

SUSTAINABILITY OF THE SLOVENIAN PENSION SYSTEM

An Analysis with an Overlapping-generations General Equilibrium Model

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Abstract

The article presents an analysis of welfare effects in Slovenia, an analysis of macroeconomic effects of the Slovenian pension reform and an analysis of effects of the pension fund deficit on sustainability of Slovenian public finances with a dynamic OLG general equilibrium model. It has been established that while young generations and new generations will lose from the pension reform, even complete implementation of the reform might not be sufficient to compensate unfavourable demographic developments. The level of expected deficit of the PAYG-financed state pension fund seems to be most worrying. Financing the pension system with VAT revenues as an extreme case could result in more sustainable public finances, since GDP and welfare levels ought to increase, yet this might be infeasible to implement politically, given that the generations of voters would have their welfare decreased. In addition, the present pension system is intransparent and tremendously complicated and should primarily be made more comprehensible to the public.

Key Words: general equilibrium models, macroeconomic effects, OLG-GE, PAYG, pension system, sustainability of public finances, Slovenia, welfare analysis

JEL Classification: C68, D58, D61, D91, E62, H55

1 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. Mechanisms and actions adopted and implemented by the Republic of Slovenia ought to ensure solid foundations for the social security, as well as enable and promote social inclusion of the population (*cf.* IMAD 2001). 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.

Early 1990s represent the beginning of Slovenia's economic transformation from the workers' self-management to a market economy through the process of restructuring. This process, which has led to recession as a result of the loss of former Yugoslavian markets, was also the cause of surpluses on the labour market. To maintain social sustainability, the costs of transition were shifted to the pension system through mass early retirement. If the increasingly perceivable unfavourable demographic developments are taken into account, it becomes obvious that the pension system, implemented with the 1992 Pension and Disability Insurance Act (PDIA), would 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 PDIA and is being implemented from 1 January 2000.

In the present analysis we are interested in the effects of the 1999 pension reform on welfare of different generations in Slovenia and on sustainability of Slovenian public finances. 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 1.0 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 welfare effects, macroeconomic effects of the pension reform and effects of the state pension fund deficit on sustainability of public finances. In the final chapter we summarize the central findings of the article.

2 Description of the OLG-GE Model of the Slovenian Economy

The model SIOLG 1.0 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. 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'être* 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 1.0 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 pillar of the Slovenian pension system is being modelled. Since the model incorporates most of the contemporary techniques of the CGE modelling (*cf.* Verbič 2005), 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 dynamic general equilibrium model SIOLG 1.0 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.

3 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 persons¹.

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.

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 Pension and Disability Insurance Institute (PDII), in the same year. Namely, with the new Pension and Disability Insurance Act the PDII was compelled to pay contributions for health insurance for pensioners, hence contributing at least additional per cent 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 PDII; 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 government budget to the PDII 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 a few years, hence we can speak, according to Štrovs (2000: 11-12), of a financial crash of the Slovenian state pension fund in 1996. 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. Disincentives are applied to the pension base and amount to 0.1 – 0.3 percentage points of accrual rate for every month, negatively depending on actual retirement age of such individual; the closer actual retirement age is to statutory retirement age, the lower are the deductions. 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 likewise amount to 0.1 – 0.3 percentage points of accrual rate for every month, positively depending on actual retirement age of an individual. They are cumulative; yet do not rise further after three

additional years of service. Both incentives and incentives are to be added 1.5 percentage points of accrual rate for every year of service missing or added, 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 gender². 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. Also, the law further diminished possibilities of the self-employed to “tamper” with their contribution base. 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 pensions³.

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 pensions⁴ 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

² Gender effects of different factors of labour force participation rate, such as age, education, wage and unemployment benefits, are presented in detail by Verbič (2004).

³ It has to be mentioned that in 2005 the Government of the Republic of Slovenia has prepared changes of the 1999 PDIA to achieve full indexation of pensions. Together with proposed increase in the pensioner’s recreation grant and adjustment of widower’s pension, this could have substantial effects on controlling the expenditure of the system of public finances in the future.

⁴ Comparable pensions exist when two pensioners enter the pension system under the same conditions and both have full pension qualifying period.

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.

And, last but not least, one should make known a very important novelty of the 1999 pension legislation, besides the system of incentives and disincentives. Namely, pensions of the existing pensioners are adjusted to entry pensions of new pensioners according to Article 151 of the 1999 PDIA; the adjustment amounts approximately to -0.6 percentage points of the pension per annum. This means that pensions of existing pensioners are being decreased in real terms, 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.

4 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 1.0, 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 deficit⁵ of the state 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) PDII deficit is of course being funded by pension contributions. The reference scenario represents the basis for comparison of consequences of a range of economic policies in the system of public finances.

⁵ 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.

Analysis of the Slovenian economy, where we take into account upcoming developments of the Slovenian pension system⁶, is then performed by forming two counterfactual scenarios and comparing their outcomes to the results of the reference scenario. Whereas the latter refers to the present structure of financing the pension system, where only the additional deficit is being financed with revenues from value-added tax, the 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 PDII 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. We commence by analyzing welfare effects in Slovenia, followed by an analysis of macroeconomic effects of the Slovenian pension reform, whilst the chapter is being concluded by analyzing effects of the PDII deficit on sustainability of Slovenian public finances.

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, where activity levels remain unchanged at the base-year level. The pension block of the model SIOLG 1.0 follows the 1999 PDIA 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; (4) average pension growth reaches 80 per cent of average wage growth; and (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. The growth of residual non-pension expenditure of the PDII follows population growth and exogenous productivity growth.

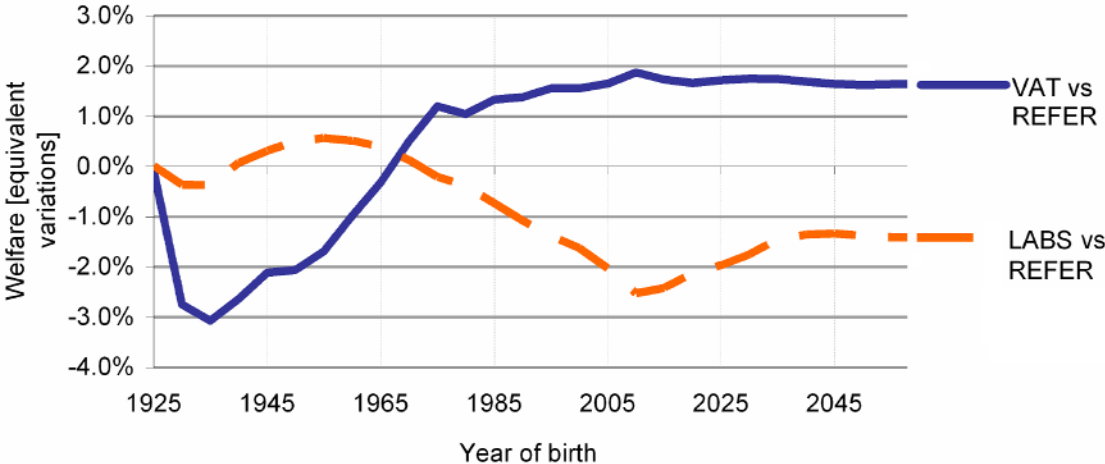
4.1 An Analysis of Welfare Effects in Slovenia

The inter-generational redistribution effects are shown in Figure 1. We use the Hicks's equivalent variations (HEV) as a measure of change in the welfare of generations. Equivalent

⁶ Pension system herein actually refers to the PAYG-financed first pillar (the PDII) of the three-pillar Slovenian pension system, unless explicitly stated otherwise.

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.

Figure 1. Welfare effects in Slovenia in case of applying different sources of financing the pension system



A first glance at the Figure 1 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.

Alternatively, according to Auerbach and Kotlikoff (1987), for young individuals the consumption tax is equivalent to a wage tax⁷. The elderly however do not supply any labour. Hence the consumption tax is equivalent to a lump sum tax on their assets. Since assets, once accumulated, are inelastic in supply, this lump sum tax does not distort economic decisions. A value-added tax will therefore have a more positive (or less negative) impact on welfare compared with a wage or labour income tax.

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. Correspondingly, a raising labour income tax rate will also 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 current for future labour supply. 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.

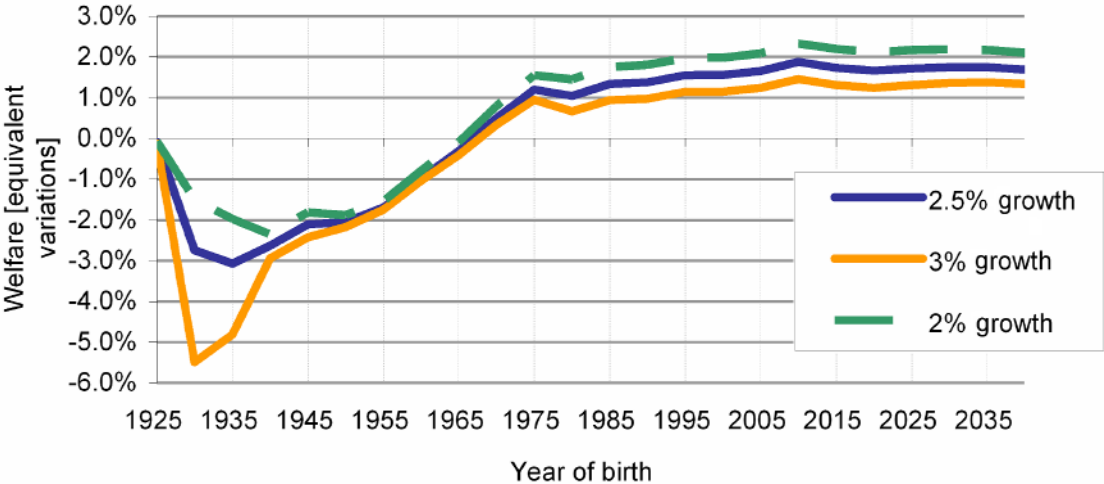
Figure 2 illustrates, what happens with the welfare effects in case of funding the pension system with revenues from value-added tax, given that the assumed steady-state growth rate is lower (2 per cent) or higher (3 per cent) than the reference growth rate. It can be established that the differences in the long run are minor. As expected, higher growth rate compared to the reference growth rate has more negative effects on the elderly as their income is not a lot higher; especially, as already mentioned, since these generations live on their savings and do not gain much from higher wage growth due to higher productivity growth. As growth of pensions is partially indexed to growth of wages and the replacement ratio only gradually decreases, the elderly have to pay more taxes compared to the reference case and will therefore suffer higher losses of welfare.

Another important aspect of the tax 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

⁷ In this case, value-added tax represents a proxy for the consumption tax, while labour income tax represents a proxy for the wage tax.

what remains is the pure efficiency effect of the tax reform. It has been ascertained that in case of funding the pension system with revenues from value-added tax, there is a positive overall efficiency effect of raising the welfare level of all generations by 0.55 per cent. In contrast, the overall efficiency effect in case of funding the pension system with revenues from labour income tax is negative and amounts to -0.81 per cent.

Figure 2. Welfare effects in Slovenia in case of financing the pension system with revenues from VAT; outcomes of different steady-state growth rates



Although potential financing of the pension system with revenues from value-added tax has a clearly positive effect on the economy in the long run, one has to bear in mind that a switch to a situation where a part of the social security system is financed by revenues from value added taxes is probably politically infeasible, as the generations that would decide on the tax reform are the ones that would lose. This is unfortunate as the young generations are the ones that will have to cope with relatively lower pensions and at the same time with higher taxes to finance the social security system.

4.2 An Analysis of Macroeconomic Effects of the Slovenian Pension Reform

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 3. One should bear in mind that in the benchmark scenario, i.e. in the case with highest GDP growth (see Figure 3), 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 3. Expected growth of gross domestic product in Slovenia in case of applying different sources of financing the pension system

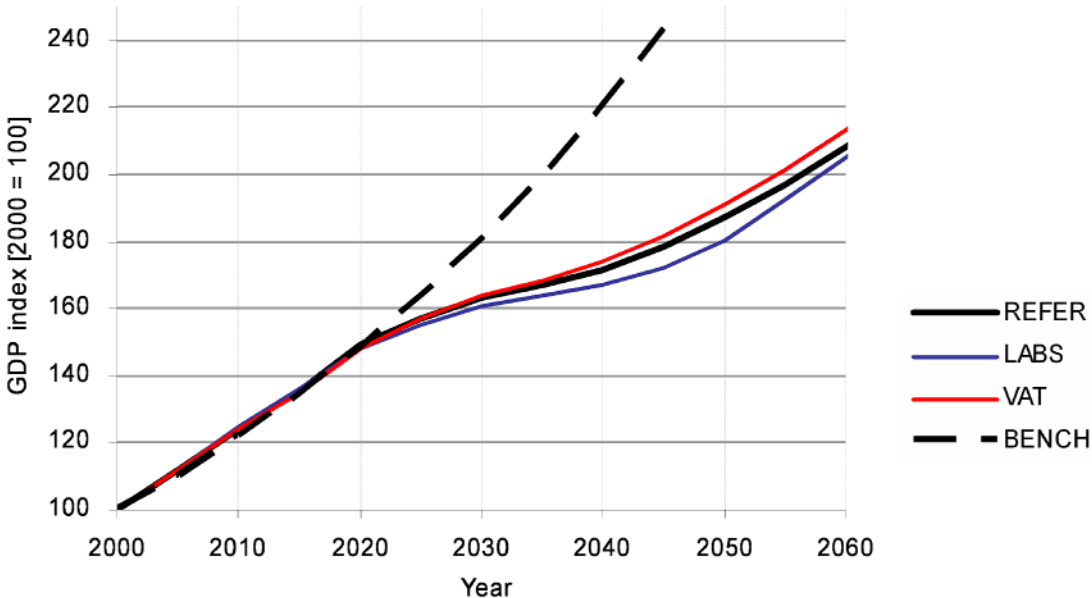
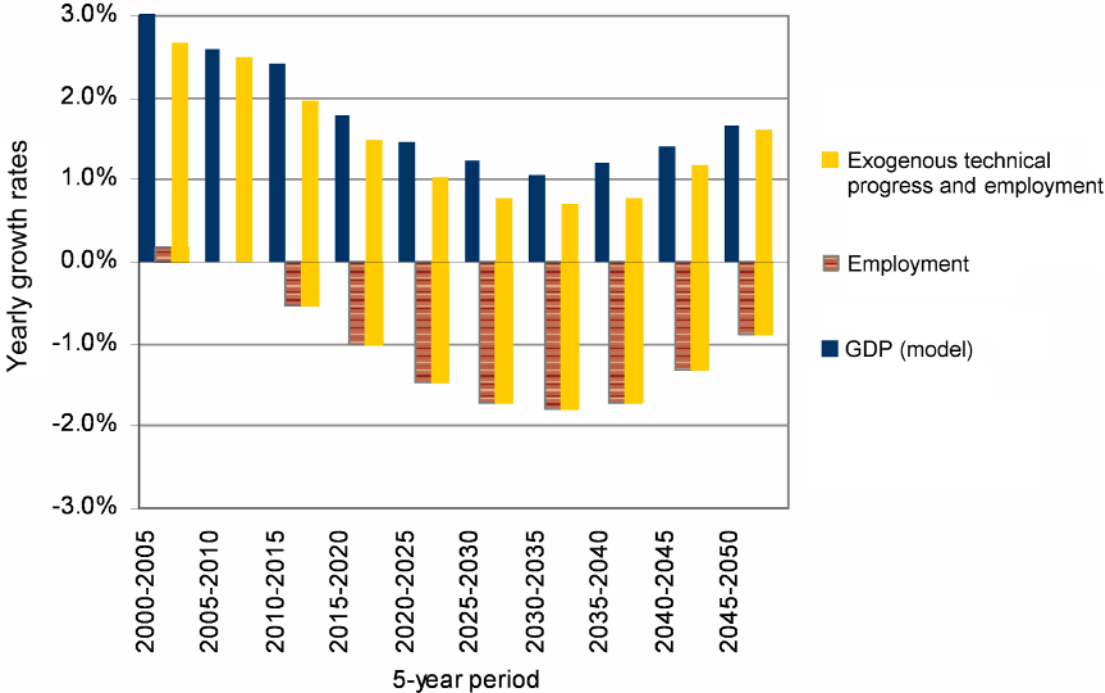


Figure 4 represents the gradual demographic slowdown of GDP growth in more detail. The assumed decline of labour supply over the coming years would lead to a negative growth rate of real GDP, provided that there was no productivity growth. Given the assumed exogenous technical progress and fixed shares of employed persons in total population one can calculate the potential GDP growth, which is higher than the modelled GDP growth. Namely, the model SIOLG 1.0 allows for adjustments of labour supply, as well as changes in production factor prices, savings and investment. The unfavourable demographic developments at given exogenously-determined productivity growth are going to considerably reduce the growth rate of GDP; from initial 3 per cent in the 2000-2005 period to meagre 1 per cent in the 2030-2035 period.

Figure 4. Effects of future demographic developments in Slovenia on gross domestic product



The effects of funding the pension system with revenues from value-added tax and with revenues from labour income tax on investment (savings⁸) and capital stock can be ascertained from Figures 5 and 6, respectively. Increase in the value-added tax rate makes consumption more expensive and therefore encourages households to reduce their present consumption and increase savings (investment). This 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 a substitution of future for current labour supply. The latter therefore decreases. In order to maintain the present level of consumption, households decrease current savings (investment). This has an effect of decreasing the capital stock, though it can potentially also represent an increase in the level of future consumption.

⁸ 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 5. Expected investments in Slovenia in case of applying different sources of financing the pension system

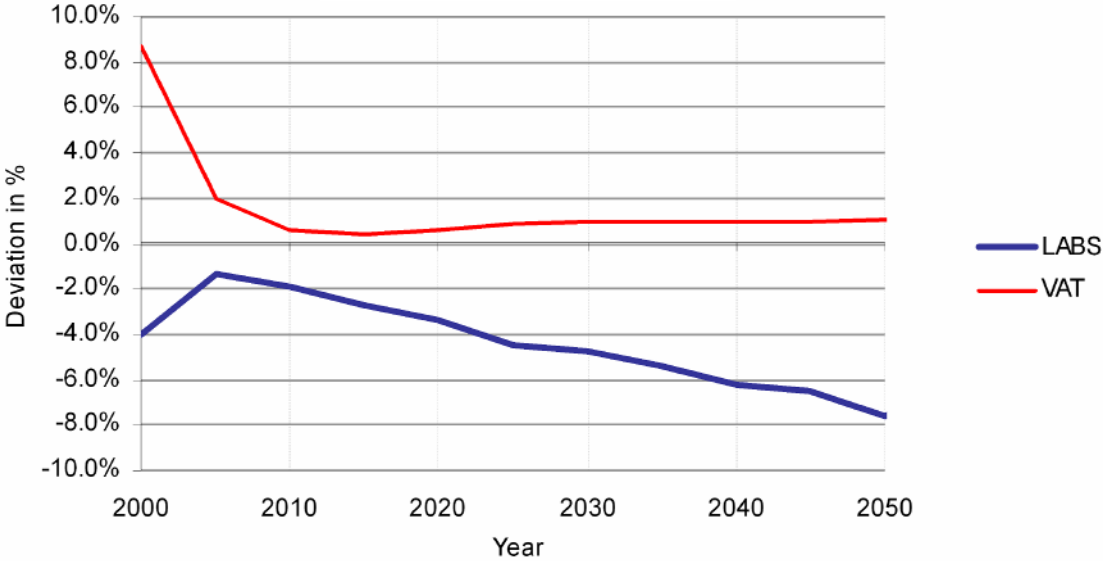
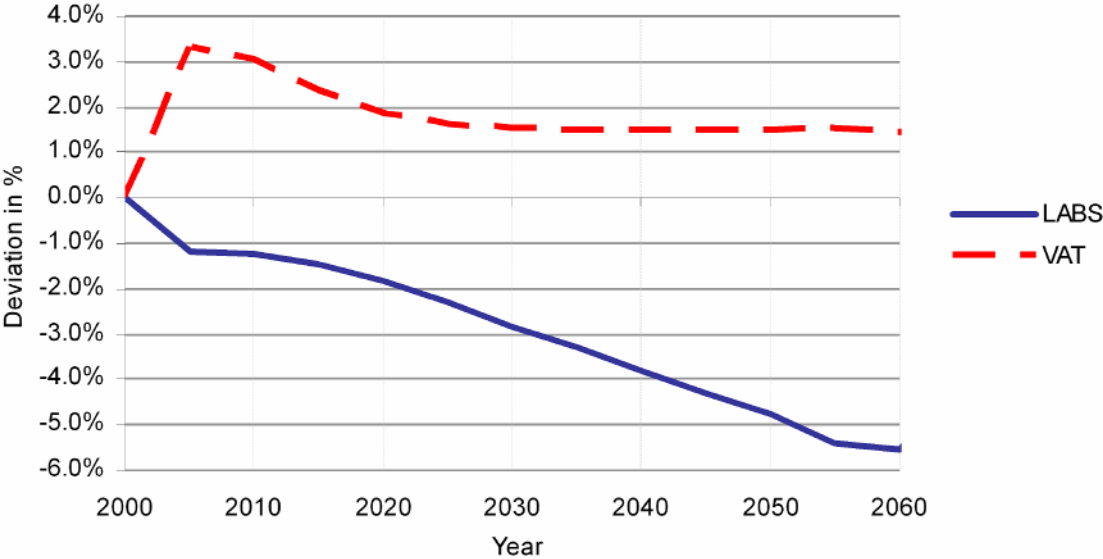


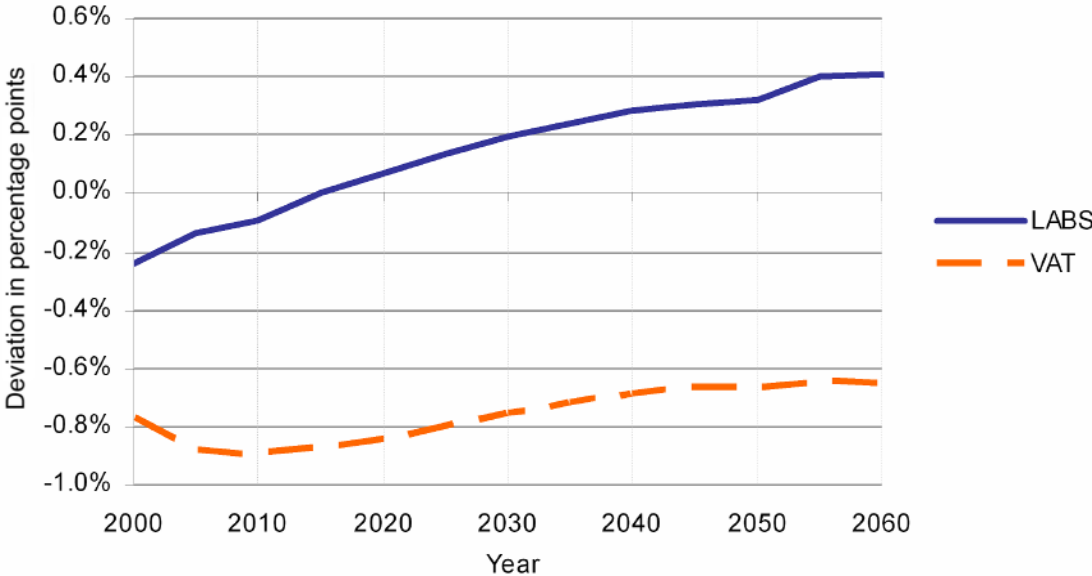
Figure 6. Expected capital stock in Slovenia in case of applying different sources of financing the pension system



The real interest rate changes can easily be explained by the effects of different scenarios on the capital stock (see Figure 7). In case of funding the pension system with revenues from value-added tax, the capital stock grows by more than in the reference case, which alone leads to a fall in the real interest rate. The latter is substantial and amounts to approximately 0.6 per cent in the long run. 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. If the

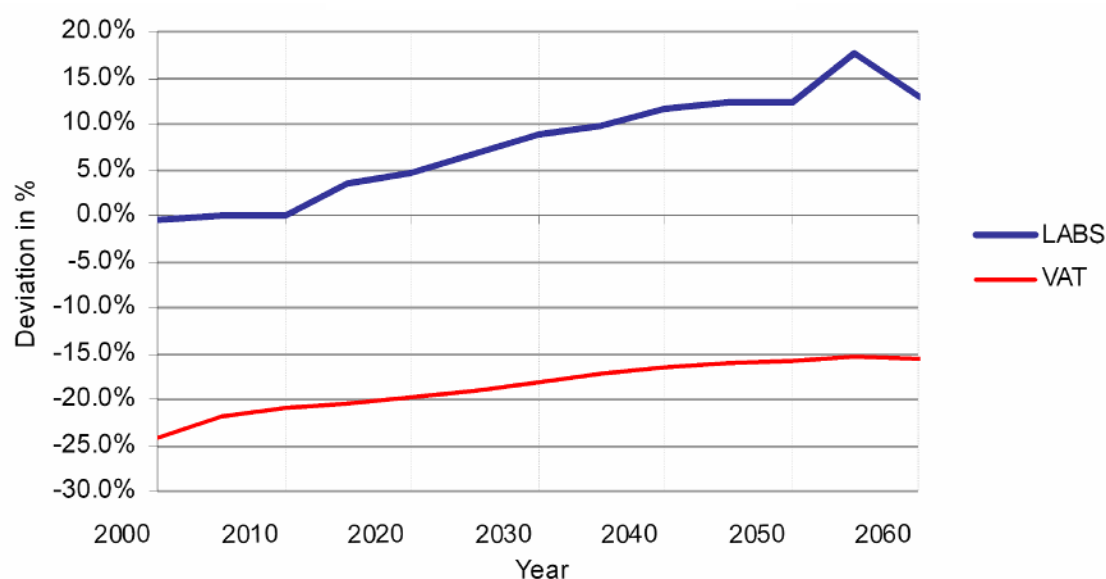
baby boomers decide to run down their assets, the asset prices would drop, thus straining the financial position of the funded systems. The additional decrease of the real interest rate would strengthen this effect, but it must be noted that the fall in asset prices due to the asset market meltdown hypothesis is controversial (*cf.* Poterba 2001; Abel 2003). 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, which leads to a raise in the real interest rate of approximately 0.4 per cent in the long run.

Figure 7. Expected real interest rate in Slovenia in case of applying different sources of financing the pension system



In case of funding the pension system with revenues from value-added tax, an important initial decline of real wages would arise due to necessary increase in the value-added tax rate and resulting raise in consumer prices (see Figure 8). To keep unchanged level of consumption, economic agents need to increase their labour supply, hence the employment also increases. 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 by approximately 8 per cent until 2040, 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 approximately 1 percentage point higher level in comparison with the reference case.

Figure 8. Expected real wages in Slovenia in case of applying different sources of financing the pension system



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 with present labour supply. Employment would consequently decrease. The additional decrease of labour income tax rate, needed to cover the PDII 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. The latter is certainly also a consequence of increasing labour costs due to declining number of active population.

4.3 An Analysis of Effects of the Pension Fund Deficit on Sustainability of Slovenian Public Finances

According to prepared model simulations, the additional annual deficit of the state pension fund is expected to rise to 8 – 12 per cent of GDP in 2040, with regard to the source of financing the pension system that is being applied (see Figure 9). Evidently, the additional deficit is higher in case of funding the pension system with revenues from labour income tax, which is a consequence of both real wage increase and lower GDP growth compared to the reference case. It should be stressed though, that the pension indexation rule has significant effects on the value of additional deficit of the PDII. Additional decrease in uprating of

pensions to the level of the so called “Swiss method”, actually indicating permanent sustenance of the present situation in the pension system⁹, might thus exhibit a nearly sustainable pension system in Slovenia in the long run, but also an exceptional decrease in the level of real pensions compared to real wages.

Figure 9. Additional deficit of the Slovenian state pension fund in case of applying different sources of financing the pension system

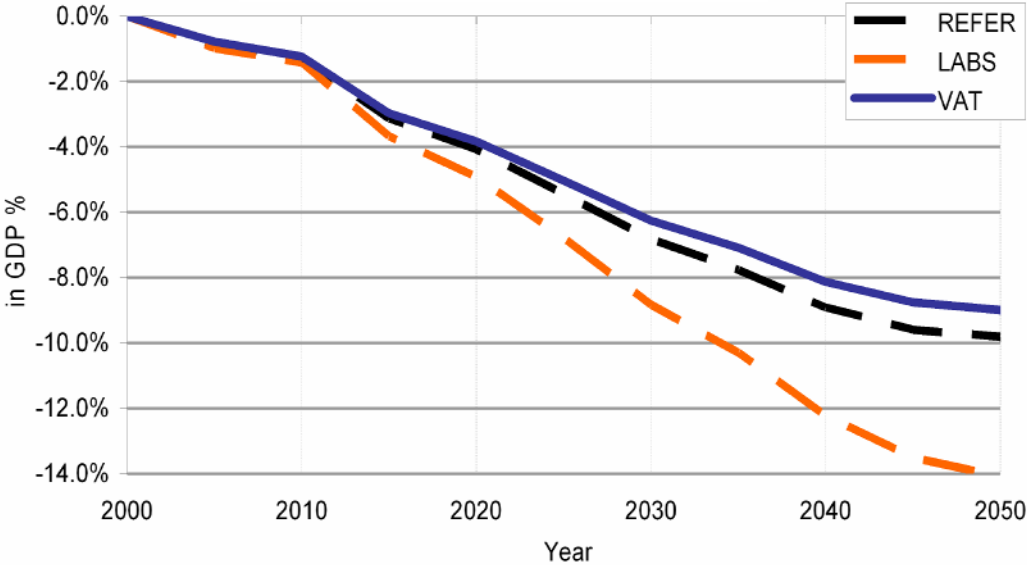


Figure 10 illustrates, what happens with the additional deficit of the state pension fund in the reference case, given that the assumed steady-state growth rate is lower (2 per cent) or higher (3 per cent) than the reference growth rate. It can be established that the additional deficit is larger in case of lower growth rate and smaller in case of higher growth rate, as expected. This is a consequence of the indexation rule applied; since wages (and indirectly also the GDP) grow faster than pensions, the additional deficit of the state pension fund is higher at lower applied steady-state growth. One should observe though, that the differences in the estimated additional deficit of the PDII in case of applying different assumed growth rates are insignificant and add up to 0.5 percentage point not earlier than in the 2000-2040 period.

⁹ Namely, the “Swiss method” requires adjustments of pensions reflecting wages and prices in equal proportions, which is becoming fairly comparable by its effects to the present pension system in Slovenia.

Figure 10. Additional deficit of the Slovenian state pension fund in the reference case; outcomes of different steady-state growth rates

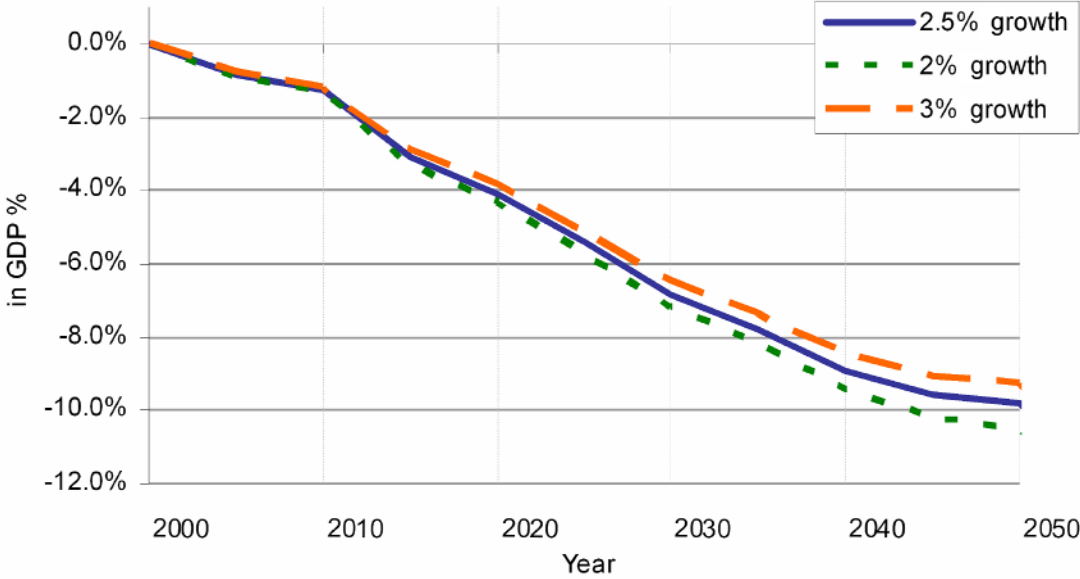
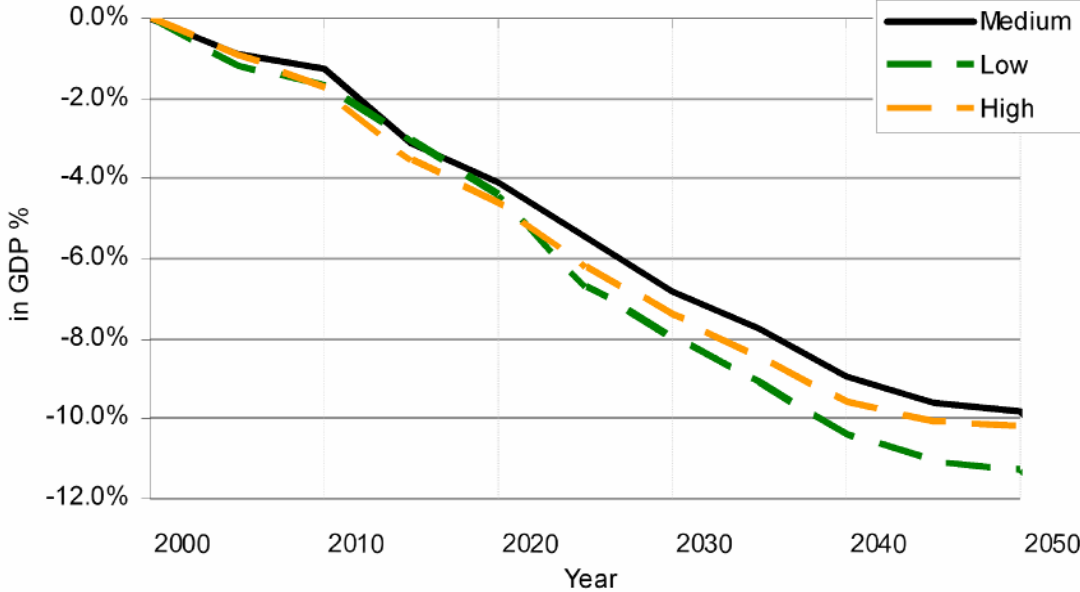


Figure 11. Additional deficit of the Slovenian state pension fund in the reference case; outcomes of different variants of demographic projections



Finally we investigate, what happens with the additional deficit of the state pension fund in the reference case, given that more or less favourable variant of demographic projections is applied. Similarly, the differences in the estimated additional deficit of the PDII in case of applying low or high variant of demographic projections of the Slovenian population are also inconsequential (see Figure 11). Reasons can be found particularly in small differences among variants of the projections, *viz.* the estimated share of population aged 65 years and over

differs only moderately among the three variants in the 2050-2050 period. Nevertheless, it should be understandable that a variant of demographic projections with lower rates of fertility and higher life expectancy would lead to higher additional deficit of the state pension fund.

5 Conclusion

The article presents an analysis of welfare effects in Slovenia, an analysis of macroeconomic effects of the Slovenian pension reform and an analysis of effects of the pension fund deficit on sustainability of Slovenian public finances. 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 1.0 in order to fulfil our goal.

It has been established that young generations born between 1970 and 2000 will lose from the pension reform. First of all, because with the 1999 PDIA the replacement rate is gradually decreasing, while the pension indexation leads to relatively lower pensions. Furthermore, demographic ageing is going to cause the dependency ratio to increase. This means that especially the aforementioned generations will have to bear the majority of the burden of financing the pensions of baby boomers. However, even complete implementation of the pension reform might not be sufficient to compensate unfavourable demographic developments. The level of expected deficit of the pension system seems to be most worrying at the moment, in part also due to the projected demographic slowdown of GDP growth. Less favourable indexation of pensions to wages for pensioners and lower accrual rates reduce the PDII deficit, but the reductions might not be enough to have a sustainable system of public finances. In the current analysis we presumed that the average pension growth reaches 80 per cent of average wage growth. The present situation in the pension system is closer to the so called "Swiss formula", but given that the Government of the Republic of Slovenia is currently considering implementing full indexation of pensions to wages, the presentation of results of implementing adjustments of pensions reflecting wages and prices in equal proportions into the model would not seem to be very prudent. We can however point out that even though such an indexation rule might lead to a nearly sustainable pension system, the economic circumstances of the elderly would seriously deteriorate due to an outsized decrease in the level of real pensions compared to real wages.

Financing of the pension system with revenues from value-added tax as an extreme case could result in more sustainable public finances, since overall GDP and welfare levels ought to increase. The problem might appear in the structure of the welfare effects; the young and future generations would gain from such a pension reform, while the elderly would incur welfare losses. This might therefore be infeasible to implement politically, given that the elderly would surely vote against the most efficient and fair scenario. In case of financing the pension system with revenues from labour tax, on the contrary, the results would be reversed and could be “acceptable”. An alternative solution in order to reduce the pension expenditure and to increase the pension revenue could be found in an increase of the statutory retirement age, which is a solution discussed in many other European countries. First simulations show that an increase of the statutory retirement age in the age bracket of 60-65 years by a year reduces on average the state pension fund deficit, measured as percentage of GDP, by approximately 1 percentage point. One should not forget though, that the 1999 PDIA also offers incentives in case of retirement after fulfilment of retirement eligibility criteria. Yet the average extent of postponing retirement is still difficult to predict at present and is therefore not being modelled herein.

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. The law also 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. One should add that financing of the pension system with revenues from value-added tax would indeed lead to increase in savings and capital stock, but also to a reduction of the real interest rate. From the perspective of growing importance of the second pension pillar, financing the pension fund deficit with revenues from labour income tax therefore seems more appropriate.

And ultimately, as has to some extent been presented herein, the present pension system is intransparent and tremendously complicated. Unfortunately, the presently active generations and especially the young have not yet fully realized in Slovenia that the importance of the first pension pillar is decreasing due to lagging of pensions behind wages in real terms. The consequences of the pension reform should primarily be made more comprehensible to the public, leading as a result to adequate timely adjustment of consumption and savings of the active generations.

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