THE ROLE OF ASSET ALLOCATION DECISIONS IN PLANNING FOR A PRIVATE PENSION: THE CASE OF SLOVENIA

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ABSTRACT: *Current demographic dynamics driven by low fertility and increasing longevity requires adjustments of the traditional frameworks of providing pensions. In this article we highlight three crucial issues policymakers should address by implementing those adjustments. First, fiscal limitations given the current and projected demographic dynamics will dramatically reduce PAYG pensions. Without sufficient savings during the active period, individuals will increasingly end up in poverty. Their savings will not be enough to support their desired consumption in old age. Second, we highlight the impact of the asset allocation decision and the general public's related lack of awareness on this issue. Therefore, we argue that financial illiteracy about both required savings and about decisions on appropriate asset class play a significant role in determining the well-being of masses in the not-so-distant future. Third, we argue that shift towards private pension away from the PAYG is expected to come with substantial benefits stemming from diversification among conceptually different sources of pension income.*

Key words: *PAYG, private pensions, financial literacy, old-age income, risk diversification, transition economics*
JEL Classification: J14, G11

1. INTRODUCTION

Population aging requires that the traditional pay-as-you-go (PAYG) systems are downscaled. Projections of age-related expenditures from the European Commission (DG ECFIN) and Economic Policy Committee (AWG) (2009) point toward a significant risk to the sustainability of PAYG systems as a consequence of increasing demographic shifts. Muenz (2007) argues that until 2050 demographic dynamics are pro-

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jected to result in a 10-year increase in the median age of the EU population, from 38 to 48 years old. Governments should build substantial funded pension systems as a supplement to the traditional PAYG (Du et al., 2011). More and more weight should be given to private pension systems, as under unfavourable demographic dynamics, they are far more efficient than PAYG systems (i.e., under realistic assumptions, they can deliver higher pension benefits with the same level of contributions or the same level of pension benefits with a lower level of contributions; Garrett and Rhine, 2005; Berk and Jasovic, 2007).

This long-term shift toward funded private pensions should be based on sound second- or third-pillar[5] frameworks, or both (Boersch Supan et al., 2008). Namely, trends in redesigning pension systems have during the past decade favoured the diversification of risks across all sources of old-age income as the coexistence of the three pillars positively effects benefits and consumption under various shocks, e.g. ageing population, inflationary shock, stock market crash etc. (World Bank Pension Conceptual Framework, 2008; Holzmann and Hinz, 2005; Lindbeck and Persson, 2003, Du et al., 2011). When a society is decreasing reliance on the PAYG and increasing reliance on private pension pillars, nature of co-movements between the drivers of pension benefits in both systems are of a great importance. Those co-movements can be measured with correlation coefficients between wages (predominant driver in the PAYG) and financial variables, i.e. stock and bond returns. Holzmann (2002) is the first published peer-reviewed research reporting very beneficial (i.e. low) national level correlation coefficients between wages and interest rates, and wages and capital return. Namely, he reports coefficients of correlation between wages and interest rates in the range between -0.197 and 0.238 and correlation coefficients between wages and capital return in the range between -0.077 and 0.202. Other authors in the area of diversification benefits report similar figures, in some cases even more beneficial (e.g. see Knell, 2010).

Despite the evident shift toward private pensions, one should not expect overnight changes. Augusztinovics (2002) argues that countries, even though they redesign their pension system and move to strengthen individual pension accounts, will still deliver their pensions predominantly from PAYG systems for quite some time. Recent experience of some countries in Central and Eastern Europe provide ample evidence of the budget constraint posed by high transition costs for cases of accelerated reform towards private pensions (Simonovits, 2011). Ferber and Simpson (2009) also argue that market meltdowns make shifts towards funded pillars less politically feasible. At the same time, private pensions should not be taken for granted, as only well-managed, efficient frameworks (e.g., competitive institutions and products, broad population coverage, sound governance mechanisms) can deliver the anticipated advantages (Pensions at a Glance, 2009; Bertranou et al., 2009).

[5] Second pillar includes mechanisms through which employers make contributions for their employees and third pillar the ones through which employees make their own contributions, regardless of the level of obligation.

The resulting pension landscape will not only provide a more sustainable and efficient environment for managing inter-temporal consumption but also support domestic underdeveloped financial markets. Davis (2008) shows that pension-fund growth in the European Union is likely to lead to beneficial financial development with a broader range of instruments and a lower cost of capital, thus leading to higher welfare. He further argues that pension-fund growth has a significant effect on Eurozone financial markets, by moving them partly toward the Anglo-American system, as well as promoting integration. Davis and Hu (2008) provide evidence that funding improves economic performance sufficiently enough to generate resources to meet the needs of an aging population and that the improvement is even greater in emerging market economies.

However, the previously mentioned characteristics of private pension systems are by themselves insufficient to provide for society's well-being if people do not have sufficient financial knowledge, i.e. are only modestly financially literate. Financial illiteracy is a very important issue, and it has been reported even for the most advanced countries (on the United States, see Lusardi and Mitchell, 2007; on the United Kingdom, see Gathergood and Disney, 2011; on Japan, see Sekita, 2011; on Germany, see Buchner-Koenen and Lusardi, 2011). Studies have found that many households are unfamiliar with even the most basic economic concepts in order to make savings and investment decisions. Financial illiteracy is lowest among women, young people, and individuals with lower incomes and lower education levels. With respect to pension savings, financial literacy increases individuals' likelihood of having a savings plan for retirement, which has a very strong impact on their wealth levels at retirement (Lusardi and Mitchell, 2007a).

We argue that very important aspect of financial literacy addresses knowledge about characteristics of various asset classes for their investments. Rooij et al. (2007) found that financially illiterate individuals are significantly less likely to invest in stocks. We show in this paper that this aspect has a very significant impact on the level of pension wealth, since choosing appropriate asset classes is extremely important. Strategic asset allocation determines approximately 90 percent of portfolio performance (see Brinson et al., 1986; Ibbotson and Kaplan, 2000; Andreu et al., 2010). Overall, it is crucial that financial literacy campaigns address both topics: individuals' need to start saving for their pension (e.g., in a pension savings account) and at the same time they also need to allocate savings into appropriate asset classes.

We focus on Slovenia, a country with a combination of a significantly aging population and an underdeveloped private pension system. Exclusive dataset on the distribution of individuals' income in Slovenia is used in this article to support our three main points, which are particularly important for people in countries like Slovenia who are entering a career or are halfway into their professional career. We contribute to the literature with the model, which shows the required monthly savings under each of three asset allocation choices (i.e., stocks, treasury bonds, and treasury bills). We calculate the required savings during the active work period of individuals' life under the assumption that they (together with the assumed long-term yield) can fill the gap between projected pensions from the PAYG system and the 70% net replacement rate suggest by the Organisation for Economic Co-operation and Development (OECD, 2009a). Different income levels (decile groups) are taken care of and insights into the potential outcome of a risk-aware individual allocating all of his or her pension savings into a risky diversified stock portfolio and prepares for poorly performing financial markets but actually achieving the long-term mean yield are offered. This case clearly favours investing in stocks over the long run. Finally, we address the issue of pension income diversification and show that benefits are greatest at the point, where private pension pillars only start to provide pension income. Our conclusions are relevant in general, i.e. for many developed countries across the globe, as not many current pension systems have sufficient solutions regarding an increasing old-age dependency ratio.

This article is structured as follows. In the second section, we briefly describe the existing Slovenian private pension system and present pension funds in the context of the whole financial market. We also report the performance of Slovenian pension vehicles since their introduction nearly a decade ago and compare that with the performance of pension funds from developed markets. In the third section, we describe benefits from the Slovenian PAYG system and related taxation. The fourth section offers demographic projections up to 2060 and future public pension expenditures, which without changes, are expected to cause huge deficits in the pension budget. As those imbalances are unsustainable and cannot be financed through subsidies from the central government budget, we impose fiscal caps at various percentages of gross domestic product (GDP) that can be allocated to finance pensions. Those in turn pose further caps on the future levels of expected public pensions. The fifth section provides overview of three basic asset classes available for the allocation of private pension savings. Using historical data, we calculate real long-term yield and further assume that those returns are a reasonable approximation of future long-term yields. We thus use historical returns as expected returns in our model, which we present in detail in the sixth section. In section seven we present the extent diversification benefits.

2. SLOVENIAN SYSTEM OF PRIVATE PENSIONS

The pension reform enacted in Slovenia in 2000 introduced private pensions within the second pillar, which comes in two forms. The first form are pensions, which are compulsory for employees in "health-risk" jobs. Employers must make special pension contributions for all such classified workers, and those contributions are transferred to employees' pension account at the special pension fund (managed by a government-sponsored institution). Second, for all other employees, participation in the defined contribution pillar is not compulsory but is promoted by a tax incentive. Namely, contributions to the second-pillar pension funds are subject to tax relief at the level of a payer. Either an employer or an employee can make a contribution, but the total amount of tax relief cannot surpass either the maximum of 5.844% of an employee's annual gross wage or a cap that is set annually[6] When an employer pays a second-pillar contribution for employees, it can deduct paid contributions from the company's corporate income tax base, while in the case that a second-pillar contribution is paid by an employee, it is deducted from her personal income tax base.

Table 1: *Size of the second pillar, average contribution to the second pillar and breakdown of total assets at the end of 2012*

	MPFs	PCs	ICs	Total
AUM (mln EUR)	839.0	655.0	302.6	1,796.6
Average annual contribution	450.72	466.92	381.47	422.53
Breakdown of total assets (%)*				
Deposits	22.2	22.7	n.a.	n.a.
Government bonds	28.1	37.4	n.a.	n.a.
Bonds: other	29.1	32.6	n.a.	n.a.
Stocks	1.1	5.3	n.a.	n.a.
Investment funds	19.0	0.0	n.a.	n.a.
Cash	0.5	2.0	n.a.	n.a.
Total assets	100.0	100.0	n.a.	n.a.

Note: MPFs = mutual pension funds, PCs = pension companies, ICs = insurance companies, and AUM = assets under management; * - PC breakdown of total assets at the end of 2011.
Sources: Ministry of Labour, Family and Social Affairs (http://www.mddsz.gov.si), Report on financial market trends (2013); Report on insurance market trends (2012).

There were 508 thousand participants in the second pillar by the end of 2012, which represents 60.7% of the total number of persons in employment[7]. Different second-pillar institutions manage the individual pension accounts: insurance companies (ICs), pension companies (PCs), and mutual pension funds (MPFs). At the end of 2012 total assets under management of the second-pillar institutions was only 1,797 mln EUR, as the average annual contribution is only about 400 EUR. Assets represented only 2.1% of the assets of the overall financial sector and only 5% of the GDP (Bank of Slovenia, 2013).

A notable characteristic of the Slovenian private pension system is inappropriate asset allocation. Rules about guarantees in the private pension system (Pravilnik o izračunu…, 2005) force pension managers to reach a certain percentage (at least 40%) of the cumulative yield of long-term bonds issued by the Treasury of the Republic of Slovenia on a single-member contribution. Because pension asset managers must provide additional capital in the case that their products don't deliver the guaranteed threshold yield, they do not take much risk. As a result, they tend to invest less than 5% in stocks, even though participants in the pension fund might have investment horizons extending as far ahead as 40 years. Fixed-income instruments together with

[6] The cap was 2,526.2 EUR in 2008, 2,604.5 EUR in 2009, 2,646.2 EUR in 2010, 2,683.3 EUR in 2011 and 2,755.71 EUR in 2012 (Tax Administration, 2012).

[7] 62% we obtain using the registry data on number of persons in employment. Using the definition of International Labour Organization (ILO) the share is even lower (54%).

deposits and cash represent at least 90% of total assets (see Table 1). Asset allocation in developed countries is dramatically different, as stocks represent roughly half of the total assets allocated.[8]

Of course, ultraconservative asset allocation can yield only meagre performance. When portfolio strategists set a conservative floor for the portfolio, the ceiling is not very high (Jensen and Sorensen, 2001). In the period 2003-2012 Slovenian pension funds recorded only 1.05% average real annual yield (mutual pension funds [MPFs]) and 0.87% (pension companies [PCs]).[9] Pension vehicles as a group beat pension guarantee, as in real terms guarantee only amounted to −0.60%. Figure 1 shows the dynamics of the real yield of MPFs, PCs, the private pension system guarantee, and the best and the worst performer (in the entire 2003-2012 period) of all products in the market for the period 2003–2012 in Slovenia.

If we compare same-period performance of Slovenian pension products with similar products in developed countries, we see that those countries did not have much better performance. However, there is a conceptual difference between Slovenian private pension products and those in the developed world. It is impossible to achieve long-run performance of 6–10% typical for countries with the developed private pension systems[10] with the strategic asset allocations of Slovenian pension products, all of which are characterized by investment policy unification regardless of the age of their members and all of which are ultraconservative.

Because Slovenia's private pension system cannot offer appropriate savings vehicles, it should change and pension products with less conservative exposure should be offered.[11] Under a new system, individuals should have their choice of asset allocation—individuals have different characteristics and needs, and not all of them need a guarantee. In the "Results" section, we point out the significant impact of the asset allocation decision on the outcomes of pension savings.

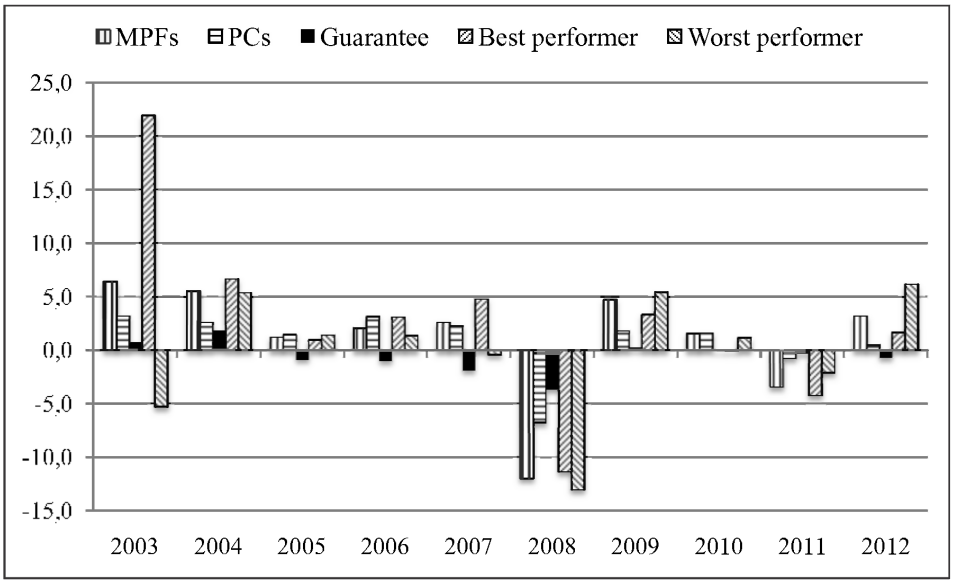
[8] For the end of 2009, a Towers Watson study reported the following stock allocations: Australia, 57%; Canada, 49%; Hong Kong, 62%; Japan, 36%; Netherlands, 28%; United Kingdom, 60%; and United States, 61% (2010 Global Pension Asset Study, 2010).

[9] Comparison of yields between MPFs and PCs must be taken with a grain of salt, as PCs are allowed not to mark to market all of their assets.

[10] Antolin (2008) reports performance between 6 and 8 percent in real terms since introduction of private pension systems, measured in geometrical terms.

[11] The legislation, which allows for asset-allocation investment policy design, became effective on Jan 1 2013 (Pension and Disability Insurance Act, 2012), but the second level rules and pension products are still being prepared.

Figure 1: *Dynamics of real annual yields of MPFs and PCs in the period 2003–2012 in Slovenia (in %)*



Source: Report on financial market trends (2013), Report on insurance market trends (2012), Monthly Bulletin (2005, 2009, 2013), authors' calculation (averages within MPFs, PC categories).

3. OVERVIEW OF CURRENT BENEFITS FROM THE SLOVENIAN PAYG SYSTEM

Under the pension law being is in force from 1 January 2013 the total accrual rate for an individual with full retirement conditions is 57.25%. By assuming his wage was growing in line with the average wage in Slovenia net replacement rate amounts to 57.25% as well. The pension base is calculated as the average from the individual's valorised best consecutive 18 years (19 in 2013, 20 in 2014 and finally 24 in 2018 and onwards).

Individual's gross wages by years are transformed to nominal wages with the ratio between average net and gross wage in that year. Those 'net' wages are multiplied with the vector of valorisation coefficients[12] to calculate the pension base. Finally, accrual rate is applied to the pension base to calculate the amount of first pension. Accrual rate for men amounts to 26% for the first 15 working years and further 1.25% for each additional working year. Thus, for a man with 40 working years total accrual rate is 57.25% (26% + 1.25% * 25 years). For women the pension system is more generous with 29% for the first 15 years and, again, 1.25% for each additional working year. Thus, for women with

[12] Calculation of those factors was based on the past growth of pensions relative to wages. After the pension law introduced with 1 January 2013 the set of factors will grow in line with the growth of average wage – thus, it will not depend on the growth of pensions any more. In the past factors were declining because the pension growth was lagging behind the wage growth.

40 working years the total accrual rate of 60.25% is applied. From 2013 to 2022 there is a transition period in which less than 40 working years is required for women and therefore in this period for women even higher accrual rate is applied for 40 working years[13]. However, in our calculations we focus only on male with 40 working years.

Slovenia, as other countries from Central and Eastern Europe, has undergone through several phases of pension reform; the last phase had passed the Parliament in 2012 and is effective from January 2013. Its most important element is a gradual increase of retirement age for both genders. The full retirement age (for old age pension) is thus increasing from 61 years (women) and 63 years (men) to 65 years (by 2016 for men and by 2020 for women). However, under both pension systems earlier retirement (up to several years) was/is possible with full benefits and without penalties if the person collects required number of working years earlier. Slovenia is also characterised by the fact that it has never implemented a compulsory second pillar[14] compared for example with Slovakia, Hungary and Poland. However, the compulsory second pillar has been recently effectively abandoned in Hungary, while in Slovakia it is not compulsory any more since February 2013. The Czech Republic which initially also did not introduce mandatory second pillar is now opening the option for employees to divert part of their contributions from the first to the second pillar (Berk et al., 2013).

3.1. Financing the PAYG pillar

Compulsory pension contributions for the PAYG pillar are set at the rate of 24.35% (employees pay 15.5%; employers, 8.85%) out of a gross wage without any ceiling.[15] The aggregate contributions total 3,348.9 million EUR, or 9.5% of GDP, in 2012. Because this is not sufficient to cover expenditures of the first pillar (which totalled 4,851.0 million EUR, or 13.7% of GDP, in 2012) in aiming to maintain the financial stability of the system, current legislation has stipulated that the central government budget cover the rest. In 2012 that transfer amounted to 1,416.2 million EUR, or 29.2% of total PAYG revenues (Ministry of Finance, 2013).

3.2. Taxation of Pensions

Contributions for the PAYG pillar are entirely deductable from the personal income tax base, while pensions from the PAYG pillar are subject to personal income tax under

[13] For 40 years of work women receive total accrual rate of 64.25% if they retire in 2013-2016 period, 63.5% in 2017-2019 and 61.5% for retiring in 2020-2022 period. Nevertheless, minimum and maximum pension base as of December 2012 are 551.2 EUR and 2,204.4 EUR, respectively. Taking into account that there is no ceiling for the PAYG contributions, such a pension base setting mechanism has a strong redistributive effect.

[14] Exemptions are some selected professions, such as miner, or soldiers, where additional compulsory contributions paid by employers' are collected by special government owned pension fund.

[15] The self-employed on the other hand pays the same rate of contributions from the base which is a function of annual income from self-employment with the ceiling equal to 2.4 average national gross wage.

an advantageous tax-credit system. As a result, most pensions (approximately 97%) are effectively tax-free, whereas the remaining 3% are taxed at a relatively low effective tax rate. On the other hand, the contributions to the second pillar are deductable from the personal income tax base up to the certain level. This tax relief is limited with the 5.844% of employee's annual gross wage or the nominal amount set annually (2,755.7 EUR in 2013) – whatever it is lower. Pensions from the second pillar are not entitled to the same tax credit as pensions from the first pillar. Instead, 50% of the second-pillar pension is subject to tax, without any special tax credit. As a result, these pensions are taxed more than the first-pillar pensions.

Table 2 includes average gross and net wages in 2013, as well as the maximum amount of tax relief for the second-pillar contribution. One can observe that only taxpayers from the highest decile group can take full advantage of the nominal tax relief for second-pillar contributions.

Table 2: *Gross average annual wage, net average annual wage and maximum amount of tax relief for the second-pillar contribution in 2013 (in EUR)*

Decile group	Average gross wage	Average net wage	Maximum tax relief (5,844 %)
1	9,671.5	6,455.4	565.2
2	10,760.0	7,140.1	628.8
3	11,939.4	7,875.8	697.7
4	13,190.8	8,642.1	770.9
5	14,563.9	9,445.3	851.1
6	16,288.2	10,417.1	951.9
7	18,546.8	11,661.9	1,083.9
8	21,740.3	13,385.6	1,270.5
9	26,755.5	15,872.7	1,563.6
10	47,663.8	24,743.2	2,785.5

Source: Authors' calculation based on data from Statistical Office (2013).

4. THE IMPACT OF DEMOGRAPHIC CHANGES ON BENEFITS FROM THE PAYG PILLAR

The twentieth century experienced explosive population growth, but the twenty-first century is likely to see the end of population growth and instead population aging (Lutz et al., 2004). According to population projections, in the future there will be strong demographic pressures on public expenditures for pensions, health care, and long-term care (European Commission, 2012). Scholars began warning of this decades ago, but we have seen no changes, mainly because short-term-oriented politicians have as their horizon only the next elections. They are not interested in projections for a distant future.

The situation, though, has become so aggravated that taking action cannot be further postponed. Many countries have already taken various measures. International organizations are pressuring countries to act in a timely manner to facilitate and accelerate change.

PAYG systems are vulnerable to population aging. In our analysis, we apply Eurostat population projections from EUROPOP2010 for 2010–2060. They were prepared by the Eurostat for the European countries (EU27) and European Free Trade Association countries (EFTA)[16]. The projections assumed gradual convergence of countries' mortality and fertility, with the year 2150 set as the convergence year. However, the projections were prepared only until 2060, when only partial convergence has been reached.

In Slovenia the life expectancy at birth is increasing rapidly. The past decade alone (from 2000–2001 to 2011) saw an increase of almost 4.5 years for males (72.1 to 76.6 years) and 3.3 years for females (from 79.6 to 82.9 years) (Statistical Office of the Republik of Slovenia, 2012, p. 79). Some developed countries already have a considerably higher, and still-increasing, life expectancy than Slovenia.[17]

The current population age structure is given. The baby-boom generations, born after World War II during times of high fertility, are now in their 50s and early 60s. Over the coming decade, they will be intensively entering retirement. At the same time, people born during the 1980s are starting to enter the labour market. During the 1980s and 1990s, fertility declined; in the first half of the 2000s, it stabilized at very low levels. In 1980 total fertility rate (TFR, or the average number of children a woman gives birth to, during her fertility period) was 2.1, which was still a replacement-level fertility. Since then, TFR declined until 2003, when it reached only 1.2 (Statistical Office of the Republic of Slovenia, 2008, p. 56). Consequently, the number of newborns decreased sharply in that period. In 2003 just 17,321 children were born in Slovenia, whereas the figure was 30,604 in 1979 (Statistical Office of the Republik of Slovenia, 2012, p. 78). Those reduced generations (they are only about one half of their parent's generations) will also determine fertility levels in the coming two to three decades. Even if fertility (TFR) were to increase, which the projections assume, the absolute number of newborns is expected to fall considerably because there will be fewer women of reproductive age.

Sensitivity analysis (in which we variate fertility assumptions while keeping other assumptions unchanged) shows that, despite the impact of fertility on population size in the long run, we cannot expect increased fertility to considerably mitigate the process of population aging in Slovenia in the coming decades (Sambt, 2008). Further, from an economic point of view, increased fertility does not have positive economic

[16] Iceland, Liechtenstein, Norway and Switzerland.

[17] E.g., in Japan the life expectancy at birth in 2009 was 79.6 years for males and 86.4 years for females (OECD, 2011).

effects for about 20 years, as cohorts of newborns start to enter the labour market. In the meantime, the economic effect can even be negative, causing higher public expenditures in the form of education and other transfers like child allowances and health care.

Immigration decreases the overall aging of the population, especially because most immigrants are relatively young (Eurostat, 2011). However, without assuming unreasonable high immigration, the positive effect is only moderate. With time, immigrants are also aging and entering the age group of 65 and older (Bonin et al., 2000).

Figure 2 presents the projected dynamics of the age structure of the Slovenian population by three broad age groups related to economic activity:[18] 0–19, 20–64, and 65 and older. According to EUROPOP2010 projections by 2060 the Slovenian population should slightly increase – by 11,000 people, which is 0.5% of the total population. However, the change in the age structure of the population is striking. The percentage of people age 65 years and older is expected to almost double in the 2012–2060 period, from 16.6% to 31.6%. In contrast, the size of the working-age population (age 20–64) is expected to shrink considerably – from 64.3% in 2012 to 49.8% in 2060. The combination of those two processes will have serious consequences for the long-term sustainability of public finance systems, unless adjusted accordingly. Sensitivity analysis reveals that those results are very robust for a broad range of assumptions about fertility, mortality and migrations since they are mainly driven by the increasing longevity, and especially by the given population structure (Sambt, 2008, Sambt, 2009).

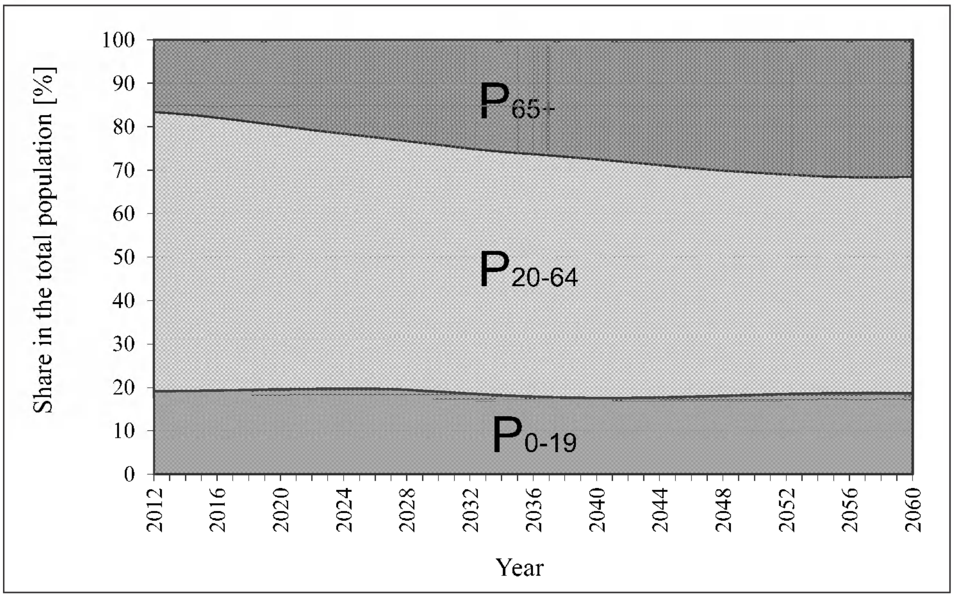
The unfavourable economic development with respect to the population age structure can be shown with the old-age dependency ratio, which is calculated as the ratio between the elderly (age 65+) and the working-age population (age 20–64), multiplied by 100.

An increasing old-age dependency ratio indicates an increasing demographic burden on the productive part of the population in order to maintain the pensions of the economically dependent. According to the EUROPOP2010 population projections, the old-age dependency ratio in Slovenia will increase from 25.9 in 2012 to 63.4 in 2060 (see Table 3).

A rapidly increasing old-age dependency ratio is not specific only to Slovenia. Practically all developed countries across the globe face strong population aging. Therefore, the analysis we present here is generalizable. Table 5 presents projected future increases in the old-age dependency ratio for all EU27 member states, including Slovenia. In the new EU member states (EU12), the increase is expected to be somewhat stronger than in the old EU member states (EU15).

[18] In demography traditionally defined dependency ratio compares population aged 65+ with population aged 15-64. However, in developed countries using 20-64 years in the denominator has been seen as more adequate from the economic point of view since not many individuals enter the labour market before age 20.

Figure 2: *Slovenian population in broad age groups: EUROPOP2010 projections for 2012–2060 (%)*



Source: Eurostat, 2011.

Table 3: *Old-age dependency ratio in EU countries: EUROPOP2010 projections for 2012, 2030 and 2060*

Old member states (EU15)				New member states (EU12)			
	2012	2030	2060		2012	2030	2060
Belgium	29.2	40.5	48.5	Bulgaria	28.7	42.4	66.3
Denmark	29.6	40.7	48.0	Czech Republic	25.0	37.6	60.4
Germany	33.8	51.0	65.1	Estonia	27.6	39.7	61.4
Spain	27.6	38.6	61.6	Greece	31.9	41.9	62.2
France	29.4	43.4	51.7	Latvia	27.4	39.4	74.3
Italy	34.0	44.5	64.5	Lithuania	26.0	38.8	62.3
Cyprus	21.7	33.7	48.7	Hungary	26.8	36.4	62.8
Ireland	19.9	31.2	48.5	Malta	25.8	42.8	60.5
Luxembourg	22.5	32.7	43.0	Poland	21.3	38.6	70.5
Netherlands	26.8	44.2	51.7	Romania	23.3	32.8	70.4
Austria	28.7	42.1	55.4	Slovenia	25.9	42.5	63.4
Portugal	29.9	40.9	59.7	Slovakia	19.0	34.2	67.4
Finland	30.6	47.3	54.5				
Sweden	32.3	41.3	51.7				
UK	28.6	38.6	46.5				

Source: Eurostat, 2011.

4.1. Projecting Future Public Pension Expenditures

Strong population aging translates into pressure on the public pension system. The model that we use in the simulations rests on the age profiles from the base year. Therefore, we refer to it as the age-profiles-based model. Such models are standard approach in Generational accounting methodology[19]. This model is also used for projecting pension expenditures for Slovenia published in 'The Ageing reports' by the European Commission (Ageing Working Group).

In calculations we use three types of matrices. The matrix of pension age profiles (PENS) includes average pensions by years in the future. It builds on the pension age profile from the base year (2011). In particular, the *PENS* matrix consists of two matrices multiplied with each other. The first one contains age profiles of average pension benefits per receiver, whereas the second one includes the share of pensioners in the total population by age group (i.e., retirement rates). This decomposition enables us to more easily, and more accurately, introduce future changes into the age profiles (e.g., increasing retirement age).

Every year those age profiles are shifted up by the assumed growth of pensions. Before 2013 all pensioners with the same retirement conditions received the same level of pension, regardless of the time of retirement ('horizontal equalization'), which strongly simplified the calculations. Horizontal equalization in Slovenian pension system was achieved through complex mechanism of valorisation that was abolished in 2013. Now growth of pension is in real terms[20] 60% indexed to the growth of wages. We follow each cohort of pensioners separately. We use the standard macroeconomic assumption that wages grow in line with labour productivity growth – we use the latest European Commission assumptions.

The coefficient matrix (C) summarizes the effects of future departures from the basic age profile, assumed in the pension matrix. It contains the impact of the Slovenian pension system on pension age profiles in the future. The legally enforced, but gradually phasing-in parameters of the Slovenian pension reform are a typical such case. We obtained several inputs for the coefficient matrix (C) from simulations on microdata on pensioners who have already retired. We simulate their behaviour under pension parameters that will be valid in future years. Weighted averages of those results (by age groups) enter the coefficient matrix.

The population matrix (P) contains the EUROPOP2010 population projections presented earlier.

[19] For review of Generational accounting methodology see, for example, the initial paper from Aurebach, Gokhale and Kotlikoff (1991) and comparative studies across countries (European Commission, 2000; Auerbach, Kotlikoff, & Leibfritz, 1999).

[20] Formally, the growth of pensions is 60% indexed to the nominal growth of wages and 40% to the growth of consumer price index (inflation). This is equivalent to 60% indexation in real terms.

The amount of pension expenditures on individuals aged k in year t is thus calculated as follows (matrices are multiplied in an element-by-element manner):

$$PENSEXP_{a,t} = PENS_{a,t} P_{a,t} C_{a,t} G_t, \tag{1}$$

where G_t contains coefficients of the cumulative growth of a pensions from the base year (here, 2011) to time t. Public pension expenditures (PENSEXP) in year t are calculated as the sum of projected expenditures (revenues) by all age groups:

$$PENSEXP_t = \sum_{a=0}^{D} PENSEXP_{a,t} \tag{2}$$

where index a runs from 0 to D, and D denotes the maximum length of life (in our model, the age group 100 and older).

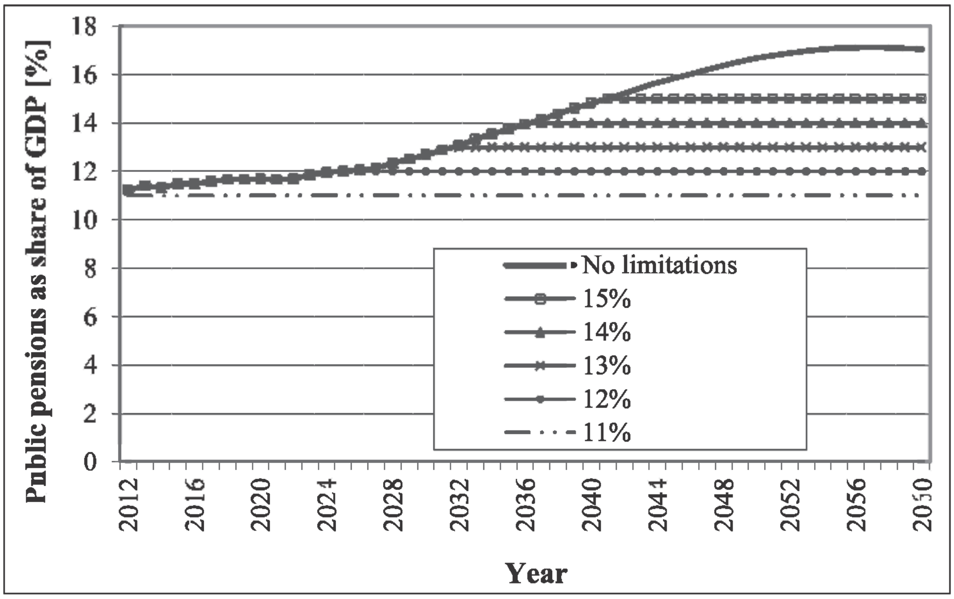
Finally, we employed the set of macroeconomic assumptions from the European Commission prepared in 2011, including assumptions on productivity growth, GDP, employment, and unemployment rates[21].

In the future the age profile of employment rates is projected to shift into higher ages. Consequently, also the age profile of retirement rates will withdraw into higher ages. Both of those two effects are entering the model through *PENS* matrix. Increasing employment rates (also because of assumed decline in unemployment rates) will have positive impact also on GDP since GDP growth in the model consists of labour productivity growth and the employment growth – the same approach uses also the European Commission in their calculations. For example, in the transition period up to 2018 the level of pensions will gradually decline relative to wages because of gradually increasing number of years that are taken into account when calculating pension base (from 19 best years in 2013 to 24 in 2018). This effect enters the model through C matrix as well as other effects of the pension legislation that were calculated using the microdata on pensioners. Nonetheless, it is projected that the public pension expenditures as a percentage of GDP will strongly increase since the results are mainly driven by the population ageing.

In 'pension' category we include old-age, disability and survivor pensions but also pensions of farmers, police officers, World War II veterans, state pensioners and so on. However, payments to the health insurance that are paid for the pensioners by the pension fund are not included. Using the age-profiles-based model, we obtained the results presented in Figure 3, labelled 'No limitation' variant. Without further changes to the current pension system, population aging would largely translate to rapidly growing public pension expenditures as a % of GDP.

[21] To link employment rates with retirement rates, we used the submodel of the Institute of Macroeconomic Analysis and Development (IMAD; for a detailed description of the submodel, see Kraigher (2005).

Figure 3: *Projections of public pension expenditures in Slovenia in 2012–2060 (% of GDP), scenario* with *no limitations and scenarios if limiting public pension expenditures to certain % of GDP*



Source: authors' calculations.

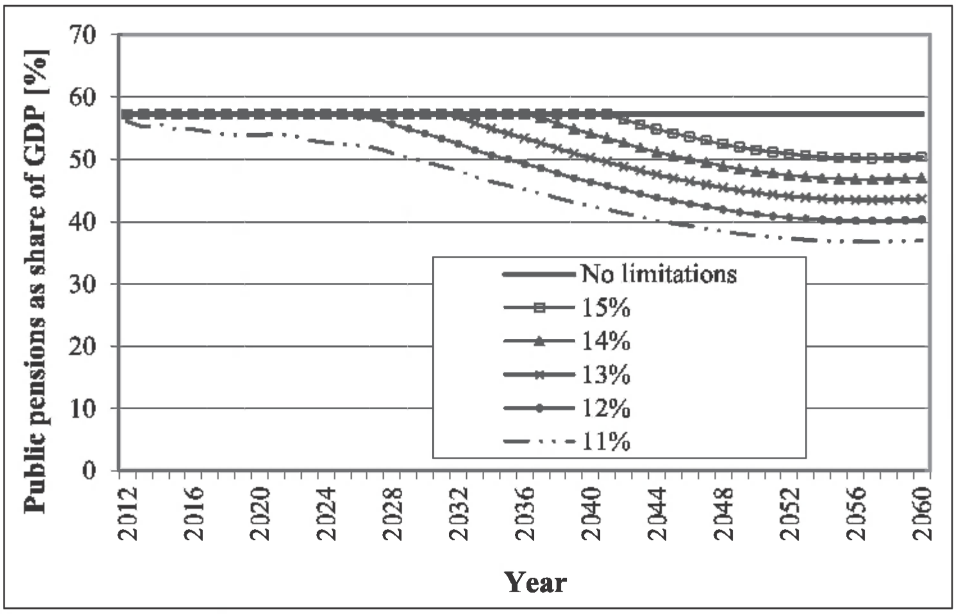
There are basically three solutions for mitigating rapidly growing pension expenditures. The first, usually considered preferable, is to increase the retirement age. This solution also provides the most straightforward response to increasing longevity. The second solution is to increase taxes, usually on labour income. In Slovenia labour is already highly taxed, which hinders its international competitiveness. Moreover, the tax burden has a negative impact on employment and incentives to work. The third solution is to reduce the level of pension benefits from the PAYG system.

In our analysis we focus on the third option by introducing a simple assumption about future reductions of pension benefits. We assume the government will have to prevent further increases in public pension expenditure above some percentage of the GDP (i.e., capping expenditures) in a way that all pensions will be cut proportionally, regardless of the type and level of pension. Thus, we set the tolerated maximum percentage of public pensions of GDP at 11%, 12%, 13%, 14%, and 15% of GDP. Figure 3 shows projected public pension expenditures as a percentage of GDP according to these scenarios.

4.2. Expected Level of Pensions from the PAYG Pillar

As already explained in section 3 in 2013 the statutory accrual rate for a man with 40 working years was set to 57.25% and according to the current pension law it will remain at this level in the future ('No limitations' scenario in Figure 4). We also present results for different scenarios of assumed maximums to which government would tolerate pension expenditures to increase; in those cases, the net replacement rate would fall to even (much) lower levels, as it is revealed in Figure 4. In the case that expenditures for pensions would be capped at 11% of GDP, the net replacement would thus decline to 37% by 2060.

Figure 4: *Projections of net replacement rate at retirement in the period 2012–2060*



Source: authors' calculations.

The presented PAYG-based net replacement rates are very low, and individuals without other means will at best not be able to sustain their living standards. Many of them are expected to fall below poverty threshold. Achieving the 70% net replacement rate suggested by the OECD will be possible only with regular private pension savings, which should fill the PAYG shortfall. Before we present the analysis about the required saving during the working period, we first present the characteristics of traditional asset classes, as they have an impact on amounts of savings needed.

5. CHARACTERISTICS OF TRADITIONAL ASSET CLASSES OVER THE LONG RUN

In this section we analyze three traditional asset classes (i.e. stocks, treasury bonds, and treasury bills). The purpose is not to simulate optimal asset allocation over the long run but to show the impact of the asset allocation decision stemming from the characteristics of the previously mentioned asset classes.

We base our approach on historical yields (arithmetic and geometric) and volatilities reported in the literature and build the yield and volatility model. We use different global historical datasets as a source[22]: US data for the period 1802–2001 and the period 1946–2011 (Siegel, 2002), US large-cap and world data for the period 1926–2005 (Bodie, Kane, and Marcus, 2009), US and world data for the period 1900–2000 (Dimson, Marsh, and Staunton, 2002), US large-cap data for the period 1926–2005 (Malkiel, 2007), and MSCI stock indices for the period 1969–2010. We calculated two to 40-year yields and standard deviations using every data source and then averaged yields and standard deviations. Yields are calculated according to the fact that they should fall over time, as over time the geometric average yield (which is lower than arithmetical average yield) becomes more realistic than the arithmetic average. We borrow the formula from Bodie, Kane, and Marcus (2009).

We calculate standard deviation according to the random-walk assumption.[23] In the short run stocks are more volatile than the other two asset classes, which calls for a higher required yield: yield together with dividends (representing one-third of total nominal return) historically has been around 10%. Over shorter horizons (even 10 years), investment performance can be quite different (e.g. MSCI US Standard Core Total Return index returned -1.29 in nominal terms on average between 31.12.1999 to 31.12.2009, but also as high as 19% between 31.12.1989 and 31.12.1999.[24]

Figure 5 shows that standard deviation is not persistent if we consider longer investment horizons. Namely, in 15 years, yield distribution has approximately one-fourth of one-year standard deviations. Thus, in the longer run, the changed relationship between yield and risk of stocks relative to bonds or bills favours stock.[25] Siegel (2002) argues that empirically verified long-term standard deviation is much lower that standard deviation assumed by the random-walk model, and that after slightly less than 20 years, standard deviation of stocks even falls bellow standard deviation of bonds.

We have deliberately chosen the conservative *i.i.d.* assumption and used a 6.53% expected average real yield for 20-year investment in stocks, 1.25% for 20-year investment in T-bonds, and 1.11% for 20-year investment in T-bills. Over the 40-year investment horizon, yields used were 6.17%, 1.17%, and 1.07% respectively (see Table 6). All the yields are expressed net of management fees, which we assumed to be 1.3% for stocks, 1.0% for T-bonds, and 0.5% for T-bills. After calculating average yields, we calculated standard deviation and then minus-one and minus-two standard deviation yields (–1 sigma and –2 sigma yields) for each asset class for various investment horizons (see Table 4).

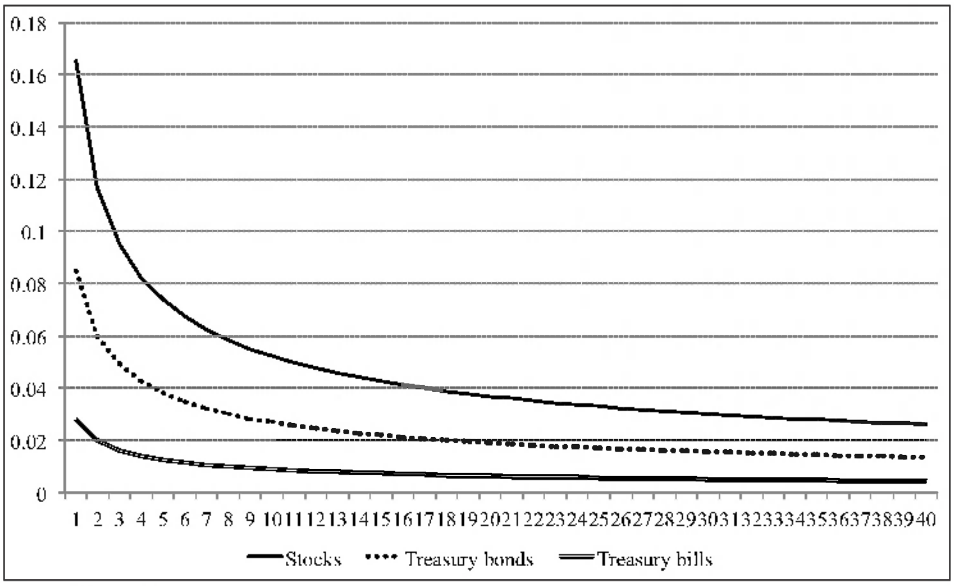
[22] Slovenian pension funds' investment policies should be global and diversified. Therefore, global historical data are the most reasonable data input in our analysis.

[23] I.e., as a square root of forecasting period multiplied by one-year standard deviation of used indices, as distribution of returns are assumed to be - identically independently distributed (*i.i.d.*).

[24] Calculations using MSCI indices are not shown for brevity.

[25] There are still multiple differences in yields but differences in standard deviations become much smaller.

Figure 5: *Standard deviation of traditional asset classes over longer periods*



Source: Malkiel (2007), world markets data, and authors' calculations.

Table 4: *Real yields and volatilities of traditional asset classes during investment horizons of 20 and 40 years (%)*

		Large- and mid-cap stocks	T-bonds	T-bills
	Average yield	6.53	1.25	1.11
20 years	–1 sigma yield	2.39	-0.67	0.43
	–2 sigma yield	-0.84	-2.59	-0.26
	Average yield	6.17	1.17	1.07
40 years	–1 sigma yield	3.24	-0.19	0.59
	–2 sigma yield	0.31	-1.55	0.10

Note: 20-year yields are somewhat higher than 40-year yield, as in the shorter run there is higher effect of arithmetic average yield, which is always higher than geometric average yield (Bodie, Kane, and Marcus, 2009). Figures are net of management fees. For stocks, we assumed annual management fees to be 130 basis points (bps); for T-bond portfolios, 100 bps; and for T-bill portfolios, 50 bps.
Sources: Siegel (2002); Bodie, Kane, and Marcus (2009); Dimson, Marsh, and Staunton (2002); Malkiel (2007); authors' calculation.

6. THE MODEL

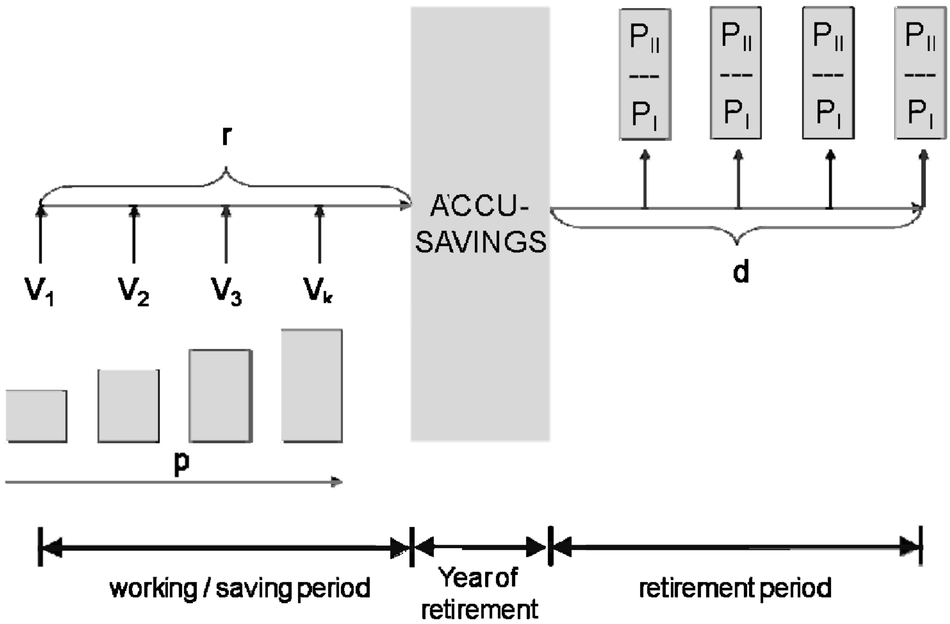
Figure 6 shows the basic model we started with. Taking into account the unsustainability of the PAYG pillar, we expect that future pension recipients will receive pensions from the PAYG pillar substantially lower that the 70% net replacement rate recommended by the OECD. Therefore, we estimate the monthly pension gap, PGAPt (i.e., the difference between the 70% net replacement rate and the forecasted PAYG replacement rate) for a typical male pension beneficiary and assume that he is motivated to increase his periodic pension savings over the entire working period to a level sufficient to cover the future pension gap:[26]

$$PGAP_t = (Pension_t^{70\%} - Pension_t^{PAYG})$$

Apart from gender and retirement age, which affect the pension gap (PGAPt), we also take into account three different public finance scenarios that affect the individual PAYG monthly pensions differently. Because of the fiscal unsustainability issues addressed in section 4, we decided to work with three hypothetical public finance scenarios:

- The no-limit scenario assumes no limits for the percentage of PAYG pension expenditures as a percentage of GDP for the future.
- The 13% GDP scenario assumes the proportion of PAYG pension expenditures to be capped at 13% of GDP.
- The 11% GDP scenario assumes the proportion of PAYG pension spending to be capped at 10% of GDP.

Figure 6: *A graphical illustration of the model*



Legend: r = investment rate of return; p = the growth rate of salaries and saving instalments; V_i = monthly saving instalments; d = discount rate; P_I = monthly PAYG pension; P_{II} = pension gap.

[26] Calculations do not conceptually differ for female individuals, but we excluded those results from this paper for sake of keeping results as short and concise as possible.

Of course, by increasing restrictions on the pension-to-GDP ratio, the actual forecasted net replacement rate deteriorates gradually and the monthly pension gap increases accordingly. Consequently, the additional pension savings that have to be accumulated through the private pension system must increase by increasing the level of public finance restrictions, assuming that individuals target their individual total pensions at the 70% net replacement rate.

In the next step the monthly pension gap values ($PGAP_t$) for individual pension recipients are discounted using a 0.5% technical discount rate[27] to the total amount of savings needed at the year of retirement (ACCUSAVINGS), which represents the target value an individual must accumulate over his working period through his monthly savings in the private pension pillar. In discounting, we use male life expectations at the age of 61 according to the Deutsche Aktuarvereinigung (DAV) tables. Again, we take into account the effect of the length of the savings period for typical individuals, and we simulate investment strategies that are consistent with three different asset allocation strategies. The simulated investment strategies rely on three asset classes, characterised by their distinct risk-return profiles: (1) stock strategy, (2) bond strategy, and (3) bill strategy. For simplicity, investors are assumed to stick to the selected asset class (i.e., risk-return profile) throughout the entire investment horizon, and they are assumed not to mix the three asset classes.

In our results we present the amounts that must be saved by a male individual in the private pension system for a 20-year and a 40-year working period. We assume the starting annuity (A_t=1) to grow monthly by the expected average growth rate of salaries (g), which should be in line with productivity growth rate (we assume the average salary grows by 1.77% per year), and we assume those annuities to be invested at the constant investment rate r, which depends on the preselected asset class and related risk-return profile. Table 6 presents yields and volatilities for selected asset classes for selected 20- and 40-year investment horizons:

$$A_{t=1} = \frac{ACCUSAVINGS * (r - g)}{(1 + r)^n - (1 + g)^n}$$

Table 5 displays a summary of the results. The results are presented for male individuals in three different decile groups (D1, D5, and D10) for selected years in the period 2035–2060. Evidently, the pension gap ($PGAP_t$) is inflated throughout the projection period for all income groups (D1, D5, and D10), as the net replacement rate from the PAYG system is projected to deteriorate. In nominal terms the gap is becoming larger for individuals who belong to higher-income groups. This means that unless such individuals accumulate greater savings until the end of their working period they will fall below the 70% net replacement rate.

As previously explained, the discounted pension gaps represent the accumulated savings that each individual pension recipient is expected to accumulate during his working

[27] We use 0.5% discount rate as it reflect the need to minimize risk exposure once the individual is retired and it is consistent with annuity industry practice.

period until the end of his retirement year. Consequently, the volume of the required accumulated savings determines the monthly savings contributions each male individual is expected to save until the retirement year. Table 8 presents the first annuity a male individual is expected to start saving under varying assumptions. First, we assume that individuals from different decile groups have to accumulate different savings volumes to supplement the regularly expected PAYG pension. Second, we assume that future public finance scenarios affect the monthly savings contributions. And third, the length of the expected savings period also affects the volume of the accumulated funds at the end of the working period. For simplicity, we present only calculations for 20 years and 40 years.

Table 5: *PAYG pensions calculated by the official net replacement rate in selected years and gaps to the 2035 pension, 70% net replacement rate pension, and gap to the forecasted salary in selected years to 2060 (in EUR)*

		2035	2040	2045	2050	2055	2060
Decile group	Net replacement rate (%)	57.25	55.29	53.39	51.56	49.79	48.08
D 1	PAYG pension (M)	461	486	513	540	570	601
	Gap to the 2035 pension	0	25	51	79	109	139
	Gap to the 70% net replacement rate	103	129	159	193	231	274
	Gap to the salary	344	393	448	508	575	649
	Salary	806	879	960	1048	1144	1249
D 5	PAYG pension (M)	675	711	750	791	834	879
	Gap to the 2035 pension	0	37	75	116	159	204
	Gap to the 70% net replacement rate	150	189	233	283	338	401
	Gap to the salary	504	575	655	743	841	949
	Salary	1179	1287	1405	1534	1674	1828
D 10	PAYG pension (M)	1768	1864	1965	2071	2184	2302
	Gap to the 2035 pension	0	96	197	304	416	535
	Gap to the 70% net replacement rate	394	496	611	741	887	1050
	Gap to the salary	1320	1507	1715	1946	2203	2486
	Salary	3088	3371	3680	4018	4386	4789

Source: Authors' calculations.

As it is evident from Table 8, the individual's decision for a particular type of investment (i.e., asset class) and the length of the savings period have a substantial impact on the size of the annuity that the individual saver is expected to start saving. So, a male individual in the D5 decile group who decides to invest in a portfolio of large- and mid-cap stocks (see section 5) is expected to start saving 54 EUR per month if he has a 40-year investment period and 121 EUR per month if he has a 20-year investment period. If the same male individual were to decide to invest in a portfolio consisting exclusively of T-bills, he would need to start saving 149 EUR with an intended investment period of 40 years and 222 EUR per month with an intended investment period of 20 years. The differences in required monthly savings contributions are significant, and one can clearly observe how important it is to decide on a proper investment strategy in terms of both portfolio structure and length of the savings period (i.e., individuals should start saving as soon as possible). All other accompanying aspects that also affect the final savings outcome (e.g., different public finance scenarios that directly affect the PAYG pensions) make the differences only more pronounced.

The second set of results is based on simulations in which the investment yields were adjusted to reflect the volatility of average historical returns of the preselected asset classes. Therefore, the three right-hand columns of Table 6 present the required monthly savings contributions for a risk-aware male individual who wants to avoid a case that investment yield deviates down to two standard deviations (–2 sigma) from the average historical returns of the individual asset classes. In this scenario all required monthly savings contributions are significantly higher, which reflects the sensitivity of the savings strategy to financial market volatility.

Table 6: *Required contributions under three different fiscal scenarios consistent with average real yield under three different asset class allocations (left) and consistent with –2 sigma real yield under three asset class allocations (right)*

		Average yields			–2 sigma yields		
		D1	D5	D10	D1	D5	D10
40 years	SC I - STOCKS - AVERAGE						
	1st contrib. under "no limit"	37	54	142	116	169	444
	1st contrib. under 13% GDP	57	84	219	179	262	685
	1st contrib. under 11% GDP	71	104	271	221	324	848
	SC2 - BONDS - AVERAGE						
	1st contrib. under "no limit"	100	147	384	154	226	591
	1st contrib. under 13% GDP	155	226	593	238	348	913
	1st contrib. under 11% GDP	191	280	734	295	431	1130
	SC3 - BILLS - AVERAGE						
	1st contrib. under "no limit"	102	149	391	120	175	459
	1st contrib. under 13% GDP	157	230	603	185	271	709
	1st contrib. under 11% GDP	195	285	746	229	335	877
20 years	SC1 - STOCKS – AVERAGE						
	1st contrib. under "no limit"	83	121	318	184	269	705
	1st contrib. under 13% GDP	128	187	490	284	416	1089
	1st contrib. under 11% GDP	158	232	607	352	514	1347
	SC2 - BONDS - AVERAGE						
	1st contrib. under "no limit"	150	219	574	184	269	705
	1st contrib. under 13% GDP	231	338	886	284	416	1089
	1st contrib. under 11% GDP	286	418	1096	352	514	1347
	SC3 - BILLS - AVERAGE						
	1st contrib. under "no limit"	152	222	582	174	255	667
	1st contrib. under 13% GDP	234	343	898	269	393	1030
	1st contrib. under 11% GDP	290	424	1112	332	486	1274

Note: D1, D5 and D10 represent first, fifth and tenth decile group of an individual's income distribution.
Source: authors' calculations.

Finally, we compare accumulated savings (i.e., pension wealth), assuming that an individual would start saving monthly contributions adequate to the expected extreme market performance (i.e., –2 sigma) and at the same time it would *ex post* turn our that he could realise expected average market yields (mean yields). The results shown Table 7 are striking. Under this approach, one can easily grasp the advantages of allocating pension wealth into stocks over the long run.

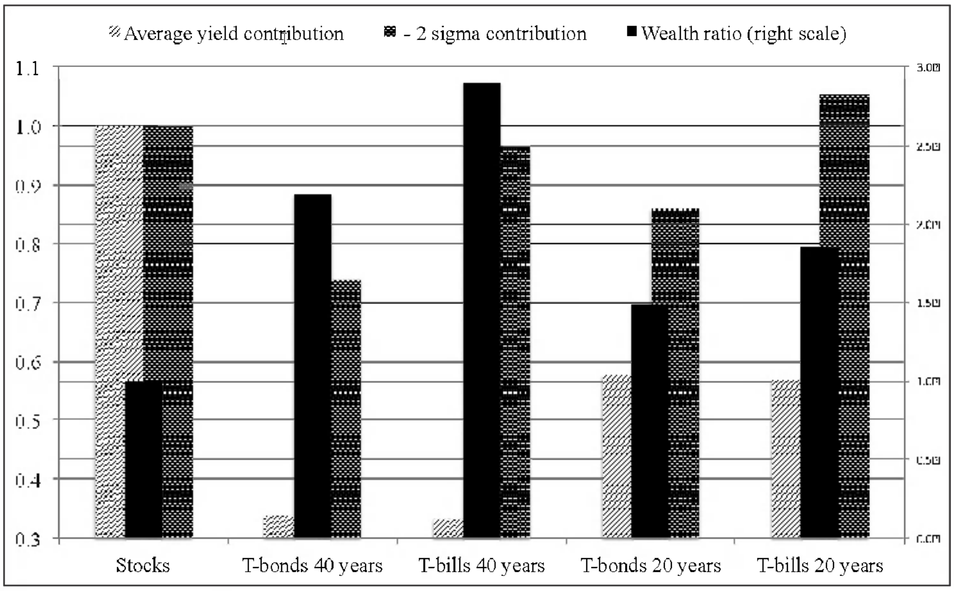
Table 7: *Pension wealth at the moment of annuitizing of an individual who anticipated extreme market performance (–2 sigma real yield) but realized average performance under three different asset class allocations and three different fiscal scenarios*

		D1	D5	D10
40 years	SC1 - STOCKS - (–2 sigma)			
	1st contrib. under "no limit"	330,880	484,132	1,268,246
	1st contrib. under 13% GDP	510,912	747,547	1,958,297
	1st contrib. under 11% GDP	632,217	925,036	2,423,253
	SC2 - BONDS - (–2 sigma)			
	1st contrib. under "no limit"	149,147	218,226	571,672
	1st contrib. under 13% GDP	230,297	336,963	882,718
	1st contrib. under 11% GDP	284,977	416,967	1,092,300
	SC3 - BILLS - (–2 sigma)			
	1st contrib. under "no limit"	113,739	166,419	435,955
	1st contrib. under 13% GDP	175,624	256,967	673,158
	1st contrib. under 11% GDP	217,322	317,978	832,985
20 years	SC1 - STOCKS - (–2 sigma)			
	1st contrib. under "no limit"	109,335	159,975	419,076
	1st contrib. under 13% GDP	168,824	247,018	647,095
	1st contrib. under 11% GDP	208,908	305,667	800,734
	SC2 - BONDS - (–2 sigma)			
	1st contrib. under "no limit"	73,977	108,241	283,551
	1st contrib. under 13% GDP	114,228	167,135	437,831
	1st contrib. under 11% GDP	141,349	206,817	541,785
	SC3 - BILLS - (–2 sigma)			
	1st contrib. under "no limit"	58,765	85,983	225,245
	1st contrib. under 13% GDP	90,740	132,767	347,800
	1st contrib. under 11% GDP	112,284	164,289	430,377

Note: D1, D5 and D10 represent first, fifth and tenth decile group of individual's income distribution.
Source: authors' calculations.

Figure 7 summarizes the effects of different investment strategies chosen by male individuals. Stocks are a benchmark in this comparison (i.e., results are expressed in terms of ratio of stocks to other asset classes). First, individuals who choose stocks over a 40-year period are (according to the expected average yield) required to save about one-third the amount of individuals who choose bond or bills. According to expectations of extreme financial market performance, stock investors can still save about one-quarter less (exactly 26% less over a 40-year investment horizon and 14% less over a 20-year horizon). Second, when risk-aware investors decide to save according to expectations that they close the gap despite extreme financial market performance, but those results turn out (most likely) to be average, a stock strategy would beat out a bond and/or bill strategy by a substantial margin. As Figure 8 shows, this margin is already very material at a 20-year investment horizon. Investors with a stock strategy accumulate 48% more pension wealth than those with a T-bond strategy and 86% relative to a T-bill strategy. Over the 40-year investment horizon, the respective differences are substantial: 121% relative to T-bond strategy and 191% relative to T-bill strategy.

Figure 7: *Stock-to-other-asset-class ratios of contributions and of pension wealth before annuitization for investment horizons of 20 years and 40 years*



Source: authors' calculations.

We argue that governments in countries with pension system facing similar issues to those of Slovenia should be interested in improving the financial literacy of the public in both aspects, i.e. improving an awareness to save and also knowledge about basic characteristics of financial asset classes. Doing so would prevent opportunity losses in terms of lower available pension wealth and old-age disposable income despite people being aware about the need to save for their pensions.

7. ADVANTAGES OF PRIVATE PENSION SAVINGS ALLOCATIONS OVER ORDINARY SAVINGS ALLOCATION

In this section we present benefits that stem from the fact that separate pension pillars react differently to various economic shocks. We calculate the extent of benefits using common finance literature metrics of a standard deviation of a portfolio. In this approach coefficients of correlation among main assets take the central role. The co-movements that are reflected in the coefficients of correlation reduce the volatility of a combination of assets. We measure and show benefits of diversification that rise from combining exposures to homogeneous assets by the percentage decrease of standard deviation of the resulting portfolio compared to the standard deviation of the asset class alone.

In order to be able to calculate standard deviation of a portfolio we have to define homogeneous assets. Our analysis was based on the traditional financial market asset classes, i.e. stocks (EQ), 10-year government bonds (10yB), money market government bills (MM), and on wages, following approach of Holzmann (2002). We used data from Thomson Reuters Datastream database for France, UK, Germany and The Netherlands, for the period from 1971 to 2011. We calculated annual yields from total return index time series in nominal terms. We used the following stock indices: *CAC 40 Total Return Index* (France), *FTSE 100 Total Return Index* (UK), *DAX 30 Total Return Index* (Germany), *Amsterdam MIDKAP DS Total Return Index* (The Netherlands), Benchmark 10-year Government Total Return Indices, and Benchmark 1-3-year Government Total Return Indices. For the time series of wages (we used two wage time series: *Wage Rate – Private Sector* and *Wages and Salaries – Total Economy*) we also used time series of aggregate wages in nominal terms.

Our goal is not to define optimal investment strategy for pension portfolio but to show benefits of diversification that rise from the characteristics of each financial asset class by combining it with the pension income that is received from the PAYG. Therefore, we calculate bivariate correlation coefficients of stocks, long-term government bonds, and short-term government bonds with both measures of wage income that proxy for the dynamics of the PAYG. Table 8 reports our results. In general, correlation coefficients are low, which means that benefits of diversification are substantial. We see that correlation coefficients are smallest in the case of combining PAYG with stocks (cross-county average 0.0016), followed by long-term government bonds - 10yB (cross-county average 0.0690) and finally by short-term government bonds – MM (cross-county average 0.2625), which means that benefits of diversification of PAYG pension income are the largest when this income is combined with pension income that derives from stocks investments.

Table 8: *Bivariate correlation coefficients between annual growth rates of aggregate wages and performance of financial asset classes for the period from 1971 to 2011*

	Stocks	10yB	MM	AVERAGE
France	0.2657	0.2327	0.4169	0.3051
WR	0.3184**	0.2584*	0.4914**	0.3561
WS	0.2130	0.2071	0.3424***	0.2542
United Kingdom	0.1931	0.2274	0.1488	0.1898
WR	0.2646*	0.1412	0.1577	0.1878
WS	0.1215	0.3136**	0.1400	0.1917
Germany	-0.2038	-0.1649	0.3268	-0.0140
WR	-0.2826*	-.1693	0.4026***	-0.0178
WS	0.1208	-.1606	0.2510	-0.0101
Netherlands	-0.2486	-0.0194	0.1574	-0.0369
WR	-.1658	-.054	0.2776*	0.0193
WS	0.3313**	0.0153	0.0372	-0.0930
ALL	0.0016	0.0690	0.2625	0.1110
WR	0.0326	0.0441	0.3323	0.1363
WS	-0.0294	0.0938	0.1927	0.0857

Notes: WR – Wage rate of the private sector, WS – Wages & salaries; 10yB – 10-year government bonds, MM – money market government bills; Performance of financial asset classes is expressed in terms of annual changes in total return indices.
*** - significant at 1%, ** - significant at 5%, * - significant at 10%.
Source: Thomson Reuters Datastream, authors' calculations.

In order to be able to express diversification benefits we have to measure standard deviations of separate time series (see Table 9) and then calculate standard deviations of portfolios comprising PAYG pension income and pension income that derives from a particular financial asset class.

Table 9: *Standard deviations of annual aggregate wages and performance of financial asset classes for the period from 1971 to 2011*

	Stocks	10yB	MM	WR	WS
France	0.2574	0.0845	0.0341	0.0487	0.0524
United Kingdom	0.1700	0.1120	0.0341	0.0583	0.0873
Germany	0.2512	0.0693	0.0339	0.0309	0.0358
Netherlands	0.3104	0.0792	0.0286	0.0471	0.0424
ALL	0.2472	0.0862	0.0327	0.0463	0.0545

Note: 10yB – 10-year government bonds, MM – money market government bills; Performance of financial asset classes is expressed in terms of annual changes in total return indices.
Source: Thomson Reuters Datastream, authors' calculations.

If we compare portfolio standard deviations with standard deviations of a particular financial asset class, we can directly measure the positive diversification impact of combining two sources of pension income, i.e. decrease of the standard deviation. Table 10 and Figure 8 report such effects for pension income that derives in 50 percent from PAYG and 50 percent from the particular financial asset class.

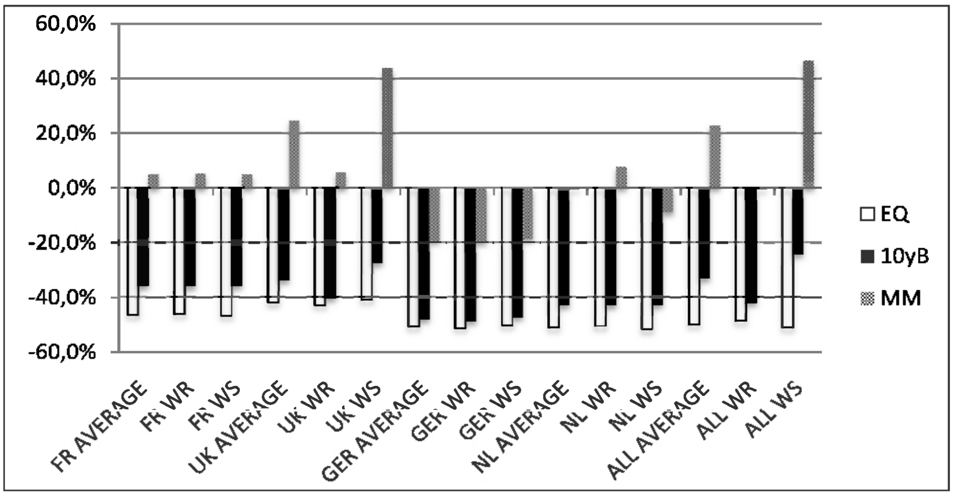
Table 10: *Diversification benefits of combining traditional asset classes (50%) with PAYG (50%)*

	Stocks		10yB		MM	
	STDEVp	% efect	STDEVp	% efect	STDEVp	% efect
FR (0.2574)	0.1376	-46.6%	0.0541	-36.0%	0.0359	5.2%
WR	0.1384	-46.2%	0.0540	-36.2%	0.0360	5.4%
WS	0.1367	-46.9%	0.0541	-35.9%	0.0358	5.0%
UK (0.1700)	0.0985	-42.0%	0.0739	-34.0%	0.0425	24.8%
WR	0.0969	-43.0%	0.0667	-40.5%	0.0360	5.7%
WS	0.1001	-41.1%	0.0811	-27.6%	0.0490	43.9%
GER (0.2512)	0.1234	-50.9%	0.0359	-48.2%	0.0274	-19.3%
WR	0.1220	-51.4%	0.0355	-48.8%	0.0272	-19.9%
WS	0.1247	-50.4%	0.0363	-47.5%	0.0276	-18.8%
NL (0.3104)	0.1513	-51.3%	0.0451	-43.1%	0.0284	-0.6%
WR	0.1531	-50.7%	0.0450	-43.2%	0.0308	7.7%
WS	0.1495	-51.8%	0.0452	-42.9%	0.0260	-9.0%
ALL (0.2472)	0.1235	-50.0%	0.0575	-33.3%	0.0402	23.0%
WR	0.1265	-48.8%	0.0498	-42.2%	0.0325	-0.7%
WS	0.1206	-51.2%	0.0653	-24.3%	0.0479	46.7%

Note: WR – Wage rate of the private sector, WS – Wages & salaries; 10yB – 10-year government bonds, MM – money market government bills; Performance of financial asset classes is expressed in terms of annual changes in total return indices; STDEVp – standard deviation of a portfolio created by combining financial asset class with PAYG; %effect – Percentage decrease of standard deviation of an asset class due to diversification through PAYG.
Source: Thomson Reuters Datastream, authors' calculations.

As expected from the levels of correlation coefficients, decreases of standard deviation and thus benefits of diversification are the largest in case of combining PAYG income with investments into stocks, whereby standard deviation decreases to about one half of standard deviation of stocks. They are followed by investments into long-term government bonds, whereby standard deviation decreases to about two thirds of standard deviation of long-term government bonds. Benefits are limited in case of short-term government bonds, which is also a result of similar levels of standard deviations of wage income and short-term government bond yields. We see from Table 11 that standard deviations of short-term government bonds are generally lower than standard deviations of wage income.

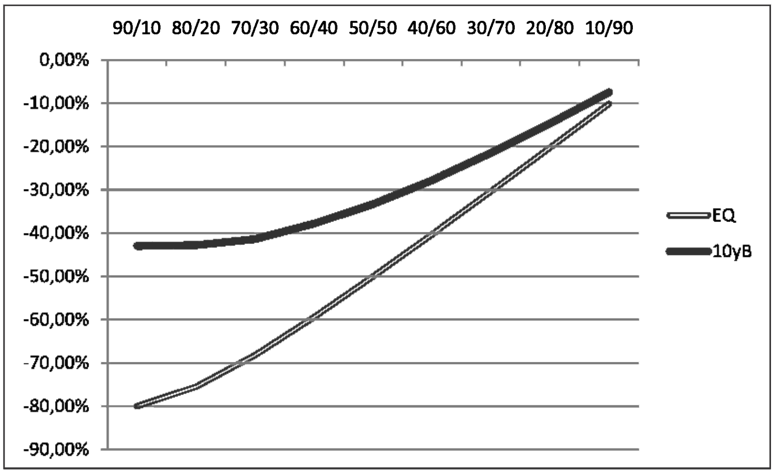
Figure 8: *Diversification benefits of bivariate combinations of financial asset classes (50%) and PAYG (50%), measured as a percentage decrease of standard deviation of a financial asset class*



Note: WR – Wage rate of the private sector, WS – Wages & salaries; 10yB – 10-year government bonds, MM – money market government bills.

However, diversification benefits depend on the weights in the standard deviation equation, i.e. on the relative importance of each source of pension income. They are the highest in situations when country makes the first moves towards private pensions from the PAYG and decrease with the relative importance of private pensions (see Figure 9).

Figure 9: *Impact of the extent of required private pension supplement on diversification benefits*



Note: 10yB – 10-year government bonds; 90/10 – pension income generated in 90% through PAYG and 10% through private pensions, 80/20 – pension income generated in 80% through PAYG and 20% through private pensions, etc..

8. CONCLUSION AND DISCUSSION

With EU demographic dynamics, many countries are expected to face a situation where PAYG system will not be able to finance levels of pensions set out in current rules. In this article, we show that this is the case in Slovenia. Taking into account the current pension system and aging population, PAYG pension benefits as a percentage of GDP would increase to about 17%, which we believe is financially unsustainable. Cuts to the PAYG benefits thus are unavoidable. It is therefore the role of the private pensions to fill the gap between projected first-pillar pension and overall level of pension at the 70% net replacement rate suggested by the OECD. Improved private pension systems would not only solve pension issues but also help develop financial markets, which would in turn lead to higher savings, higher capital budgets of companies, economic growth, and most importantly, well-being of the population.

Today Slovenia's private pension system is of minor importance. Second-pillar legislation was enforced in 2000, a significant step forward, but evolution in the field has since been negligible. New legislation is now effective since January 2013, but secondary level acts are still being prepared. In general, people do not have enough knowledge to make proper decisions. Because a large majority of the population is only modestly financially literate, there is a real risk that many people will not have enough means to live through old age without financial difficulties.

In this paper we have shown how much people should save and what kind of asset allocation they should choose. The government should try to address the issue of financial illiteracy and encourage people to save. In addition, government should conceptualise reasonable legislation on the available financial vehicles offered in the private pension system and work on ways to properly communicate the asset allocation decision. Namely, we have shown that if an individual saves over a period of 40 years and allocates savings into a well-diversified stock portfolio, he can save far more than an individual who allocates savings into a well-diversified T-bond or T-bill portfolio for the same expected horizon. The differences are also significant over a 20-year period.

However, story should not be based solely on returns but should also include risk. Namely, higher stock returns should also be more risky compared to bond and bill returns. That was why we checked the episodes of the worst historic financial market performance. Average annual real yields at two standard deviations below the average value are 0.31%, –1.55%, and 0.10% for stocks, bonds, and bills, respectively. If a risk-aware investor chooses to save amounts consistent with –2 sigma yields (which are higher than amounts consistent with average yield), the required amount for stock allocation is about 26% less than for T-bond allocation over a 40-year investment horizon.

In addition, we have revealed the significant upside in yield potential with stock investing, which is not the case for fixed-income investments. Namely, if risk-aware investor decides to save according to expectations that they save enough to achieve 70% net replacement rate despite extreme financial market performance (but the investment result turns out to be average, which is obviously the most likely), individuals with a stock strategy would beat individuals with a bond and/or bill strategy by a substantial margin. Investors with a stock strategy accumulate 49% more pension wealth than those with a T-bond strategy and 85% more than those with a T-bill strategy over a 20-year investment horizon. Over a 40-year investment horizon, the stock allocation beats the T-bond portfolio by 119% and the T-bill strategy by 190%. We thus conclude that when people who save for their pension have a long-enough horizon, they should predominantly allocate investments into stocks. The amount that people should save every month is in this setting where individuals choose asset allocation for the whole investment horizon determined by asset allocation choice, not income level, which is commonly assumed to determine individual's risk aversion. Governments should bring that finding into legislation, and one way of doing so would be the life-cycle investment policy approach.

According to the results presented here and the characteristics of Slovenia's current pension system, the first thing needed is to give individuals a certain degree of free asset allocation choices and/or life-cycle investment choices for the automatic transition of aging individuals to more conservative asset classes (i.e., toward T-bill allocation). Even though this issue is sensitive, current guarantees set uniformly for all individuals are ill advised. We argue that besides a robust, strong, well-designed second pillar, individual retirement accounts should be introduced in the third pillar. Such accounts, when properly tax-calibrated, would provide lower-income individuals with additional incentives to save for their pension. Over the long run, this would significantly increase chances that Slovenia's aging population will not slip into poverty.

In this paper we also show that allocation of savings is less risky in the context of pensions compared to traditional allocation of savings. Namely, as pension income has to be combined from the PAYG and from the funded pension portfolio, and both depend on specific drivers having different sensitivities to various shocks, pension beneficiaries are protected by diversification benefits. Such benefits are the largest in case of investments in stocks and at times where PAYG is relatively important source of pension income, i.e. when country makes first steps towards building private pension system. Namely, where total pension income already relies to a small extent on the PAYG only pension beneficiaries almost entirely bear the risk of a capital market crash.

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