Supplementary pension insurance in Slovenia: an analysis with an overlapping-generations general equilibrium model

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Abstract

The article presents an analysis of supplementary pension insurance in Slovenia and its subsequent effects on welfare, macroeconomic variables and pension fund deficit with a dynamic OLG general equilibrium model. It has been established that the volume of supplementary pension saving is insufficient at present in Slovenia to compensate the deterioration of rights from the first pension pillar. Not only is the participation in the (voluntary) second pillar insufficient, but especially the premia are too low. The macro-economic consequences of introducing a fully-funded mandatory component of pension insurance would not be unfavourable. Increased pension saving reduces current consumption and increases the labour supply of active generations, but also increases the volume of disposable savings, so the increased investment may increase capital stock and production, which leads to an increase in economic growth and potential future consumption. Increased labour supply of insured persons would also lead to a higher volume of contributions for mandatory pension insurance, which would reduce the state pension fund deficit.

JEL classification: C68, D58, D91, G23, H55, J32.

Keywords: general equilibrium models, mandatory second pillar, macroeconomic effects, OLG-GE, Slovenia, supplementary pension saving, welfare analysis.

Introduction

Economic sustainability of social security systems is under severe pressure nowadays due to ageing caused by decreasing fertility rate, increasing life expectancy, increasing share of recipients of social benefits, and decreasing share of active population (*cf*. OECD, 2000; European Commission, 2001). These are the reasons for anticipated increase of traditional social security benefits and introduction of new types of old-age insurance. Among key topics of social security in Slovenia is therefore the development of sustainable, efficient and fair system of funding social security in the environment of expected further ageing of the population. Special emphasis is being put on the pension system due to its weight in the system of public finances; therefore it is also the focus of our research.

Due to increasingly perceivable unfavourable demographic developments it became obvious in Slovenia in the 1990s that the former pension legislation will not be able to sustain the pressure. This became distinctly obvious in 1996, when the state pension fund needed additional financing from the central budget for the first time. This was enough to start intense preparations for the Slovenian pension reform, which was adopted in the form of the 1999 Pension and Disability Insurance Act (PDIA) and is being implemented from 1 January 2000. With gradual implementation of the 1999 PDIA, the second pension pillar is becoming increasingly important on account of the first pension pillar. This means that people will become less dependent on the pension from the first pillar as soon as they retire. However, since the second pension pillar in mainly voluntary in Slovenia, there are reservations regarding whether the present amount of supplementary pension saving will be sufficient to compensate the deterioration of rights from the first pension pillar.

In the present analysis we are interested in the effects of introducing mandatory supplementary pension insurance in Slovenia on welfare of generations, macroeconomic categories and sustainability of public finances. The effects of mandatory second pillar shall then be compared to the effects of present (voluntary) supplementary pension saving. To achieve this, Slovenian economy is being analyzed with an overlapping-generations general equilibrium (OLG-GE) model, which is the most developed version of computable general equilibrium (CGE) models. Namely, the model SIOLG 2.0 makes possible analysis of intra-generational and inter-generational redistribution effects of potential effects of different strategies of public financing in order to achieve sustainable long-term economic growth and social development. It also enables monitoring and anticipation of effects of

unfavourable demographic developments on the volume of social transfers to the population.

The outline of the article is as follows. In Chapter 2 a short description of the OLG general equilibrium model of the Slovenian economy is presented, while the developments in the Slovenian pension system from the 1990s onwards are explained in some detail in Chapter 3. In Chapter 4 some of the simulation results of the model are presented, with special focus on supplementary pension insurance in Slovenia and its subsequent effects on welfare, macroeconomic variables and state pension fund deficit. In the final chapter we summarize the central findings of the article.

Description of the OLG-GE Model of the Slovenian Economy

The model SIOLG 2.0 is a dynamic overlapping-generations general equilibrium model of the Slovenian economy, based on social accounting matrix (SAM) for the year 2000, data on demographic structure of the population, expected future demographic developments, characteristics of Slovenian households, and decomposition of households within generations (*cf.* Verbič *et al.*, 2006; Verbič, 2007). The model has been developed with the very intention of analyzing the sustainability of the Slovenian public finances, though it can be used to analyze any part or any sector of the economy.

The starting points of the OLG-GE model are the life cycle theory of consumption by Modigliani and Brumberg (1954) and the permanent income hypothesis by Friedman (1957), which are actually special cases of the more general theory of intertemporal allocation of consumption (Deaton 1992). Unlike in the Keynes's theory of behaviour of consumption and savings, based only on current income, in the OLG-GE model consumption and savings are derived from intertemporal optimization behaviour and are therefore dependent on full lifetime income. In the simplest case of unchanged income until retirement (*cf.* Modigliani 1986), consumers save during their active lifetime and spend their savings after the retirement in order to maintain unchanged consumption. The retirement is therefore *raison d'etre* for saving.

Overlapping-generations general equilibrium models represent the pinnacle of dynamic CGE modelling. OLG-GE modelling was established and promoted by Auerbach and Kotlikoff (1987) and is based on detailed decomposition of the consumption side of the model. Namely, unlike in the Ramsey-type models the consumers live a finite length of time, but long enough to live at least one period with the next generations of consumers.

Determination of consumers by their birth cohort enables analysis of inter-generational effects, which makes OLG-GE models especially valuable for analysis of tax policies, pension policies and other social policies.

Dynamic general equilibrium model SIOLG 2.0 comprises not only the standard model structure of a national economy, but also the demographic block and the pension block, within the framework of which the first and the second pillar of the Slovenian pension system are being modelled. Since the model incorporates most of the contemporary techniques of the CGE modelling, the arrears in this field in Slovenia compared to the rest of the world have practically been eliminated. Namely, the model is build within the general algebraic modelling system (GAMS), which has become both most widely used programming language and most widespread computer software (Brooke *et al*. 1998) for construction and solving large and complex CGE models.

Within the GAMS framework, the dynamic general equilibrium model is written in Mathiesen's (1985) formulation of the Arrow-Debreu (1954) equilibrium model, i.e. as a mixed complementarity problem (MCP). The key advantage of this formulation is the compact presentation of the general equilibrium problem, which is achieved by treating variables implicitly and thus significantly reducing the computation time for higher-dimensional models. Namely, the mathematical program includes equalities as well as inequalities, where the complementarity slackness holds between system variables and system conditions (*cf*. Rutherford 1995a; Böhringer *et al*. 2003). Functions of the model are written in Rutherford's (1995) calibrated share form; a reasonably straightforward algebraic transformation, which nevertheless considerably simplifies the calibration of the model (*cf*. Böhringer *et al*. 2003; Balistreri and Hillberry 2003). To solve the model, i.e. to achieve convergence, a recent version of the PATH solver (Ferris and Munson 2000) is used, which is renowned for its computational efficiency.

Consumers live in the model according to their expected length of life, i.e. their life expectancy at birth. Assuming that the life expectancy is approximately 80 years and that the active lifetime period starts at the age of 20, there are 60 generations in each period of the model. There is a new cohort of consumers born in each such period, thus increasing the population, while at the same time a number of consumers pass away and decrease the total population. Consumers are observed in five-year intervals within households, which maximize the expected lifetime utility subject to their income constraints, where one has to put out the need to save for retirement and to support children. Households are differentiated in the model according to year of birth, income and size; within each cohort

distinction is made between couple without children and nuclear family with two children on average, and five income profiles representing different income brackets. Consequently, there are ten versions of the model altogether, which facilitates analysis of intra-generational effects of different economic policies.

The volume of labour and the labour productivity growth are given exogenously. Changes in wages are reflected in changes of the labour supply. Consumption of households with children is additionally corrected due to extra cost per child, where the children are born in the childbearing age of the woman or, to be precise, the household, i.e. in the age bracket of 20-40 years. In the first ten years after retirement the household is comprised of two persons and afterwards of one adult. Saving decisions of households affect investment decisions of firms in the capital markets and thus future production. The effects ascribed herein have recurrent effects on product market through decreasing prices and on labour market through higher productivity, leading to higher wages and finally higher income of households. Both effects can be analyzed with a dynamic OLG-GE model quite straightforwardly.

The perfect foresight assumption in the forward-looking model specification implies the ability of households to perform intertemporal optimization of the present value of entire future consumption. In other words, the consumers have full information at their disposal, adopt on average the right decisions and are familiar with future modifications of key economic indicators, which is the quintessence of rational expectations. They are able to anticipate new policies and to prepare themselves to future changes. The assumption of equilibrium in all markets and assumption of achieved sustainable economic growth enable analysis of different scenarios, which cause deviations from the reference growth path and changes in macroeconomic and microeconomic indicators. This is especially important when analyzing social security, because it makes possible projecting the effects of demographic changes on the social security system. For this we have three variants of demographic projections available; the low variant combines lower fertility with lower life expectancy and lower net migration, while the high variant combines higher fertility with higher life expectancy and higher net migration than in the reference medium variant.

On the other hand, the assumption of perfect foresight is also valid for firms, which maximize profits in the environment of perfect competition. Technology is given by the constant elasticity of substitution (CES) production function. The number of production sectors in the model is dependent on availability of the input-output table for the base year, which means that there are 60 sectors of the standard classification of activities (SCA)

available for discretionary aggregation. Government spending is dependent on economic growth and growth of the population, and is financed with revenues from personal income tax, capital income tax, value-added tax and import duties. Sources of revenue of the Slovenian system of public finances represent various possibilities of funding different economic policies in the simulation phase of the modelling.

The modelling of the first pension pillar was designed to capture the key pension system parameters that are usually the subject of modification within pension reforms. The emphasis is on the cash flow of the mandatory pension insurance institution, the relationship between the pension base and pensions, and the process of adjustment of pension growth with respect to wage growth. The modelling of the second pillar is focused on the implementation of the liquidity constraint. For this purpose the so-called total pension was introduced, representing the sum of the pension from the first and second pillars, where at every point households adjust the scope of their labour supply and their current consumption towards a target total pension. This creates a certain volume of supplementary pension saving, which can be treated as mandatory supplementary pension insurance, if the target total pension is defined at a level dissimilar to the reference level.

The dynamic general equilibrium model SIOLG 2.0 is closed using the Armington's (1969) assumption of imperfect substitutability, where the commodities are separated by its source on domestic and imported products. Demand for imported products is derived from cost minimization criterion of firms and utility maximization criterion of consumers. As regards the export side of the model, domestically produced products are sold at home and abroad, but are nevertheless treated as imperfect substitutes. Slovenia is assumed to be a small open economy, implying that the changes in the volumes of imports and exports do not affect the terms of trade. International capital flows are endogenous, given the intertemporal balance of payments constraint.

Representation of Developments in the Slovenian Pension System

The Republic of Slovenia inherited the legislation of its pension system, which was based on inter-generational contract and is therefore a pay-as-you-go (PAYG) system, from the former Yugoslavia. After Yugoslavia splintered into newly independent countries at the beginning of the 1990s, transformation from the workers' self-management to a modern market economy was initiated in Slovenia, thus requiring the formation of new markets and taking its rules into account. However, the consequences of bankruptcy of firms, economic recession and restructuring of the business sector, all resulting from

economic transformation, were being "solved" contemporaneously in order to preserve social sustainability by mass early retirement.

After Slovenia's independence in 1991, the new pension legislation was adopted somewhat behind schedule in 1992, when the restructuring was for the most part already finished. Even the rise of retirement age was therefore not able to put the break on early retirement pressure. Because the price of additional years of service was low and therefore not consistent with the actuarial principles, purchase of additional years of service was a common phenomenon. Consequently, the increase in actual retirement age was modest and very close to minimum retirement age. The ratio between the number of insured persons and the number of pensioners has been relatively steady over the last decade (Stanovnik 2002), although this stability is somewhat misleading for the new pension legislation introduced additional categories of insured persons[1].

Legislative modifications adopted in 1992 are partially responsible also for the large increase of pension expenditure of the PAYG-financed state pension fund, i.e. the Institute for Pension and Disability Insurance (IPDI), in the same year. Namely, with the new Pension and Disability Insurance Act the IPDI was compelled to pay contributions for health insurance for pensioners, hence contributing at least one additional percentage point to the ratio of pension expenditure to GDP. After 1992 the pension expenditure, measured as percentage of GDP, somewhat stabilized at the level of 11 per cent. This could have been a sign of financial stabilization of the IPDI; however things took a drastic turn for the worse, as we will find out hereinafter. Until 1996 all extensive increases of pension expenditure were financed by increasing the pension contribution rate. As a result the (joint employer and employee) pension contribution rate ascended from 22.55 per cent of the gross wage in 1989 to 31 per cent of the gross wage in 1995. Finally, in 1996 the Government of the Republic of Slovenia decided to lower the employer pension contribution rate from 15.5 per cent of the gross wage to 8.85 per cent of the gross wage in order to increase competitiveness of the Slovenian economy.

The year 1996 hence represent a decisive moment, since until then financially autonomous state pension fund demonstrated a deficit for the first time, which has after that been filled up every year until 2004 with the so-called "generalized" transfers from the central budget in order to maintain social stability. Transfers of funds from the central

[1] Evident examples of introducing additional categories of insured persons are "voluntarily insured persons" and "unemployed persons receiving unemployment benefits" for whom the contributions are paid by the National Employment Office.

government budget to the IPDI indeed existed prior to 1996, but were only intended for financing additional obligations of the government, such as pensions of farmers, policemen, customs officers and combatants of the World War II. Now the government actually committed itself to partially finance pensions, which were primarily established on actuarial principles and were before 1996 entirely funded with contributions of the active population. Until the economic transformation relatively favourable pension figures become insupportable in just a few years. One should certainly adjoin that the effects of demographic changes on the social security system are yet to be observed in the subsequent years.

The decrease of employer pension contributions was thus a "suitable" occasion for the extreme measure of transfer funding of the pension system. The insolvency of the pension system therefore passed by unnoticed to the general public, but the consequences of the pension deficit can be seen in the structure of the Slovenian budget, where there are fewer funds available for investments and for research and development. Yet the economic situation is commonly not perceived to be so pessimistic. The fiscal position was relatively favourable for the whole time and certainly the most promising among the new EU member states; the budget deficit was relatively low in the last decade despite the difficult situation in the first years of economic transition, hence the public debt increased only moderately.

The problem, which has by that time drawn attention of economists of the International Monetary Fund and the World Bank, was being properly addressed with the preparation of the White Paper on the subject in 1997, which led to the adoption of new PDIA in 1999. The implementation of this law started on 1 January 2000 and is to be finished in 2024. The pension system has become more complex than ever before; partially due to difficult negotiations in the government coalition, but mainly because of tiresome negotiations between management and labour (Stanovnik 2002). The main characteristic of the new pension legislation in comparison with the former legislation is path-dependency, which appears to be a universal feature of predominantly gradualistic reforms of the Slovenian economic system. In addition, the transitional periods are lengthy, so the actual values of parameters of the present three-pillar pension system in Slovenia converge only gradually to the final values.

Statutory retirement age under the 1999 PDIA, which guarantees insured persons retirement benefits, dependent only on completed years of service (without deductions), is 63 years for men and 61 years for women. This criterion is to be increased from 58 years

and 6 months in 2000 by 6 months per annum for men and from 53 years and 4 months in 2000 by 4 months per annum for women. However, an individual can retire already at the age of 58 and receives pension without deductions in case he or she fulfilled the full pension qualifying period, which is 40 years of service for men and 38 years of service for women. The transitional period terminates at the end of 2008 for men and at the end of 2022 for women. Minimum pension qualifying period is still 15 years of service. The retirement age can be decreased for every born or adopted child, brought up and supported by the insured person at least for five years.

There is more consideration given in the 1999 PDIA to actuarial fairness for the system of incentives and disincentives was adopted in case of retirement before and after fulfilment of retirement eligibility criteria, respectively. Namely, for all insured persons without full pension qualifying period, retired before completed 63 (men) and 61 years of service (women), the pension adequately decreases for every month missing until the statutory retirement age. If, on the contrary, the insured pension remains employed after completed statutory retirement age and full pension qualifying period, the pension adequately increases for every month, completed after the statutory retirement age. Incentives and disincentives are to be added or subtracted 1.5 percentage points of accrual rate for every year of service added or missing, respectively.

The calculation of pensions is less favourable for insured persons under the 1999 PDIA. Old-age pension is calculated from the pension base in per cent, depending on number of completed years of service; 35 per cent in case of men and 38 per cent in case of women for the first 15 years of service, and 1.5 per cent for each additional year of service irrespective of gender. Under the proviso that the insured person is not subjected to pension disincentives, the pension in case of full pension qualifying period amounts to 72.5 per cent of pension base, instead of prior 85 per cent (1992 PDIA). Since the pension base under the 1999 PDIA is calculated out of best 18 consecutive years of service instead of prior best 10 consecutive years of service (1992 PDIA), the decrease in pensions is even higher. However, the most complex procedures of the 1999 pension legislation are revalorization of pension bases and indexation of pensions (*cf.* Stanovnik 2004). Revalorization of the pension base in the Slovenian pension system is a procedure of recalculating sources of pensionable income in the best 18 consecutive years of service using a vector of revalorization coefficients, in order to obtain the pension base. It is actually an instrument in the pension system, used for obtaining horizontal equity between existing and new pensioners. Indexation of the pension, on the other hand, is a procedure of adjusting retirement benefits to existent economic developments in the country using a

complex set of rules, where consumer price index is the floor and wage index is the ceiling for the growth rate of pensions.

It has to be emphasized that in 2005 the Government of the Republic of Slovenia introduced several changes to the 1999 PDIA that were aimed at increasing the pensions (in real terms). The most important among then was the introduction of full indexation of pensions that is being carried out twice a year (in February and in November). Additionally, the changes of pension legislation include increases in the level of pensioner's recreation grant and lowering eligibility requirements of the widower's pension. These provisions, especially the introduction of full indexation of pensions, will undoubtedly have substantial negative long-term effects on controlling the expenditure of the system of public finances.

The 1999 PDIA introduced a number of elements that improved horizontal equity in the system (*cf*. Stanovnik 2002). The gender divide regarding eligibility and benefits was considerably narrowed. Not only were accrual rates equalized, but the eligibility criteria for women are now closer to those for men. Nonetheless, even greater emphasis was laid on the principle of vertical equity or "solidarity". Thus the ratio between two comparable pensions[2] can not exceed 4:1, which is less than the prior ratio of 4.8:1 (1992 PDIA). Instead of explicit minimum and maximum pension, the Slovenian pension system includes minimum and maximum pension base; the former is set nominally, yet amounted to approximately 62.5 per cent of average net wage in 2000, while the latter is four times the minimum pension base. A further redistributive element lies in the fact that social security contributions are not capped.

Another very important innovation of the 1999 pension legislation is the adjustment of pension growth of the existing pensioners to entry pensions of new pensioners, which amounts approximately to –0.6 percentage points per annum. This means that pensions of existing pensioners are being decreased, taking account of the lower pensions of new entrants. There was an initiative given to the Institutional Court of the Republic of Slovenia for constitutional review of this article, but the Court ruled in December 2003 that the article is congruent with the Constitution of the Republic of Slovenia. Such outcome is particularly important, since this modification of the pension legislation represent a large share of overall effects of the pension reform and has also a significant positive effect on managing expenditure of the pension system.

[2] Comparable pensions exist when two pensioners enter the pension system under the same conditions and both have full pension qualifying period.

The 1999 PDIA enabled the development of supplementary pension saving within the second pillar. In Slovenia the second pillar comprises supplementary pension insurance, which can be broken down to: (1) individual and collective, (2) voluntary and mandatory, and (3) based on employee or employer payments. Following significant consolidation on the pensions market in the first half of this decade, the first and third classification can be taken as practically the same and one can speak of *individual supplementary pension insurance* as insurance based on employee payments, and *collective supplementary pension insurance* as insurance based on employer payments. Distinguishing between whether participation is mandatory and the type of scheme is somewhat more difficult; individual supplementary pension insurance is voluntary, while collective supplementary insurance may be mandatory or voluntary.

According to the current pension legislation, the second pillar includes insurance companies and pension companies as well as the state. It covers private professional schemes financed from employee contributions and their employers. Participation in the first pillar is a condition for inclusion in the second pillar. The investment financing system represents the collection of funds in personal pension accounts with the purpose of providing the insured persons with an additional pension on reaching a set age, or in other cases defined in the pension scheme. Monthly contributions gain interest at an agreed rate, or based on the profit the fund manager generates from investments. There is a minimum return requirement for pension funds, requiring them to provide at least 40% of the average annual interest rate on long-term government bonds.

Insured persons participating in voluntary supplementary pension insurance can claim tax relief, if the pension scheme is on the approved list at the Ministry of Labour, Family and Social Affairs. According to the Act, value added tax is not paid on premia, and they are also exempt of 6.5% of insurance service tax. The tax relief on a premium paid by an insured person works by reducing the personal income tax base by the amount the insured person paid for voluntary supplementary pension insurance. However, the reduction of the personal income tax base is limited. The premium an employer pays for an insured person is not counted in that person's income tax base. The pension is included in the income tax base in the year in which the beneficiary receives payment of the pension, while premium paid by the employer is recognised for tax relief on corporate income tax, but they do not count as wages paid nor are contributions paid on them. Experience to date with collective schemes indicates that employers finance most of the premium or even the entire premium.

The pension scheme manager is eligible for reimbursement of input costs from premia paid, output costs and to an annual management commission. The input costs are calculated as a percentage of the paid premium, and reduce the paid premium. The output costs are calculated as a percentage of the surrender value, and reduce the surrender value. The commission for managing an active fund is defined as a percentage of the average net annual value of mutual fund assets and reduces the fund's actual return. The Minister of Finance prescribes the maximum permitted percentages for these costs; at present these stand at 5.5% for input costs; output costs at 1%, and the management commission at 1.5%. Administrative costs are high therefore, though the trend is for them to fall.

The second pillar of the Slovenian pension system has undoubtedly undergone considerable growth, as in mid-2006 over half the active working population was already included in voluntary pension insurance. However, most of these insured persons were involved via collective insurance, while the individual pension saving segment is marginal. Civil servants represent a significant proportion, though they pay the minimum premium. On 1 November 2005 439,280 insured persons were included in supplementary pension insurance, but 167,363 of them were civil servants with a minimum pension insurance premium. Overall, the key worrying indicator of progress in supplementary pension insurance in Slovenia is the value of paid premia. As this analysis indicates, there is a large gap between the actually paid premium for supplementary pension insurance and the target premium value that would enable compensation of effects of the pension reform on the welfare of the elderly. Below the article will present the consequences this problem may present in future.

Results of the OLG-GE Simulations

The groundwork for our analysis is execution of dynamic calibration of the OLG-GE model and consequently preparation of the pertinent reference solution. In the framework of performing dynamic calibration of the model SIOLG 2.0, we follow the strategy of using the model to generate the entire dynamic path of endogenous variables in order to accurately reproduce the values of every endogenous variable in the base year (2000). The dynamic calibration scenario described herein simultaneously represents the benchmark scenario (BENCH), referring to steady-state growth of all relevant variables in the model. The reference scenario (REFER) is then obtained by solving the model with implemented both demographic and pension block, where additional deficit[3] of the state

[3] Additional deficit is the excess of the state pension fund deficit in a particular year over its value in the base year, when it amounted to 3.9 per cent of the GDP.

pension fund at changed demographic structure is being financed from the central government budget with revenues from value-added tax. Alternatively, the additional deficit could have been financed with revenues from labour income tax. The initial (base-year) IPDI deficit is of course being funded by pension contributions. The level of supplementary pension saving in the second pillar remains unchanged. The reference scenario represents the basis for comparison of consequences of a range of economic policies in the system of public finances.

Analysis of the Slovenian economy, where we take into account upcoming developments of the Slovenian pension system, is then performed by forming counterfactual scenarios and comparing their outcomes to the results of the reference scenario. First, we distinguish counterfactual scenarios with respect to the level of supplementary pension saving. This entails defining the concept of the total pension received by the insured person on retirement. This may be the same sum as the pension from the currently applicable mandatory pension insurance system and pension from the existing low savings in the second pillar, or may – with an appropriately defined mandatory second pillar saving – compensate either the overall effects on mandatory pension insurance of the 1999 pension reform, or only for the key changes ushered into the Slovenian pension system in 2005. The reference scenario and the first counterfactual scenario, therefore, only model the voluntary second pillar, while the final two counterfactual scenarios model the mandatory second pillar in relation to the level of the target total pension.

Furthermore, we distinguish two counterfactual scenarios with respect to the means of financing the first pension pillar. Whereas the reference scenario refers to the present structure of financing the pension system, where only the additional deficit is being financed with revenues from value-added tax, these counterfactual scenarios are different. Namely, in the first counterfactual scenario (VAT) we assume that the entire state pension fund is financed with revenues from value-added tax, while in the second counterfactual scenario (LABS) the IPDI is by assumption funded exclusively with revenues from labour income tax. These scenarios are used in order to represent the effects of two extreme approaches to funding the pension system and to demonstrate their strengths and weaknesses.

Unless explicitly stated otherwise, steady-state growth rate of 2.5 per cent and medium variant of demographic projections are used for OLG-GE simulations. The GDP growth is endogenously determined, while the productivity growth is exogenous and equal

to the chosen steady-state growth. Wage growth follows the productivity growth, but is also dependent on changes in labour supply. The pension block of the model SIOLG 2.0 follows the 1999 PDIA and its subsequent changes with the following key elements: (1) pension as proportion of the pension base is gradually decreasing for new and existing pensioners to 72.5 per cent; (2) number of consecutive years of service for calculation of the pension base is gradually increasing from 10 to 18; (3) eligibility criteria for retirement are being raised, to be reflected in estimated increase in average retirement age of 2 years for men and 4 years for women (retirement age of 60 years for both men and women); (4) average pension growth reaches 100 per cent of average wage growth (full indexation of pensions); (5) calculation of the revalorization coefficients is based on lagging of pension growth behind wage growth, which enables equalizing the financial situation among existing and new pensioners; and (6) growth of residual non-pension expenditure of the IPDI follows population growth and exogenous productivity growth.

We commence by analyzing supplementary pension saving in Slovenia, followed by an analysis of welfare effects in Slovenia and an analysis of macroeconomic effects of the Slovenian pension reform, whilst the chapter is being concluded by analyzing effects of the IPDI deficit on sustainability of Slovenian public finances.

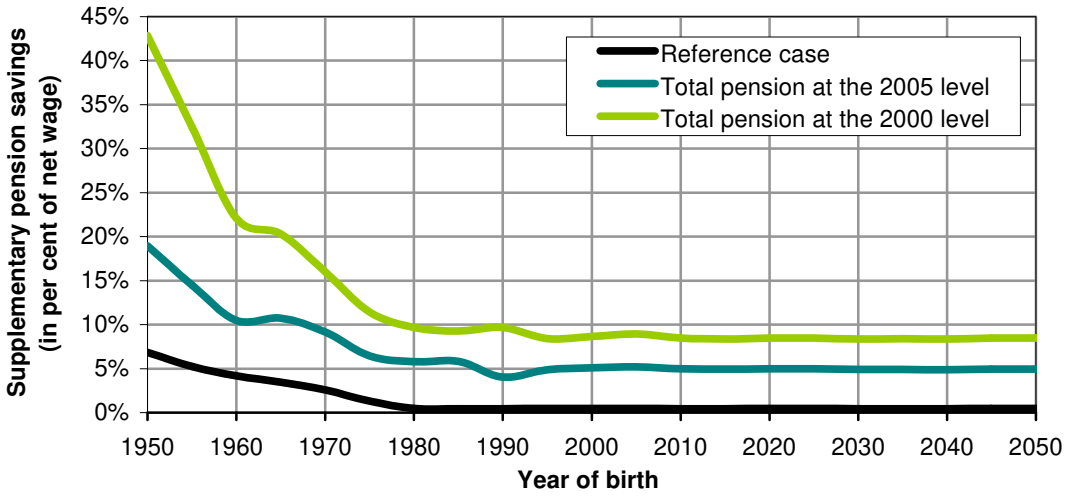
An Analysis of Supplementary Pension Saving in Slovenia

The level of savings required in the mandatory second pillar depends primarily on the amount of the target total pension, which comprises the pension from the mandatory pension insurance (first pillar) and the pension from the supplementary pension insurance (second pillar), and on mandatory pension insurance parameters. Within the latter, one should put out the retirement age and the wage indexation of pensions from mandatory pension insurance. A distinction must be made between saving in the second pillar, which is required to compensate for the overall effects of the 1999 pension reform (which only came into effect from 2000) on mandatory pension insurance, and saving in the second pillar which is only required to compensate for key changes in the pension system as of 2005 (coming into effect in that same year). Both are defined in the model by the proportion of the net wage allocated to saving in the second pillar of the pension system.

Figure 1, which relates to the retirement age of 60 years and full wage indexation of pensions, indicates that second pillar saving required to achieve the given target total pension is falling along with reduction in household age, while it remains stable in the base period, and is constant for new generations of household. This is to be expected given the

assumptions in the model (households start saving in the second pension pillar in 2000) that older generations have less time to compensate for the effects of the pension reform with additional pension saving, hence making the required saving level higher. Compensating for the total effects of the pension reform requires a higher level of savings that compensating for the changes in pension legislation alone, so the first liquidity constraint curve lies above the second. The saving required for the new generation to compensate for the total effects of the pension reform is 8.48% of the net wage, while compensating for the changes in the pension legislation from 2005 would require savings of 4.97% of the net wage. The reference saving in the second pillar is very low in Slovenia, which is in accordance with the supplementary pension insurance profiles constructed for Slovenia (Verbič, 2007, pp. 214-221).

Figure 1. Supplementary pension savings required in order to keep the total pension at the given level (retirement age of 60 years and full indexation)

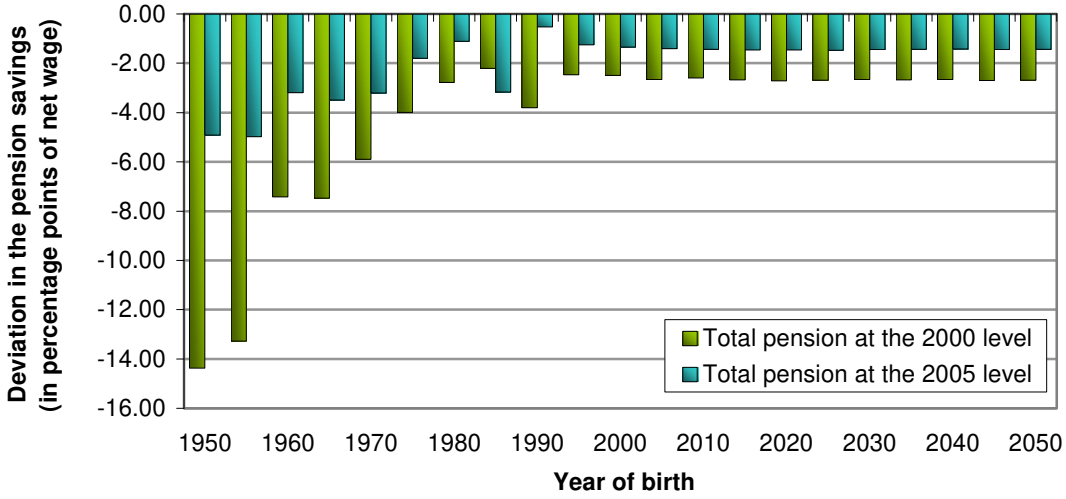


Source: Author's simulations using SIOLG 2.0.

Figure 2 indicates the changes required in second pillar saving by age cohort to achieve the required target total pension when raising the retirement age by five years, while retaining full wage indexation. It can be ascertained that the development of both liquidity constraint curves is similar to the preceding case, while the required saving level to achieve the given target full pension is significantly lower. Therefore, the saving required for the new generation to compensate for the total effects of the pension reform is 5.82% of the net wage, while compensating for the changes in the pension legislation from 2005 requires savings of 3.54% of the net wage. Increasing the retirement age by an

additional year therefore reduces the additional second pillar saving required to achieve the given target pension by 0.4 percentage points of the net wage.

Figure 2. Expected change in the supplementary pension savings required in order to keep the total pension at the given level in case of increasing retirement age to 65 years and unchanged indexation of pensions

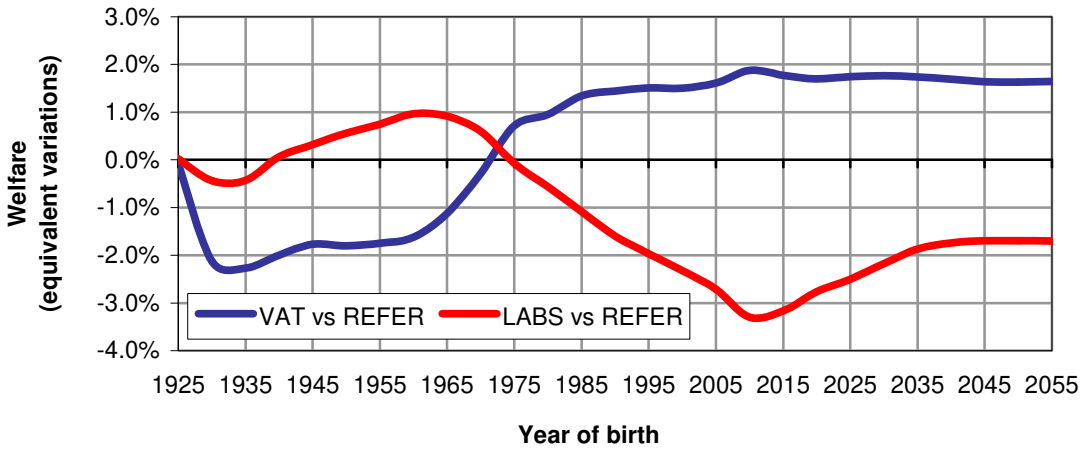


Source: Author's simulations using SIOLG 2.0.

An Analysis of Welfare Effects in Slovenia

For the purpose of welfare analysis we use the Hicks's equivalent variations (HEV) as a measure of change in the welfare of generations. Equivalent variations can be defined as the equivalent percentage change in full lifetime resources needed in the reference scenario to produce the same level of welfare under the counterfactual scenarios. A positive value means that a generation will gain from switching from the reference scenario to the counterfactual scenario. The inter-generational redistribution effects for the current pension system parameter values in Slovenia, i.e. retirement age of 60 years and full (100 per cent) indexation of pensions, are shown in Figure 3.

Figure 3. Welfare effects in Slovenia in case of applying different sources of financing the pension system (retirement age of 60 years and full indexation)



Source: Author's simulations using SIOLG 2.0.

A first glance at the Figure 3 shows that in case of funding the pension system with revenues from value-added tax, the future generations would gain. It is obvious that in this scenario the elderly would lose, as they have to pay more value-added tax in comparison with the reference scenario; they would be forced to bear a larger burden of the present value of public expenditure. In case of funding the pension system with revenues from labour income tax, all future generations would lose, as they alone would need to bear the burden of public expenditure.

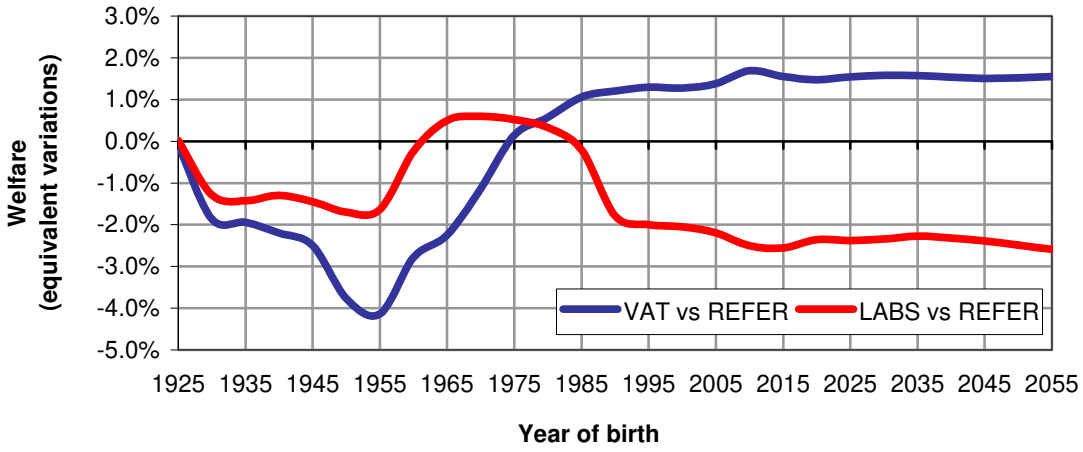
Funding of the pension system with revenues from value-added tax appears to be somewhat better alternative than funding of the pension system with pension contributions, which can be explained as follows. Replacement of social security contributions with revenues from value-added tax improves financial situation of young generations for the consumption of the elderly is being taxed additionally. Since young generations have lower marginal propensity to consume compared to the elderly, after the tax reform their consumption decreases, whilst their supply of labour has to increase. Total consumption therefore decreases, whereas the total labour supply increases; savings increase and higher capital stock leads to higher GDP.

As value-added tax rate is raised over time, making consumption in the future more expensive, the value-added tax acts like a capital income tax. In case of funding the pension system with revenues from value-added tax, there is a substantial increase in labour supply. This is to a lesser extent also true in case of funding the pension system with revenues from labour income tax. People will not only work more, they will also work

longer. The retired generations suddenly have to pay an increased tax on their consumption. As they live on their savings, the only way to keep their consumption at unchanged level is by providing additional labour to the labour market, i.e. by retiring later. Correspondingly, a raising labour income tax rate will change the relative intertemporal prices of leisure. The future price of leisure will fall relatively to the price of current leisure, inducing a substitution of future for current labour supply.

Now consider the impact of introducing a mandatory second pension pillar on the welfare of individual generations in Slovenia. Figure 4 indicates the intergenerational distribution effects in case of keeping the target total pension at the level before the changes in the pension system in 2005 came into effect (i.e. before 30 July 2005). It can be seen that the effects on welfare of financing the pension system with revenues from values added tax would be less favourable in comparison with the scenario with a total pension based on the existing reform. This holds for younger and future generations, as well as for older generations (compare Figure 4 with Figure 3). Namely, since the increase in aggregate saving is now higher due to the supplementary pension saving, consumption would decrease further or the labour supply would increase more than in the scenario of total pension based on the existing pension reform. In case of financial the pension system with revenues from labour income tax, the effects on welfare would also be somewhat less favourable compared to the scenario of total pension based on the existing pension reform. The reduction in aggregate saving would now be lover or the aggregate saving may even increase due to the supplementary pension saving, which in each case leads to a reverse trend in the dynamics of real consumption (decrease) and labour supply (increase).

Figure 4. Welfare effects in Slovenia in case of introducing mandatory supplementary pension savings and applying different sources of financing the pension system (retirement age of 60 years and full indexation)



Source: Author's simulations using SIOLG 2.0.

In the group of scenarios that maintain the total pension at the level before the pension reform or its amendments came into effect, the additional gap in the welfare of older generations that are still active, evident in Figure 4, is a consequence of the assumption of the model, according to which these generations only start to compensate for the effect of the pension reform from 2000, and manage to do so despite the small proportion of their active working period remaining.

Another important aspect of the reform is its overall efficiency effect. In order to obtain this effect, we have changed the model in such a way that there are no inter-generational effects; all generations lose or gain the same amount. This is accomplished by introducing a lump-sum redistribution authority (LSRA), which redistributes gains and losses evenly among the generations using lump-sum transfers. These transfers have no distortional effects; hence what remains is the pure efficiency effect of the tax reform. As can be seen in Table 1, there is a positive overall efficiency effect in case of funding the pension system with revenues from value-added tax, i.e. the welfare level of all generations increases by 0.29-0.35 per cent. In contrast, the overall efficiency effect in case of funding the pension system with revenues from labour income tax is negative; the welfare level of all generations decreases by 0.12-0.74 per cent.

Table 1. Overall effect on efficiency (LSRA) given different methods of financing the pension deficit, different retirement ages, and different levels of indexation

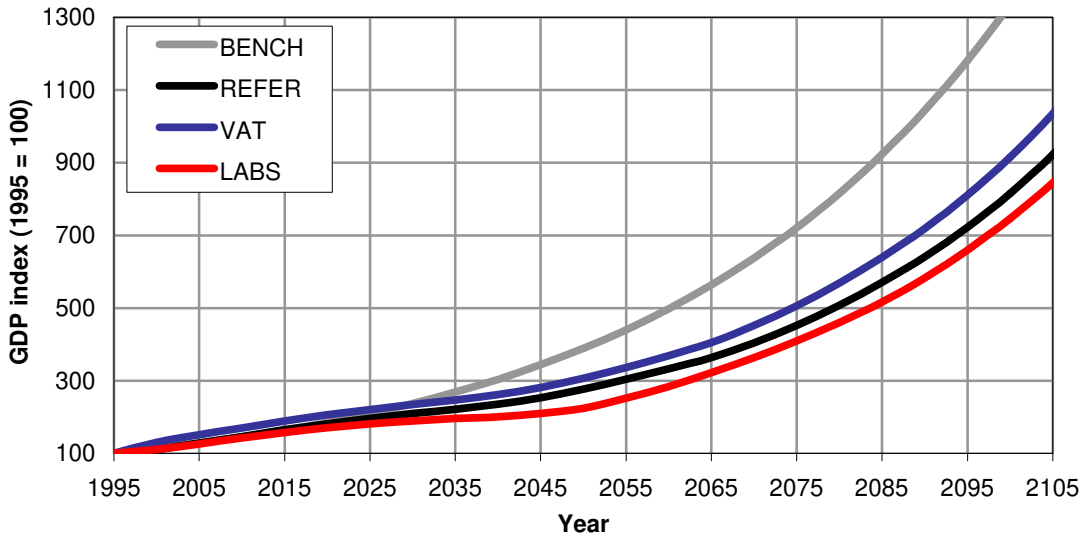
Scenario determination		Efficiency effect (LSRA)	
Retirement age	Indexation level	VAT vs. REFER	LABS vs. REFER
60 years	100 per cent indexation	0.29%	–0.74%
	80 per cent indexation	0.35%	–0.51%
65 years	100 per cent indexation	0.29%	–0.22%
	80 per cent indexation	0.34%	–0.12%

Source: Author's simulations using SIOLG 2.0.

When calculating the average value of the total LSRA effect for the scenario group with total pension based on existing reforms (i.e. for the entire Table 1), and comparing the value acquired with the value for the scenario group that retains the total pension at the level before the 2005 amendments of the pension reform came into effect and with the value for the scenario group that retains the total pension at the level before the 1999 pension reform came into effect, one finds that in the first case the welfare level of all generations would decrease by 0.24 percentage points, and in the second case by 1.27 percentage points. Since by introducing mandatory supplementary pension savings the households become liquidity constrained (at least in some periods of life), their total level of welfare would decrease somewhat, as expected.

Based on developed scenarios, it can be established that the choice of source of financing pensions does not have a significant effect on GDP growth and thus on GDP level. Namely, neither the annual growth rate in case of financing the pension system with revenues from value-added tax nor the annual growth rate in case of financing the pension system with revenues from labour income tax differ much from the annual growth rate of the GDP in the reference scenario, as can be seen from Figure 5 for the current pension system parameter values in Slovenia, i.e. retirement age of 60 years and full indexation of pensions. One should bear in mind that in the benchmark scenario, i.e. in the case with highest GDP growth (see Figure 5), unfavourable demographic developments are not implemented, and thus the differences between the benchmark scenario and other three scenarios clearly demonstrate the demographic slowdown of GDP growth.

Figure 5. Expected gross domestic product in Slovenia in case of applying different sources of financing the pension system (retirement age of 60 years and full indexation)

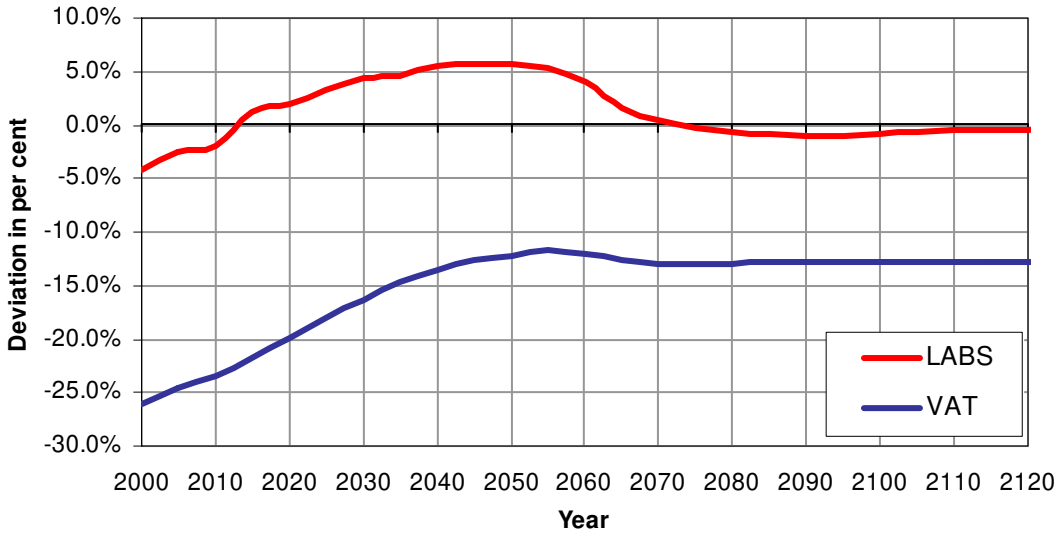


Note: The base year (2000) is not fixed in the model, because this would lead to too many additional restrictions on the model, i.e. it would increase its complexity significantly, and indirectly make the model less solvable. As a consequence of this fact the changes to economic variables occur already in the year 2000. The problem that arised is being 'solved' by fixing the (pre)model year of 1995.

Source: Author's simulations using SIOLG 2.0.

The effects of funding the pension system with revenues from value-added tax and with revenues from labour income tax on consumption, investment (savings[4]) and capital stock can be ascertained from Figures 6 and 7. Increase in the value-added tax rate makes consumption more expensive and therefore encourages households to reduce their present consumption (see Figure 6), and increase savings and therefore investment (Figure 7). This consequently increases the capital stock and raises the level of possible future consumption. Increase in the labour income tax rate, on the other hand, increases the price of present compared to future leisure, inducing substitution of future for current labour supply. The latter therefore decreases. In order to maintain the present level of consumption (see the long-term trend on Figure 6), households decrease current savings, thus decreasing investment (Figure 7). This has an effect of decreasing the capital stock, though it can potentially also represent an increase in the level of future consumption.

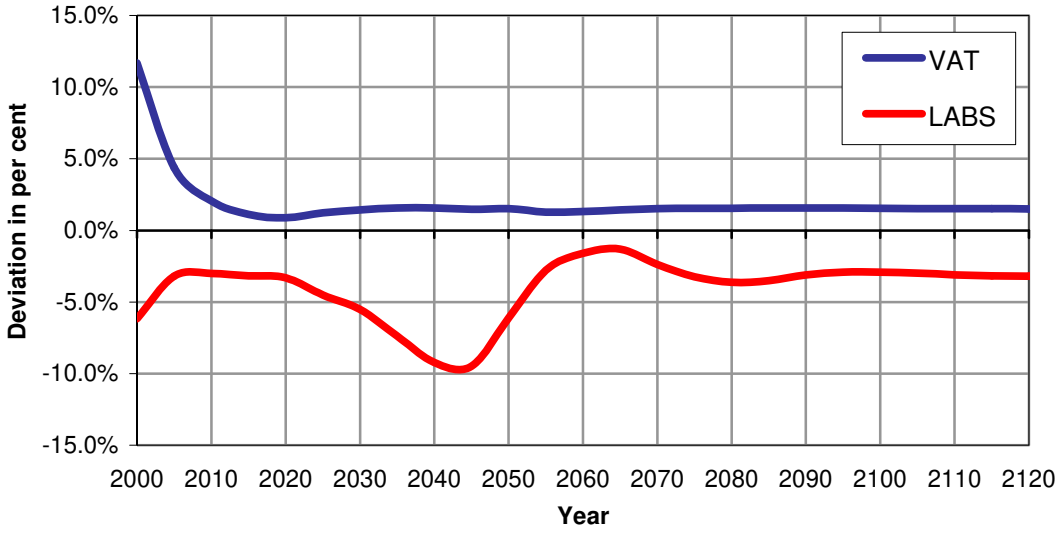
Figure 6. Expected real consumption in Slovenia in case of applying different sources of financing the pension system (retirement age of 60 years and full indexation)



Source: Author's simulations using SIOLG 2.0.

[4] Since general equilibrium theory is acknowledged as a version of the neoclassical theory, in an OLG-GE model effects on investment are also effects on savings.

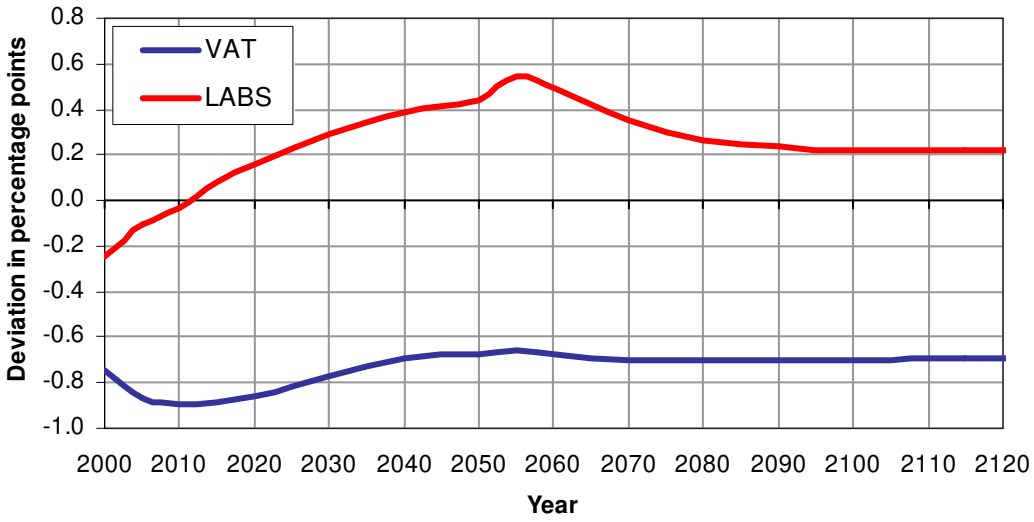
Figure 7. Expected real investments in Slovenia in case of applying different sources of financing the pension system (retirement age of 60 years and full indexation)



Source: Author's simulations using SIOLG 2.0.

The real interest rate changes can easily be explained by the effects of different scenarios on the capital stock (see Figure 8). In case of funding the pension system with revenues from value-added tax, the capital stock grows by more than in the reference case (Figure 8), which alone leads to a substantial fall in the real interest rate. This should be kept in mind as the second pillar, which is a fully-funded system in Slovenia, is expected to become of more importance in the following decades. In case of funding the pension system with revenues from labour income tax, on the other hand, the capital stock grows by less than in the reference case (see Figure 8), which leads to a somewhat higher real interest rate in the long run.

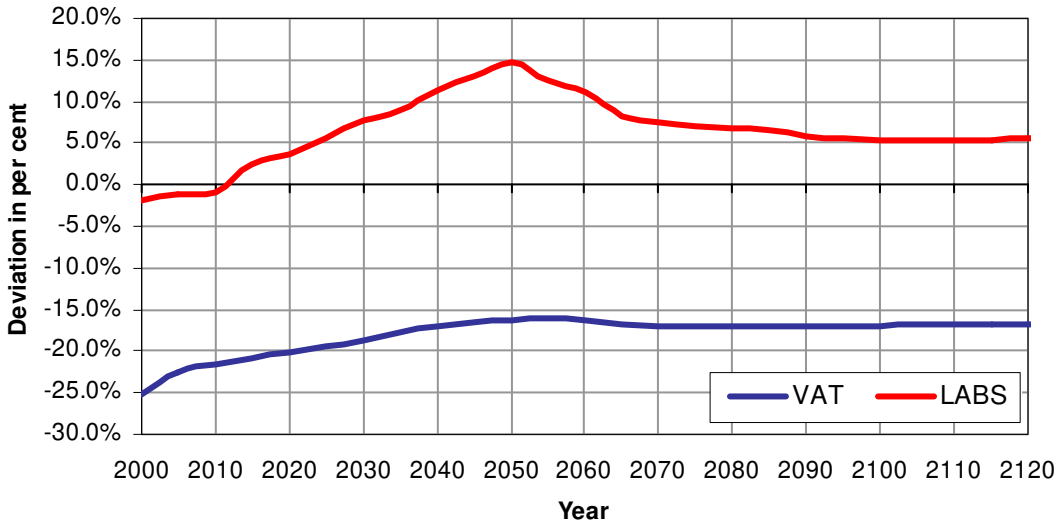
Figure 8. Expected real interest rate in Slovenia in case of applying different sources of financing the pension system (retirement age of 60 years and full indexation)



Source: Author's simulations using SIOLG 2.0.

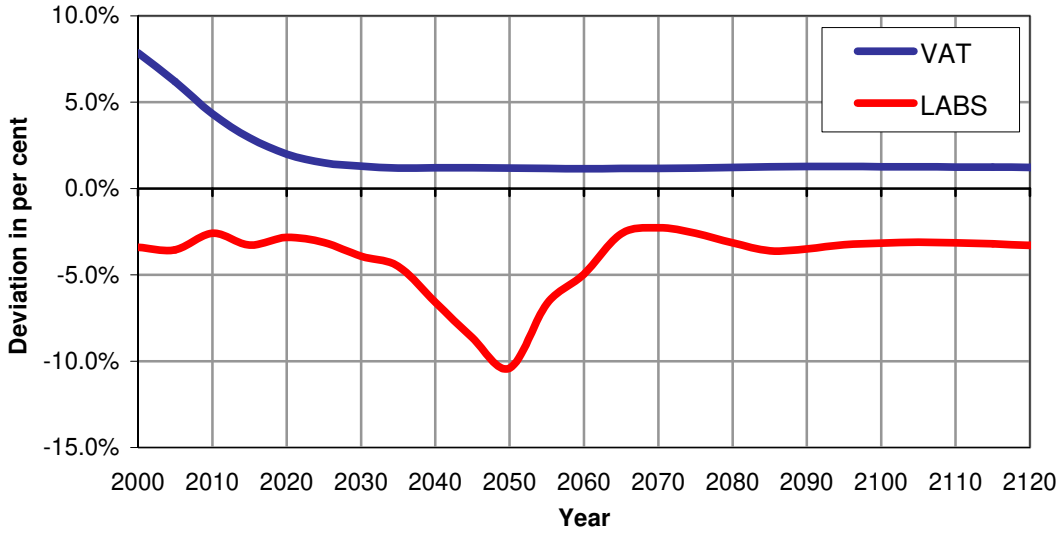
In case of funding the pension system with revenues from value-added tax, an important initial decline of real wages would arise (see Figure 9) due to necessary increase in the value-added tax rate and resulting raise in consumer prices. To keep unchanged level of consumption, economic agents need to increase their labour supply, hence the employment also increases (see Figure 10). Due to anticipated unfavourable demographic developments and consequential decrease in the number of active population, the labour supply and production factor prices would then adjust accordingly. Thus the real wages in case of funding the pension system with revenues from value-added tax are anticipated to gradually increase (after the initial decrease), as a consequence of gradual lessening of growth of consumer prices and accompanying increasing of labour costs. Changes in production factor prices would cause rising employment to settle down at somewhat higher level in comparison with the reference case.

Figure 9. Expected real wages in Slovenia in case of applying different sources of financing the pension system (retirement age of 60 years and full indexation)



Source: Author's simulations using SIOLG 2.0.

Figure 10. Expected employment in Slovenia in case of applying different sources of financing the pension system (retirement age of 60 years and full indexation)



Source: Author's simulations using SIOLG 2.0.

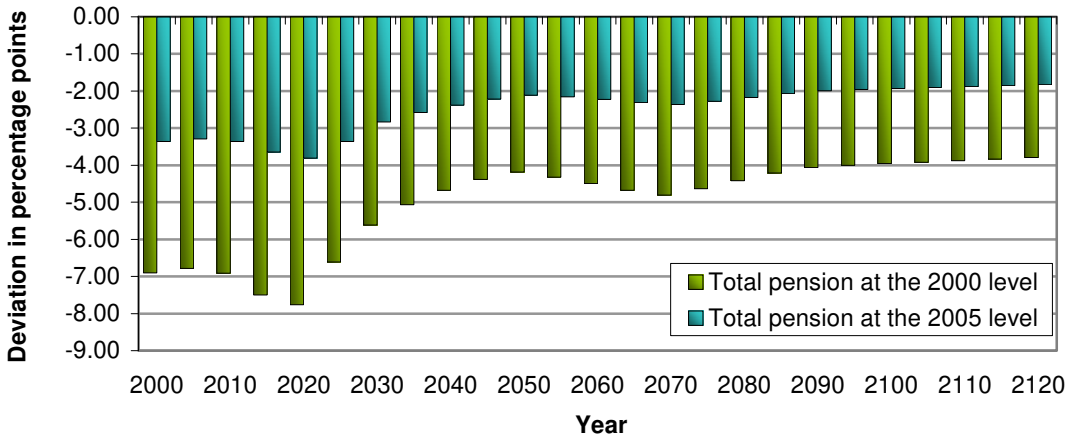
In case of funding the pension system with revenues from labour income tax, increases of labour income tax rate would, as already said, alter the intertemporal price of leisure. The future price of leisure would decrease in comparison with the present price of leisure, resulting in substitution of future labour supply for present labour supply. Employment would consequently decrease (see Figure 10). The additional increase of

labour income tax rate, needed to cover the IPDI deficit, would lead to additional reduction in the level of employment, while at the same time consumer prices would decrease in comparison with consumer prices in the reference case, resulting in rising real wages in comparison with real wages in the reference case (see Figure 9). The latter is certainly also a consequence of increasing labour costs due to declining number of active population.

Now consider the impact of introducing a mandatory second pension pillar on macroeconomic variables of the Slovenian economy. The increased saving leads to complex reciprocal effects within the economy between sources and consequences of economic activity. Despite the fact that this form of saving is not voluntary, additional sources of income to reach the target level of savings must be found and be as optimal as possible (with respect to the additional liquidity constraint incorporated into the model). If one assumes that any additional economic growth would be insufficient, nor would it appear immediately, households could reduce their current consumption or increase their labour supply (dedicating a larger proportion of their labour endowment to labour at the expense of leisure). On the other hand, the greater accumulation of savings leads to higher investment, high capital stock and, finally, plausibly higher economic growth and higher potential future consumption as well.

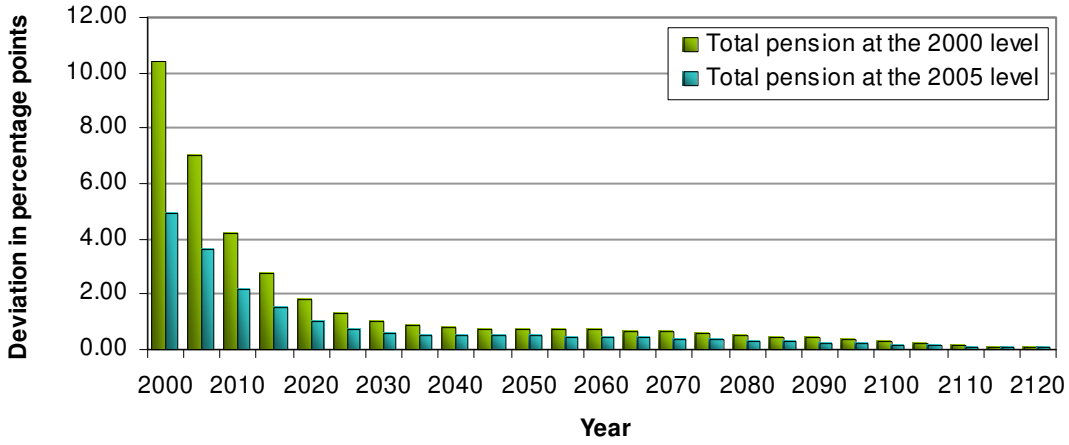
As indicated by Figure 11, the supplementary saving required due to the introduction of mandatory supplementary pension insurance reduces real household consumption compared to the scenario with only the minor existing (reference) second pension pillar (See Figure 6). Figure 12 indicates that this also leads to growth in household labour supply compared to the scenario with just the reference second pension pillar (see Figure 10). The growth in labour supply is initially considerable (on introduction of the mandatory second pension pillar), and then decreases before stabilising in the long term. The large initial growth in labour supply is related to the assumption in the model that households start to save within the second pension pillar in 2000. Subsequently, demographic trends come to the fore that reduce the size of the active population and by increasing labour costs (see Figure 9) compensate for the quantitative reduction of labour in the value of labour.

Figure 11. Expected change in real consumption in Slovenia due to supplementary second pension pillar saving (retirement age of 60 years and full indexation)



Source: Author's simulations using SIOLG 2.0.

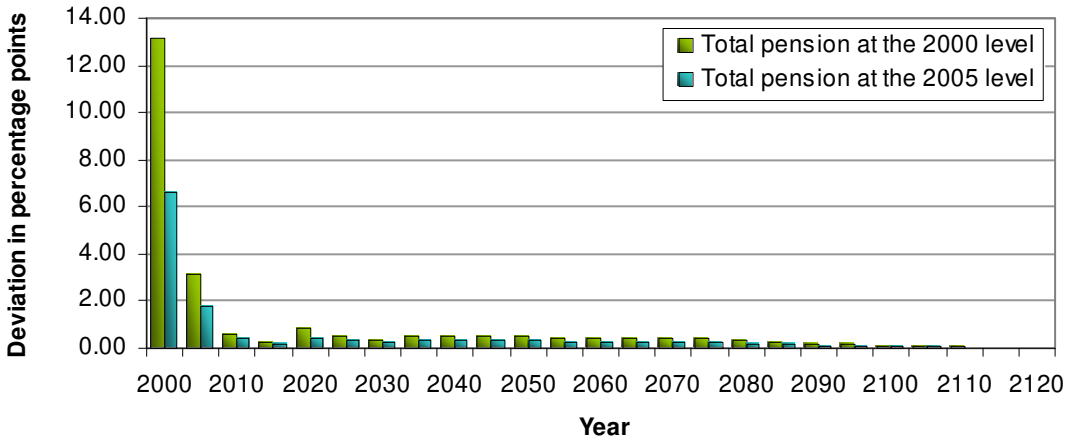
Figure 12. Expected change in employment in Slovenia due to supplementary second pension pillar saving (retirement age of 60 years and full indexation)



Source: Author's simulations using SIOLG 2.0.

On the hand, as stated above, the increased volume of saving facilitates an increase of real investment, as indicated in Figure 13. In comparison with the scenario with just the reference second pension pillar (see Figure 7), real investment first grows heavily (on the introduction of the mandatory second pension pillar), and then rapidly stabilises, maintaining low long-term growth compared to the reference scenario excluding the mandatory second pillar. The reason for this dynamics can again be found in the assumption of the model, according to which households save within the second pension insurance pillar from 2000 onwards. As a consequence, the capital stock follows a similar dynamics, only with a lag of one model time period (five years). It may further be stated that the growth of investment and capital stock is favoured by a fall in real interest rate, which is indeed small and stabilises in the long term at 0.15 percentage points.

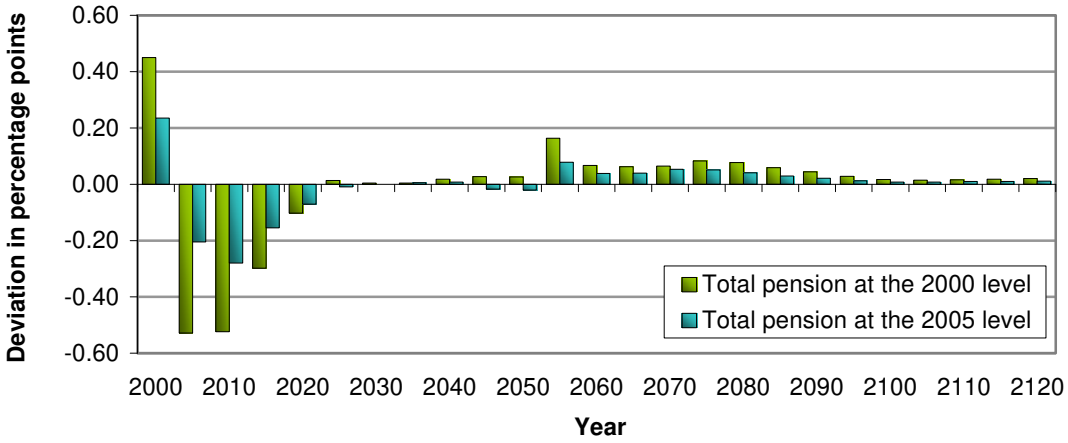
Figure 13. Expected change in real investment in Slovenia due to supplementary second pension pillar saving (retirement age of 60 years and full indexation)



Source: Author's simulations using SIOLG 2.0.

Finally, Figure 14 indicates that increased investment leads to somewhat higher long-term growth of real GDP compared to the scenario with just the reference second pension pillar (see Figure 5). The additional growth is initially significant (on introduction of the mandatory second pension pillar), but then immediately becomes negative in the following period. This is understandable, since at the introduction of the mandatory second pillar the initial shock due to growth in real investment caused by the additional saving is so large that it compensates for the fall in real consumption (see Figures 11 and 13). The economy then requires some time to make use of the additional capital stock generated by the additional investments. The effects of the demographic slowdown of real GDP must also be taken into account.

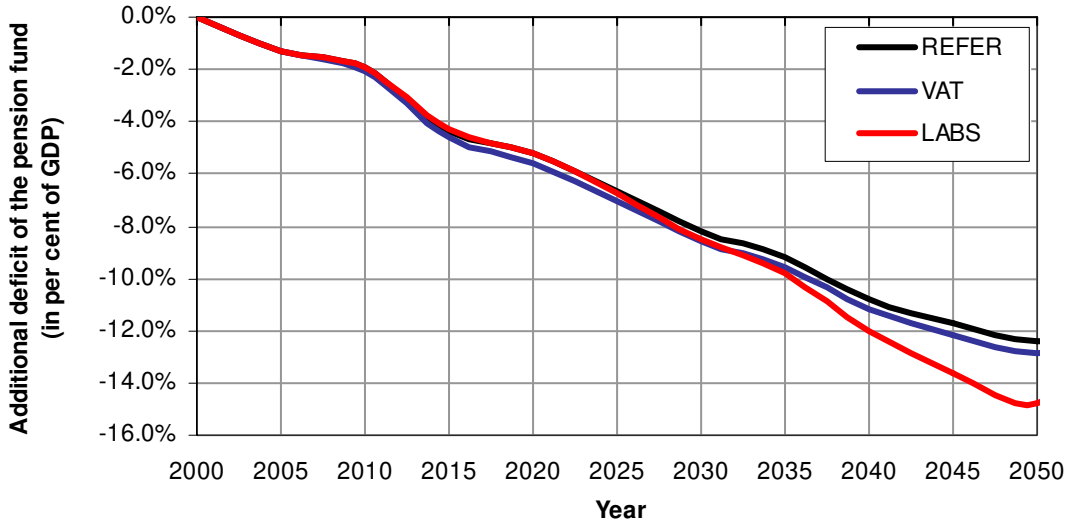
Figure 14. Expected change in real GDP in Slovenia due to supplementary second pension pillar saving (retirement age of 60 years and full indexation)



Source: Author's simulations using SIOLG 2.0.

The model simulations indicate that in case of the current situation in the pension system, i.e. given retirement age of 60 years and full indexation of pensions with respect to wages, the additional IPDI deficit would grow to between 10% and 12% of GDP by 2040, given the scenario applied (see Figure 15). The significantly higher deficit seen in the scenario where the public pension system is financed with revenues from labour income tax is a consequence of growth of real wages and of a lower rate of GDP growth, compared to the reference scenario. To understand the dimensions of the forecast growth in pension expenditure, it is sufficient to mention the fact that over the period 1947 to 1951, when the pension system started functioning, the total proportion of the IPDI's funds in GDP was just 2.5% (Stanovnik and Kukar, 1995). Meanwhile, at the beginning of the 1990s, due to a drastic fall in the number of employees and the subsequent steep rise in pensioners, pension expenditure had already passed the 10% of GDP milestone, with the figure settling at around 13% of GDP following the implementation of the 1999 pension reform.

Figure 15. Additional deficit of the Slovenian state pension fund in case of applying different sources of financing the pension system (retirement age of 60 years and full indexation)

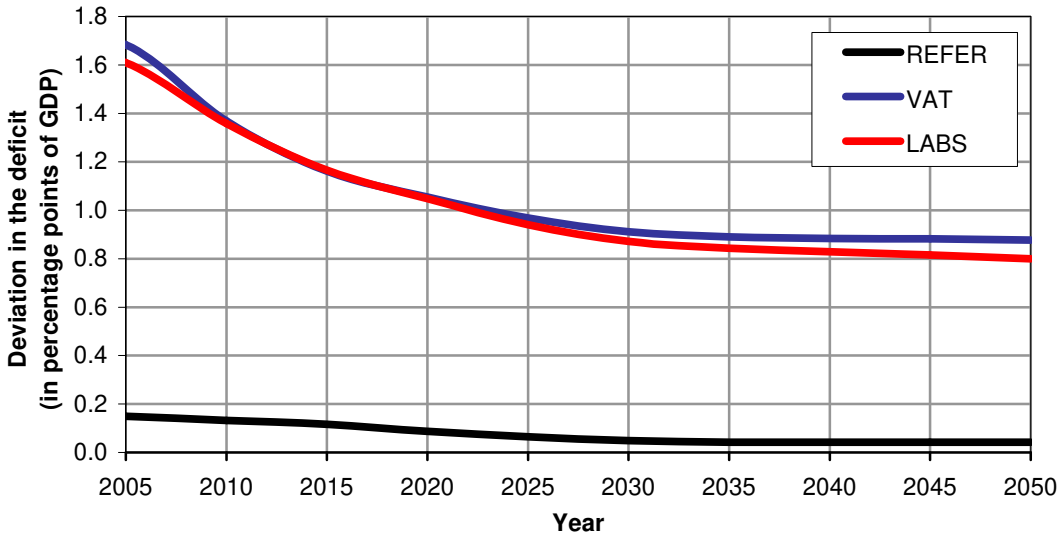


Source: Author's simulations using SIOLG 2.0.

At last, we are interested in the impact of a mandatory second pension pillar on the first pillar, i.e. the effect on the balance of cash flows of the IPDI. If employees increase

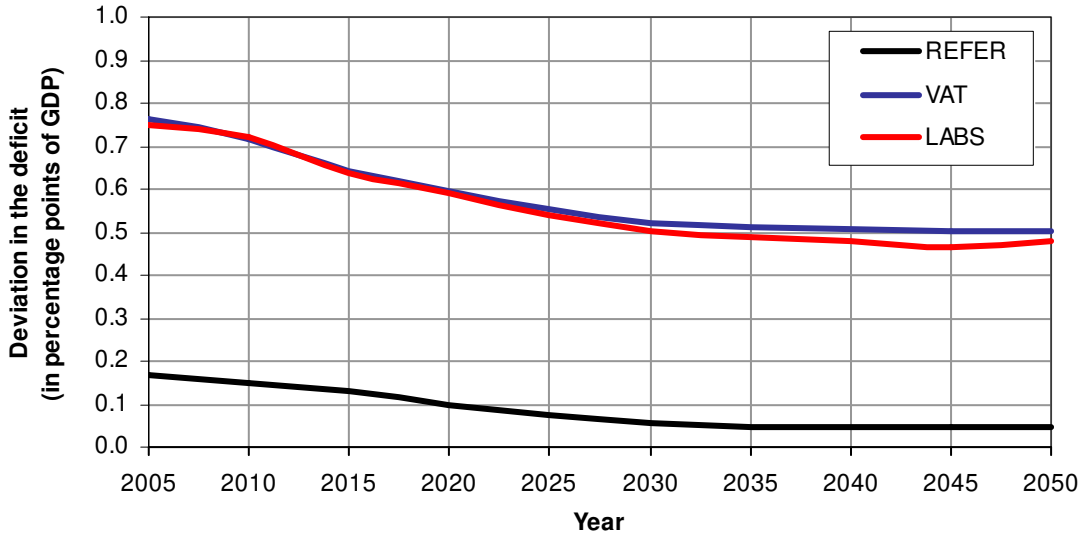
second pillar saving, the value of their labour supply has to increase or they have to reduce the value of their current consumption. If the first option is selected, their gross income from the employment on which social insurance contributions (including pension and disability insurance contributions) are paid will increase, which could lead to a reduction in the IPDI deficit. As indicated by Figure 16, keeping the target full pension at the level before the 1999 pension reform came into effect would actually lead to this phenomenon. The pension fund deficit would be reduced due to the participation of employees in a (target) mandatory second pillar by between 0.80 and 1.74 GDP percentage points, depending on the year selected. On the other hand, in case of keeping the target full pension at the level before the 2005 changes of the pension reform were implemented, the pension fund deficit would be reduced merely by between 0.58 and 0.75 GDP percentage points, depending on the year selected.

Figure 16. Expected change in the deficit of the Slovenian state pension fund in case of supplementary pension savings in the second pillar keeping the total pension at the 2000 level



Source: Author's simulations using SIOLG 2.0.

Figure 17. Expected change in the deficit of the Slovenian state pension fund in case of supplementary pension savings in the second pillar keeping the total pension at the 2005 level



Source: Author's simulations using SIOLG 2.0.

Conclusion

The article presents an analysis of supplementary pension insurance in Slovenia and its subsequent effects on welfare in Slovenia, macroeconomic variables of the Slovenian economy and the pension fund deficit. Thus a dynamic OLG general equilibrium model was constructed, which enables analysis of intra-generational and inter-generational redistribution effects of different strategies of public financing in order to achieve sustainable economic growth. Different scenarios were then prepared and analyzed with the model SIOLG 2.0 in order to fulfil our goal.

It has been established that the volume of current second pillar saving in Slovenia is too low to compensate for the reduction in the mandatory pension insurance rights. It is not only the fact that participation in the second pension pillar is too low, but especially the premia paid in are too low. The model simulations indicated that in case of retirement age of 60 the saving required for the new generations to compensate for the total effects of the pension reform is approximately 8.5% of the net wage, while the changes in the pension legislation from 2005 can be compensated by savings of approximately 5.0% of the net wage. The reference (voluntary) second pillar saving of the present new generations amounts to approximately 0.4% of the net wage on average.

The burden of introducing the 1999 pension reform and its amendments will largely be born by the young active generations and future generations on behalf of already retired generations and the baby boom generations that are starting to retire. Due to a fall in the replacement rate and the effect of incomplete pension indexation with respect to wages between 2000 and 2005 on one hand, but primarily due to growth in the dependency ratio as a consequence of demographic aging on the other hand, the younger existing and new generations will have to pay higher contributions for the same or a lower pension, while to compensate for welfare from supplementary pension insurance they will have to reduce current consumption or increase their labour supply. The effect of current second pillar saving on welfare is practically negligible, while a higher level of second pillar saving would have a greater effect on welfare. The intergenerational distribution of welfare depends on the target that the introduction of mandatory supplementary pension saving would be intended to meet.

The macroeconomic consequences of introducing a mandatory fully-funded component of pension insurance would be positive or at least not negative. Increased pension saving reduces current consumption and increases the labour supply of active generations, but also increases the volume of savings available, so the increased investment may increase capital reserves and production, which leads to an increase in economic growth and potential future consumption. The model simulations indeed indicated that increased investment would lead to somewhat higher long-term growth of GDP, compared to the scenario with just the reference second pension pillar. The additional growth is initially significant (on introduction of the mandatory second pension pillar), but then immediately becomes negative in the following period. This is understandable, since at the introduction of the mandatory second pillar the initial shock due to growth in real investment caused by the additional saving is so large that it compensates for the fall in real consumption (see Figures 11 and 13). The economy then requires some time to make use of the additional capital stock generated by the additional investments.

It may further be stated that the growth of investment and capital stock is favoured by a fall in real interest rate, which stabilises in the long term at a relatively low value. Alongside all the above, one must also take into account the effects of the demographic slowdown of real GDP, and the effects of the demographic reduction of the active population on future labour cost growth. Mandatory supplementary saving indeed reduces the consumption and welfare of young generations due to the liquidity constraint, however, the welfare and potential consumption increases later in the life cycle for these generations.

One can conclude with the finding that alternative forms of old-age saving are not developing quickly enough to successfully deal in the long term with the problems of an aging population, therefore Slovenia will require additional measures at a number of levels to normalise the state of the pension system. The 1999 PDIA introduced incentives for retirement saving in funded systems, which could be subject to modifications. Another possible solution to deteriorating economic circumstances of the elderly could be to reduce the difference between the minimum and maximum pension base by raising the former and reducing the latter. This would enable insured persons from lower income brackets and compel insured persons from middle and higher income brackets in Slovenia to save "voluntarily" for retirement in the context of the second pension pillar. Ultimately, mandatory (legally binding) supplementary pension insurance would assist in the move towards a more rational reallocation of life-cycle consumption and a more optimal labour supply. The consequent increased activity of insured persons would also lead to a greater volume of contributions for mandatory pension insurance, which would reduce the public pension fund deficit.

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