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Sustainability of the Slovenian Pension System

An Analysis with an Overlapping-Generations General Equilibrium Model

ABSTRACT: *This paper uses a dynamic overlapping-generations (OLG) general equilibrium model to analyze welfare effects in Slovenia, the macroeconomic effects of the Slovenian pension reform, and the effects of the pension fund deficit on the sustainability of Slovenian public finances. Although young and new generations will lose from the pension reform, even complete implementation of reforms might not sufficiently compensate for unfavorable demographic developments. The level of expected deficit for the pay-as-you-go state pension fund seems to be most worrying. Financing the pension system with value-added tax revenues, as an extreme case, could result in more sustainable public finances, because gross domestic product and welfare levels ought to increase; however, this might be infeasible to implement politically, given that generations of voters would have their welfare decreased. In addition, the present pension system is opaque and tremendously complicated and primarily, should be made more comprehensible to the public.*

The economic sustainability of social security systems in Slovenia is currently under severe pressure, due to aging caused by decreasing fertility rates, increased life expectancies, increased numbers of recipients of social benefits, and a decreased active population (European Commission 2001; Organization for Economic Cooperation and Development [OECD] 2000). For these reasons, policy makers anticipate increases in traditional social security benefits and the introduction of new types of old-age insurance. Among the key topics of social security in Slovenia is developing a sustainable, efficient, and fair system of funding social security in an

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environment of expected further aging of the population. The mechanisms and actions that Slovenia adopts ought to ensure solid foundations for social security, as well as enable and promote social inclusion for the population (Institute of Macroeconomic Analysis and Development [IMAD] 2001). Special emphasis is being put on the pension system due to its weight in the system of public finances; it is also the focus of our research.

In the early 1990s, Slovenia began its economic transformation from workers' self-management to a market economy through the process of restructuring. This process, which has led to recession because of the loss of former Yugoslavian markets, also created surpluses in the labor market. To maintain social sustainability, the costs of transition were shifted to the pension system through mass early retirement. Today, however, if the increasingly visible unfavorable demographic developments are taken into account, it becomes clear that the pension system, implemented with the 1992 Pension and Disability Insurance Act (PDIA), cannot sustain the pressure. This was obvious in 1996, when the state pension fund needed additional financing from the central budget for the first time in its history. This began intense preparations for Slovenian pension reform, leading to the 1999 PDIA, which was implemented starting January 1, 2000.

In the present analysis, we are interested in the effects of the 1999 pension reform on the welfare of different generations in Slovenia and on the sustainability of Slovenian public finances. We examine the Slovenian economy with an overlapping-generations general equilibrium (OLG-GE) model, the most developed version of computable general equilibrium (CGE) models. The model, SIOLG 1.0, makes possible the analysis of intra- and intergenerational redistribution effects of different strategies of public financing to achieve sustainable long-term economic growth and social development. It also enables monitoring and anticipation of the effects of unfavorable demographic developments on the volume of social transfers to the population.

The OLG-GE Model of the Slovenian Economy

The SIOLG 1.0 model is a dynamic OLG-GE model of the Slovenian economy, based on a social accounting matrix (SAM) for the year 2000, data on the demographic structure of the population, expected future demographic developments, characteristics of Slovenian households, and decomposition of households within generations. The model has been developed specifically to analyze the sustainability of Slovenian public finances, though it can be used to analyze any part or any sector of the economy as well.

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 of Friedman (1957), which are actually special cases of the more general theory of intertemporal allocation of consumption (Deaton 1992). Unlike in the Keynesian theory of behavior of consumption and savings, based only on current income, in

the OLG-GE model, consumption and savings are derived from intertemporal optimization behavior, and are therefore dependent on full lifetime income. In the simplest case of unchanged income until retirement (Modigliani 1986), consumers save during their active lifetimes and spend their savings after retirement to maintain unchanged consumption. Retirement is therefore a reason to save.

Overlapping-generations general equilibrium models are the current pinnacle of dynamic CGE modeling. OLG-GE modeling was established and promoted by Auerbach and Kotlikoff (1987) and is based on detailed decomposition of the consumption side of the model. Unlike in Ramsey models, consumers live a finite length of time, but long enough to live at least one period with the next generation of consumers. Determining consumers by their birth cohort enables analysis of intergenerational effects, making OLG-GE models especially valuable for analyzing tax, pension, and other social policies.

SIOLG 1.0 encompasses not only the standard model structure of a national economy, but also demographic and pension blocks, within the framework of which the first (PAYG) pillar of the Slovenian pension system is modeled. Because the model incorporates most of the contemporary techniques of CGE modeling (Verbič 2005), the arrears in this field in Slovenia compared to the rest of the world have practically been eliminated. The model is built within the general algebraic modeling system (GAMS), which has become both the most widely used programming language and the most widespread computer software (Brooke et al. 1998) for constructing and solving large and complex CGE models.

Within the GAMS framework, the dynamic general equilibrium model follows Mathiesen's (1985) formulation of the Arrow–Debreu (1954) equilibrium model—that is, 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. The mathematical program includes equalities as well as inequalities, in which complementarity slackness holds between system variables and system conditions (Böhringer et al. 2003; Rutherford 1995b). Functions of the model are written in Rutherford's (1995a) calibrated share form—a reasonably straightforward algebraic transformation that nevertheless considerably simplifies the calibration of the model (Balistreri and Hillberry 2003; Böhringer et al. 2003). To solve the model—that is, to achieve convergence—a recent version of the PATH solver (Ferris and Munson 2000) is used; the PATH is renowned for its computational efficiency.

Consumers live in the model according to their life expectancy at birth. Assuming that life expectancy is approximately eighty years, and that the active lifetime period starts at the age of twenty, there are sixty generations in each period of the model. A new cohort of consumers is born in each period, thus increasing the population; at the same time, a number of consumers pass away, decreasing the total population. Consumers are observed in five-year intervals within households. Households maximize expected lifetime utility, subject to their income constraints

and the need to save for retirement and support children, and are differentiated in the model according to year of birth, income, and size. Within each cohort, couples without children are distinguished from nuclear families with two children on average. Five income profiles represent different income brackets. Consequently, there are ten versions of the model altogether, which facilitates analysis of intragenerational effects of different economic policies.

The volumes of labor and labor productivity growth are given exogenously. Wage changes are reflected in changes in the labor supply. Consumption of households with children is corrected for extra cost per child. Childbearing age for women is in the age bracket of twenty to forty years. In the first ten years after retirement, the household is comprised of two persons, and afterward of one adult. Household saving decisions affect firms' investment decisions in the capital markets and, thus, future production. The effects ascribed herein have recurrent effects on product markets through decreasing prices, and on labor markets through higher productivity, leading to higher wages, and finally, higher income of households. Both effects can be analyzed with a dynamic OLG-GE model, such as SIOLG 1.0, in a straightforward way.

The perfect foresight assumption in the forward-looking model specification implies that households can perform intertemporal optimization of the present value of their entire future consumption. In other words, 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 for future changes. The assumptions of equilibrium in all markets and 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 allows us to project 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, and the high variant combines higher fertility with higher life expectancy and higher net migration. A medium variant serves as a reference point.

The assumption of perfect foresight is also valid for firms, which maximize profits in a perfectly competitive environment. Technology is given by the constant elasticity of substitution (CES) production function. The number of production sectors in the model depends on the availability of the input–output table for the base year, which means that there are sixty sectors of the standard classification of activities (SCAs) available for discretionary aggregation. Government spending depends on economic and population growth and is financed with revenues from personal income tax, capital income tax, value-added tax, and import duties. Sources of revenue for the Slovenian system of public finances represent various possibilities of funding different economic policies in the simulation phase of the modeling.

SIOLG 1.0 is closed using Armington's (1969) assumption of imperfect substi-

tutability, under which commodities are separated by source on domestic and imported products. Demand for imported products is derived from the cost minimization criterion of firms and utility maximization criterion of consumers. Regarding 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 changes in the volumes of imports and exports do not affect terms of trade. International capital flows are endogenous, given the intertemporal balance of payments constraint.

Representing Developments in the Slovenian Pension System

Slovenia inherited the legislation of its pension system from the former Yugoslavia. That system was based on an intergenerational contract and is, therefore, a pay-as-you-go (PAYG) system. After Yugoslavia splintered into newly independent countries at the beginning of the 1990s, Slovenia initiated its transformation from worker self-management to a modern market economy, requiring the formation of new markets and taking their rules into account. However, the consequences of bankruptcy of firms, economic recession, and restructuring in the business sector, all resulting from economic transformation, were being “solved” contemporaneously 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 introduction of statutory retirement age (previously only the full pension qualifying period was legislated) could not alleviate early retirement procedures. Because the price of additional years of service was low, and therefore inconsistent with actuarial principles, the 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), though this stability is somewhat misleading, as the new pension legislation introduced additional categories of insured persons.¹

Legislative modifications adopted in 1992 are also partially responsible for the large increase in pension expenditure of the PAYG-financed state pension fund, the Institute for Pension and Disability Insurance (IPDI), in the same year. Under the 1992 PDIA, the IPDI was compelled to pay contributions for health insurance for pensioners, thus contributing at least one additional percent to the ratio of pension expenditure to gross domestic product (GDP). After 1992, the pension expenditure, measured as a percentage of GDP, somewhat stabilized at the level of 11 percent. This could have been a sign of IPDI’s financial stabilization; however, things took a drastic turn for the worse, as is discussed below. 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 con-

tribution rate increased from 22.55 percent of gross wages in 1989 to 31 percent in 1995. Finally, in 1996, the Slovenian government lowered the employer pension contribution rate, from 15.5 percent of the gross wage to 8.85 percent, to improve the competitiveness of the Slovenian economy.

The year 1996 hence represents a decisive moment; since then, the pension fund has run a deficit, met every year up to 2004 with so-called “generalized” transfers from the central budget to maintain social stability. Transfers of funds from the central government budget to the IPDI occurred prior to 1996, but were only intended to finance additional government obligations, such as the pensions of farmers, policemen, customs officers, and World War II veterans. After 1996, the government actually committed itself to partially finance pensions primarily established on actuarial principles, and which before 1996 were entirely funded with contributions from the actively working population. Relatively favorable pension figures became insupportable in a few years. Thus, according to Štrovs (2000, pp. 11–12), we could even speak of a financial crash of the Slovenian state pension fund in 1996. The effects of demographic changes on the social security system in subsequent years, of course, have yet to be seen.

As the decrease in employer pension contributions was offset by government transfers to the pension system, the insolvency of the pension system passed unnoticed by the general public. However, the consequences of the pension deficit can be seen in the structure of the Slovenian budget, in which there are fewer funds available for investments or research and development. Yet the economic situation is commonly not perceived to be so pessimistic. Slovenia’s fiscal position has remained relatively favorable, and it is certainly the most promising of the new EU-member states; its budget deficit was relatively low in the last decade, despite the difficult situation in the first years of economic transition. Public debt increased only moderately.

The social security pressure drew the attention of economists at the International Monetary Fund and the World Bank; it was addressed with the preparation of a white paper on the subject in 1997, which led to the adoption of the new PDIA in 1999. The law was implemented on January 1, 2000, and is set to expire 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 labor (Stanovnik 2002). The main characteristic of the new pension legislation compared to the former legislation is path dependence, which appears to be a universal feature of the predominantly gradual reforms of the Slovenian economic system. In addition, transitional periods are lengthy, so the actual values of parameters of the present three-pillar pension system² in Slovenia converge to final values only gradually.

The 1999 PDIA guarantees insured persons retirement benefits, dependent only on completed years of service, without deductions. Under the more recent PDIA, beginning in 2000, the statutory retirement age is increased six months each year for men and four months each year for women. For men, retirement age rises from

fifty-eight and a half to sixty-three. For women, it rises from fifty-three and a quarter to sixty-one. However, an individual can retire at the age of fifty-eight and receive a pension without deductions if he or she works for the full pension qualifying period, which is forty years of service for men and thirty-eight for women. The transitional period terminates at the end of 2008 for men, and at the end of 2022 for women. The minimum pension-qualifying period is still fifteen years of service. The retirement age can be decreased for every born or adopted child, brought up and supported by the insured person for at least five years.

The 1999 PDIA gives greater consideration to actuarial fairness for the system of incentives and disincentives adopted in case of retirement before or after fulfilling retirement eligibility criteria. For all insured persons who do not work for the full pension-qualifying period and retire before they reach the statutory retirement age, the pension decreases for every month missing from the qualifying age. Disincentives applied to the pension base amount to 0.1–0.3 percentage points of accrual rate for every month, negatively depending on the actual retirement age of such individuals; the closer the actual retirement age is to the statutory retirement age, the lower the deductions. On the other hand, if the insured person remains employed after reaching statutory retirement age and working for the 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 the actual retirement age of the individual. They are cumulative, yet do not rise further after three additional years of service. Both disincentives and incentives add 1.5 percentage points of accrual rate for every year of service missing or added, respectively.

Overall, the calculation of pensions is less favorable for insured persons under the 1999 PDIA. Old-age pension is calculated from the pension base in percent, depending on the number of completed years of service: 35 percent for men and 38 percent for women for the first fifteen years of service, and 1.5 percent for each additional year of service regardless of gender.³ Under the provision that the insured person is not subject to pension disincentives, the pension for a full pension-qualifying period amounts to 72.5 percent of the pension base, instead of the prior 85 percent under the 1992 PDIA. Because the pension base under the 1999 PDIA is calculated out of the best eighteen consecutive years of service instead of the prior best ten consecutive years of service under the 1992 PDIA, the decrease in pensions is even higher. Also, the law further diminishes the possibilities for the self-employed to tamper with their contribution base. However, the most complex procedures of the 1999 pension legislation are the revalorizations of pension bases and indexations of pensions (Stanovnik 2004). Revalorization of the pension base in the Slovenian pension system is a procedure of recalculating sources of pensionable income in the best eighteen consecutive years of service, using a vector of revalorization coefficients to obtain the pension base. It obtains horizontal equity between existing and new pensioners. Indexation of the pension, on the other hand, is a procedure for adjusting retirement benefits to existing 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.⁴

The 1999 PDIA introduced a number of elements that improved horizontal equity in the system (Stanovnik 2002). The gender divide regarding eligibility and benefits was narrowed considerably. 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 pensions⁵ cannot exceed 4:1, which is less than the prior ratio of 4.8:1 (1992 PDIA). Instead of explicit minimum and maximum pensions, the Slovenian pension system includes minimum and maximum pension bases. The former is set nominally, yet amounted to approximately 62.5 percent of average net wage in 2000. The latter is four times the minimum pension base. That social security contributions are not capped is a further redistributive element.

Finally, the 1999 pension legislation added new provisions besides the system of incentives and disincentives: Pensions of existing pensioners are adjusted to the entry pensions of new pensioners, according to Article 151 of the 1999 PDIA. The adjustment amounts to approximately –0.6 percentage points of the pension each year. This means that the pensions of current pensioners are decreased in real terms, accounting for the lower pensions of new entrants. An initiative in the Institutional Court of the Republic of Slovenia called 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 an outcome is particularly important, because the modification of the pension legislation represents a large share of the overall effects of the pension reform, and also has a significant positive effect on managing the pension system’s expenditures.

Results of the OLG-GE Simulations

The groundwork for our analysis is dynamically calibrating the OLG-GE model and, consequently, preparing the pertinent reference solution. To calibrate the SIOLG 1.0 model, we use it to generate the dynamic path of endogenous variables to accurately reproduce the values of every endogenous variable in the base year (2000). The dynamic calibration scenario described herein 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 implementing both the demographic and pension blocks, in which the state pension fund’s additional deficit,⁶ brought about by changing demographics, is financed from the central government budget with revenues from value-added taxes. Alternatively, the additional deficit could be financed with labor-income taxes. The initial (base-year) IPDI deficit is, of course, funded by pension contributions. The reference scenario represents the basis for evaluating the consequences of a range of economic policies in the system of public finances.

Accounting for the upcoming developments in the Slovenian pension system,⁷ we then analyze the Slovenian economy by forming two counterfactual scenarios and comparing their outcomes to the results of the reference scenario. In the reference scenario, only the additional deficit is financed with revenues from value-added taxes. In the first counterfactual scenario (VAT), we assume that the entire state pension fund is financed with revenues from value-added taxes. In the second counterfactual scenario (LABS), the IPDI is funded exclusively with revenues from labor-income taxes. These scenarios are used to represent the effects of two extreme approaches to funding the pension system and to demonstrate their strengths and weaknesses. We analyze welfare effects in Slovenia, the macroeconomic effects of the Slovenian pension reform, and the effects of the IPDI deficit on the sustainability of Slovenian public finances.

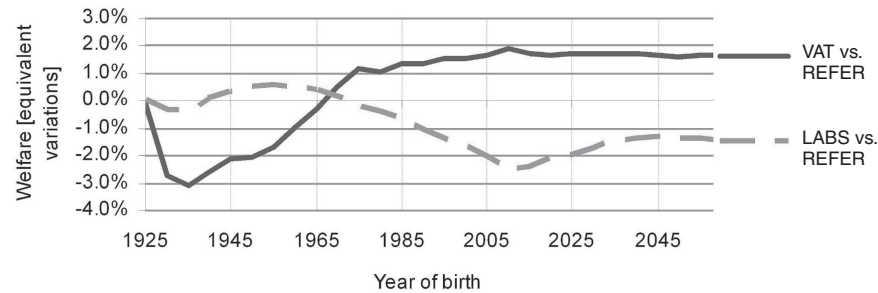
Unless explicitly stated otherwise, a steady-state growth rate of 2.5 percent and medium variant of demographic projections are used for OLG-GE simulations. GDP growth is determined endogenously, and productivity growth is exogenous and equal to the chosen steady-state growth. Wage growth follows productivity growth, but also depends on changes in labor supply, the activity levels of which remain unchanged at the base-year level. The pension block of the SIOLG 1.0 model follows the 1999 PDIA with the following key elements: Pension as a proportion of the pension base gradually decreases for new and existing pensioners to 72.5 percent; the number of consecutive years of service to calculate the pension base gradually increases from 10 to 18; eligibility criteria for retirement are raised, reflected in the estimated increase in average retirement age of 2 years for men and 4 years for women; average pension growth reaches 80 percent of average wage growth; and calculation of the revalorization coefficients is based on lagging pension growth behind wage growth, which enables the equalization of the financial situation among existing and new pensioners. The growth of residual nonpension expenditure of the IPDI follows population growth and exogenous productivity growth.

Analyzing Welfare Effects in Slovenia

Intergenerational redistribution effects are shown in Figure 1. We use Hicks's equivalent variations (HEV) to measure change in the welfare of successive 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.

A first glance at Figure 1 shows that if the pension system is funded with value-added taxes, future generations will gain. Obviously, in this scenario, the elderly lose, as they have to pay more in value-added taxes than they do in the reference scenario; they are forced to bear a larger burden of the present value of public

Figure 1. Welfare Effects in Slovenia in Case of Applying Different Sources of Financing the Pension System



Source: Authors' simulations using SIOLG 1.0.

Notes: REFER represents the reference scenario; VAT and LABS represent the counterfactual scenarios.

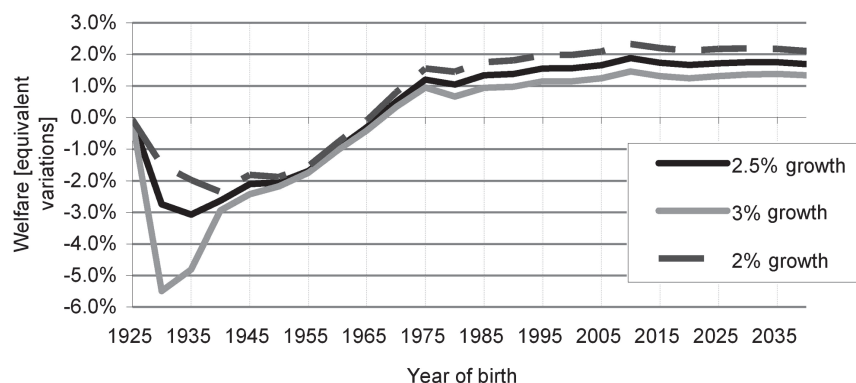
expenditure. If the pension system is funded with revenues from labor-income tax, all future generations lose, as they alone bear the burden of public expenditure.

Funding the pension system with revenues from value-added taxes appears to be a somewhat better alternative than funding with pension contributions, which can be explained as follows. Replacing social security contributions with revenues from value-added taxes improves the financial situation of young generations, because the current consumption of the elderly is being taxed. Because young generations have lower marginal propensity to consume than do the elderly, after the tax reform, their consumption decreases, and their supply of labor has to increase. Total consumption therefore decreases, and total labor 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 tax.⁸ The elderly, however, do not supply any labor. Hence, the consumption tax is equivalent to a lump-sum tax on their assets. Because assets, once accumulated, are inelastic in supply, this lump-sum tax does not distort economic decisions. A value-added tax therefore has a more positive (or less negative) effect on welfare than does a wage or labor-income tax.

As the 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 rising labor-income tax rate also changes the relative intertemporal prices of leisure. The future price of leisure falls relative to the price of current leisure, inducing a substitution of current for future labor supply. When funding the pension system with value-added taxes, there is a substantial increase in labor supply. This is, to a lesser extent, also true when funding the pension system with a labor-income tax. People not only work more, but also longer. Retired genera-

Figure 2. Welfare Effects in Slovenia in Case of Financing the Pension System with Revenues from VAT: Outcomes of Different Steady-State Growth Rates



Source: Authors' simulations using SIOLG 1.0.

tions suddenly have to pay an increased tax on their consumption. As they live on their savings, the only way to keep their consumption unchanged is to provide additional labor to the labor market—that is, to retire later.

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

Another important aspect of the tax reform is its overall efficiency effect. To obtain this effect, we change the model so that there are no intergenerational 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. If the pension system is funded with value-added taxes, there is a positive overall efficiency effect of raising the welfare level of all generations by 0.55 percent. In contrast, the overall efficiency effect of funding the pension system with revenues from labor-income taxes is negative, amounting to -0.81 percent.

Although financing the pension system with value-added taxes potentially has a clearly positive effect on the economy in the long run, switching to financing part of the social security system with revenues from value-added taxes is probably politically infeasible, as the generations that would decide on the tax reform are the ones that would suffer from it. This is unfortunate, as the young generations will have to cope with relatively lower pensions and higher taxes to finance the social security system.

Analyzing the Macroeconomic Effects of Slovenian Pension Reform

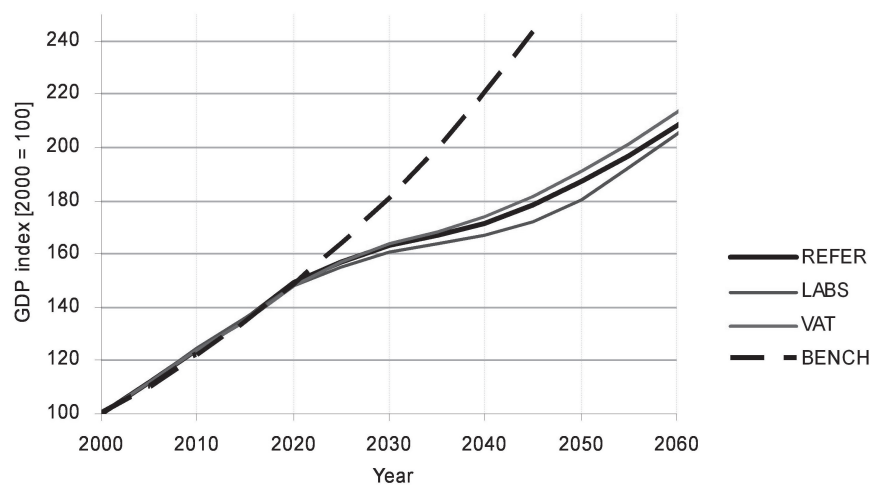
Based on the scenarios developed, the choice of source of financing pensions does not have a significant effect on GDP growth or GDP level. Neither of the annual growth rates from either scenario—financing the pension system with value-added taxes or labor-income taxes—differ much from the annual growth rate of GDP in the reference scenario, as Figure 3 shows. In the benchmark scenario, in the case with the highest GDP growth (see Figure 3), unfavorable demographic developments are not implemented, and thus, the differences between the benchmark scenario and the other three scenarios clearly demonstrate the demographic slowdown of GDP growth.

Figure 4 represents the gradual demographic slowdown of GDP growth in more detail. The assumed decline in labor supply in the coming years leads to a negative growth rate of real GDP, provided that there is no productivity growth. Given exogenous technical progress and fixed shares of employed persons in the total population, one can calculate potential GDP growth, which is higher than the modeled GDP growth. The SIOLG 1.0 model allows for adjustments in labor supply, as well as changes in production factor prices, savings, and investment. Unfavorable demographic developments at a given exogenously determined productivity growth considerably reduce the growth rate of GDP, from an initial 3 percent in the 2000–2005 period to a mere 1 percent in the 2030–35 period.

The effects of funding the pension system with value-added taxes and labor-income taxes on investment (savings)⁹ and capital stock can be ascertained from Figures 5 and 6, respectively. Increasing 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. An increase in the labor-income tax rate, on the other hand, increases the price of present leisure relative to future leisure, inducing a substitution of future for current labor supply. Current labor supply therefore decreases, and to maintain the present level of consumption, households decrease current savings (investment). This decreases the capital stock, though it can potentially also represent an increase in the level of future consumption.

The effects of different scenarios on the capital stock easily explain real interest rate changes (see Figure 7). If the pension system is funded with revenues from

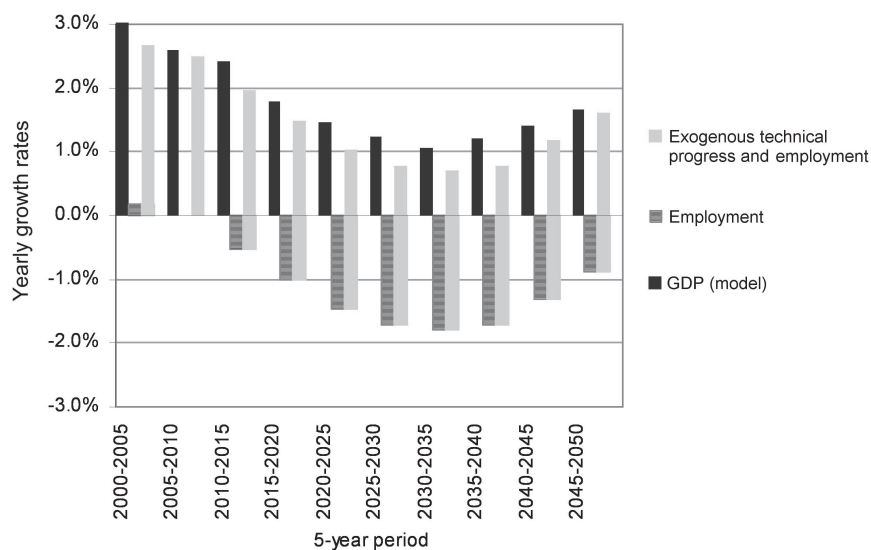
Figure 3. Expected Growth of GDP in Slovenia in Case of Applying Different Sources of Financing the Pension System



Source: Authors' simulations using SIOLG 1.0.

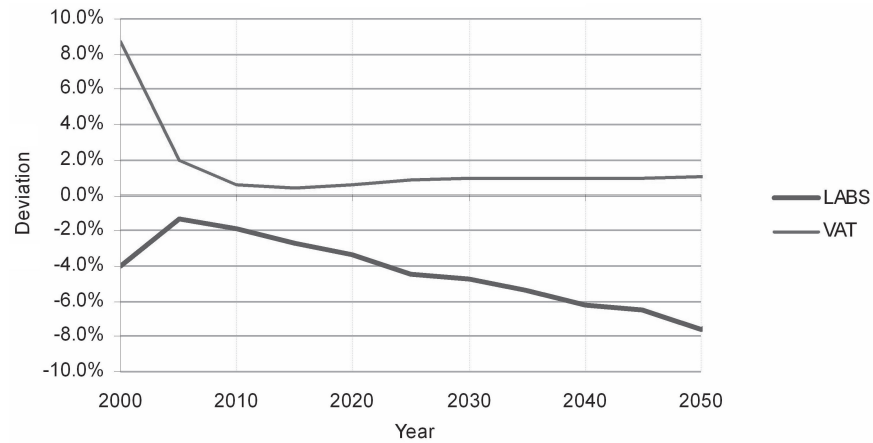
Notes: BENCH represents the benchmark scenario, REFER represents the reference scenario, and VAT and LABS represent the counterfactual scenarios.

Figure 4. Effects of Future Demographic Developments in Slovenia on GDP



Source: Authors' simulations using SIOLG 1.0.

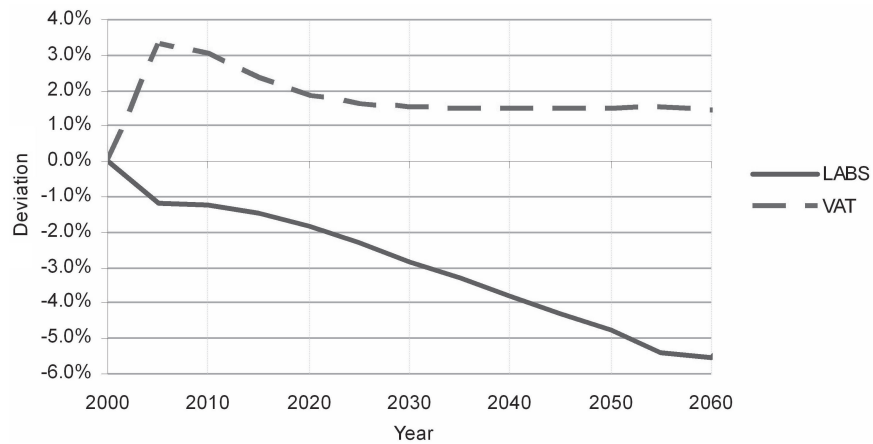
Figure 5. Expected Investments in Slovenia in Case of Applying Different Sources of Financing the Pension System



Source: Authors' simulations using SIOLG 1.0.

Notes: VAT and LABS represent the counterfactual scenarios.

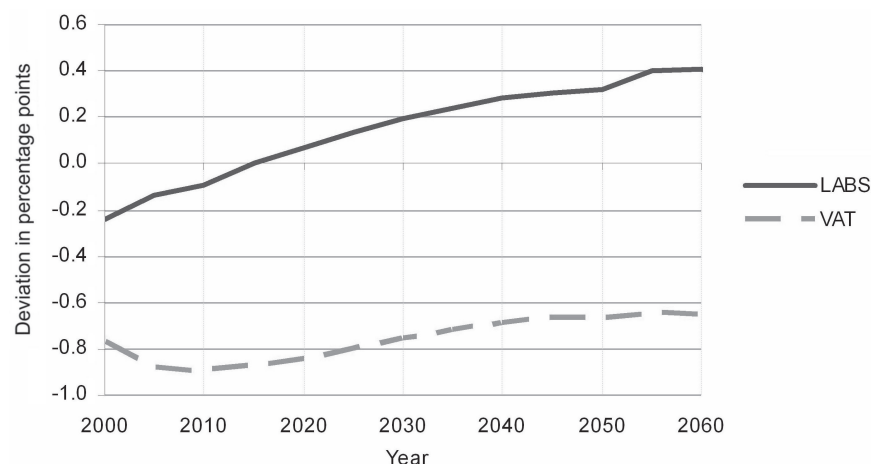
Figure 6. Expected Capital Stock in Slovenia in Case of Applying Different Sources of Financing the Pension System



Source: Authors' simulations using SIOLG 1.0.

Notes: VAT and LABS represent the counterfactual scenarios.

Figure 7. Expected Real Interest Rate in Slovenia in Case of Applying Different Sources of Financing the Pension System



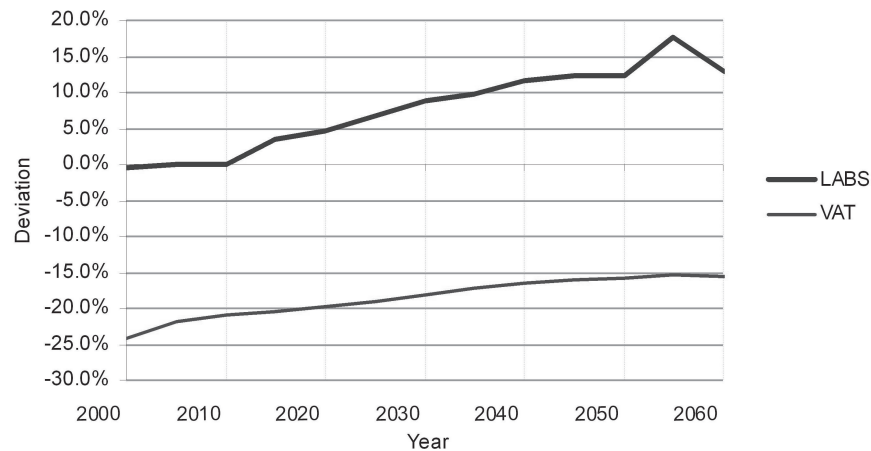
Source: Authors' simulations using SIOLG 1.0.

Notes: VAT and LABS represent the counterfactual scenarios.

value-added taxes, 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 percent 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 grow in importance in the coming decades. If the baby boomers decide to run down their assets, asset prices will drop, thus straining the financial positions of the funded systems. The additional decrease of the real interest rate will strengthen this effect, though the fall in asset prices due to the asset market meltdown hypothesis is controversial (Abel 2003; Poterba 2001). If the pension system is funded with labor-income taxes, the capital stock grows by less than in the reference case, which leads to a rise in the real interest rate of approximately 0.4 percent in the long run.

If the pension system is funded with value-added taxes, an important initial decline of real wages will arise, due to a necessary increase in the value-added tax rate and resulting rise in consumer prices (see Figure 8). To maintain the level of consumption, economic agents need to increase their labor supply; hence, employment also increases. Due to the anticipated decrease in the active population, the labor supply and production factor prices adjust accordingly. Thus, real wages are anticipated to gradually increase by approximately 8 percent until 2040 because of the gradual lessening of growth in consumer prices and accompanying increases in labor costs. Changes in production factor prices would cause rising

Figure 8. Expected Real Wages in Slovenia in Case of Applying Different Sources of Financing the Pension System



Source: Authors' simulations using SIOLG 1.0.

Notes: VAT and LABS represent the counterfactual scenarios.

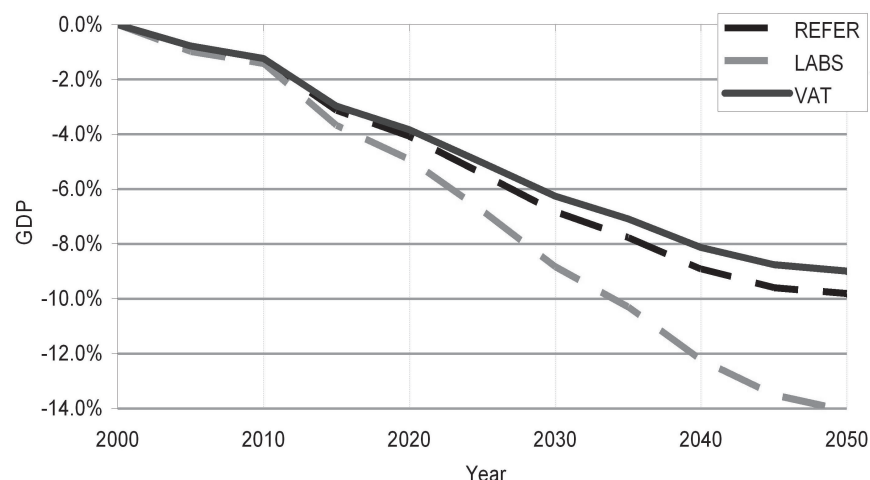
employment to settle at a level approximately 1 percentage point higher than in the reference case.

If the pension system is funded with labor-income taxes, increases in the labor-income tax rate alter the intertemporal price of leisure, as mentioned above. The future price of leisure decreases relative to the present price of leisure, resulting in substitution of future labor supply with present labor supply. Employment consequently decreases. The additional decrease in the labor-income tax rate needed to cover the IPDI deficit leads to additional reductions in employment. At the same time, consumer prices decrease compared to consumer prices in the reference case, resulting in rising real wages compared to real wages in the reference case. The latter is certainly also a consequence of increasing labor costs, due to a declining active population.

Analyzing Effects of the Pension Fund Deficit on Sustainability of Slovenian Public Finances

According to the model simulations, the additional annual deficit of the state pension fund is expected to rise to 8 to 12 percent of GDP in 2040, depending on the source of financing for the pension system (see Figure 9). Evidently, the additional deficit is higher if the pension system is funded with revenues from labor-income tax, which is a consequence of both real wage increase and lower GDP growth compared to the reference case. However, the pension indexation rule significantly

Figure 9. Additional Deficit of the Slovenian State Pension Fund in Case of Applying Different Sources of Financing the Pension System



Source: Authors' simulations using SIOLG 1.0.

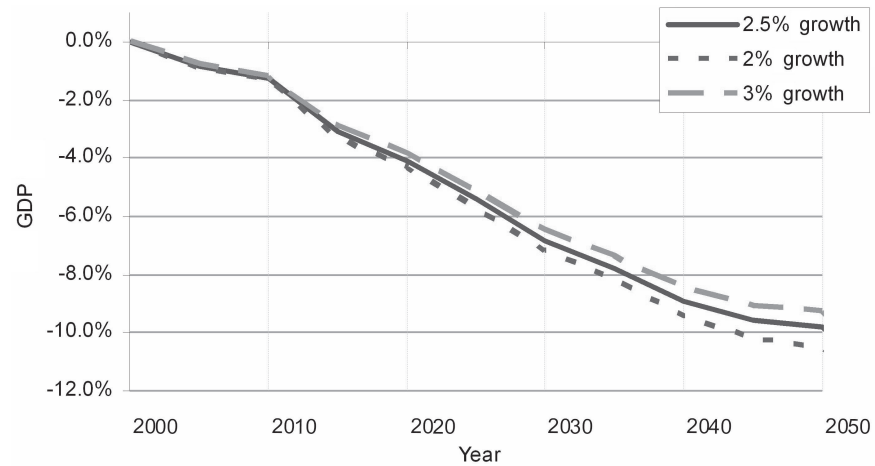
Notes: REFER represents the reference scenario; VAT and LABS represent the counterfactual scenarios.

affects the value of the IPDI's additional deficit. Additional decrease in rating pensions to the level of the "Swiss method," actually indicating permanent sustenance of the present situation in the pension system,¹⁰ might allow for 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 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 percent) or higher (3 percent) than the reference growth rate. The additional deficit is larger for lower growth rates and smaller for higher growth rates, as expected. This is a consequence of the indexation rule; because wages, and indirectly, GDP, grow faster than pensions, the additional deficit of the state pension fund is higher at lower applied steady-state growth. However, the differences in the estimated additional deficit of the IPDI when applying different assumed growth rates are insignificant, adding up to 0.5 percentage points by 2040.

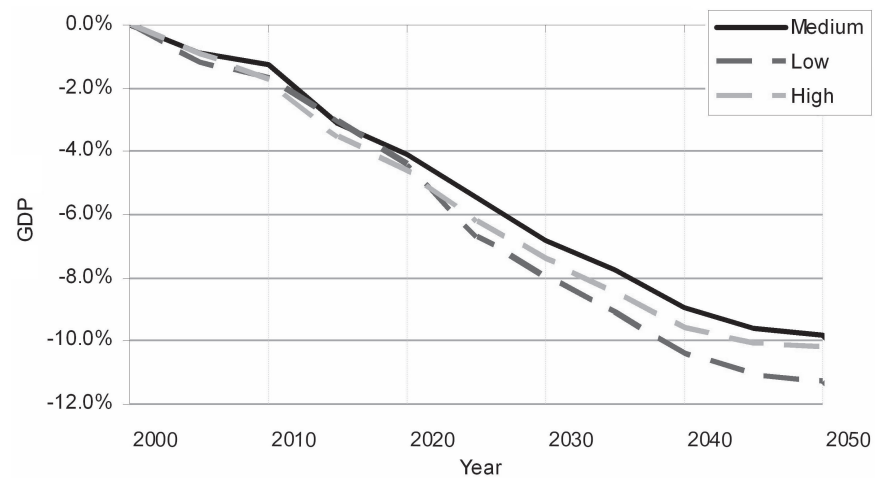
Finally, we investigate what happens with the additional deficit of the state pension fund in the reference case, given that a more or less favorable variant of demographic projections is applied. Similarly, the differences in the estimated additional deficit of the IPDI when applying low or high variants 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 pro-

Figure 10. Additional Deficit of the Slovenian State Pension Fund in the Reference Case; Outcomes of Different Steady-State Growth Rates



Source: Authors' simulations using SIOLG 1.0.

Figure 11. Additional Deficit of the Slovenian State Pension Fund in the Reference Case; Outcomes of Different Variants of Demographic Projections



Source: Authors' simulations using SIOLG 1.0.

jections. The estimated share of the population aged 65 years and over differs only moderately among the three variants in the 2001–2050 period. Nevertheless, a variant of demographic projections with lower rates of fertility and higher life expectancy could lead to higher additional deficits in the state pension fund.

Conclusion

This paper analyzes welfare effects in Slovenia, the macroeconomic effects of Slovenian pension reform, and the effects of the pension fund deficit on the sustainability of Slovenian public finances. A dynamic OLG general equilibrium model, SIOLG 1.0, was constructed, enabling analysis of intra- and intergenerational redistribution effects of different strategies of public financing to achieve sustainable economic growth. Different scenarios were then prepared and analyzed with the SIOLG 1.0 model.

Generations born between 1970 and 2000 will lose from the pension reform. First, with the 1999 PDIA, the replacement rate is gradually decreasing, and the pension indexation leads to relatively lower pensions. Second, demographic aging will cause the dependency ratio to increase. This means that the aforementioned generations will bear the majority of the burden of financing the pensions of baby boomers. However, even completely implementing pension reform might not sufficiently compensate for unfavorable demographic developments. The level of expected deficit of the pension system seems to be most worrying at the moment, in part because of the projected demographic slowdown of GDP growth. Less-favorable indexation of pensions to wages for pensioners and lower accrual rates reduce the IPDI deficit, but the reductions might not be enough to make the system of public finances sustainable. In the current analysis, we presumed that average pension growth reaches 80 percent of average wage growth. The present situation in the pension system is closer to the “Swiss formula,” but given that the Slovenian government is currently considering implementing full indexation of pensions to wages, presenting the model’s results of implementing adjustments of pensions reflecting wages and prices in equal proportions would not be 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 the pension system with revenues from value-added taxes, as an extreme case, could result in more sustainable public finances, as 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, but the elderly would incur welfare losses. Such a reform might therefore be politically infeasible to implement, given that the elderly would surely vote against the most efficient and fair scenario. If the pension system were financed with revenues from labor taxes, the results would be reversed, and thus politically

feasible. An alternative solution to reducing pension expenditures and increasing pension revenue could be to increase the statutory retirement age, a solution discussed in many other European countries. First simulations show that increasing 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 to those who retire after they have passed the statutory retirement age. However, the average extent of postponing retirement is still difficult to predict at present and is, therefore, not modeled.

With the 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 the deteriorating economic circumstances of the elderly could be to reduce the difference between the minimum and maximum pension bases, by raising the former and lowering the latter. This would insure persons in lower income brackets, and compel insured persons from middle and higher income brackets to save “voluntarily” for retirement. Financing of the pension system with revenues from value-added taxes would lead to increases in savings and capital stock, but also to a reduction in the real interest rate. From the perspective of the growing importance of the second pension pillar, financing the pension fund deficit with revenues from labor-income taxes seems more appropriate.

Ultimately, however, the present pension system is opaque and tremendously complicated. Unfortunately, the presently active generations, especially the young, have not yet fully realized that the importance of the first pension pillar is decreasing due to lagging of pensions behind wages in real terms. The consequences of pension reform should be made more comprehensible to the public, so that actively working generations can adjust their consumption and savings adequately.

Notes

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.

2. Namely, the Slovenian pension system consists of the mandatory PAYG-financed first pillar, the semi-mandatory fully funded second pillar, and the voluntary fully funded third pillar.

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

4. 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 a proposed increase in the pensioner’s recreation grant and an adjustment of widower’s pension, this could have substantial effects on controlling the expenditure of the system of public finances in the future.

5. Comparable pensions exist when two pensioners enter the pension system under the same conditions and both have worked for the full pension qualifying period.
6. 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 percent of the GDP.
7. Pension system herein actually refers to the PAYG-financed first pillar (the IPDI) of the three-pillar Slovenian pension system, unless explicitly stated otherwise.
8. In this case, value-added tax represents a proxy for the consumption tax, while labor income tax represents a proxy for the wage tax.
9. Because 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.
10. 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.

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