THE SLOVAK PENSION SYSTEM AND ITS REFORMS

by

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Abstract

Slovakia has recently reformed its pension system and replaced the old PAYG scheme with a multi-pillar structure. In this thesis I analyze the reformed PAYG and mixed systems by using selected efficiency indicators to evaluate the impact of the systems on the individual's pension benefits. I find that the reformed PAYG system offers generous pension benefits to its participants, which may be outperformed by the mixed system only if fund returns in the 2nd pillar evolve in a very optimistic way. Based on my results and considering also the projected financial deficit for the PAYG system, I conclude that the Slovak public pension scheme should be reformed.

Table of Contents

Introduction **1**

Chapter 1. Overview of the main issues concerning pension systems **4**

Chapter 2. The Slovak economy **11**

Chapter 3. Overview of the Slovak pension reform **16**

3.1. The pension system before 2004 16

3.2. Reform of the PAYG system 18

3.3. Introduction of the funded pillar 19

3.4. Evolution of pensions in the Slovak economy 21

3.5. Latest developments, reform proposals and the financial crisis 23

Chapter 4. Case study: Old-age pensions in Slovakia **25**

4.1. The model for pension calculations 25

4.2. Measuring the efficiency of the two pension systems 30

4.3. Results 34

4.4. Improving the system. Suggestions. Recommendations. 41

Conclusion **46**

Appendices **48**

References **51**

List of Figures

1 The evolution of income and consumption in an individual's life-cycle 38

2 The evolution of assets in an individual's life-cycle.....39

3 Indicators for male average wage worker, realistic scenario……..…….39

4 Indicators for female average wage worker, realistic scenario.....39

5 Indicators for male average wage worker, optimistic scenario.....40

6 Indicators for female average wage worker, optimistic scenario.....40

7 Life insurance from the 2nd pillar.....41

8 Indicators for male average wage worker, realistic scenario (CPI/65) 44

9 Indicators for female average wage worker, realistic scenario (CPI/65) 44

10 Indicators for male average wage worker, optimistic scenario (CPI/65).....44

11 Indicators for female average wage worker, optimistic scenario (CPI/65).....44

A.1 The evolution of real GDP growth rate in Slovakia.....48

A.2 The evolution of government debt in Slovakia.....48

A.3 The evolution of the unemployment rate in Slovakia 49

A.4 The evolution of public deficit in Slovakia 49

A.5 The marginal progressive character of the pre-reform PAYG system in Slovakia.....50

List of Tables

1 Pension reforms in Europe after the 1990s....7

2 Social security contributions in the Slovak Republic (% of gross wage)....20

3 Investment limits by type of pension funds....21

4 Pensions in the Slovak economy 1994-2007 (%) 22

5 Financial development of the public pension system in Slovakia 2004-2050....23

6 Proportion of stocks and bonds in the funds (%)....28

7 Calculation of bond yield 29

8 Stock returns under different scenarios 30

9 Returns of pension funds 30

10 Efficiency indicators under the current system....34

11 Efficiency indicators, case of CPI indexation, retirement age 62....42

12 Efficiency indicators, case of CPI indexation, retirement age 65....43

A.1 Yearly returns of pension funds for the period 01.04.2008 and 31.03.2009 50

List of Abbreviations

A - assets

ADH - actual pension point value

b_R^U - initial monthly pension benefit in the pure PAYG system

b_R^F - initial monthly pension benefit in the funded system

b_R^{U+F} - initial monthly pension benefit for the mixed system

$b_R^{\hat{U}}$ - initial level of benefits from the unfunded pillar of the mixed system

β_w - net entry replacement rate

C - consumption

D – maximal survivable age

δ - discount factor (here it equals the nominal wage growth rate)

ED – expected age of death at age R

F - funded system

f^{adm} - administration fee coefficient

f^{trans} - transfer fee coefficient

K - number of years spent in the funded pillar

L – age at entering to the labor market

l_t - probability that a person aged L will survive until age t

N - number of years paying contributions

NPV - net present value of pension benefits

NPV^{norm} - net present value of pension benefits normalized by the average gross annual wage at the beginning of 2009

PAYG - unfunded system

POMB - average personal wage point

PVB - present value of pension benefits

PVC - present value of pension contributions

R – age at retirement

r_b - rate of return of the Balanced Fund

r_c - rate of return of the Conservative Fund

r_g - rate of return of the Growth Fund

r_i - interest rate on assets

S - savings from the 2nd pillar

T - tax

t - time

τ - pension contribution rate

U - unfunded system

U+F - mixed pension system

u() - utility function

W_t - annual gross wage

x - tax rate

Y - income

γ - discount factor for the optimization problem

z - time index

Introduction

Pension systems are very important for society and for individuals as well. Pension expenditures constitute a significant and increasing part of government spending, while pension benefits are the main source of income for senior citizens. In recent years the accentuated trend of population aging has created new challenges for the pension systems of both developed and emerging countries. The main driving forces of this process are increased life expectancy and the drop in fertility rates below the critical values needed for maintaining population size.

The growing share of older people in the population raises serious concerns regarding the social, economic and political impact of this phenomenon. This leads to increasing fiscal problems and makes the financing of pensions more difficult. As a consequence, after 1990 many European countries realized that financing their pension system (usually pay-as-you-go or PAYG) became unsustainable in the long run and changes in the pension scheme should be considered to deal with this problem. However, finding the optimal design of a pension system is very difficult due to the ongoing debate between the proponents of contradictory theories. Different approaches have been undertaken by governments depending on their objectives, the roles they assigned to individuals, markets and state in a pension system.

In Central and Eastern Europe there have been two streams of pension reforms. Many transition countries — such as Hungary, Poland, Slovakia, Romania, and Latvia — have opted for a structural transformation of their retirement schemes during recent years. The reforms implied partial privatization of the public PAYG pension systems. This radical wave of pension reform originated in Latin America with the leading example of the Chilean reform in 1981. On the other hand countries like the Czech Republic and Slovenia decided to improve the public

PAYG system by introducing parametric reforms of the system and completing it with a voluntary private pillar.

Due to the importance of the topic, a rich literature in the field of pension economics has emerged, assessing the impact of the pension reforms on different stakeholder. Concerning Slovakia, the country of interest for my paper, previous research such as Melichercik and Ungvarsky (2004) studies the financial sustainability of the new system and the level of future pension benefits. Sido (2005) evaluates the impact of 2nd pillar on workers with various ages and education by the help of a dynamic accumulation model. Kilianova et al. (2006) apply the dynamic accumulation model for studying the optimal switching behavior between pension funds with different risk profiles.

When evaluating the effect of pension reform on the beneficiaries of the system, these papers use only the replacement rate as an efficiency measure. However, conclusions made only on the basis of this indicator do not provide us with a complete picture regarding the effects of reform on the individual; they reflect only the relative level of pension benefits at the beginning of the retirement period. My work aims to complement this deficiency by using a wide range of efficiency indicators to evaluate the performance of the system. In this thesis I carry out a microeconomic analysis of the PAYG and mixed pension schemes in Slovakia by illustrating how selected efficiency indicators change and what do they imply about the pension benefits of an individual. As a result of my analysis I find that Slovakia has a generous PAYG system which may be outperformed by the mixed system only if fund returns in the 2nd pillar evolve in a very optimistic way. Taking into account that the projected financial deficit of the PAYG system will be continuously widening, I recommend further measures for the improvement of the public scheme.

The rest of the paper is organized as follows. The first chapter reviews the main issues regarding pension systems; it gives a brief summary of pension reforms undertaken in Europe since the 1990s and describes the main efficiency measures used in evaluating a pension scheme's impact on its beneficiaries. The situation of the Slovak economy during the last two decades is the subject of the second chapter. The third chapter describes the Slovak pension system, how it evolved during the last 15 years, what kind of pension reforms were undertaken and what kind of problems is the pension system currently facing. The final chapter comprises the case study of the pension system. It describes the model for pension calculations, the efficiency measures used, the main results and further recommendations.

Chapter 1. Overview of the main issues concerning pensions

There is a growing literature of pension economics stimulated by the challenges arising from population aging. These problems require policy makers to redesign their pension system, taking into account the impact of population aging on public finances and also its effects on labor markets, national savings, economic growth, and the distribution of expenditures and benefits among different stakeholders. However, finding the optimal pension scheme is not an easy task for a country. Old-age pensions are subject to intense debate both from a theoretical and policy making perspective. The controversy concerns the underlying economic theory, the degree of the problem and the optimal policy mix to protect old-age security.

The root of the problem regarding pensions lies in the combined effect of increasing life expectancy and decreasing birth rates which lead to rising pension expenditures in terms of GDP, in some cases accompanied also by notable pensioner poverty. Martin and Whitehouse (2008) point out that the average pension expenditure across OECD countries in 2005 was 7% of GDP. The same figure for the EU25 was about 12% of GDP, with spending around 14% for Italy, Austria, Germany and Poland. Without changes in the pension schemes, pension spending in some countries could double in just a few decades. For example, the UK Pensions Commission (2005) has projected that pension spending in Greece will increase to 22.6% of GDP by 2050 from the projected 12.3% in 2009 unless they reform their pension system.

One of the main debates about pension systems is whether they should be organized as PAYG or funded. PAYG systems are usually operated by the state. Under these systems the state collects taxes and contributions from the working population and uses them to pay the pensions of the retired generation; this way current workers support current pensioners. Thus the main feature of the PAYG system is to redistribute and share risk across generations. Fully funded

systems on the other hand are private schemes in which pension contributions are paid into a pension fund and they are invested in financial assets. Pension benefits are received at the end of a member's working life in accordance with the invested amount into the fund and the returns on the fund's assets. Though fully funded schemes can be defined benefit (DB) but nowadays, most of them are run as defined contribution (DC), on an actuarial basis. There are also mixed systems which combine the two. These are multi-pillar models, usually consisting of three tiers: the first pillar is a mandatory public (PAYG) pension; the second one is the mandatory private (funded) pillar; the third component is the voluntary private (funded) pillar. The ongoing debate considers the second pillar of a mixed system, namely the mandatory funded pensions.

Another aspect of the debate is how pension contributions should be related to pension benefits. There are three common ways of organizing pension systems. DC schemes specific to fully funded individual accounts are organized in the following way: the pension of an individual depends on his or her lifetime contributions to the funded account and on the returns of the fund's investments. This scheme implies that individuals bear the risks of the pension fund's performance and also that their pension benefits are linked to their contributions by a strictly actuarial relationship. DB schemes can be operated by the state or by the employer. In a DB scheme pension benefits depend on the worker's wage history and the length of working years and pension entitlements are derived according to some rule set by the government. Accordingly risks do not fully fall on the individuals, but they are mainly borne by the government. The third alternative is the notional defined contribution (NDC) where pension are PAYG but an individual's pension benefit depends on his or her lifetime contribution on an actuarial basis, given the age at retirement and the person's life expectancy. Thus an NDC scheme combines the two different claims of the debate.

Proponents of the funded system, such as Feldstein (1996 and 2005) and Holzmann and Hinz (2005) are very optimistic about the potential benefits of the funded system and they have fully supported the idea of structural reforms to the old, PAYG system. An influential paper by the World Bank (1994) also promoted the idea of funding and the introduction of mixed pension schemes. However, they have underestimated the costs of transition and the problems arising from the financing of these costs. Moreover, the recent financial crises revealed that private fund returns may not be as optimistic as they predicted: in October 2008 private pension plans assets' in the OECD lost about 20% of their value compared to December 2007.[1] Other authors, like Barr (2000), Diamond and Orszag (2005), have argued that PAYG systems can be adapted to demographic changes by parametric reforms and there is no need to employ structural changes. I consider that appropriate parametric reforms to PAYG systems may attenuate the problems caused by population aging. But then one has to take into account the costs imposed on the population by these parametric changes. In addition, a smaller funded pillar may be introduced in order to allow participants to take advantage of the higher returns on capital markets and to adjust part of their pensions to their individual risk preferences. I especially prefer the Swedish example (Sunden, 2006), where the PAYG system is organized according to the NDC scheme and benefits are automatically adjusted if the system's financial stability is in danger. This system provides also minimum pension guarantees and a small funded pillar.

Since the 1990s many European countries have undertaken important pension reforms, combining parametric and structural changes in various ways. Table 1, based on Martin and Whitehouse (2008) and completed with other countries, gives a brief overview of these reforms and helps identifying some trends and common features among pension reforms.

[1] Source: OECD 'Pension markets in focus' December 2008, Issue 5

Table 1. Pension reforms in Europe after the 1990s

	Parametric changes				Systematic changes		
Country	Legal retirement age male/female	Retirement incentives	Change in indexation	Change in benefit formula	Introducing DC	Introducing NDC	Life expectancy
Germany	65/65	■					■
Italy	65/65	■	■			■	
UK	65/65	■					
Sweden	65/65			■	■	■	
France	60/60	■		■			■
Finland	65/65	■	■	■			■
Hungary	62/62	■	■	■	■		
Poland	65/60	■	■	■	■	■	
Slovakia	62/62		■	■	■		
Czech Republic	63/61	■	■	■			
Slovenia	63/61	■	■	■			
Portugal	65/65	■	■	■			■
Austria	65/60	■	■	■			

Source: Adapted from Martin and Whitehouse (2008)

One of the most conspicuous changes is the increase in legal pension age which serves as an adjustment to the increased life expectancy. The general tendency in the EU is to gradually increase the legal retirement age and also to equalize the pension age of women to that of men. In most European countries this is 65 years; however, there are countries with a lower retirement age and also countries where the full pension eligibility age for men is higher than for women. In line with the above changes, countries have also tried to increase the incentives of older workers to stay in the workforce for a longer time and they have introduced penalties for early retirement. The objective of the EU in the framework of the Lisbon strategy is to increase the employment rate of the older people (between 55 and 64 years) to 50 %. The rationale behind these measures is that longer working period leads to more years of contribution and less years of benefit, helping to improve the sustainability of the pension system. Other parametric reforms have been more technical. Countries frequently have made changes in the benefit formula by extending the

period over which earnings were accounted. They have been revaluating past earnings and also changing the indexation methodology.

Several European countries have opted for structural reforms besides the parametric ones. They have been partially removing the public DB pension system and replacing it with DC or NDC schemes. A common feature of these systemic reforms has been that they made pension benefits to automatically adjust when life expectancy changes. Moreover, this automatic adjustment has been built-in also to some pension systems which undertook only parametric reforms.

There is a large literature about how these reforms took place in some countries and the underlying consequences of introducing such changes. Regarding the Slovak pension reform, early work such as Golias (2003), Melichercik and Ungvarsky (2004) deals with the financial sustainability of the new system and the potential level of pension benefits and replacement rates. Sido (2005) performs a sensitivity analysis of the impact of 2nd pillar on workers with various ages and education by the help of a dynamic accumulation model. Kilianova et al. (2006) use the dynamic accumulation model for studying the optimal switching behavior between pension funds with different risk profiles, while Koske (2009) explores the problem of financial sustainability in the context of fiscal flexibility.

In my work I compare the current PAYG and mixed pension schemes in Slovakia and I recommend further measures for their improvement. This is done by examining the impact of alternative scenarios on the beneficiaries of the pension system. For this purpose several measures may be employed. The most widely used indicator in the academic literature is the replacement rate. Golias (2003) as well as Melichercik and Ungvarsky (2004) use exclusively this measure in evaluating the impact of the Slovak reform on the microeconomic level.

Replacement rates reflect how efficiently earnings have been replaced by pension benefits at the beginning of the retirement period. But using only replacement rates for measuring a pension system's efficiency does not give us a comprehensive picture of the reform's effect on the individual. That is why in my work I use a large set of efficiency indicators which express the performance of a pension system from different perspectives.

The OECD in its comprehensive work *Pensions at a Glance* (2007) uses in addition to the replacement rate the efficiency indicator of gross/net pension wealth which has the advantage of expressing the present value of pension benefits as a multiple of economy-wide average earnings. This study highlights the key features of mandatory pension systems in thirty OECD countries providing a basis of comparison of pension systems across a large set of countries.

Geanakoplos et al. (1998) use three 'money's worth measures' to evaluate social security reforms. These measures are the discounted benefit-to-tax ratio, the internal rate of return and the net present value. The authors calculate these indicators for the US social security system, including privately managed accounts, in order to compare different cohorts relative to each other under a given system and how a certain group behaves under alternative systems. In my work I use two of these indicators, namely the net present value and the discounted benefit-to-tax ratio, while the approach taken resembles the latter application of the authors: I am studying the case of a representative worker under alternative systems. The difference is that I use these indicators for calculating 'money's worth measures' for an individual. In addition, I normalize the *NPV* of benefits by the average annual gross wage in the economy for an easier interpretation.

Based on Sido (2005), I also use and further develop a simple optimization model where an individual is maximizing his/her lifetime utility from consumption, with certain constraints,

tailored to the Slovak economic conditions. Based on this model, I calculate the lifetime utility of consumption and the present value of bequest which I use in my work as efficiency measures of the different pension systems.

This overview showed the main issues concerning pension systems, the state of pension reforms in Europe as well as potential efficiency measures that may be used in evaluating the Slovak pension reform. The next chapter describes the Slovak economic situation during the last two decades which I think is essential for understanding the radical reform of their pension system.

Chapter 2. The Slovak economy

Slovakia emerged as an independent state in 1993, after the split of the Czechoslovak Federation, with a population of 5.5 million people. At that time, just a few years after the fall of the communist regime, Slovakia faced the challenges of any transition country: to transform ownership from the state to the private sector and the economic system into a modern market-oriented economy. This process of transformation and liberalization had several consequences for the country: unemployment, a previously unknown concept, appeared; the society started to fragment much more than before. In 1991, after the liberalization of prices, output started to decline. According to the Eurostat statistics, in 1990 the GDP per capita of Slovakia was about 68% of the average GDP per capita of the EU-15. By 1993 this declined to 49% and even in 2000 it was only around 51% of the EU average.[2] Consequently, poverty started to be spread.

During the early 1990s unemployment aid and other forms of social assistance were introduced. The number of individuals in need of social insurance was continuously increasing. In 1994 necessary steps, like the reform of the social and health insurance system, were taken: health insurance and social security were detached from the state budget and a compulsory Bismarck-style public insurance system as well as the Social Insurance Agency was created.[3] However these were more like unavoidable measures and not the result of a coherent economic and social policy.

Between 1994 and 1998, during Prime Minister Vladimir Meciar's government, the reform process slowed due to irresponsible fiscal policy and poor governance. This led to inefficient investments and wide-spread corruption. Since a tight monetary policy was needed to offset the loose fiscal stance, interest rates started to grow sharply causing debt servicing

[2] Eurostat Database (http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database)
[3] For detailed information about the Slovak welfare reform see Gonda et al. (2006)

problems. Although the real annual GDP growth reached 6.5% in 1995, it declined to 1.3% in 1999.[4] However, the sources of this growth were the large government spending and overborrowing and not the productive efficiency of the economy. Moreover, in my opinion, the autocratic style of Meciar and its lack of respect for democracy also strengthened the above difficulties: by the end of 1998 he managed to completely undermine the country's reputation on an international level.

The international insulation and the threat of being left out from the first round of EU-enlargement caused an identity crisis in Slovakia and, with the help of the reformer government elected in 1998, changes started to take place.[5] The most important goal of the first Dzurinda-government (1998-2002) was to regain the international credibility of the country. For this reason it was willing to collaborate and comply with the European Union and other international organizations. The government stabilized the economy: it carried out fiscal restraint, consolidated the banking system and stimulated the inflow of foreign capital in the country. As a result, in 2000 Slovakia became a member of OECD and in 2002 it became a member of NATO. The price of this stabilization package was that unemployment reached its peak in 1999, being around 20%, but on the eastern part of the country it hit 40%.[6]

The successful reaching out to the international community assured that the Dzurinda-government was reelected in 2002. With much larger support compared to the previous period this government introduced a very radical reform package with the primary goal to set in order the budget and to boost competitiveness.[7] First of all they introduced a 19% flat tax rate which eased the administration burdens and rolled back tax evasion. In 2003 the public finance

[4] See Appendix: Figure A.1. The evolution of real GDP growth rate in Slovakia
[5] A very good comparison between the Slovakian and Hungarian reform experience may be found in Győrffy (2009)
[6] See Appendix: Figure A.3. The evolution of the unemployment rate in Slovakia
[7] These reforms were considered radical even by the World Bank and IMF. For further reference see Győrffy (2009)

management reform program was started to help fiscal consolidation in Slovakia. In this period there were also important reforms on the labor market aiming to increase its flexibility. They limited the power of trade unions and relaxed the laws protecting employees. Also, social aid and unemployment benefits were curtailed. Interestingly, there was no major opposition to these measures. A possible explanation in my opinion is that due to the 19% flat tax, employment for companies became cheaper, and on the other hand, the motivation to get employed increased because of the cut in unemployment benefits. Thus supply and demand on the labor market met. These measures ended the earlier status, when – if certain conditions given – people could get a higher unemployment benefit than their wage.

The reforms continued with the introduction of a three-pillar pension system. Although the deficit produced in the state budget by the pension system required it be reformed, there was no adequate justification why the Slovak government chose the structural reforms and not only the parametric ones. For me it seems that the choice was driven more by the wish of the Slovak government to comply with international trends and organizations, rather than by an optimal cost-benefit analysis.

Another set of actions aimed to reduce the expenditures of the state budget and to improve the financing possibilities of the health care system. These actions included the introduction of a visit fee, a daily fee in hospitals, the transformation of the state social insurance funds into private joint-stock companies, the creation of the voluntary health funds and the conversion of the hospitals into self-supporting entities.

These comprehensive reforms helped Slovakia to consolidate its budget. While the country's public deficit peaked to 12.3 % of GDP in 2000, in just a few years the government managed to pull it down to a level of around 3% of GDP, making it compatible with the

Maastricht criteria.[8] Also these reforms made it possible for Slovakia to attract large FDI inflows – mainly in the automotive and electronic sectors – and contributed to the incredible economic boom, with the highest growth rate in the region. With the help of the successful privatization in this period, Slovakia significantly reduced its government debt from 50% of GDP in 2000 to 30% of GDP in 2006.[9] Due to the positive evolution of its economy, Slovakia managed to join the EU in 2004. The economic boom continued in the following years. GDP growth in 2006 was 8.5%, in 2007 it was 10.4% and even in 2008, despite of the global economic downturn it managed to reach 6.4%. Unemployment dropped from 18% in 2003-2004 to about 9% in 2008.[10]

However, the gap in the state of development between the western and eastern parts of Slovakia is one of the country's main weaknesses. There is no appropriate infrastructure in the eastern part, and because of this, FDI inflows target mainly the western part of the state. Thus unemployment is significantly higher in the eastern region and in addition, the workforce is inflexible and immobile. A potential explanation of this problem may be that Slovakia was so eager to fulfill the Maastricht criteria and join the Euro-zone that it preferred to spend less for developing its infrastructure in order to keep the budget deficit low. This could be an explanation also to the strange situation that emerged around the gas-problem in the beginning of 2009, namely that Slovakia had almost no gas reserves and the network of pipelines was not adequate to import enough gas from Hungary and Czech Republic.

The above sequence of reforms was not continued by Robert Fico's government, although it did not reverse the reforms because of the disciplinary effect of meeting the criteria for the introduction of Euro in 2009. Instead, the government regulated energy and food prices. However, only a few months after joining the Euro zone, there are signs that fiscal discipline has

[8] See Appendix: Figure A.4. The evolution of public deficit in Slovakia
[9] See Appendix: Figure A.2. The evolution of government debt in Slovakia
[10] See Appendix: Figure A.3. The evolution of the unemployment rate in Slovakia

loosened and that the budget deficit in 2009 may break the EU's fiscal rules and exceed 3% of GDP. Moreover, as a consequence of the financial crises, 2009 may be the first year in a long time when Slovakia will experience a GDP contraction, estimated to be -2.5%, even if it will be lower than in the rest of the Euro zone, which is forecasted to contract by 4% in 2009.[11]

Considering the economic context of the country, one can notice that the Slovak pension reform was a very optimistic decision of the government. It was implemented in a period when the economy was growing more than 3-5% points faster than the EU-15 growth rate, thus the transition costs implied by the multi-pillar pension system did not seem to be a huge burden for the state. If we look at the economic situation in 2009, the pressure made by the pension system on the state budget is much stronger than it was expected in 2004. In addition, the pension system is continuously exposed to the political risk and its stability is in danger.[12]

[11] European Commission: Economic Forecast Spring 2009, released on 4 May 2009.
[12] For an extensive study of the political risk in Slovakia, Hungary and the Czech Republic see Dusek and Kopecsni (2008)

Chapter 3. Overview of the Slovak pension reform[13]

3.1. The pension system before 2004

The Czechoslovak pension system started as a traditional, Bismarck-style one, but it went through significant changes during the communist period. In this period the communist party used the pension system as a tool for pushing through the political and ideological concepts of the regime. While it was a very generous pension scheme to some low-paid categories of workers, it was notably "discriminating" against others. This system was financed by general taxation and the indexation of pensions was very arbitrary.

The first substantial changes to the pension system started in 1988, when the Social Security Act was adopted. It introduced a differentiated indexation of pensions based on the year they were assigned and the ceiling on pensionable income was lowered. After the 'Velvet Revolution' in 1989 transformation to a market economy started, and the economic reforms were accompanied by a substantial set of social reforms. In 1993 the Czech and Slovak Republics split and in 1994 the Slovakian Social Insurance Agency was set up to be in charge of health insurance and pension funding. This was the first structural change in the system, the Social Insurance Agency being separated from the state budget, meaning that contributions were introduced as a form of financing social insurance benefits.

The pre-reform pension system – until the end of 2003 – was inherited from the Czechoslovak era and it was organized as a PAYG system, with significant redistribution elements. Since 1997 it was complemented by a smaller voluntary private fully funded system. In the pre-reformed PAYG system people were entitled to an old-age pension benefit if they

[13] Unless otherwise stated, information in this chapter is based on the Slovak Institute of Financial Policy report (2006) and on data displayed by the Ministry of Finance of the Slovak Republic.

have been employed at least for 25 years and they reached the retirement age. The retirement age was set at 60 years for men and 53 to 57 years for women, depending on the number of children. A minimum pension around one third of the minimum wage was also provided. Pension benefit was determined on the basis of the individual's average monthly salary, which was calculated as the average of the five best earning years among the ten years period before retirement. This was a progressive pension system: the monthly income considered for determining the assessment base ranged from 0 to 330 Euro.[14] The benefits calculated this way were afterwards adjusted by a coefficient which reflected the growth rate of wages since 1989 and the indexation of pensions since 1991 (determined by the government). As a consequence, the assessment base was highly reduced, the redistribution effect was significant and the link between contributions paid and benefits received was weak. Even in 2002, when the average monthly wages were about 450 EUR, the amount above 330 EUR was not considered for pension calculations. This significantly undermined the motivation of people to pay pension contributions. Moreover, as a legacy from the communist regime, the system positively discriminated certain categories of workers (such as policemen, soldiers) by offering them the possibility to retire at an earlier age and with more advantageous terms.

The low motivation for paying contributions and the high rate of unemployment led to financial problems of this pension system and starting with 1998 the system was generating deficits. Golias (2003) explains the low motivation for paying contributions by workers' attitude of perceiving contributions rather as taxes and by the widespread belief that the system will not be able to meet its 'promises'. With Slovakia's ambitious goals to join the EU in 2004 and later on to introduce the Euro as well, such a growing deficit of the pension system was not acceptable and reforming the pension system became an urgent need.

[14] See Appendix: Figure A.5. The progressive character of the pre-reform PAYG system in Slovakia

3.2. Reform of the PAYG system

Reforming the old PAYG pension system was the first stage of the Slovak government in its attempt to create a stable, financially sustainable social security system which adapts to the demographic trends of the aging population of Slovakia. Thus a DB pension system with a direct link between contributions and benefits (in this aspect it resembles DC systems) was created in order to motivate people to pay contributions and not to underreport their earnings. A three-year transition period was set up to provide a smoother change from the previous redistributive system to the new scheme. The reform increased the ceiling on the assessment base to three times the average salary. The old age insurance contribution rate was set at 18% of the gross wage, out of this 14% was paid by the employer and 4% by the employee. The retirement age was increased gradually to 62 years both for men and women.

The pension formula changed significantly and a point-system for the calculation of old-age benefits was introduced. The new formula became:

$$P = POMB \times N \times ADH \;;\; POMB = Avg\left(\frac{IndividualGrossWage}{Avg.GrossWageInTheEconomy}\right) \qquad (3.1)$$

where: P= initial monthly pension; POMB= average personal wage point; N= number of years paying contributions to the Social Insurance Agency (working years) and ADH= actual pension value, a coefficient given by law to provide 50% gross replacement rate in 2004. Compared to the pre-reform pension benefit calculations, this formula gives proportionally higher pension to those who earned more and paid more contributions during their working life and vice versa. The indexation of pensions was set at 50% to inflation and 50% to nominal wage growth. Although this indexation method is not as favorable for pensioners as a full wage indexation, it is still very generous and it is an improvement compared to the one before 2004 when indexation was completely arbitrary and dependent on the Parliament's actions. The main disadvantage of this

formula in my opinion is that it does not link pension benefits to life expectancy. This problem will be developed in Chapter 4.

The new pension system also introduced some measures to strengthen the incentives of older workers to work for a longer time. Thus a worker may retire earlier than set by the legislation, but in this case his old-age pension will be decreased by 6% per year until he reaches the minimum retirement age. Similarly, if he works over the legal retirement age, his pension will be increased by 6% per year. The efficiency of these measures is not straightforward. According to Bednarik and Skorpik (2007), during recent years participation and employment rates of older workers (age group 55-64) have risen; however, it is not known how much of this rise is due to the economic growth and to what extent it is a consequence of the increased retirement age and the pension penalties described above.

3.3. Introduction of the funded pillar

The introduction of the mandatory private funded pillar in the Slovak pension system was the most spectacular if not the most important step of the reform. By this measure, ownership rights were introduced into the pension system and it became a three-pillar system. The first pillar is the mandatory public reformed PAYG system. The second pillar is the mandatory private funded scheme. This is completed by a third pillar, the voluntary private funded system. The reasoning behind the introduction of the second pillar was that it will solve the problem of demographic crises, will motivate people to pay-in contributions and will result in higher pensions than the PAYG system. However, none of the current pension systems can entirely offer a solution to the demographic pressure and these arguments do not seem to be satisfactory for such a structural change.

In the new system, the old-age pension contributions, summing up to 18% of the gross wage, are divided equally between the two pillars: 5% is paid by the employer to the first pillar and 9% to the second pillar, while the employee is paying 4% into the first pillar. Compared to other Central European countries, it is striking that the Slovak second pillar is the largest in the region. In Poland contribution rate to the 2nd pillar is 7.3% (Chlon et al., 1999), while in Hungary this is currently 8% (Simonovits, 2009). Furthermore, contributions to disability benefits and to a reserve fund have to be paid which will be retained by the Social Insurance Agency (see Table2).

Table 2. Social security contributions in the Slovak Republic (% of gross wage)

	2003 (pre-reformed PAYG)	2004 (reformed PAYG)	2005 (multi-pillar system)
Paid by employer:	*21.60*	*21.75*	*21.75*
Pension insurance	21.60	19.00	17.00
- old-age insurance	-	16.00	14.00
- disability insurance	-	3.00	3.00
Reserve fund	-	2.75	4.75
Paid by employee:	*6.40*	*7.00*	*7.00*
Pension insurance	6.40	7.00	7.00
- old-age insurance	-	4.00	4.00
- disability insurance	-	3.00	3.00
Total	*28.00*	*28.75*	*28.75*

Source: Ministry of Finance of the Slovak Republic

The Social Insurance Agency keeps on collecting all the contributions and it will transfer the contributions of the second pillar to the private pension company chosen by the member. Currently in Slovakia six privately-managed pension asset management companies operate. They manage three types of funds (see Table 3.). During the last 15 years prior to retirement, savers are not allowed to hold assets in the Growth Fund and in the last 7 years preceding retirement all their savings should be invested in the Conservative Fund.

Table 3. Investment limits by type of pension funds

Type	Stocks	Bonds and money market instruments
Growth Fund (g)	up to 80%	at least 20%
Balanced Fund (b)	up to 50%	at least 50%
Conservative Fund (c)	no stocks	100%

Source: Kilianova et al (2006)

It is also prescribed that a worker should stay at least 15 years in the 2nd pillar in order to receive a pension from the funded pillar. According to the original plan, workers enrolled in the PAYG system could join the mixed system by June 2006, while new entrants to the labor market are automatically enrolled in the mixed system. However, in practice the second pillar is exposed to a high political risk, having been reopened several times during the recent years, leading to the instability of the system and to the loss of credibility.

3.4. Evolution of pensions in the Slovak economy

The pension system in Slovakia has been exposed to different political, economic and demographic changes during the last 15 years. To get a general idea about the system's overall evolution, it is worth looking at the fundamental macroeconomic indicators characterizing pensions. Table 4 is designed on the basis of Simonovits (2009) and it uses data from the Slovak Statistical Office.

Pension expenditure as a share of GDP stayed around 7% in this period due to the fact that the huge economic growth of the country outweighed the increase in pension expenditures imposed by population aging. The eligibility rate was constantly above 100%, indicating that a large share of people rely on other than old-age forms of pension. For simplifying calculations, the increase of the retirement age in 2004 is assumed to be without transition. This has caused a jump in the indicators in 2004; however the direction of change is still valid. The participation rate decreased by 5 % in this period, in 2007 only 68% of the working age population was

actually working. This is a warning sign for the Slovak pension system, because fewer workers mean fewer contributions, thus a higher pressure on the state when paying out current pensioners.

Table 4. Pensions in the Slovak economy, 1994-2007, %

Year	Pension expenditure/ GDP	Eligibility rate*	Participation rate*	Demographic dependency ratio*	System dependen-cy ratio	Net efficiency of earnings	Pension /Net wage
1994	—	133.31	73.69	30.86	55.82	—	—
1995	7.21	132.08	73.89	30.57	54.64	—	—
1996	7.15	131.31	75.49	30.31	52.72	—	—
1997	7.16	130.89	73.84	30.10	53.36	—	—
1998	7.28	130.97	72.63	29.89	53.90	385.32	—
1999	7.38	131.51	69.65	29.78	56.24	408.30	—
2000	7.28	130.85	67.96	29.73	57.24	411.44	59.82
2001	7.20	130.55	68.45	29.56	56.36	407.00	59.14
2002	7.18	130.26	67.90	29.56	56.70	378.61	53.43
2003	6.99	129.36	68.49	29.62	55.95	392.10	54.37
2004	6.99	158.72	64.35	22.64	55.84	391.42	52.74
2005	7.04	157.86	65.14	22.65	54.89	391.63	54.07
2006	6.94	157.91	67.20	22.80	53.59	388.51	53.19
2007	6.83	158.04	68.29	22.85	52.89	386.74	52.46

Source: Calculations made based on Slovak Statistical Office data

*Old-age people: 57+ for women, 60+ for men until 2004 and 62+ for both from 2004.
Working-age people: 19-56 for women, 19-59 for men until 2004 and 19-61 for both from 2004.

Although the demographic dependency ratio has dropped due to the increase of retirement age, the system dependency ratio is staying steadily around 55% which is again an alarmingly high value for the system. It is expected that the increased retirement age will lower the system dependency ratio; however this effect is not perceptible yet, due to the phased-in transition to the retirement age of 62. The net efficiency of earnings was 386% in 2007, almost the same as in 1998, thus the net wages increased in line with the GDP per worker. The relative pension, as compared to the net wage, somewhat diminished in the last years, illustrating that the Slovak pension system is becoming less and less generous.

Taking into account the EU Economic Policy Committee projections (Table 5.), one can see that by 2050 pension expenditure as a share of GDP will increase to 9%. At the same time,

pension contributions as percentage of GDP will continuously decrease (as a result of introducing the 2nd pillar and the demographic tendencies), leading to 4.6% projected deficit for the pension system.

Table 5. Financial development of the public pension system in Slovakia 2004-2050 (according to the baseline projection of EU Economic Policy Committee)

Year	2004	2010	2015	2020	2025	2030	2040	2050
Gross public expenditure as percentage of GDP	7.2	6.7	6.6	7.0	7.3	7.7	8.2	9.0
Pension contributions as percentage of GDP	6.5	5.0	4.9	4.8	4.7	4.7	4.7	4.4
Projected First Level Deficit (% of GDP)	-0.7	-1.7	-1.7	-2.2	-2.6	-3.0	-3.5	-4.6
Projected benefit ratio (1)	13.0	12.6	12.4	12.3	12.0	11.4	9.9	8.8
System dependency ratio	54	53	53	57	61	67	83	101

Source: DG ECFIN: The impact of aging on public expenditure, Special report No.1/2006
Notes: (1) Benefit ratio=average public pensions relative to output per worker

3.5. Latest developments, reform proposals and the financial crisis

The recent financial crisis points out the weaknesses of the funded pension system. In Slovakia losses in the pension funds' asset values were moderate, due to the conservative investment strategy of the funds. The Growth Fund had a loss of 8.2%, the Balanced Fund realized a loss of 6.1%, while the Conservative Fund, which had the highest proportion of bonds, had a yield of 2.8% in 2008.[15] These losses were small if one considers that losses in the OECD in this period amounted to 20%. The risk-aversion of the Slovak pension funds helped them in avoiding major losses during the crisis. They invested the majority of funds in fixed income securities and this conservative investment strategy proved to be a good choice in this economic situation.

[15] For a detailed display of losses, by types of funds and types of asset management companies see Table A.1 in the Appendix.

Another problem of the Slovak policy-makers is financing the transition costs caused by the introduction of the second pillar. This represents a continuous pressure on the state budget. Initially it was planned that transition costs would be covered by privatization revenues, newly issued debt and by further reforms of the PAYG system. However, at this moment revenues from privatization have been spent, debt financing is costly for the country because of the financial crisis and the government is trying to find different solutions in order to increase its revenues, to the detriment of the pension system. It has inconsistently opened up the second pillar for several longer periods and proposals were made that the second pillar should be left open forever. These measures harm the pension systems' stability and credibility to a great extent.

Several proposals have been made also for a drastic cut in the pension funds' administrative fees. Although the administrative fees of the Slovak pension funds are among the lowest in the world, the monthly administrative fee currently standing at 0.065%, the government just adopted legislation that the monthly administrative fee will be lowered to 0.025% starting with 1 July 2009 ("DSS-ky dostatnú 2009…"). This prompts pension asset management companies to a very tight management of their assets and it may damage the efficiency of these investments.

This overview shows how pension reforms took place in Slovakia as well as problems the pension system is currently facing. The case study described in the next chapter and its results should be evaluated based on the information presented here and in the second chapter.

Chapter 4. Case study: Old-age pensions in Slovakia

This section presents a microeconomic analysis of the impact of the Slovak pension reform on pension benefits and on the efficiency of the system. It aims to complement the macroeconomic projections made about the long-term financial sustainability of the system.

The calculations show the case of a worker with average wage, who enters the labor force today (starting with 1 January 2009), at the age of 23 and he spends his career under the same set of pension parameters as those applying currently to the pension system. He retires at the legislated pension eligibility age, which is currently 62 years in Slovakia. The model looks at the alternative scenarios, depending on whether the worker entered the 2nd pillar or he opted only for a 1st pillar pension, and indicates which pension scheme would be more favorable for him. Moreover if he considers exiting the 2nd pillar, the option currently promoted by the government, the model is able to give an answer in this case as well.

In order to compare the pure PAYG system (only 1st pillar) with the mixed system (1st and 2nd pillars), the analysis uses the following measures: net entry replacement rate, present value of net benefits (*NPV*), *NPV* normalized by the gross annual average wage, benefit to tax ratio and lifetime utility from consumption, (described in detail in Section 4.2). Results are shown for the individual average wage worker.

4.1. The model for pension calculations

The Slovak pension model has been reformed in such a way that pensioners may receive two types of pensions. Depending on their preferences, workers may opt for a pension only from the 1st pillar (*U*) or they may decide to enter the 2nd pillar and receive a pension from the 1st and 2nd pillars together (*U+F*).

The life cycle of an individual is denoted the following way:

$$\underbrace{0, \ldots L-1}_{\text{child, student}}, \underbrace{L \ldots R-1}_{\text{worker, paying pension contribution}}, \overbrace{\underbrace{R \ldots ED}_{\text{pensioner}} \ldots D}^{\text{expected period for pension}}$$

L – age at entering to the labor market

R – age at retirement

D – maximal survivable age

ED – expected age of death at age R.

In case workers enter only the 1st pillar (pure PAYG), they will receive their pensions from the Social Insurance Agency. The initial monthly pension benefit in the pure PAYG system (b_R^U) follows the formula presented in Chapter 3:

$$b_R^U = POMB \cdot N \cdot ADH \qquad (4.1)$$

It is a product of the average personal wage point (*POMB*), the number of years paying contributions (*N*) and the actual pension point value (*ADH*). The *ADH* for 2009 was set to 8.9955 EUR and it is valorized every year by the nominal wage growth in the economy. Pensions from the 1st pillar are indexed half to the CPI-inflation and half to the nominal wage growth, called also Swiss indexation.

In the mixed system (*U+F*) pensioners have one part of their pensions from the 1st pillar and the other part from the 2nd pillar. In the 2nd pillar the pensioner at the time of retirement will buy life annuities for the amount of his savings (S_{R-1}) in the private pension fund. When calculating the annuity, it is assumed that the remainder sum on the individual account will increase by the rate of return of the Conservative Fund (r_c). The initial monthly pension under the funded system is:

$$b_R^F = \left[S_{R-1} \cdot \left(\frac{r_c \cdot (1+r_c)^{ED-R}}{(1+r_c)^{ED-R} - 1} \right) \right] / 12 \qquad (4.2)$$

where $S_t = \left[S_{t-1} + \tau^F \cdot W_t \cdot (1 - f^{trans}) \right] \cdot (1 - f^{adm}) \cdot (1+r)$ (4.3)

$S_L = 0$ and $L < t \leq R$

Savings at the end of time t (S_t) in the 2nd pillar are described by equation (4.3). S_t is the sum of savings in the previous year and the amount of contributions in year t, after all fees regarding the funded pillar are deducted, and the remaining sum bears interest at the rate of r. *Fees (f)* applying to 2nd pillar contributions are of two types. There are transfer fees, $f^{trans} = 1.5\%$, out of which 1% goes to the Social Insurance Agency and 0.5% to the pension asset management company. Transfer fees are charged every month at the time of paying-in the contributions. The second type is the administration fee which is paid to the pension asset management company. Administration fees are deducted on a monthly basis and they are charged for the whole amount of savings accumulated by that time. Starting with 1 July 2009 administration fees will be decreased by the government, such that on a monthly basis they will be equal to 0.025%, so the yearly fee is $f^{adm} = 0.3\%$.

Returns in the private pension fund vary according to the types of funds (see fund types in Table 3.3.2):

$$r = \begin{cases} r_g \ if & R - t > 15 \\ r_b \ if & 7 \leq R - t \leq 15 \\ r_c \ if & R - t < 7 \end{cases} \qquad (4.4)$$

In conformity with the Slovak legislation, it is assumed that a worker exits the Growth Fund 15 years prior to retirement age, he leaves the Balanced Fund 7 years before the retirement age and for the last 7 years of work he stays in the Conservative Fund.

Based on (4.2) the initial monthly pension benefit for the mixed system is obtained by:

$$b_R^{U+F} = b_R^{\hat{U}} + b_R^F \tag{4.5}$$

Where $b_R^{\hat{U}} = POMB \cdot N \cdot ADH - POMB \cdot \frac{1}{2} K \cdot ADH$. Here $b_R^{\hat{U}}$ shows the initial level of benefits from the unfunded pillar of the mixed system and K is the number of years stayed in the funded pillar. Due to the equal proportions of paid-in contributions in the two pillars (9%, 9%) there is a special case when the worker stays in the mixed system from the beginning of work (*K*=*N*). In this case:

$$b_R^{U+F} = \frac{1}{2} b_R^U + b_R^F \tag{4.6}$$

This equation (4.6) applies for the case studied in the rest of this chapter.

Additional assumptions about the future were necessary for the calculation of future benefits and contributions. A 3% growth rate of real wages and a 2% inflation rate is assumed. The average monthly gross wage in Slovakia at the beginning of 2009 was 723 Euro. The variable t measures the age of an individual, *t*=*L*=23 is the age at which a person starts working. In calendar time this corresponds to 2009. Retirement age (R) is set up to 62 or in later scenarios to 65.

It is presumed that pension funds will invest the proportion of stocks and bonds in the three-types of portfolios as shown in Table 6:

Table 6. Proportion of stocks and bonds in the funds (%)

Type	Stocks	Bonds and money market instruments
Growth Fund (g)	80	20
Balanced Fund (b)	50	50
Conservative Fund (c)	no stocks	100

I use the simplifying assumption that the return-contribution function will be linear in every year. Here I calculate bond yield as a weighted average of the US, German, UK and Slovak government bonds with maturities of 1-year, 2-years, 5-years and 10 years (Table 7). These are the leading government bonds on the market hence it is reasonable to assume that pension funds will invest in them. Weights reflect the preferences of the Slovak asset management companies. Bond yield is assumed to be 2.68% in every year from 2009 onward.

Table 7. Calculation of bond yield

Bonds	Yield	1 year maturity	2 years maturity	5 years maturity	10 years maturity
	Weights	*15%*	*15%*	*35%*	*35%*
US	*10%*	0.47%	0.96%	1.94%	2.99%
German	*40%*	0.95%	1.38%	2.39%	3.19%
UK	*20%*	0.72%	1.23%	2.47%	3.49%
SK	*30%*	1.30%	2.50%	4.00%	4.75%
Weighted bond yield: 2.68%					

Source: www.bloomberg.com, www.bsse.sk;

Furthermore, my assumption is that stock investments are made in the American (S&P), German (DAX) and English (FTSE) stock exchange indices, with the weights of 30%-40%-30%, because the German market is considered more influential for Slovak investors.[16] The Slovak stock exchange index is not included in the data because it is a small market and it has been functioning only for a few years; thus there are no historical returns available.

Return on stocks is calculated as the average of the historical returns for the above market indices weighted by their shares of investment. Two scenarios are set up. In the optimistic scenario the return is calculated as the average of the historical returns from the start of the market index until the end of 2000. For all the indices this was a very favorable period, the average annual return on stocks being 14.34%. The second scenario is a more realistic one. It

[16] Return series for the S&P, DAX and FTSE indices are downloaded from www.finance.yahoo.com.

calculates the return as the average of the historical returns from the set up of the market index until the end of 2008. This scenario seems to be more realistic. With a horizon of 50 years, as in this calculation, it is more reasonable to assume that there will be longer periods of increasing stock indices but also periods when stock prices will drop. Under the realistic scenario the average return on stocks is 7.71%.

Table 8. Stock returns under different scenarios

	Realistic scenario	Optimistic scenario
Return on stocks	7.71%	14.34%

Based on the information displayed in Tables 6-8., returns for the three types of pension funds are shown in Table 9:

Table 9. Returns of pension funds

	Realistic scenario	Optimistic scenario
Growth Fund	6.70%	12.01%
Balanced Fund	5.19%	8.51%
Conservative Fund	2.68%	2.68%

4.2. Measuring the efficiency of the two pension systems

From the individual's perspective a pension system's performance may be evaluated based on different measures. In this work the following efficiency measures are used: net entry replacement rate, net present value of benefits normalized by the average gross annual wage, discounted benefit to tax ratio, lifetime utility from consumption and the present value of bequest.

The old-age pension replacement rate reflects the effectiveness of a pension system in replacing earnings with pension benefits and the change in income caused by retirement. It is a widely used measure which has been calculated for Slovakia for example in Golias (2003),

Melichercik and Ungvarsky (2004) and for a set of OECD countries (among which for Slovakia) in OECD (2007), Martin and Whitehouse (2008). In this work I use the same methodology for calculating the replacement rates, the difference compared to the above works being that I incorporate the latest legislative changes regarding the Slovak system and I calculate replacement rates both for the PAYG and mixed system, under alternative scenarios and different parametric changes. The **net entry replacement rate** (β_w) is the ratio of the initial monthly pension to the net wage in the last month of an individual's working life:

$$\beta_w = \frac{b_R}{W_{R-1}^{net}} \qquad \text{where } b_R \text{ is the initial pension benefit.} \tag{4.6}$$

Gross replacement rates may be also calculated by using the gross wage instead of the net wage in equation (4.6). The latter approach is misleading because in Slovakia pensions are not taxable; however in some countries they are.

A general measure for the efficiency of a pension system is **ratio of the present value of the net benefits to current gross average earnings (*NPV*)**. Geanakoplos et al. (1998) use the *NPV* as 'money's worth measure' mainly for unfunded systems and they calculate it by cohorts. However, it may be applied to mixed systems as well and calculations can be made on the level of individuals, too. The latter approach is used in this paper. The *NPV* is calculated for the average wage worker, by deducting the present value of contributions from the present value of benefits:

$$NPV = \sum_{z=R}^{D} b_z \cdot l_z \cdot (1+\delta)^{-(z-L)} - \sum_{t=L}^{R-1} \tau \cdot W_t \cdot l_t \cdot (1+\delta)^{-(t-L)} \tag{4.7}$$

Contributions and benefits are discounted to the time of entering the labor force ($t=L$) and the discount factor used (δ) is the nominal wage growth.

The *NPV* is an absolute measure of gain or loss from the pension system. In order to make it more informative, in this paper I prefer to use the ***NPV* normalized by the average gross annual wage** at the beginning of 2009.

$$NPV^{norm} = \frac{NPV}{W_L} \tag{4.8}$$

A similar efficiency indicator, also used in Geanakoplos et al. (1998), is the **discounted benefit to tax ratio** which expresses the present value of benefits (*PVB*) in terms of the present value of contributions (*PVC*). Again, this relative measure is computed here for the individual, for the average wage worker.

$$\frac{PVB}{PVC} = \frac{\sum_{z=R}^{D} b_z \cdot l_z \cdot (1+\delta)^{-(z-L)}}{\sum_{t=L}^{R-1} \tau \cdot W_t \cdot l_t \cdot (1+\delta)^{-(t-L)}} \tag{4.9}$$

In addition to the above efficiency metrics, I consider that the individual's **lifetime utility from consumption** may be also used as a measure to compare different pension systems. This is a more subjective measure than the previous ones and it puts pensions in the context of an individual's life cycle. In the model used also in Sido (2005), the individual is maximizing his lifetime utility from consumption, more exactly the utility from the time of entering the labor market until his death. The maximization problem is:

$$\max_{C_t} \sum_{t=L}^{D} \left[\gamma^{t-L} \cdot u(C_t) \cdot l_t \right], \text{ where } u(x) = \ln(x) \tag{4.10}$$

subject to: $$A_{t+1} = (A_t + Y_t - C_t - T_t) \cdot (1 + r_i) \tag{4.11}$$

$$A_L = 0, \; A_t \geq 0 \text{ when } t > R$$

$$Y_t = W_t \text{ for } t \leq R \text{ and } Y_t = b_t \text{ for } t > R \tag{4.12}$$

$$C_t > C_L^{\min} \cdot (1+\delta_t)^{t-L} \tag{4.13}$$

$$T_t = \frac{x}{1+x} \cdot C_t + \tau^{employee} \cdot Y_t + \max(0; Y_t - W^{\min}) \cdot (1-\tau^{employee}) \cdot x \text{, for } t \le R$$

$$T_t = \frac{x}{1+x} \cdot C_t \text{, for } t > R \tag{4.14}$$

Thus the individual maximizes the sum of his discounted utility, adjusted with the appropriate survival probability (l_t). l_t is the probability that a person aged L will survive until age t. The discount factor (γ) is 98%. The utility function takes the form of the CRRA utility which ensures a positive marginal utility of consumption.

Asset dynamics is depicted by equation (4.11) and it is assumed that a person has to repay his debt until retirement. r_i is the interest rate on assets and it varies for loans and deposits: $r_{deposit} = 2\%$ and $r_{loan} = 4\%$. Since all the calculations are in Euro, interest rates apply to Euro deposits and loans. *Income* in year *t* (Y_t) equals the gross wage in year *t* until retirement; afterwards it is equal to the pension benefits received in year *t*. *Net Consumption (C)* in every t should be higher than the net subsistence level ($C_t^{\min}$). The subsistence level in 2009, at the time the representative worker enters the labor force (L) was $C_L^{\min} = 167$ Euro. The subsistence wage is assumed to increase at the nominal wage growth rate. *Taxes (x)* are illustrated by equation (4.14). A worker pays three types of taxes: value added tax (*VAT*) for his consumption, social contributions from his gross wage and wage tax for the taxable amount of his gross wage. The uniform tax rate in Slovakia is 19%, so *tax = VAT = wage tax = 19%* while the amount of social contributions payable by the employee adds up to 13.4%, $\tau^{employee} = 13.4\%$. (There is another 33.6% as social contributions paid by employer.) A pensioner pays as tax only the *VAT* for his consumption.

The model used here cannot capture the possibility of leaving bequest; however the size of bequest may be calculated. Consequently, I have made those calculations and later on in the paper I will use the **PV of bequest** as an efficiency indicator. In order to calculate the amount of bequest, I assume that after retirement the individual consumes the same amount as at the time of retirement, valorized by the inflation rate. Adding up the difference between the model's consumption and the normalized consumption, together with the accumulated assets at age *ED* represent the bequest. The formula for the PV of bequest is illustrated by equation:

$$PV\_Bequest = \sum_{t=R}^{D} \left[\; (C_t - C_{R-1}(1+i)^{t-R} \; \right] \cdot (1+\delta)^{-(t-L)} + A_{ED} \cdot (1+\delta)^{-(t-L)} \qquad (4.15)$$

4.3. Results.

Efficiency measures for the PAYG and funded systems are compared for male and female average wage workers under the realistic and optimistic scenarios concerning fund returns (Table 10).

Table 10. Efficiency indicators under the current system

Measures	Male			Female		
	PAYG	Mixed		PAYG	Mixed	
		Realistic Scenario	Optimistic Scenario		Realistic Scenario	Optimistic Scenario
Net Entry Replacement Rate	63.79%	61.74%	92.55%	63.79%	61.74%	92.55%
Gross Entry Replacement Rate	48.52%	46.96%	70.40%	48.52%	46.96%	70.40%
NPV norm	-2.02	-2.68	-1.00	0.01	-1.08	1.34
Benefit-to-tax	69.3%	59.3%	84.8%	100.2%	84.3%	119.6%
Lifetime utility	122.24	121.95	122.61	133.95	133.49	134.44
PV of bequest	18 180	11 937	30 708	17 541	8 952	30 366
PV of bequest norm	2.10	1.38	3.54	2.02	1.03	3.50

The net entry replacement rate for the male and female average wage worker is the same under both systems. This could happen because the pension formula for the PAYG scheme is not related to life expectancy, while in case of the mixed system, the current law describes that

pensions from the 2nd pillar should be calculated based on unisex life expectancies. In my opinion, these features of the two systems in a way discriminate men against women. Since women live longer than men, they get more benefits from both systems while they are paying-in the same amount of contributions as men do. This way men are in fact disadvantaged, because they have lower life expectancy than women and therefore they should get higher benefits from the 2nd pillar. In line with the Slovak legislation, in my calculations for pension benefits and replacement rates I use unisex life tables, while for the rest of the indicators—those which use PV and lifetime utility—I use gender specific life tables since those are more relevant from the individual's point of view (the individual knows his/her gender).

Under the realistic scenario there is no big difference between the net/gross entry replacement rates of the two systems. The PAYG system offers a net replacement rate of 63.79%, while this value for the mixed system is 61.74%. Nevertheless it may be surprising that the PAYG system offers higher replacement. A possible explanation for this is that replacement rates under the mixed system depend very much on the assumptions made about fund returns. If we consider the optimistic scenario, the mixed system will yield considerably higher entry replacement rates.

The results obtained for the net entry replacement measure already point out that the choice between the two systems depends more on the risk-taking preferences of the individual. While the PAYG system is slightly less exposed to the economic situation, it bears the political risk of changing the parameters of the scheme. In case of the mixed system, where the funded pillar is also involved, people are exposed to the financial risk connected to fund returns. However, the mixed system has the advantage that during the working years savings in the 2nd

pillar are private property of the person and they are inheritable. Thus both systems are affected by the economic performance and political situation of the country.

Present value (PV) measures are useful in evaluating a pension system's efficiency since they compare the *PV* of the stream of pension benefits to that of pension contributions, while at the same time adjusting them with the gender-specific probability that a person will actually survive until that age. These measures are very sensitive to the choice of the discount rate. In this work the nominal wage growth is used for discounting contributions and benefits since it has a high relevance for pensions.

The net present value normalized by the average annual gross wage in the first year of work (NPV^{norm}) reflects the relative gain or loss of entering the pension system. Indifferent of the scenario, the average male worker always has a negative *NPV*. If he enters the PAYG system he looses 2.02 times his current annual average gross wage. Similarly, by entering the mixed system his loss is 2.68 times the initial annual average gross wage in the realistic scenario, and somewhat less in the optimistic case. The high loss resulting from the mixed system—compared to the PAYG—is due to the generous indexation of the PAYG benefits, where Swiss indexation is used. Returns from the mixed system under the realistic scenario cannot offset this generosity.

The NPV^{norm} for the female worker has higher value compared to the male one. In the PAYG system she gets all her contributions back, NPV^{norm}= 0.01. Under the realistic scenario, mixed system she has a smaller loss than the male worker, which is 1.08 times the initial annual average gross wage. The very favorable NPV^{norm} indicator for the PAYG case is a result of the deficient PAYG pension formula which is not adjusted for life expectancy. In case of the mixed system, women have higher NPV^{norm} indicator than men, which may be explained by the unisex

indexation and by the fact that they live longer in general, thus their savings can be invested for a longer period and their accumulated benefits will be larger than for men.

These PV measures are sensitive to the choice of discount factor. Therefore the discount factor has to be chosen carefully. Since here the future income streams of an individual are discounted, the nominal wage growth was chosen as a discount rate.

The benefit-to-tax ratio displays consistent results with the NPV^{norm} indicator. In the PAYG system, the average male worker receives back 69.3% of his paid-in contributions in forms of pension benefits, expressed in present value. The same value for women is 100.2%, pointing out again that for women it is worth more to stay in the PAYG system than for men. Benefit-to-tax ratios are somewhat lower in the realistic case for the mixed system; However, these values are still of reasonable magnitude, as they are in all cases above 50%.

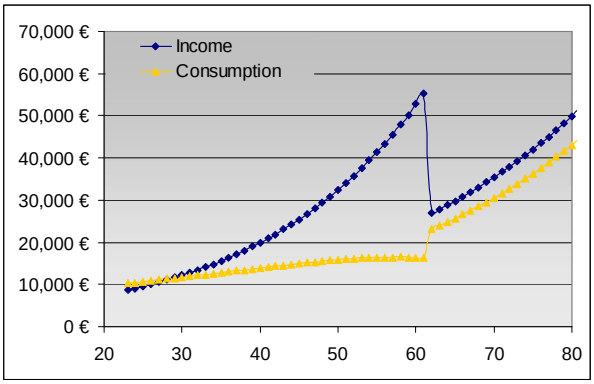
Lifetime utility of consumption shows small changes depending on the type of pension system. Pensions represent the source of income for a worker only in the last third of his life and they have a smaller impact on lifetime utility since utility is adjusted with the discount factor and survival probability (see Figure 1). Moreover in the last period of life, an individual may accumulate assets in order to leave it as bequest. In the realistic scenario lifetime utility under the PAYG scheme is higher both for men and women compared to the mixed system. This is due to the large indexation of pensions in the PAYG system. Higher returns from the 2nd pillar, as it is the case in the optimistic scenario, turn the lifetime utility measure in favor of the mixed system.

Figure 1.a) illustrates that after retirement a person's consumption increases since by that time he had to repay all his debt (See also Figure 2). Moreover this increase of consumption is larger than it would be caused only by inflation (See Figure 1.b)). That is one reason why a bequest should be left. As explained in the previous section, the model cannot capture the

possibility of leaving a bequest; however the amount of bequest may be calculated. The PV of bequest normalized by the average gross wage in the initial year is informative about the relative efficiency of the different pension systems.

Figure 1. The evolution of income and consumption in an individual's life-cycle
(Case of male average worker, PAYG system, realistic scenario)

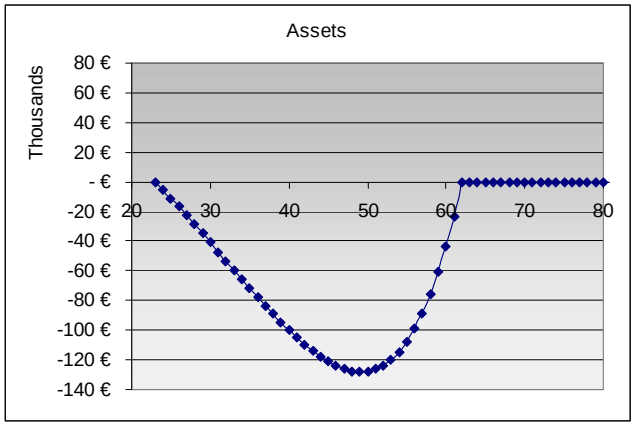
a) (Nominal price)



b) (Real price)

The normalized PV of bequest measure gives results consistent with the lifetime utility measure. For example, under the realistic scenario, in the mixed system, an average male worker leaves bequest an amount of 1.38 times the annual average gross wage in the year of entering the labor market, while under the PAYG system this amount is 2.10 times the annual average gross wage in time *L*.

Figure 2. The evolution of assets in an individual's life-cycle
(Case of male average worker, PAYG system, realistic scenario)



The set of efficiency measures presented in Table 10 analyze pension systems from different points of view. The following figures illustrate the optimal choice of pension scheme for the different cases.

Figure 3. Indicators for male average wage worker, realistic scenario

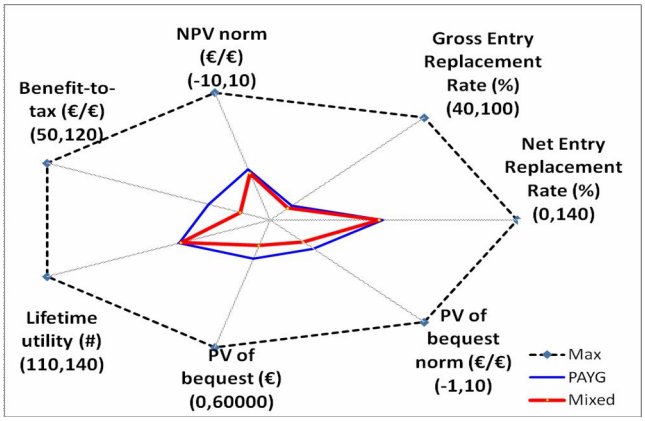


Figure 4. Indicators for female average wage worker, realistic scenario

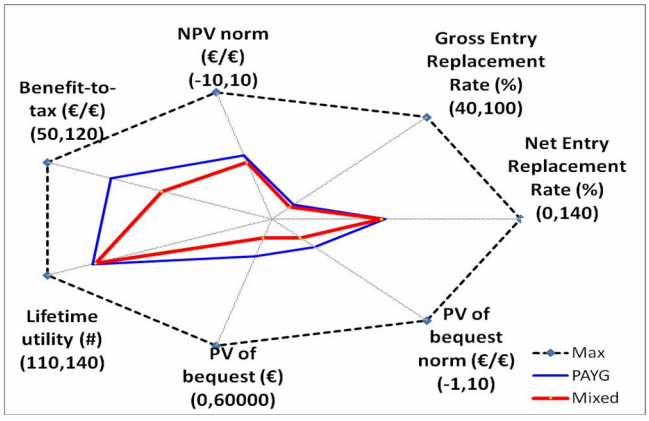


Figure 3 depicts the case of a male worker with average wage under the realistic scenario. Both the entry replacement rates and the rest of the indicators—which evaluate the systems for the individual's entire life-cycle— favor the PAYG system. This can be seen in the figure by comparing the area encircled by the blue line to that encompassed by the red line Thus, under these assumptions, the PAYG scheme seems to be more beneficial for the male, average wage

worker. Similarly, in Figure 4 all the indicators show that for a female worker with average wage under realistic scenario, the PAYG system is a better choice. The reason for this is that the benefit formula in the PAYG scheme is not connected to life expectancy.

Figures 5 and 6 plot the case of the optimistic scenario. In this case the mixed system clearly outperforms the PAYG scheme irrespective of gender.

Figure 5. Indicators for male average wage worker, optimistic scenario

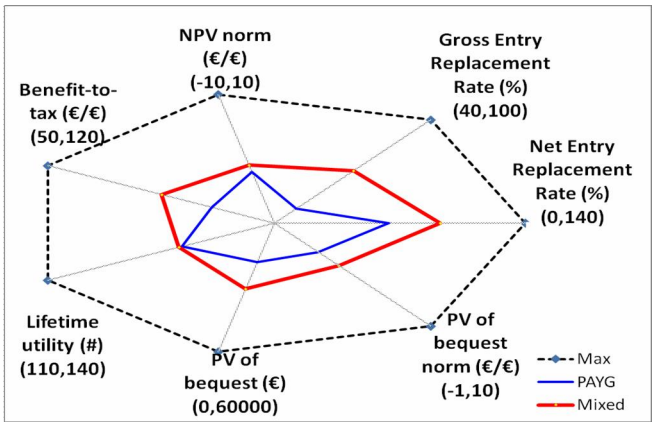
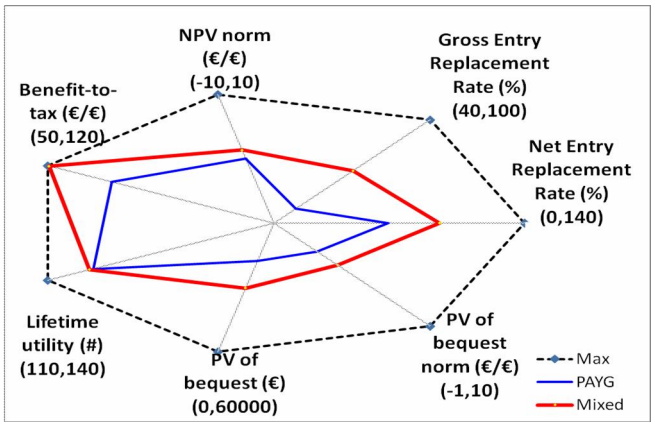


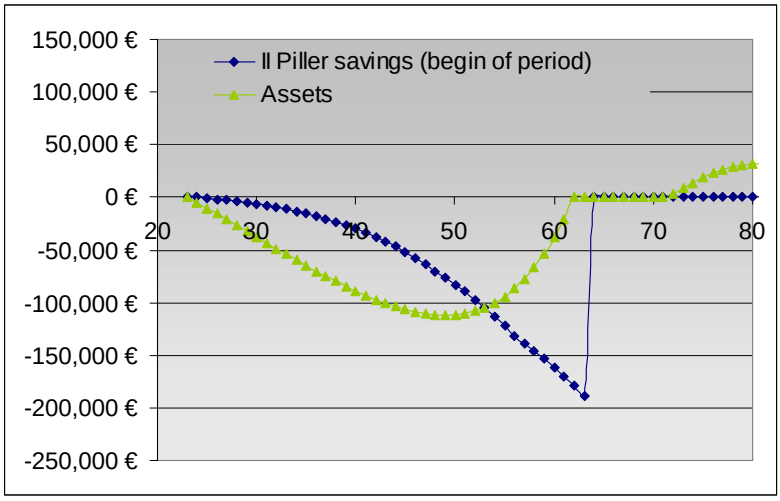
Figure 6. Indicators for female average wage worker, optimistic scenario



Figures 3-6 are displayed with the same metrics on axes. This means that they may be compared to each other even by visual inspection. The area surrounded by the line of pension scheme ($Area^{gender}_{pension\_scheme}$) shows the performance of the system. It is clear that $Area^{female}_{PAYG} >> Area^{male}_{PAYG}$ and $Area^{female}_{mix} > Area^{male}_{mix}$. The main reason for these inequalities is that both the 1st and 2nd pillar is unisex.

An additional outcome of the analysis highlights the funded system's advantage of offering life insurance for the worker until he reaches the retirement age. If the worker dies before retirement, the accumulated savings in the 2nd pillar will be paid out to the worker's family. Figure 7 shows that depending on the time of death, the money from insurance covers a significant part of the entire debt repayable by the worker.

Figure 7 Life insurance from the 2nd pillar



4.4. Improving the system. Suggestions. Recommendations.

Taking into account the long term projections for the financial sustainability of the public pension system, which predicts a deficit of 4.6% of GDP by 2050 (See Table 5), it is reasonable to assume that some of the PAYG systems' parameters have to be changed. A possible solution for the financial problems of the PAYG scheme is to change the current Swiss-indexation to price-indexation (CPI indexation), thus reducing the level of benefits. This harms pensioners to a certain extent; however it is not very bad because practice shows that pensioners do not increase their real consumption. Thus it is enough to keep their standard of living as it was at the time of retirement and this is exactly what price-indexation does. Consequently by a tolerable loss to the pensioner, the state can use CPI indexation and save significant amounts to reduce the deficit of the system.

Originally, Swiss indexation was implemented by Slovak policy makers as a tool for preserving the competitiveness of pension levels against the increasing wages since it was expected that the real wage increase will be high in the following years. Thus in a developing

economy Swiss indexation causes a higher increase in pension levels than price indexation would do. However, in few years time the Slovak economy is expected to become a stable and mature economy. That is why for the target group studied in this work (average young worker, entering the labor force now) it is unreasonable to use Swiss indexation. Therefore, as a first suggestion, for young workers only price-indexation should be applied. The drawback of this solution is that it would cause inequalities around the cut-off point. A better solution would be to index that part of the pension which is below a certain amount according to Swiss-indexation, while the part above that threshold according to price-indexation. The threshold should be defined as a percentage of the average net wage. For defining the exact value of this threshold deeper analysis is required. This solution has the advantage that it does not cause inequalities across generations and at the same time it improves the deficit of the public pension system. Moreover it redistributes some wealth to those with very low pensions.

Table 11 displays the effect of the CPI indexation in terms of the efficiency measures for our average wage worker. In all the cases the new indexation decreases the gains from the pension system, as it was expected. For example in terms of the NPV^{norm}, under the PAYG system, realistic scenario, a male worker has losses 0.52 times the initial annual average wage more than in the case of Swiss indexation.

Table 11. Efficiency indicators, case of CPI indexation, retirement age 62

Measures	Male			Female		
	PAYG	Mixed		PAYG	Mixed	
		Realistic Scenario	Optimistic Scenario		Realistic Scenario	Optimistic Scenario
Net Entry Replacement Rate	63.79%	61.74%	92.55%	63.79%	61.74%	92.55%
Gross Entry Replacement Rate	48.52%	47%	70.40%	48.52%	46.96%	70.40%
NPV norm	-2.54	-2.94	-1.27	-0.89	-1.53	0.89
Benefit-to-tax	61.3%	55.3%	80.8%	87.0%	77.7%	112.9%
Lifetime utility	122.017	121.59	122.527	133.589	133.008	134.301
PV of bequest	13 839	8 905	28 286	11 549	7 042	27 227
PV of bequest norm	1.60	1.02	3.26	1.33	0.81	3.14

A further suggestion is to increase the retirement age to 65 years. Since in many EU countries the legal retirement age is 65 years or even higher, it would be rational for Slovakia to follow this example in the long run. Increasing the retirement age would reduce the system dependency ratio and accordingly, it would ease the pressure on the public system's finances. While life expectancies differ across generations, a phased-in increase of retirement age would be a fair solution. Moreover, if other things unchanged, increased pension age would yield higher level of benefits but these benefits would be received for a shorter time. At the same time, rising the retirement age would create room to decrease the accrual rate of pensions if the system's financial stability requires it, without pushing pension benefits to unacceptably low levels.

Table 12 illustrates the effects of price indexation and increased retirement age on the Slovak pension scheme in case of a worker with average wage. Comparing it with the current situation (Table 10), one can see that although the replacement rates increased, the NPV^{norm} and benefit-to-tax measures worsened; in all the cases the individual pays in more contributions in the system than the benefits he receives. The lifetime utility measure is not very informative in this case since it does not consider the effect on leisure of the three additional working years.

Table 12. Efficiency indicators, case of CPI indexation, retirement age 65

Measures	Male			Female		
	PAYG	Mixed		PAYG	Mixed	
		Realistic Scenario	Optimistic Scenario		Realistic Scenario	Optimistic Scenario
Net Entry Replacement Rate	68.70%	70.44%	115.56%	68.70%	70.44%	115.56%
Gross Entry Replacement Rate	52.26%	53.58%	87.90%	52.26%	53.58%	87.90%
NPV norm	-3.38	-3.53	-1.48	-1.74	-2.03	1.11
Benefit-to-tax	51.5%	49.33%	78.8%	76.3%	72.4%	115.2%
Lifetime utility	122.707	122.630	123.249	134.406	134.270	135.242
PV of bequest	18 378	16 909	42 229	17 176	14 317	43 723
PV of bequest norm	2.12	1.95	4.87	1.98	1.65	5.04

In case of CPI indexation and retirement at 65 years, realistic case, both for the male and female average wage worker replacement rates are higher in the mixed system, but the rest of the

indicators show still the superiority of the PAYG system. In the optimistic case the mixed system is better for both workers. This is illustrated also by Figures 8-11, where we can see that under the realistic scenario the two systems' parameters are very close to each other, while under the optimistic scenario the mixed system offers much higher benefit.

Figure 8. Indicators for male average wage worker, realistic scenario (CPI/65)

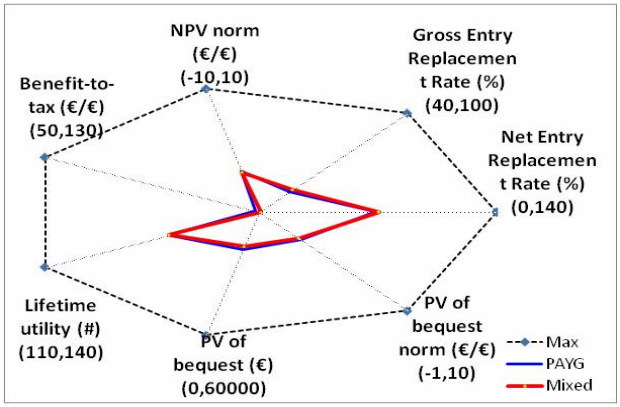


Figure 9. Indicators for female average wage worker, realistic scenario (CPI/65)

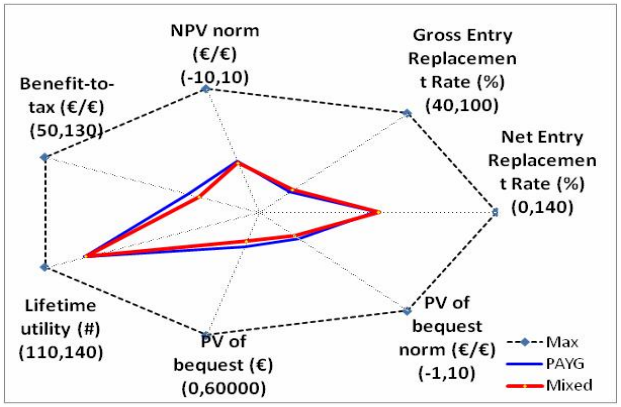


Figure 10. Indicators for male average wage worker, optimistic scenario (CPI/65)

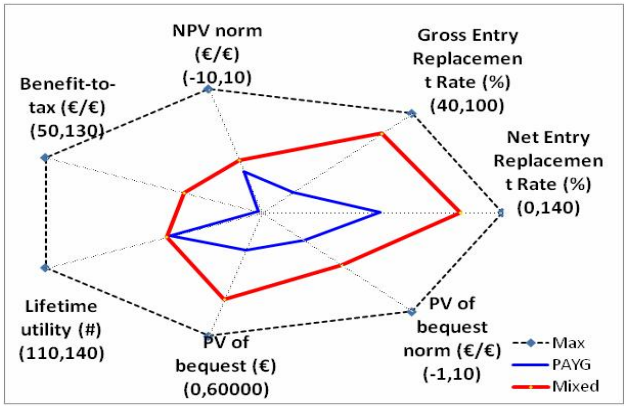
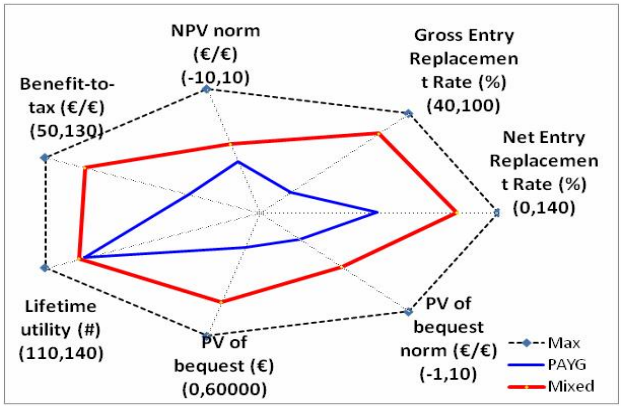


Figure 11. Indicators for female average wage worker, optimistic scenario (CPI/65)



Calculations up to this point have been done for a worker with average wage. However, if we take the case of a worker who earns just half of the average wage in the economy, his pension will be exactly 50% of the average worker's pension. It is a characteristic of the Slovak pension system — similarly to the Hungarian and Polish systems — that benefits are related to earnings and there is no redistribution from rich to poor. While the gross entry replacement rate is equal

for every worker, the net entry replacement rate is lower for a lower wage worker. This happens because of the non-taxable part of the wage. Thus a low wage worker receives lower pension compared to his net wage than a worker with average wage. This inequality could be diminished by the indexation suggested above. Furthermore introduction of minimum guarantees for pension levels would be highly recommended for the Slovak system. Taking into account the relatively high and unevenly distributed unemployment rate in the country, certain groups of people might end up with very low benefit levels. This is contrary to one of the main goals of pension systems, which is to prevent poverty.

A further recommendation is to link the level of benefits to life expectancy in the PAYG system. This would help the PAYG scheme to incorporate part of the demographic changes, namely, to adjust the level of pension benefits to the expected period of retirement and thus it would contribute to the system's long run sustainability. Whether pension benefits should be adjusted to unisex or gender specific life expectancy depends on the system's solidarity towards women. In practice, women have lower earnings than men due to the career breaks caused by the maternity leaves and they spend more time in retirement because of the higher life expectancy. For these reasons, it may be a reasonable compromise to use unisex life expectancies; however, I would opt for using gender-specific life expectancies and compensating women for maternity leaves by other forms of social insurance.

This chapter analyzed the PAYG and mixed pension schemes in Slovakia through the case of the average wage worker and displayed the changes in pension benefits for alternative scenarios. A summary of the main findings and insights is displayed in the following concluding section.

Conclusion

In this thesis I compared the Slovak PAYG and mixed pension systems and their impact on an individual's pension benefits with the help of a set of efficiency measures. More precisely, I analyzed the case of a worker with average wage who is entering the labor force today and will keep working until retirement age. Based on this case study, I suggested further measures for the improvement of the system which would bring the pension system more in line with the recent demographic changes and would improve its financial position.

A key finding of my analysis is that Slovakia has a generous PAYG system, with a high indexation of pension benefits which may be surpassed by the mixed system only if fund returns in the 2nd pillar evolve in a very optimistic way. Consequently, if fund returns evolve according to the realistic scenario, the PAYG system is more favorable for the average wage worker in terms of all the efficiency measures. Moreover, both the PAYG and mixed schemes favor women in terms of total benefits received since women have longer life expectancy.

Furthermore, I examined how the life-cycle of an individual changes with retirement. I found that after retirement an individual could potentially consume more than during his working years since by that time he had to repay all his debt. However, it seemed to me more reasonable to assume that he will choose to smooth his consumption and will leave a bequest to his children. As an additional result, I showed that the funded system has the main advantage of offering life insurance for the worker until he reaches retirement age, and that the money from this insurance covers a significant part of the entire debt repayable by the worker.

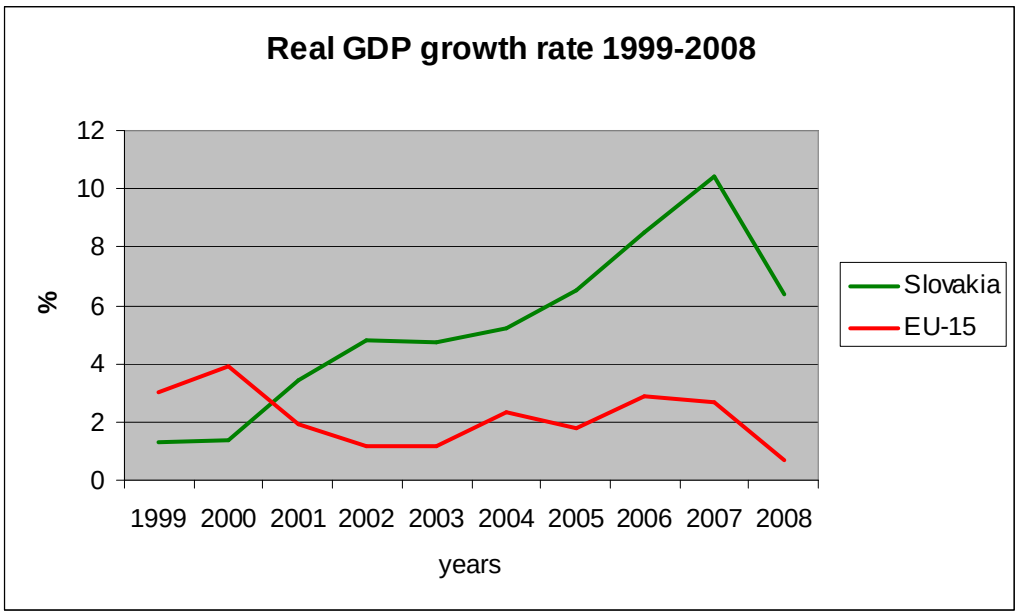
Finally, I recommended some changes to the current pension system. Suggestions such as changing the indexation to Swiss indexation up to a threshold and price indexation above that threshold as well as introducing minimum pension guarantees aim to bring some redistribution

and measures against poverty in the system. Other recommendations like a gradual increase of the retirement age up to 65 years and incorporating life expectancy in the PAYG benefit formula would improve the system's financial stability and would link it to the demographic changes.

In conclusion, under a realistic scenario, the PAYG system offers higher benefits for retirees than the mixed one. However, it is clear that the public system cannot remain operable in this form for very long. Policy makers should implement further reforms to improve the financial position of the system by making further parametric changes and by promoting measures which would motivate older people to stay in the labor force for longer time. However, at this moment I don't see the political commitment for carrying out these changes.

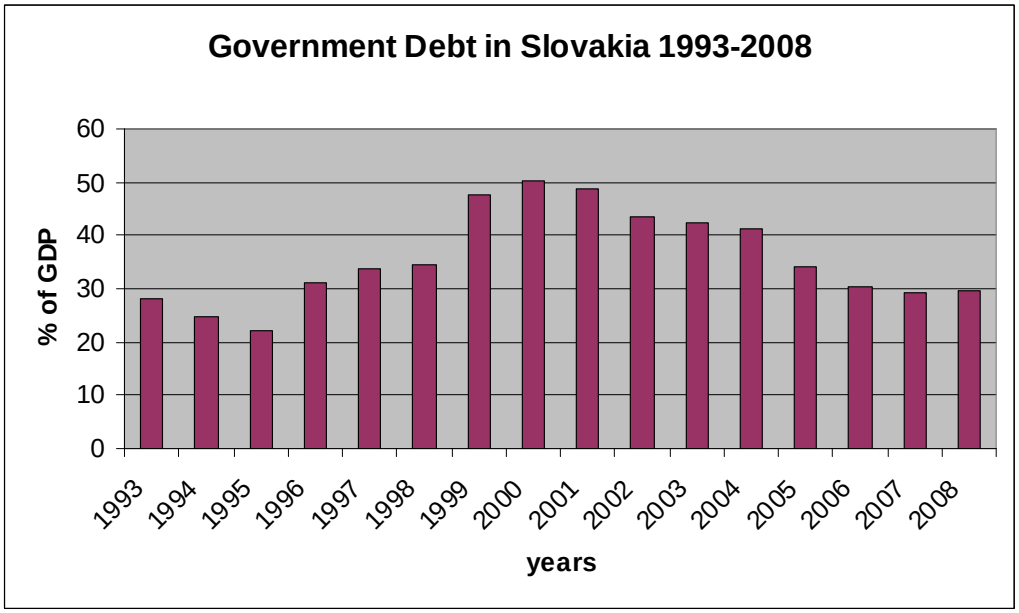
Appendices

Figure A.1. The evolution of real GDP growth rate in Slovakia



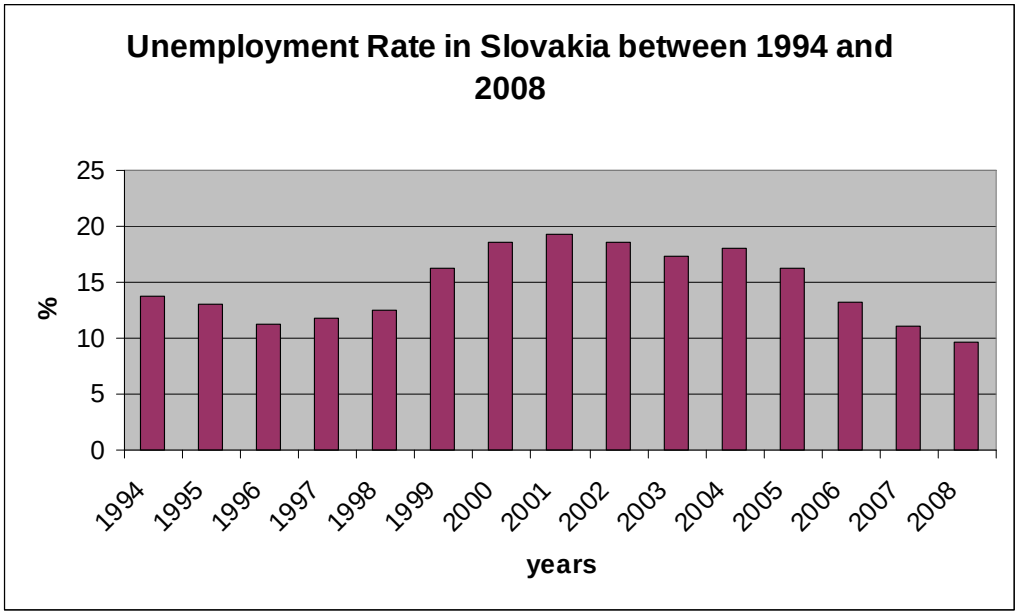
Source: Eurostat

Figure A.2. The evolution of government debt in Slovakia



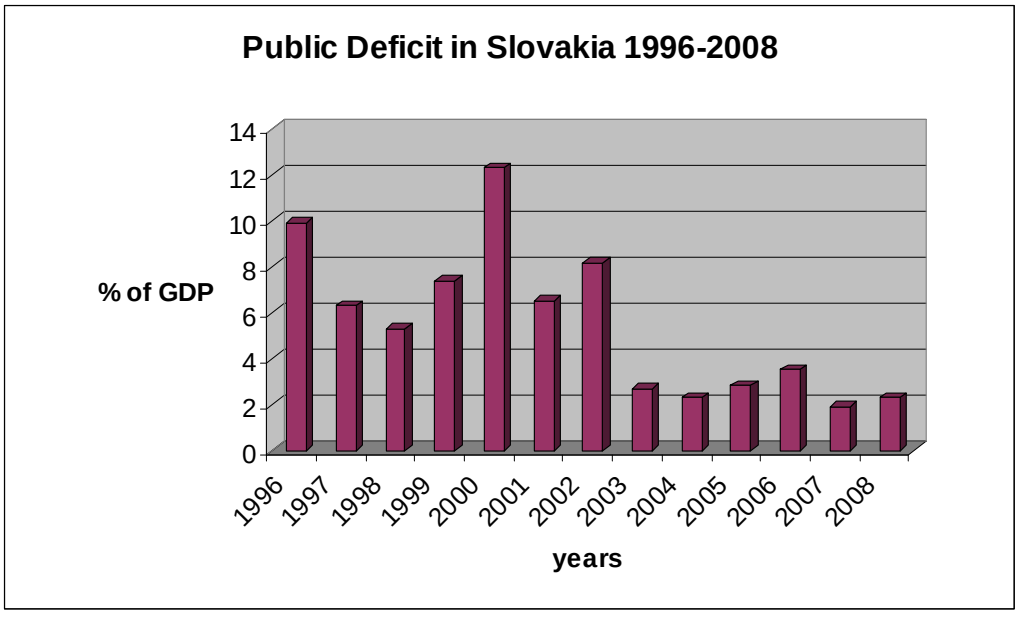
Source: Eurostat, Slovak Ministry of Finance

Figure A.3. The evolution of the unemployment rate in Slovakia



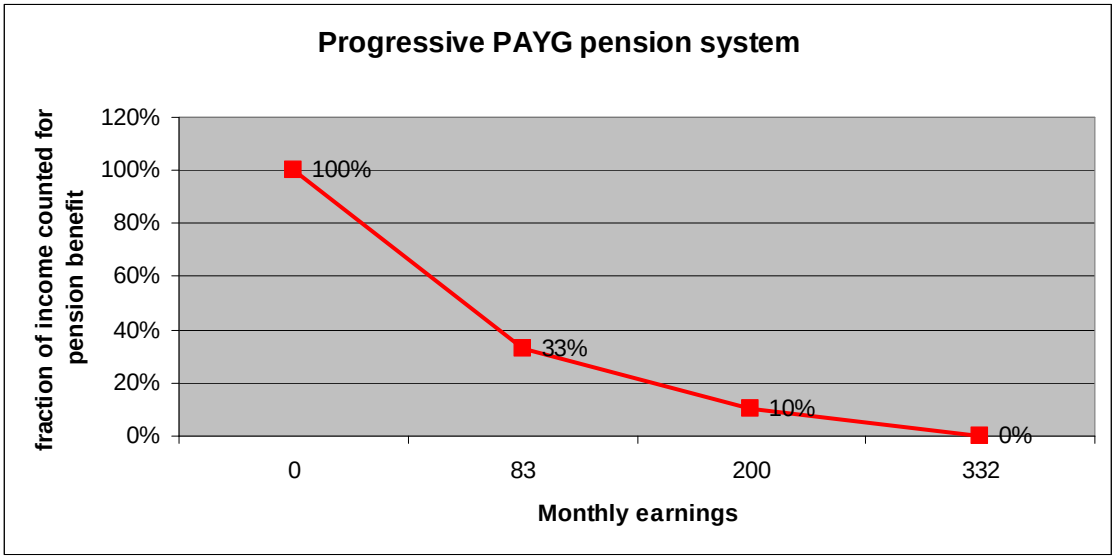
Source: Slovak Statistical Office

Figure A.4. The evolution of public deficit in Slovakia



Source: Eurostat

Figure A.5. The marginal progressive character of the pre-reform PAYG system in Slovakia



Source: Eurostat, Slovak Ministry of Finance

Table A.1. Yearly returns of pension funds for the period 01.04.2008 and 31.03.2009

Pension fund	Growth Fund	Balanced Fund	Conservative Fund
AXA	-5.60%	-3.90%	2.80%
CSOB	-7.20%	-5.60%	4.70%
AEGON	-8.40%	-5.30%	3.40%
ING	-4.60%	-3.50%	3.80%
ALLIANZ	-4.70%	-3.10%	2.80%
VUB	-5.60%	-3.90%	3.30%

Source: Monthly reports of the Slovak Asset Management Companies

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