://www.boi.org.il/en/DataAndStatistics/Pages/MainPage.aspx?Level=3&Sid=47&SubjectType=2

Barr N., Diamond, P., (2009), Reforming Pensions: Principles, Analytical Errors and Policy Directions, International Social security Review, 62(2) 5-29. https://doi.org/10.1111/j.1468-246X.2009.01327.x

Benish, A, Haber, H, & Eliahou, R. (2016). The Regulatory Welfare State in Pension Market: Mitigating High Charges for Low-Income Savers in the United Kingdom and Israel. *Journal of Social Policy,* 1–18. ISSN 0047-2794.

Ben-Basat, A. (2002). The Israeli economy 1985-1998: From Government Intervention to Market Economics. Cambridge, MA: MIT Press.

Boelaars, I. & Broeders, D. (2019) Fair pensions. De Nederlandsche Bank, Working Paper No. 630. Available via SSRN. https://ssrn.com/abstract=3374456. http://dx.doi.org/10.2139/ssrn.3374456

Bleikh, H. (2016). Poverty and Inequality in Israel: An International Perspective. LIS Working Paper Series 661. http://hdl.handle.net/10419/169221

Bonizzi, B. & Churchill, J. (2017). Pension Funds and Financialisation in the European Union. *Revista de Economía Mundial*, 46: 71-90. https://www.redalyc.org/articulo.oa?id=86652391004

Bowers, L. & Fuchs, H. (2016). Women and Parents in the Labor Mmarket—Israel and the OECD. Available via Taub Center. http://taubcenter.org.il/wp-content/files_mf/womenandparents_eng.pdf

Carmi, S. & Kimhi, A. (2018). A Primer on Israel's Pension System Where it is Today and Suggestions for the Future. Shoresh Institute for Socio-Economic Research, Jerusalem.

De Menil, G., Murtin, F., Sheshinsky, E. & Yokossi, T. (2016). A Rational, Economic Model of PAYG Tax Rates. *European Economic Review,* 89:55–72. https://doi.org/10.1016/j.euroecorev.2016.06.002.

Eckstein, Z. & Ramot-Nyska, T. (2008). Twenty Years of Financial Liberalisation in Israel: 1987–2007. *BIS Papers chapters, in: Bank for International Settlements* (ed.), Financial Globalisation and Emerging Market Capital Flows, 44, 289-304, Bank for International Settlements.

Galnoor, I., (2018). Privatization Policy: The Burden of Proof. In*: Paz-Fuchs A., Mandelkern R., Galnoor I. (eds) The Privatization of Israel*. Palgrave Macmillan, New York. https://doi.org/10.1057/978-1-137-58261-4_5

Gavious, I. Spivak, A. & Yosef, R. (2009). Pension Reform in Israel Under Mandatory Pension Law. *Pensions*: *An International Journal* 14 (1):4–13. https://doi.org/10.1057/pm.2008.33

Giorno, C. & Adda, J. (2016). Improving the Pension System and the Welfare of Retirees in Israel, *OECD Economics Department Working Papers, No. 1288*, OECD Publishing, Paris, https://doi.org/10.1787/5jm0xf1fsqvf-en.

Goescke, O (2013). Pension Saving Schemes with Return Smoothing Mechanism. *Insurance*: *Mathematics and Economies*, 53(3):678–689. https://doi.org/10.1016/j.insmatheco.2013.09.010

Grande, G., & Visco, I. (2010). A Public guarantee of a minimum return to defined contribution pension scheme members. *The Journal of Risk*, *13*(3), 3–43.

Grech, A. (2018). What makes pension reforms sustainable? *Sustainability*, 10(8). https://doi.org/10.3390/su10082891

Hakohan R. (2014). Employment among Elders in Israel. Policy Paper. Israeli Employment service, Jerusalem. https://www.taasuka.gov.il/he/InfoAndPublications/Documents/ adultsemployment0214.pdf

Holzmann, R. & Hinz, R. (2005). Old-Age Income Support in the 21st Century: An International Perspective on Pension Systems and Reform. *The World Bank*. https://doi.org/10.1596/0-8213-6040-X

Holzmann, R., Robalino, D. & Takayama, N. (2009). Closing the Coverage Gap: Role of Social Pensions and Other Retirement Income Transfers. Washington, DC: World Bank Publications.

Huyse, H., Fonteneau, B., Vaes, S., Phlix, G., Eisele, U., & Asukai, N. (2017). Independent Evaluation of the ILO's strategy and Actions for Creating and Extending Social Protection Floors, 2012–2017. Geneva: International Labour Office.

Kay, A. (2012). From Altneuland to the New Promised Land: A Study of the Evolution of Americanization of the Israel Economy. *Jewish Political Studies Review*, 24(1/2), 99-128. http://www.jstor.org/stable/41575906

Kimhi, A. & Kyrill, S. (2013). Employment and Income Trends among Older Israelis. *In: Dan Ben-David (ed) State of the Nation report: Society, Economy and Policy in Israel.* Taub Center for Social Policy Studies in Israel, 119–162, Jerusalem.

Levi R. & Levy, K. (2019). The Effect of Attitudes Regarding Retirement on Pension Savings. *Review of Economics & Finance*, Better Advances Press, Canada,15: 1-13. Available at https://EconPapers.repec.org/RePEc:bap:journl:190101

Lurie L. (2018). Pension Privatization in Israel. *In: Paz-Fuchs A., Mandelkern R.& Galnoor I. (eds) The Privatization of Israel.* Palgrave Macmillan, New York. https://doi.org/10.1057/978-1-137-58261-4_5

Manor, M. & Ratajczak, J. (2020). Shift to Private Pension System: The Case of Poland and Israel. *Economics and Business Review,* 6(1). https://doi.org/10.18559/ebr.2020.1.4

Ministry of Development. (2016). Responsible Development. Nanotechnology and the Environment. http://doi.org.10.1038/359115a0

Ministry of Finance. (2019a). Default Pension Funds. Capital Markets and Insurance Director. https://mof.gov.il/hon/Pages/DefaultPensionFund.aspx

Ministry of Finance, (2019b). Financial statements 2018 of Israel. Accountant general. Retrieved September 26, 2019 from https://mof.gov.il/AG/AccountingReports/FinancialReports/MoneyReports2018_b.pdf

Ministry of Finance. (2020).https://www.gov.il/he/departments/publications/reports

Murthi, M. (2014). Are Second Pillar Pensions Robust in the Face of Economic Shocks? *The World Bank*. http://blogs.worldbank.org/futuredevelopment/are-second-pillar-pensionsrobust-face-economic-shocks

National Insurance Institute, Financial Report (2019). https://www.btl.gov.il/Publications/Financial%20reports/Documents/mazan2018.pdf

OECD (2011), Pensions at a Glance 2011: Retirement-income Systems in OECD and G20 Countries, OECD Publishing, Paris, https://doi.org/10.1787/pension_glance-2011-en.

OECD (2019), Pensions at a Glance 2019: OECD and G20 Indicators, OECD Publishing, Paris, https://doi.org/10.1787/b6d3dcfc-en.

Orenstein, M.A. (2011). Pension privatization in crisis: Death or Rebirth of a Global policy Trend? *International Social Security Review*. 64(3): 65-80, https://doi.org/10.1111/j.1468-246X.2011.01403.x

Ortiz, I., Duran, F., Urban, S., Wodsak, V. & Yu, Z. (2018). Reversing Pension Privatization: Rebuilding Public Pension Systems in Eastern European and Latin American Countries. *ILO Report*, http://dx.doi.org/10.2139/ssrn.3275228

Paz-Fuchs, A, Mandelkern, R, & Galnoor, I. (2018). The privatization of Israel: The withdrawal of state responsibility. *Springer Books, Palgrave Macmillan*, New York. https://doi.org/10.1057/978-1-137-58261-4

Smetters, K. (2002). Controlling the Cost of Minimum Benefit Guarantees in Public Pension Conversions. *Journal of Pension Economics and Finance*, Cambridge University Press, 1(1), 9–33. http://doi.org.10.1017/S1474747202001014.

Spivak, A. & Troitsky, R. (2013). Pension Reform in Israel. *Public and Municipal Finance*, 2(1), 26-45.

Spivak, A, Tzemah, S & Carmel, E (2017). Israel Pension Reform. Van-Leer Institute, Jerusalem.

Stier, H. & Bleikh, H. (2014). Poverty within the Elderly Population in Israel. *In: Dan Ben-David (ed) State of the nation: Society, economy and policy*. Taub Center for Social Policy Studies in Israel, Jerusalem, 393–434.

Swirsky, S., Attias, E. & Liberman, A. (2020). Israel Social Report 2020. Adva Center. Retrieved from https://adva.org/wp-content/uploads/2020/02/social-2020-ENG.pdf

Wolf, I. & Ocerin, J. M. C. (2021). The Transition to a Multi-Pillar Pension System: the Inherent Socio-Economic Anomaly. *Journal of Financial Economic Policy*. https://doi.org/10.1108/JFEP-07-2020-0162

X. Conclusions

"The main lessons from the two financial crises during the 2000s are the need for stricter rules regarding public supervision, investment restrictions and partly new benefit protection mechanisms. This indicates that the role of private pension governance, including (state) regulation, continues to gain importance despite claims of privatization that suggest a retreat of the state. Furthermore, state regulation is often complemented by social partners' governance and regulation" (Ebbinghaus, 2015, p.5).

8.1. Main Insights

8.2. Recommendations

8.3. Thoughts about The State Role

8.4. Further Research

8.1. Main Insights

This chapter is an amalgamation of previous chapters that helps outline the key arguments of the thesis. The compositions in this dissertation offer a multi-faceted analysis of global pension policy. This type of analysis is necessary to capture the very essence of the multi-dimensional nature of different pension designs and the different players' interests in the market. This section provides a summary of the key contributions to the knowledge of this thesis, concerning the research question presented in chapter 1. The main findings set out below are an interplay between the global evolution of pension reforms and the individual's preferences, studied from the perspective of risk.

a. Different earning cohorts of participants and the governments are all actors in the pension field who are trying to shift undiversifiable risks to the other.
b. The government is a mediator and a central planner that can manage intergenerational and intra-generational risk among the actors.
c. One of the main keys that have put a favorable influence on market design is the extent that actors can share risk. Based on global experience over the last two decades, while shifting to funded pension scheme, one has to understand the kind of risks the government can diversify and hedge and what kind of risks are embedded in the pension scheme and cannot be transferred to a third party. Awareness to these kind of risks can help manage them more carefully in designing a coherent pension system.
d. Acquiring a lesson from the cyclical reforms across Europe and Latin America, the question whether a pension scheme will be sustainable or not depends in a critical mass of participant's financial position. While higher share of pension participants worsen in the pension reform, the probability of cyclical pension reform increases. The trigger to the re-reform is usually a financial slowdown. In these times, the individual has difficulty in diversifying personal and financial risks. Unstable pension landscape threats the trust on government policy and the country's economy. Additionally, as was find in this work, unbalanced funded pension scheme results in socio-economic tension among different earning cohorts in society.

e. The transition to a funded scheme creates a socio-economic anomaly that favors high-earning cohorts at the expense of low earning cohorts. That is realized in two dimensions:
    - The contribution rates are closer to high earning preferences and expose low earning cohorts to excessive financial risks.
    - The financial position of high earners has improved considerably when compared with the deterioration in the financial position of low earners. That is realized by the ability of risk pooling and hedging risks.
f. Pension benefits under the dominant funded pillar are highly vulnerable to market fluctuations. The financial crisis, such as the current COVID-19 turmoil, may affect the future pension benefits to younger cohorts in the following years.

The thesis is divided into two main parts. The first part overviews the taxonomy and the history of pension evolution in the context of different pension systems available. Moreover, this part delves the pension reform wave in Europe over the last three decades. Those reforms are an important motive to understand the analytical researches in this thesis. The second parts provide a novel study of funded pension schemes from several angles aided by different tools. Here we have introduced the main conclusions and insights from the thesis chapters.

The risk perspective captured in this thesis is in line with the post-privatization literature strand (e.g. Orszag and Stiglitz, 2001; Holzmann & Hinz, 2005; Barr & Diamond, 2009; Espin-Andersen, 1996). The findings of this thesis strengthen the need for risk management in funded pension designs for both fiscal considerations and for the individual regarding the consumption throughout his life cycle and retirement.

The cyclical reforms described in chapter 3 have taught us that there is no single best pension design. Proper applications of the principles stated above can and lead to widely differing systems. Thus, it is not surprising that countries have successfully implemented very different pension systems (see Barr & Diamond, 2009). A wide range of systems explicitly addresses both objectives. Chapter 3 traces pension reforms during the 1990s, their cause, and evolution. Also, the chapter opens a debate within the thesis, as a motive, discussing the reasons for some countries' reversals back to a state-dominated pension design.

"Similarly, there is a wide range in the degree of funding (the extent to which benefits are financed from contributions). Some countries have significant reliance on funding (Canada, Israel, Chile, and Sweden), while others rely mainly on an unfunded pillar such as France, Germany, and Italy." (ILO, 2018, p.23). Barr and Diamond (2009) claim that the way of funding the pension system is not the most significant thing, as the public finance one way or another for its consumption post-retirement. After agreeing on that assumption, we claim that the extent of the government intervention in the market signals the state's responsibility towards its citizens on a variety of issues. That may include income smoothing at retirement, alleviating income inequality, avoiding old-age poverty, etc. We sum up our thoughts about the state's role in the pension market over the next section.

Chapter 4 opens the theoretical aspect of this thesis. This composition explores pension risks that entail different actors in the pension field. That composition treats the pension as a portfolio. By that, this theory explains the financial relationships among players in the field. Implementing this theory on the global front, one may explain it as being one of the reasons for the cyclical reforms across CEE and Latin American countries.

We claim that the extent of the funded scheme and the design of the pension system depends on the ability of the public and the government to shift undiversifiable risks to each other. The first wave of reforms was clearly an attempt by the governments to shift to the public longevity risk that is translated to a fiscal burden. In other words, the government transfers un-diversifiable risk to the individual such as longevity risk, affecting its fiscal condition. On the contrary, the individuals transfer some portions of their un-diversifiable risk as poverty portion of wage/career risk and structural risks that are connected to market failures. We argue in this chapter that the bi-path ways of risk-sharing may explain the reversals of the trend in CEE and Latin American countries. The global experience implies that the total weight of government obligation to assure pension benefit adequacy depends on their ability to reduce structural risks in funded schemes. It means that as the following risks become higher and unbearable by the working population or retirees, the government has to intervene and take up more responsibility on its shoulders to assure a higher level of income adequacy upon retirement.

In chapter 5 the dissertation studies funded pension benefit outcomes as a function of contributions. Here we reveal that funded schemes include inherent socio-economic

anomaly that in favour high earning cohorts at the expense of low earners. To alleviate this anomaly and the excess market risk exposure to low earners, it is suggested to implement a minimum pension guarantee with intra-generational risk sharing. We show the value of the insurance to all earning cohorts. The results of this study are quiet surprising as they point of a value of insurance also to high earning cohorts, who bear the financial burden to finance the insurance. It is shown that the preferences to the guarantee, by all earning cohorts, increases in financial crisis, when the market is volatile.

The same outcomes, from a different angle, were revealed in chapter 6 when studying the pension market from an exchange options perspective. The options exchange theory differentiates among earning cohorts and explains the financial position among earning cohorts and the government by financial option risks. In addition to the anomaly in funded pension schemes revealed in chapter 5, chapter 6 provides insights about the risk-sharing mechanisms, which alleviates this anomaly. That includes special characteristics learned from the exchange option theory. At the second part of this chapter, we show the demand for pension guarantee in funded schemes. That part strengthen the argument that as part of funded pension scheme the central planner has to implement minimum pension guarantee to ensure sustainability of pension design.

Chapter 7 delves in the funded pension scheme studying the government role in the pension market. This chapter includes an empirical composition, analyzing the adequacy of benefits in an almost purely funded pension scheme specifically in – The Israeli market. The suggestions from this study were the same as the theoretical chapters. This study points to the vulnerability of pension benefits from financial and labor risks. This research captures some of the current financial crisis and shares the concerns of long-term influence of systemic risk on pension benefits. It is also suggested in this chapter to impose a minimum pension guarantee and risk-sharing mechanisms to alleviate the risk burden on individuals.

The thesis also includes a debate regarding the ways to finance the risk-sharing mechanisms, as one of the constraints in this study is to avoid tax-raising and further pension contribution to pension pillars. It is shown that implementing intra-generational risk sharing is the most efficient and effective way of alleviating the socio-economic anomalies as revealed by the study.

8.2. Recommendations

In this section, we attribute several dimensions aiming at the central planners who design pension systems. The recommendations set below were processed from each chapter in this dissertation, detailing the key findings above, and present implications for these findings in different situations.

a. Specific pension design and the way of funding is not the most significant thing but the balance it creates is.

The pension design itself as studied in chapter 2 should not be exaggerated in its significance. We argue that the specific pension scheme and its way of funding is only a secondary issue in providing old-age adequacy benefits. The way the pension scheme is organized needs to serve a certain point, as there is no crucial difference between funded schemes or PAYG non-funded schemes (Barr & Diamond, 2009; Brown, 2014; Orszag, & Stiglitz, 2001).

Pensions have multiple objectives. Some scholars focus on one while ignoring others. For example, the right weight for the first and second pension pillars. Policy analysis that focuses on a single objective, particularly if it does so implicitly, will be flawed. One should understand there is no single perfect design and it depends mostly on the different objectives and the underline economy.

This dissertation points out towards the importance of a more comprehensive pension designs. for policymakers, the message is to avoid considering solely narrow fiscal targets. As was demonstrated empirically in this thesis, that path may lead to unintended substantive fiscal costs in the future and inadequate pension benefits for the participants.

Each country should design its own pension model suitable to its social targets, population's standard of living, and which alleviates the particular challenges in each economy, such as income inequality, intensive aging, market failures, high public debt, and so on. Anyway, there is no economic preference for one scheme over the other. Hence, no matter how many reforms be conducted over the coming years in every single economy, the market will need to manage certain risks and constraints to address specific goals.

b. Recognizing different considerations for different players

Pensions have multiple objectives, where some are more significant to the public and other to the government. Individuals seek consumption smoothing and insurance, while governments have additional goals, including poverty relief and redistribution which fall under fiscal constraints. In some economies, the pension markets are used to gain capital from the public to finance the public debt (Banyar, 2017). Analysis needs to take into account all of these considerations. There is no efficiency gain from designing one pension pillar without distortions of the other part.

In that context, we mention that the public is not a single player. Different earning cohorts and genders have different preferences and risk management capabilities (see also Haan, et al. 2020). There is a necessity to recognize these needs and to have balance among them. We attribute to the various players in the field in chapters 5 and 6 and are avoiding relating the public as a single player.

Future pension reforms should consider the consequences of past reforms. According to Nobel Laureate, Stiglitz, "The consensus today is that the 'Washington Consensus' did not provide the answer" (Stiglitz, 2004, p.2). The Economic Policy Committee from 2006 claim, "Reforms have been guided by fiscal sustainability concerns and the net impact of risks of poverty for the current and future generations of pensioners. Though the recent pension reforms are expected to have significant economic effects, most of the studies that have been carried out to date have mainly focused on their effect on fiscal sustainability. This, in part, confirms that reforms were broadly driven by financial sustainability motives and less on pensioners' poverty" (The Economic Policy Committee, 2006, p.18). Hence, in the last decade, there developed a new strand in the pension literature that has been incorporated within this dissertation research, which tries to optimize the social pension goal of the pension systems while considering tight fiscal conditions in the era after the last financial crisis (Mesa-Lago & Valero, 2020).

c. Considering costs and budget constraints

"Spending on pensions must be compatible with a country's ability to finance the consumption of retirees in the long-term" (Genser and Holzmann, 2018, p.14). In every pension design, one should remember that government expenditures for social targets

entail costs that may cause tax raises, if not now perhaps in the future (Feldstein & Liebman, 2002). Also, there might be economic costs of the forgone resources used to implement social policy. Hence, the pension model has to attribute the utility on one side against the costs to another party. Accordingly, the models assumed in this dissertation in chapter 5 and 6 preserve fiscal expenditures level, constant Debt to GDP, and no tax-raising.

Also, to avoid the sensitive balance between unions and employees, concerning wage and proper contributions rates, the model treats employees' contributions as constant, both to social security and to funded pension plans. Indeed, in chapters 5, 6, and 7 we suggest methods for financing unfunded pension components without raising contributions or taxes. In any case, one might consider that in the steady- state employees' contributions may change relative to the workers' contributions level, due to political forces and fiscal constraints. Social sustainability can only be achieved if policymakers recognize these tradeoffs.

d. Considering stress economic conditions

In chapter 5 and 6, it was revealed that the financial crisis amplifies the socio-economic anomalies in a funded pension scheme. The results in chapter 7 point to the significant effect of the financial crisis on pension benefits adequacy. Based on the experience of pension reversals and the pension designs which emerged during the last years, we claim that these anomalies contribute to the pension reversals in CEE and Latin American countries. From the governmental perspective, financial turmoil might change its preferences in a short time. In other words, what might seem as alleviating fiscal burden might be realized as something that is causing fiscal stress in times of financial crisis, as was the situation in Poland and Hungary during the last decade (Naczyk & Domonkos, 2016). Consequently, it has been suggested to avoid dramatic steps during the financial crisis and to take into account the influence of such stressful situations in advance by implementing risk-sharing and balance mechanisms.

e. Creating a framework for full working life

As studied in chapter 3, governments keep operating in parametric reforms increasing the retirement age, adapting pension systems to longevity risk and low fertility (OECD, 2020). Many countries, especially in Europe, are still struggling to increase the effective age of retirement beyond 60 or 65 to 67, which appears to be the current international standard for men and women alike.

According to Meier et al.: "Expanding the period of economic activity as longevity increases directly addresses a major cause of the impact of ageing on pension schemes. Furthermore, it is a powerful instrument to slow down expected increases in systems' dependency ratios, affecting both the numerator and the denominator" (Meier et al. 2007, p.9). Therefore, it may allow for paying higher benefits but only if individuals live longer.

Society needs to adapt employment in higher ages. Reconsideration of the labor market has to be done by companies, families, financial institutions and the government. For example, readapting facilities and infrastructure for Individuals above the age of 67 in working places.

From another perspective, the central planner has to take into consideration the risks and not only the macro-economic ones. One of the novel arguments of this dissertation is that along the individual's lifetime, the probability of different risks to realize increases. That not only includes financial turmoil but also periods of personal unemployment, market falls, and systemic risks. As the funded benefits are vulnerable to these risks, the government has to impose balance mechanisms such as unfunded pillars and minimum pension guarantees. Many of the parametric steps taken by governments since the 1990s, such as increasing the eligibility age to retirement, affecting the fiscal/financial adequacy of the supply institutions but ignoring the risk burden on the individual shoulders.

In this dissertation, we expand the discussion on minimum pension guarantee. Here we mention that considering a framework for longer life is compatible to this mechanism. According to Jimenez-Martin (2014) avoiding eligibility to early retirement helps to avoid substantial distortions in the incentives to work as individuals age.

f. Implementing Minimum Pension Guarantee in Funded Schemes

In this dissertation, it was shown, in various ways that efficient funded schemes must include the pillar of minimum pension guarantee with intra-generational risk sharing mechanism. We show that guarantee implementation alleviates several of financial and systemic risks to all earning cohorts and increase the probabilities of sustainability to the pension design. By that, the guarantee creates value not only to participants but also for the government, as it reduces the possibility to pension reform. The necessity to social floor has been discussed analytically and empirically here and strengthen the literature in that aspect (for e.g. Ebbinghaus, 2019; Ortiz et al. 2018; Huyse et al. 2017; Gale et al. 2016; Orenstein, 2008).

Imposing governments guarantee, in any kind, is not insignificant subject. The assessment of whether to introduce investment return guarantee in the new pension schemes of the developed countries needs to be done in the context of the overall pension system. If public pensions already provide sufficient protection, investment returns may lose some of their purpose. Furthermore, one should evaluate the costs of government guarantee both fiscal and economic value influences. We discussed several ways to finance the guarantee as function of the market structure and the macro-economic conditions.

g. State regulation and supervision

"Supervision and monitoring are of major significance and recent innovations are expected to extend their importance even further and reinforce their public-private partnership" (Ebbinghaus, 2019, p.8). Although this dissertation detail largely unfunded pension schemes imposed by the government, one has to remember, they are only residual to the government's direct actions in the market. Chapter 4 concludes that the maturity of the market and the level of regulation derive eventually the implementation of unfunded schemes and their weight in total benefits. Hence, to minimize the risks on the individual shoulders, there is a strong case for efficient supervision and monitoring of a mandatory funded tier by the state. These risks encompass a large variety such as financial, systemic, and asymmetric information (Kay, 2014). As Barr argued (2006, 2010), in the U.K, pension markets are increasingly regulated and the state is asked to intervene to deal with market failures.

8.3. Thoughts about the Government Role in The Pension Market

The increasing trends in recent years toward DC schemes have brought to the fore the question of how risk should be distributed in the dimension of private pension systems. In some circumstances, where the various designs of DC plans suggest increasing the risk-bucket on the individual shoulders, the role of the state in private pension governance gains added importance. The debate on the state role intensifies in periods of the financial crisis, where the fiscal and individual interests crash in a short span of time (Fultz & Hirose, 2019).

Policymakers can do much to improve the major social insurance programs that protect old-age benefits at retirement. In the last two decades we witness that policymakers are starting to give due consideration to pension adequacy. Even in cases where benefit generosity has been reduced considerably, minimum pensions have been strengthened.

Studying the gentle balance of the pension objectives, one might claim that the design of pension schemes represents social contracts among generations. The government's role is to ensure sustainability, fairness, and adequacy of these schemes where the government itself is a mediator among actors in the market and a central planner working on behalf of the participants to ensure these characteristics (Splinter, 2017). In the opposite approach, the state is an active player with interests of its own, affecting the pension system design. This approach can or may count on incentives to develop the markets or to alleviate income inequality gaps in the pension system. According to this approach, the government can also attribute the pension system as another path to borrow and finance state debt (Grech, 2018; Irwin, 2015).

Two similar countries with the same economic challenges can have different pension system designs because of differing perspectives of the state's role (Levi & Levy, 2018). In some countries, the debate of the state's role has not come to an end. That is true regarding France, Spain, Lebanon, and Israel and of course regarding many countries in Latin America and CEE countries (Ortiz et al. 2018). For example, one of the explanations for the difference between Britain and Germany in pension design is the historic differences of the state role as Beveridge and Bismarck argue, respectively (Disney & Johnson, 2001). Yet after financial shocks, the merits of the trust in the government actions may cause a stir to rethink the state’s role (Vis et al. 2011).

While during the pension wave reforms in the 1990s, the state took a step back from its traditional role ensuring adequate old age benefits, private pension schemes were gaining popularity in global perspective (Mabbett, 2020). "The retreat of the state from public pension commitments thus has not only increased the need to fill the retirement income gap by privately funded pensions but has also led to demands for better regulation of these pensions by the state and the social partners. Without such regulation, it may be questionable whether the funded pension route remains politically sustainable if it remains a rather risky business for more and more ordinary people facing retirement" (Vis et al. 2011, p.15).

This thesis does not point to the extent of the optimal governmental intervention in the pension market, as it connects to the variation of countries' history, economic challenges, cultural influence, etc. However, the thesis details the future consequences of insufficient intervention by the government. For instance, we novel in chapters 5 and 6 that the absence of intervention in the pension market may realize in worsening socio-economic gaps. This work also advises the central planner to avoid excessive exposure of the individual to financial and personal risks in funded pension schemes. In chapters 4 and 7 we challenge the conservative economic strand from the 1990s. That strand of literature led by Chicago University, argues for reducing government intervention in the market (Friedman & Warshawsky, 1987; Feldstein, 1974). Here we argue that a funded pension system, with insufficient inherent risk-sharing mechanisms, during a financial crisis may be translated to fiscal spending for bailouts plans. We further demonstrate this argument in chapters 4 and 6 with the experience of CEE and Latin American countries after the last financial crisis.

Eventually, the state actions in the pension market are derived from an ideology and navigate along a strip of constraints and incentives to fulfill the public agenda (Levi & Levy, 2019). Tracing the evolution of the economic agenda of the 'Washington Consensus' and its crash teaches us a modest lesson in judging economic solutions to a variety of countries. There is no single answer of pension design for each country but a variety of opportunities and options for the state targets.

Different risk profiles require different regulations during old age. "It is argued that this protection can be organized in various ways depending on the national circumstances and the political priorities" (Fultz & Hirose, 2019, p.14)).

8.4. Further research

Across the thesis, it is argued that to understand pension outcomes, it is necessary to relate to a variety of variables connected both to the individual, the state, and to other players in the field. Major aspects have been attributed in this thesis such as the individual's preference and his risk aversion, his path of income along with his career, his standard of living, and the government fiscal constraints. Pension systems interrelate with labor markets and living arrangements in manifold ways, for instance: retirement, quitting jobs, periods of unemployment, etc. Also, there is a need to analyze macroeconomic pension-schemes by cross-national comparative studies to provide an understanding of the consequences of the specific pension system. All of these aspects may emerge as opportunities to further investigate global pension designs and reforms.

During the writing of this dissertation, the COVID-19 pandemic financial crisis has erupted. Besides the heavy price of more than a 2.5 million victims around the world[41], the global economy fell dramatically, affecting every aspect of our daily life. Substantiate weight of this thesis studies the consequences of the financial crisis in pension markets for both the individual and the governments. To the best of our knowledge, only a few researchers have explored empirically the consequences of funded pension benefits even less during financial and fiscal turmoil.

In chapter 7, we only scratch the future influence of systemic and market risk realizations. These influences might affect generations ahead. We invite further research developing additional insights regarding the benefit adequacy of a variety of pension designs, for example, Notional-Defined-Contributions, Points, etc. We identified a lack of empirical studies in the literature for these aspects.

We identified a few types of research on the social efficiency of different pension schemes. To interpret the current contribution of inequality by the pension scheme, a detailed study of the country's historical path-developments of each pillar is a precondition to interpret empirical findings on pension benefits. Individual's benefits in old age are affected from decisions during early stages in working phase. Thus, individual saving profiles differ by birth cohorts and need to be analyzed in light of the maturing phase of the contributory pension scheme. Here we mention another promising field of

[41] This number is due to February 2021.

study, which includes comparison researches among different countries of old-age protection schemes.

In addition to empirical studies, the preference theory, detailed in chapter 5 has to be further strengthened. The OLG model's purpose was to provide intuitions about the socio-economic anomalies among earning cohorts. We intend to further specify the model according to different country's pension designs and to compare the results to actual pillar sizes.

Especially it will be interesting to investigate economies that have made another re-reform in their pension scheme due to political pressure. Socially, in the strand of OLG pension models, there is a need for more investigation into the different contributions rates by gender, as women face different career paths from men, which influence personal accumulations. Another interesting growing issue is how behavioral biases and low levels of financial knowledge affect the level of pension contributions.

Ending where we started, we intend to follow closely the developments in the global pension market, during and after the current financial crisis. As was claimed as a repetitive motive in this dissertation, we identify economic crises as crucial cross-points of political and economic pressure. One might ask if the pension reversals wave will further intensify as a consequence of this crisis or the fiscal burdens of governments will result in erosion of old-age benefits over the coming years.

Conclusion - References

Banyar, J. (2017). European Handling of Implicit and Explicit Government Debt as an Obstacle to the Funding-Type Pension Reforms. *European Journal of Social Security*. 19(1). https://doi.org/10.1177/1388262717697746.

Barr, N. & Diamond, P. (2006). The Economics of Pensions, *Oxford Review of Economic Policy*, 22 (1), 15–39, https://doi.org/10.1093/oxrep/grj002

Barr N. & Diamond, P. (2009), Reforming Pensions: Principles, Analytical Errors and Policy Directions, International Social security Review, 62(2): 5-29. https://doi.org/10.1111/j.1468-246X.2009.01327.x

Cai, Y., Feng, W. & Shen, K., (2018), Fiscal Implications of Population Aging and Social Sector Expenditure in China, *Population and Development Review*, The Population Council, Inc. 44(4): 811-831

Clements, B.; Coady, D.; Eich, F.; Gupta, G.; Kangur, A.; Shang, B.; Soto, M. The challenge of Public Reform in Advanced and Emerging Market Economies; International Monetary Fund: Washington, DC, USA, 2012

Disney, R., & Johnson, P. (2001). Pension Systems and Retirement Incomes across OECD countries. Cheltenham: Edward Elgar Publishing. Available at http://www.e-elgar.com/shop/isbn/9781840645637

Ebbinghaus, B. (2019). Multi-Pillarisation Remodelled: the Role of Interest Organizations in British and German Pension Reforms, *Journal of European Public Policy*, 26(4): 521-539, http://10.1080/13501763.2019.1574875.

European Commission. Pension Adequacy Report 2018—Current and Future Income Adequacy in Old Age in the EU; European Commission: Brussels, Belgium, 2018.

Feldstein, M. (2005). Structural Reform of Social Security. *Journal of Economic Perspectives*, 19 (2): 33-55. http://doi.org.10.1257/0895330054048731

Feldstein, M. Liebman, J.B. (2002). The Distributional Aspects of Social Security and Social Security Reform. University of Chicago Press

Friedman, B., & Warshawsky, M. (1987). Annuity Prices and Savings Behavior in the United States. *In Z. Bodie, J. Shoven, & D. Wise, Pensions in the U.S. Economy* pp. 53-84. Chicago: University of Chicago Press.

Fultz, E. & Hirose, K. (2019). Second-Pillar Pensions in Central and Eastern Europe: Payment Constraints and Exit Options. *International Social Security Review*. 72 (2): 3-22. https://doi.org/10.1111/issr.12201

Gale, w. & John, D., Kim, B., (2016), You Get What You Pay For: Guaranteed Returns in Retirement Savings Accounts, *Economic Studies.* The Brooking Institution.

Genser, B. & Holzmann, R. (2020). Frontloaded Income Taxation of Old-Age Pensions: For Efficiency and Fairness in a World of International Labor Mobility, *CESifo Economic Studies*,ifz017, https://doi.org/10.1093/cesifo/ifz017

Grech, A., (2018). What Makes Pension Reforms Sustainable? *Sustainability*. 2018. 10(8). https://doi.org/10.3390/su10082891

Holzmann, R.; Hinz, R. (2005) Old-Age Income Support in the 21st Century: An International Perspective on Pension Systems and Reform; *The World Bank:* Washington, DC, USA.

Huyse, H., Fonteneau, B., Vaes, S., Phlix, G., Eisele, U., & Asukai, N. (2017). Independent Evaluation of the ILO's strategy and Actions for Creating and Extending Social Protection Floors, 2012–2017. Geneva: International Labour Office.

ILO. (2018). Social protection for older persons: Policy trends and statistics 2017-19. Geneva: International Labour Organization.

Irwin, t. (2015). Defining the Government's Debt and Deficit, *Journal of Economic Surveys*, 29 (4), 711-732

Jiménez-Martín, S. (2014). The incentive effects of minimum pensions. *IZA World of Labor* 2014: 84 doi: 10.15185/izawol.84

Kay, S. J. (2014). Political Risk and Pension Reform in Latin America and Central and Eastern Europe. *Documento elaborado para la reunión de la ISA/FLACSO, Buenos Aires.*

Levi R. & Levy, K. (2019). The Effect of Attitudes Regarding Retirement on Pension Savings. *Review of Economics & Finance*, Better Advances Press, Canada,15, 1-13. Available at https://EconPapers.repec.org/RePEc:bap:journl:190101

Mabbett, D. (2020). Reckless Prudence: Financialisation in UK Pension Scheme Governance after the Crisis. *Review of International Political Economy*. https://doi.org/10.1080/09692290.2020.1758187.

Masten, E. & Thorgesen, O. (2004). Designing Social Security – A Portfolio Choice Approach. *European Economic Review, 48*(4): 883-904. https://doi.org/10.1016/j.euroecorev.2003.09.006

Merton, R. & Bodie, Z. (2005). Design of Financial Systems: Towards a Synthesis of Function and Structure, *The World of Risk Management*, 1-27 https://doi.org/10.1142/9789812700865_0001

Mesa-Lago, C. & Valero, D. (2020). The New Wave of Pension Reforms in Latin America. *In: Peris-Ortiz M., Álvarez-García J., Domínguez-Fabián I., Devolder P. (eds) Economic Challenges of Pension Systems*. Springer, Cham. https://doi.org/10.1007/978-3-030-37912-4_12

Modigliani, F., & Muralidhar, A. (2004). "Rethinking Pension Reform". Cambridge, United Kingdom: Cambridge University Press.

Munnell, A., Kopcke, R., Aubry, J. & Quinby, L. (2010), Valuing Liabilities in State and Local Plans, Center of Retirement Research at Boston College. http://hdl.handle.net/2345/bc-ir:104251.

Naczyk, M. & Domonkos, S. (2016). The financial crisis and varieties of pension privatization reversals in Eastern Europe. *Governance, 29*(3): 167–184. https://research.upjohn.org/up_bookchapters

Nepp, A. & Larinova, V. (2018), Optimal Pension System: Case Study. *Economics and Sociology*, 11(1): 267-292

Splinter, D. (2017), State Pension Contributions and Fiscal Stress, *Journal of Pension Economics and Finance*, 16(1): 65-80, http://doi.org.10.1017/S147474721500019

Feldstein, M. (1974). Social Security, Induced Retirement, and Aggregate Capital Accumulation. Journal of Political Economy, 82: 905–926.

Organization for Economic Co-operation and Development. Pensions at a Glance. (2020) OECD: Paris, France,

Pierson, P. Increasing Returns, Path Dependence, and the Study of Politics. Am. Political Sci. Rev. 2000, 94, 251–267.

Orenstein, M. A. (2008). Privatizing Pensions: The Transnational Campaign for Social Security Reform. New Jersey: Princeton University Press.

Ortiz, I., Durán-Valverde, F., Urban, S. & Wodsak, V. (2018). Reversing Pension Privatizations: Rebuilding Public Pension Systems in Eastern Europe and Latin America. Geneva: International Labour Organization. http://dx.doi.org/10.2139/ssrn.3275228

Orszag, P.R.; Stiglitz, J.E., (2001). Rethinking Pension Reform: Ten Myths about Social security Systems, World Bank: Washington, DC, USA.

Stiglitz, J. E. (2004). The Post Washington Consensus, The Initiative for Policy Dialogue. Columbia University, *available at: http://policydialogue. org/files/events/Stiglitz_Post_Washington_Consensus_Paper. pdf.*

Vis, B., Kersbergen, K. & Hylands, T. (2011). To What Extent Did the Financial Crisis Intensify the Pressure to Reform the Welfare State? *Social Policy Administration*. 45(4): 338-353. https://doi.org/10.1111/j.1467-9515.2011.00778.x

World Bank. (1994) Averting the Old-Age Crisis: Policies to Protect the Old and Promote Growth; Oxford University Press: Oxford, UNITED KINGDOM

Zaidi, A. & Grech, A.G. (2007). Pension policy in EU25 and its impact on pension benefits. *The Journal of Poverty and Social Justice*. 15(3): 229–311.