



LITHUANIAN PENSION SYSTEM'S REFORMS FOLLOWING DEMOGRAPHIC AND SOCIAL TRANSITIONS

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Lithuanian pension system's reforms following demographic and social transitions

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Abstract

The aim of this article is to define the Lithuanian public pension system reforms, influenced by the last economic crisis and social challenges (ageing processes, raising social expenses). The paper also investigates the influence that current demographic trends will exert on the financial dynamics of the pension system. Results reveal the long-term sustainability of the system, albeit at a cost of initial negative balances to be covered with public budget. Also, the system may expose pensioners to the risks of poverty and social exclusion because of low payments. It is then necessary to intensify the pension system's reform. Policy solutions should encourage and extend employment (especially for the disadvantaged) and rebuilt trust in both public and private pension systems.

Keywords: Lithuanian pension system, public budget, demographic risk, Markov chain, population forecasting, new entrants, pension forecasting.

Jel classification: C02, H55, H68, H75, J11.

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1. Introduction

Social insurance reforms in Lithuania is an ongoing process because of changing economic, political and social phenomena, developing the concept of reforms strategies, increasing the European Union's institutions activity in the field of pensions etc. Today we could underline common challenges to be met by Europe's social security systems: demands for more personal choice and quality improvements in services and benefits; the impacts of globalization (greater flows of people, goods, services and capital across national borders); population ageing and economic, fiscal and social fallout of the current economic crisis.² M. Ferrera emphasized that a genuine European invention, public protection schemes were introduced to respond to the mounting "social question" linked to the industrialization and the disruption of traditional, localized systems of work-family-community relations and the diffusion of national markets (based on free movement and largely unfettered economic competition within the territorial borders of each country) profoundly altered the pre-industrial structure of risk and need.³ R. Liddle and P. Diamond indicate that, firstly, the after-shock of the current crisis originate in long-term structural trends relating to the demography, life expectancy, globalization, and the changing shape of the productive economy in the West, not just the financial sector crash itself. Second argument is that crisis aftershocks put social and economical inequality back at the center of the public policy agenda.⁴

When we are searching for the better efficiency of the social security system and higher social security coverage, it is important to note, that social security structure depends on the type of social model. Today it is difficult to find pure social model, designed in the classic Bismarck or Beveridge

² International social security association. Dynamic social security for Europe: choice and responsibility: developments and trends. International social security association, Geneva, 2010, p. 93.

³ Ferrera, M. Mapping the components of Social EU: a critical analysis of the current institutional patchwork. In Marlier, E. and Natali, D. (eds.). Europe 2020: Towards a more social EU? Work and Society No. 69, P.I.E. Peter Lang S.A, Brussels, 2010, p. 45.

⁴ Liddle, R., Diamond, P. Aftershock: the coming social crisis in the EU and what is to be done. In Marlier, E. and Natali, D. (eds.). Europe 2020: Towards a more social EU? Work and Society No. 69, P.I.E. Peter Lang S.A, Brussels, 2010, p. 72-76.

tradition, but the essential elements of a theoretical model still dominates. The strengths of *Continental model* (France, Germany) could be: mandatory participation in the social insurance system; the right to social security benefits is related to the paying of social insurance contributions; relatively high benefits; indexation related to the economic situation; autonomous management of the system; social insurance contributions are related to the social insurance risks. The weaknesses of this model are: complexity of the system; the system is not fully universal; the system do not guarantee minimum level of benefits. The strengths of *Anglo-Saxon model* (United Kingdom, Ireland) are: universality; free medical care; the system includes all needs of person. The weaknesses are the following: relatively low level of benefits; medical care (financed by taxes) coverage depends on the economic situation; the biggest role is given to the additional voluntary private systems. The strengths of *Nordic model* (Scandinavian countries) are: universality (wide coverage); extremely high benefits; the minimum level of benefits is established; the public social insurance depends on the contributions paid; large public confidence in the system; equality between women and men. The weaknesses of this model are the high cost of the system and high level of social insurance contributions.⁵ *Eastern European social model* (Lithuania) characterized by both Nordic social model features (active labour market policies), Continental model (the structure of the social security system) and the Anglo - Saxon features (development of private initiatives and labour market liberalization policy). Development of Eastern European social model is related to the fact, that countries in this region changed economic orientation from socialist to market-oriented system. But we could point out, that the economic transformation (increased unemployment, poverty, inequality, bankruptcies of companies and industries, fiscal crisis, creation of new public institutions) and other related facts (the needs of different social groups, recommendations of international institutions, European integration) resulted in the limited public financial resources. G. Esping - Andersen argues, that the Eastern European countries have opted for a liberal social security system concept, where the basis of social security schemes have been privatized, reduced social security coverage, social

⁵ Kahil-Wolff, B., Greber, P. Y. Sécurité sociale: aspects de droit national, international et européen. Bruxelles: Helbing & Lichtenhahn, 2006, p. 47-49.

assistance is based on the means-testing principle and labour market is flexible.⁶

In this perspective, we present the Lithuanian pension system and its reforms. Also, we give a qualitative and quantitative evaluation of its sustainability in the light of current economic and demographic trends. We conclude with an agenda of further reforms. The paper starts with the presentation of Lithuanian pension system (Sect. 2) and its reforms (Sect. 3). It continues with an actuarial model for pension schemes (Sect. 4) and its application to Lithuania (Sect. 5). Finally, conclusions are drawn (Sect. 6).

2. Lithuanian pension system in the light of the economic crisis

Before the economic crisis in 2008, Lithuania reformed pension system in 1995 and 2003. Lithuania's pension system model is based on classical Bismarkian principles (earning related benefits and ensured state's guarantees) and from 2002 to 2008 had social security fund budget surplus.

Pension expenditures in Lithuania in 2007 was only 6,8% of GDP and it was almost twice lower than an average of EU-27 (11,8% of GDP in 2007): this is due to a more favorable population structure and to the fact that in the pre-crisis rapid economy growth period pensions have increased at a lower pace than the GDP. Without any pension reform the replacement rate (male worker retiring at 65 after 40 years of career) in the first pillar will decline from 48% to 35% in 2048.⁷

Pension expenditures in Lithuania will grow: the change of the age-related expenditure in 2007-2060 will be 4,6% of GDP (in EU-27 will be 2,4% of GDP in the period 2007-2060). Despite of negative prognosis showing increase of the pension expenditure in Lithuania, there are some factors which could mitigate the growth of the pension system expenses: restriction of the eligibility for a public pension (through higher retirement age, reduced access to early retirement and changes of the disability

⁶ Esping-Andersen, G. Welfare states in transition. After the Golden Age? Welfare state dilemmas in a global economy. London: Sage Publications, 1996, p. 20.

⁷ European Commission. Joint report on pensions: Progress and key challenges in the delivery of adequate and sustainable pensions in Europe (country profiles). EPC Secretariat, SPC secretariat, Brussels, 2010, p. 88.

pension system), higher employment and reduced generosity of pensions.⁸

According to the projections of the Eurostat and Lithuanian Ministry of Social protection and Labour, the population of Lithuania will decline to 2,5 million from 2009 to 2060, the elderly population (aged 65 and older) will more than double from 16% to 32,7% . Lithuania has one of the highest negative rates of crude migration (net) in EU-27 (-4,6% in Lithuania and 1,9% in EU-27).⁹ However, in Lithuania we could fix still relatively high employment of the older workers (55-64 years): the employment rate of older workers in 2009 was higher (51,6%) than the average of EU-27 (46% in 2009).¹⁰

Lithuania sharply affected by the economic crisis. In Lithuania (according to the data of Lithuanian statistics institution) GDP declined from 2,9% (in 2008) to minus 14,7% (in 2009) and economic growth returned only in 2011; unemployment rate raised from 5,8% in 2008 to 17,8% in 2010; employment rate (15-64) declined from 64,3% to 57,8%. According to the Eurostat data, public sector debt grown from 15,6% of GDP (2008) to 38,2% in 2010.

European Commission noted that the purpose of automatic adjustment mechanisms is to maintain the balance between revenues and liabilities in pension schemes, and these mechanisms impact on both intergenerational adequacy and sustainability. These mechanisms imply that the financial costs of demographic changes will be shared between generations subject to a rule. To a varying degree they link: i) life expectancy to pension eligibility or replacement rates; ii) economic performance in terms of GDP growth or labour market performance (with valorisation of entitlements or indexation of benefits); iii) balance of the system to valorisation of entitlements or indexation of benefits and contribution rates

⁸ European Commission. The 2009 Ageing report: economic and budgetary projections for the EU-27 member states (2008-2060). European Commission, Luxembourg, 2009.

⁹ European Commission. Joint report on pensions: Progress and key challenges in the delivery of adequate and sustainable pensions in Europe (country profiles). EPC Secretariat, SPC secretariat, Brussels, 2010, p. 87.

¹⁰ European Commission. The 2009 Ageing report: economic and budgetary projections for the EU-27 member states (2008-2060). European Commission, Luxembourg, 2009.

with indexation of benefits.¹¹ OECD (Organisation for Economic Co-operation and Development) noted that automatic link between pensions and a change in life expectancy could be: mandatory defined-contribution schemes substituting for or adding to public pension provision (the accumulated contributions and investment returns must be converted from a lump sum into a regular pension payment – annuity and the calculation of annuity should be based on the life-expectancy of retirees at the time of retirement); transformation of public, earning related plans into notional-accounts schemes (also include an annuity calculation and at the time of retirement, all accumulated contributions and notional interest is converted into a periodic payment) and a link between benefit levels or qualifying conditions for pensions and life-expectancy.¹²

Analysis shows that while some of the losses incurred during the crisis may be recovered during economic recovery relatively quickly, a complete restoration of pension finances may take many years (it means that people have lost a number of years of savings due to the financial crisis) and might not recover during their remaining active life (because of vulnerability of pension levels in defined contribution schemes).¹³ The crisis has wiped out years of economic and social progress and exposed structural weaknesses in Europe's economy, the world is moving fast and long-term challenges: globalization, pressure on resources and ageing.¹⁴ Because the public pension replacement rates in general declined in the EU, reforms have given and will continue to give rise to greater individual responsibility for outcomes and it is important to provide sufficient opportunities for complementary entitlements: e.g. enabling longer working lives and

¹¹ European Commission. Joint report on pensions: Progress and key challenges in the delivery of adequate and sustainable pensions in Europe (occasional paper). EPC, SPC, DG for Economic and Financial Affairs and DG Employment, Social Affairs and Equal Opportunities, Brussels, 2010.

¹² Pensions at a Glance 2011. Retirement – income systems in OECD and G20 countries, OECD publishing, 2011, p. 81-101.

¹³ International Labour conference „Social security for social justice and a fair globalization“. International Labour Office, Geneva, 2011, p. 61.

¹⁴ European Commission. Communication from the Commission Europe 2020: A strategy for smart, sustainable and inclusive growth. European Commission, Brussels, 2010.

increasing access to supplementary pension schemes.¹⁵

International Labour organization (ILO) notes, that the repercussions that these developments will have on contributors and pensions are not straightforward, and will most likely affect people who retire after the crisis but pensions funds in 2008 in many countries suffered enormous losses during the global crisis. OECD emphasized that countries private pension funds lost 23% of their value in 2008. The degree of vulnerability of future pension levels to the performance of capital markets and other economic fluctuations, introduced in so many pension systems during the last three decades, was clearly a mistake that stands to be corrected. Strong minimum pension guarantees may work here as “automatic stabilizers” of retirees’ living standards. Response to the economic crisis is only possible on the basis of existing administrative structures, that is, existing social institutions which either can automatically react to changing economic conditions thanks to their design, or can be easily adjusted (e.g. extended) to crisis-induced requirements.¹⁶ European Commission in the White paper “*An agenda for adequate, safe and sustainable pensions*” indicated that member states should: create i) link the retirement age with increases in life expectancy; ii) restrict access to early retirement schemes and other early exit pathways; iii) support longer working lives by providing better access to life-long learning, adapting work places to a more diverse workforce, developing employment opportunities for older workers and supporting active and healthy ageing; iv) equalise the pensionable age between men and women; v) support the development of complementary retirement savings to enhance retirement incomes.¹⁷

When revenue is declining, the simplest way to regulate the social insurance fund budget is to increase state social insurance contributions or to reduce benefits. However, these methods cannot be applied as the fastest

¹⁵ European Commission. Green paper: towards adequate, sustainable and safe European pension systems. European Commission, COM(2010)365 final, Brussels, 2010.

¹⁶ International Labour Office. World's social security report 2010/2011: providing coverage in times of crisis and beyond. International Labour Office, Geneva, 2010, p.106-118.

¹⁷ European Commission. Green paper: An Agenda for Adequate, Safe and Sustainable Pensions. European Commission, COM(2012) 55 final, Brussels, 2012.

economic effect because they indirectly impact State's competitiveness and employment policy. Reduction of pension benefits may affect certain undesirable legal and social implications, raise the questions of social solidarity, social security unity, benefits differentiation and legitimate expectation principles. Thus, the reduction of pensions means that persons are not encouraged further work and expect a higher pension, and pensions will decline despite of paid higher social insurance contributions. The economic crisis and reduction of pensions, deny the contribution-benefit balance and it's important to maintain the state social insurance pension guarantees. Reduction of pensions could violate main principle of Bismarck social tradition: the benefits depend on paid contributions.

The last economic recession strongly impacted Lithuanian pension system reforms. From 1 July 2009, the amendments to the Lithuanian Pension system reform law adopted: the state social insurance contributions transfers to the private pension funds fallen to 2% and social insurance benefits reduced for two years. On 28 October 2009, a National Agreement was signed between the Government of the Republic of Lithuania and social partners: the largest trade unions, business and employers as well as pensioners' organizations. Under this Agreement, the Government undertook to implement measures for financial consolidation, including a temporary reduction in all pensions (except the smallest pensions). Therefore, the government reduced pension benefits in 2009 (however, the Lithuanian Constitutional Court decided, that reduced part of pensions must be compensated in the future). Only in 2010 a complex pension system reforms adopted and future policies designed.

3. Pension system's reforms

3.1. Purpose of reforms

Pension system's reforms should cover not only the traditional measures (to reduce benefits and to increase contributions), but should be done together with the comprehensive social security system and labour law reform: to grow the employment, to introduce more flexible labour forms and active labour market policies, to review the system of social security benefits (reduce or eliminate some benefits), to introduce health social insurance contributions for pensions (pensions are taxable in many EU countries, except Lithuania). Economic Cooperation and Development

Organization in the pensions review of 2009 noted, that in the face of the economic crisis, the government adopts the short-term practical solutions, meanwhile, long-term strategic plans, which are important to pensioners' incomes, are ignored.²⁰ ILO indicated that the short-term responses to a crisis – macroeconomic stabilization, trade policies, financial sector policies and social security – cannot ignore longer-term implications for both economic development and vulnerability to future crises.²¹

International social security association (ISSA) marked that key policy in the field of pension reforms is to stabilize pension system finances and to increase pensionable age, choosing different options to link pension benefit levels more closely to life expectancy (defined contribution plans as in Hungary and Denmark, notional defined contribution accounts as in Italy and Sweden, adjusting benefit levels in defined benefit schemes as in Finland and Germany or changing qualifying conditions as in France and Denmark) and to introduce mechanisms to stabilize pension system finances by reducing benefits automatically as population ageing causes the ratio of workers to pensioners to decline.²²

International Labour Organisation does not have a specific pension model, but it does have a set of basic requirements for pension systems: *i) universal coverage; ii) benefits as a right; iii) equity and fairness; iv) protection against poverty; v) replacement of lost income; vi) collective actuarial equivalence of contributions and pension levels; vii) guarantee of a minimum rate of return on savings* (the real value of contributions paid into savings schemes should be protected wherever these are part of the national pension systems); *viii) sound financing and fiscal responsibility* (schemes should be financed in such a way as to avoid uncertainty about their long-term viability); *ix) policy coherence and coordination* (providing affordable access to essential health care and income security to all those in need); *x) state responsibility* (the state should remain the ultimate

²⁰ Pensions at a Glance. Retirement – income systems in OECD countries, 2009 www.oecd.org/els/social/pensions/PAG

²¹ International Labour Office. World's social security report 2010/2011: providing coverage in times of crisis and beyond. International Labour Office, Geneva, 2010, p.112.

²² International social security association. Dynamic social security for Europe: choice and responsibility: developments and trends. International social security association, Geneva, 2010, p. 8.

guarantor of the right to affordable retirement and access to adequate pensions, such guarantees can be applied to both PAYG and fully funded pension schemes).²³

OECD stressed that older workers need help to preserve and augment their human capital to make them more employable, seniority-based wages structures (which make it expensive to employ older workers) need to be reconsidered, the health of older workers, working conditions (through rehabilitation, training, improvements in occupational health and raising awareness of the work needs of older workers), to prepare older workers for greater job mobility at the end of their careers and working-time arrangements also play an important role in retirement decisions.²⁵

The time for reforms is actually critical: without the prolongation of retirement age and without incentives for the private pension accumulation, the deficit of state social insurance fund will be higher and the trust of the society in social insurance system could fell down.

3.2. Pension system reform in 2003

In 2000, the Government of the Republic of Lithuania adopted the Concept of the Pension system reform. This Concept indicated the principal goal – to change the pension system in such way, that persons at the retirement age could get higher pension income, the pension system should become more viable and would cover all population as well as the redistribution effect in the system should be decreased. Concept stated that quasi/mandatory funded pension system will be introduced (without increasing contribution rate for the pension insurance). It should be mentioned that the Concept has been adopted at the time of economic and social crisis: existing deficit of the state social security fund, economic recession, declining demographic situation.

The Concept provides also that the first level (pillar) of pension

²³ International Labour Office. World's social security report 2010/2011: providing coverage in times of crisis and beyond. International Labour Office, Geneva, 2010, p.119.

²⁵ Pensions at a Glance 2011. Retirement – income systems in OECD and G20 countries, OECD publishing, 2011.

system of Lithuania should guarantee the state social security pension (retirement, disability, widows and orphans). The second level (pillar) is quasi/ mandatory funded pensions operated by the private pension funds. The third stage (level) of the pension system is an additional voluntarily funded pension system (operated by pension funds or life insurance companies).

In July 2003 the Parliament adopted a Law on Funded Pensions . This law provides, that from 1 January 2004 the part of the contributions will be transferred to the private pension funds (if person decides to participate). The reasons to introduce funded pension system were deterioration of demographic situation, sustainability of the pension system and the surplus of the state social security budget.

Social insurance contribution rate to the funded system fixed by 2,5% for the first year and increased every year by 1% to 5,5% maximum. There were no restrictions for participation by age (below the legal retirement age). The supplementary part of the state social insurance old-age pension reduced in proportion to the size of the contribution rate.

The participants of the funded pension system can receive accumulated benefits at the retirement age. The volume of the accumulated sum depends on the annuity period, transferred contributions, investment results and the level of administration costs of the pension funds. Every year pension funds must inform participants about the accumulated sum.

Law on Funded Pensions defined, that lack of finances in the budget of social security (because of transferred contributions to the private funds) should be financed from the state property privatization and from the state budget. Each year the Law on the Approval of Indicators of the Budget of the State Social Insurance Fund provides the compensation level for the state social fund.

Participation in the funded pension system was active; however this may be related to the Government incentives explaining in mass media positives points to accumulate. Relatively high part of the older population (from 45 year) accumulates in this funded pension system (about 28% of total population in 2010). About 85% of the social insurance system's participants decided to accumulate for the funded pension in 2010.

Economic crisis strongly influenced the funded pension system. The state social pension insurance contributions (which are transferred to the

pension funds) were reduced from 5,5 to 2% in 2009–2011.

The introduction of the funded pension system in 2003 means, that Lithuanian pension system turned into Anglo-Saxon model: the state social security system become partly dependent on the state budget and participants of the funded pension system have less state guarantees from the first pension's pillar.

3.3. Pension system reforms after economic crisis

Economic crisis and analysis (indicated in the Concept of the reform of state social insurance and pension scheme of 15 June 2010) showed that there are several problems in pension insurance: the current benefit scheme enables the duplication of benefits; the redistributed part of social insurance pensions (the basic pension) has great significance for the pensions level, while the impact of contributions paid by a person is reflected insufficiently. It makes this scheme unattractive; benefits are not linked to the life expectancy; no incentives to continue longer work career; the identification of work incapacity and special needs are insufficiently transparent and controlled; the state social insurance scheme is financially vulnerable and the pension reserve fund not established; the indexation of the pension benefits is not linked to the economic and demographic indicators and is under a strong political impact; no long-term strategy for the pension accumulation.

On 15 June 2010, the Concept of the reform of state social insurance and pension scheme has been approved. The goal of the reform is to establish financial sustainability, to guarantee adequate and target-oriented benefits and to administer pension system more efficiently. In this concept some proposals has been fixed: to increase the pensionable age for women and for men until 65 years of age for the both genders in 2027; to cancel new state pensions (not related with the insurance record); to introduce private pension's fund better management means; to pay non-contributory social insurance pensions from the state budget; to apply a new clearer formula for pensions; to introduce economic indexation of pensions; to change the formula of the social insurance old-age pension calculation, introducing accounting units ("points") system or to introduce notional pension system; to integrate state pensions into the general scheme of social insurance.

The Lithuanian Parliament reached a wide political agreement and on 24 May 2011 adopted Guidelines of pensions and social security reform. The

Government adopted the Measures plan for implementation of Parliament Guidelines (adopted in Government on June 8, 2011) and timetable for the preparation of the laws projects.

The reform will last in two stages. The transitional period will start since 2012 and will last until 2026. Second stage will start from 2027.

The main aim of the reform as indicated in the Guidelines, is to ensure that persons could receive adequate pensions, to stabilise the state social insurance fund budget and to adjust the pensions level to the economical and demographical changes. Several principles indicated in the Guidelines:

1. More transparency in the pension system – pension system participants should receive all information about pension rights, should know about system's benefits and should be constantly notified of the obtained rights to the state social security pension.
2. Separation of the social insurance and social assistance: better correlation between contributions and benefits; to make labour market more flexible; to increase gradually a retirement age; pension's level should be related to the demographic and economic situation; government should encourage employment of elderly persons.
3. To establish clear indexation rules and clear relationship between social insurance fund and state budget. The pension benefits indexation should be linked to the economic and demographic, but not to the political indicators. Other changes related to the new pension formula: to transfer the basic flat-rate pension to the state budget and to introduce NDC (virtual accounts) system or accounting units ("points") system.
4. To cancel privileged benefits in future, to integrate all state privileged pensions into the social insurance system and to create professional pension funds.
5. Better regulation and more efficiency in second pillar private funded pension schemes. The accumulation in the second pillar gradually should be restored and voluntary pension accumulation should be encouraged. The measures for the better management of the pension funds should be introduced: introduction of the life-cycle investment system; to analyze the possibility to introduce state pension fund etc.

3.4. Prolongation in the retirement age

The increase of the pensionable age is strongly related to the longer life-expectancy. One of the key recommendations of European Union is prolongation of pensionable age and changes in the pre-retirement pension schemes. Prolongation of pensionable age is common process in many European countries because of state social security pension system vulnerability, ageing and raising of life expectancy. In the European Union's strategy "Europe 2020: Integrated guidelines for the economic and employment policies of the member states" is indicated that, member states should emphasize promoting increased labour force participation through policies to promote active ageing.²⁶

However, prolonging one's working life is not appropriate for everyone (poor health, work in difficult conditions or persons have long contributions periods), so active ageing policies have to be combined with policies in other areas: promoting employment of older workers, combating prejudice and age discrimination, fostering employability and lifelong learning, ensuring a safe and healthy working environment and adapting working time, working life and work organization.²⁷

On June 9, 2011 the Parliament approved the amendments to the Law on state social insurance pensions and it was decided to increase the retirement age. The retirement age will be increased by 4 months per year for women and 2 months per year for men from 2012, until it reaches 65 years in 2026. This decision was adopted with regard to the longer lifespan after the retirement age. According to the data from the Department of Statistics of Lithuania, in 2009 the average life expectancy after 65 years of age in Lithuania was 13.38 years for men and 18.25 years for women. According to the Eurostat projections, in future the life expectancy will grow (19 years for men and 22,6 years for women in 2050).

3.5. Accumulation for the retirement pension in the second pillar

Private schemes can relieve some of the pressure on public pension

²⁶ European Commission. Europe 2020: Integrated guidelines for the economic and employment policies of the member states. European Commission, Brussels, 2010.

²⁷ International Labour conference „Social security for social justice and a fair globalization“. International Labour Office, Geneva, 2011, p. 88-89.

provision, however, increasing reliance on private schemes has fiscal costs, given the widespread practice of providing tax incentives during the accumulation phase.²⁸ International Labour Organization indicated that where the schemes were financed collectively and have been fully managed by State (in particular through PAYG financing), the immediate impact has been small. In contrast, fully funded schemes, where individual savings have been invested in relatively volatile products, have sustained severe losses. States should implement following principles: regular actuarial studies, establishment of contingency reserve or stabilization funds and strict investment rules.³⁰ While some countries have directly tapped into national pension reserves, other countries have modified the regulations of pension funds to give the government a greater say in the investments to the national economy.³¹

On 14 November 2012, the Parliament approved the changes in the funded pension scheme. The aim was to create opportunities for current and future retirees to decide how they would like to accumulate their pensions in future. According to the new regulation, from 2014 the financial sources for the second pillar will consist from three parts: the contribution transferred from state social insurance fund budget, contribution paid from person's earnings and subsidy from the state budget.

There are three possibilities for persons. *First*, person could accumulate pension under current conditions, when 2% of state social insurance contribution's part is transferred from state social insurance fund to the private funds. The current contribution rate will remain until 2020 (since 2020, the contribution rate will be increased from 2% to 3.5%). *Second*, the person could pay additional 1% (from 2016 – 2%) from his earnings to private pension fund and 2% (from 2020-3,5%) of social insurance contribution's part will be transferred from state social insurance fund to the

²⁸ European Commission. Green paper: towards adequate, sustainable and safe European pension systems. European Commission, COM(2010)365, Brussels, 2010.

³⁰ International Labour Office. Social security and the rule of law: general survey concerning social security instruments in light of the 2008 Declaration on social justice for a fair globalization (ILC.100/III/1B). International Labour Office, Geneva, 2011, p. 183.

³¹ International Labour conference „Social security for social justice and a fair globalization“. International Labour Office, Geneva, 2011, p. 62.

private funds. In order to encourage a person to accumulate in private funds, the state will financially encourage person: in this option, the subsidy from the state budget (1% from an average wage in the national economy from 2014 and 2% from 2016) will be transferred from the state budget to a person's pension account. Additional 1% will be transferred from the state budget for every child until three years. *Third*, during transitional period (from 1 April 2013 to 30 November 2013), persons have a possibility to stop the participation in the pension fund and to return to the state social insurance fund.

4. Actuarial evaluation of public pension systems

4.1. Reference literature

Over the last decade a vast literature regarding management and regulation of pension systems has developed. Quantitative research on risk management in pay-as-you-go pension schemes, has focused on developing stochastic models for demographics risks. Indeed, the financial sustainability depends on the demographic composition of its members, because pensions are funded by contributions of current workers.

Demographic analyses of pension schemes have been proposed by Janssen and Manca³⁵ and by Colombo and Haberman³⁶. Sinn³⁷ and Abio et al.³⁸ consider the age structure of future national population as a prime risk factor in PAYG public pension systems. Devolder et al.³⁹ analyse the

³⁵ Janssen, J, Manca, R. (1997). A realistic non-homogeneous stochastic pension fund model on scenario basis. *Scandinavian Actuarial Journal*, 2, 113-137

³⁶ Colombo, L., Haberman, S. (2005). Optimal contributions in a defined benefit pension scheme with stochastic new entrants. *Insurance: Mathematics and Economics*, Elsevier, 37, 2, 335-354

³⁷ Sinn, H.W. (1998). The Pay-as-you-go Pension System as a Fertility Insurance and Enforcement Device. NBER Working Paper 6610.

Sinn, H.W (2000). Pension reform and demographic crisis. Why a funded system is needed and why it is not needed. *International Tax and Public Finance*, 7 389-410

³⁸ Abio, G., Mahieu, G., Patxot, C. (2004). On the Optimality of PAYG Pension Systems in an Endogenous Fertility Setting. *Journal of Pension Economics and Finance*, 3, 1

³⁹ Devolder P., Melis R., Miller A (2012) Optimal mix between pay-as-you-go and funding for pension liabilities in a stochastic framework, Discussion Paper 2012/29,

financing of public pension in a stochastic environment, with a mix of funded and unfunded schemes. Angrisani et al.⁴⁰ propose a demographic model for studying the impact on PAYG pension systems of future developments of the population. Bianchi et al.⁴¹ conduce joint demographic and behavioural analyses via dynamic microsimulation to test the economic effects of pension reforms. Fiori Maccioni⁴² proposes a discrete-time stochastic model for the estimation of new entrants in pension schemes of a professional category. In open pension schemes, such model can forecast new entrants divided by their education and profession. A joint stochastic model for asset returns and new entrants has been also proposed by Melis and Trudda⁴³.

An introduction to longevity risk with a comprehensive literary review is proposed by Pitacco⁴⁴. Rigorous analyses of mortality projections have been conducted by Lee and Carter⁴⁵, Benjamin and Pollard⁴⁶, Benjamin and Soliman⁴⁷, Haberman and Renshaw⁴⁸, Lee⁴⁹, Olivieri⁵⁰, Thatcher et al.⁵¹ and

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⁴⁰ Angrisani, M., Attias, A., Bianchi, S., Varga, Z. (2004). Demographic dynamics for the pay-as-you-go pension system. *PU.M.A.*, 15, 4, 357-374

⁴¹ Bianchi, C., Romanelli, M., Vagliasindi, P. (2003). Microsimulating the Evolution of the Italian Pension Benefit. *Labour*, 17, 139-173

⁴² Fiori Maccioni, A. (2008). A stochastic model for the analysis of demographic risk in pay-as-you-go pension funds. *Mathematical Methods in Economics and finance*, 3, 2, 41-60

⁴³ Melis R., Trudda A. (2012) Solvency indicators for partially unfunded pension funds, *Investment Management and Financial Innovations* 9 (4):71-77

⁴⁴ Pitacco, E. (2004). Survival models in a dynamic context: a survey. *Insurance: Mathematics and Economics*, 35, 2, 279-298

⁴⁵ Lee, R., Carter, L. (1992). Modelling and forecasting U.S. mortality. *Journal of the Statistical Association*, 87, 419

⁴⁶ Benjamin, B., Pollard, J.H. (1993). The analysis of mortality and other actuarial statistics. The Institute of Actuaries, Oxford

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⁴⁹ Lee, R. (2000). The Lee-Carter method for forecasting mortality, with various

Olivieri and Pitacco⁵². Joint analyses of both financial and longevity risks have been proposed by Olivieri and Pitacco⁵³ and by Coppola et al.⁵⁴. The securitisation of mortality risk has been analysed by Lin and Cox⁵⁵ and by Cairns et al.⁵⁶. Ryan and Fabozzi⁵⁷ study the defaults of US pension funds due to actuarial losses and not to wrong portfolio investments. Several stochastic models for global asset return in pension funds have been proposed; see for example Parker⁵⁸, Cairns and Parker⁵⁹, Blake et al.⁶⁰. Haberman⁶¹ identifies a ‘contribution rate risk’ and considers as stochastic

extensions and applications. *North American Actuarial Journal*, 4, 1, 80-93

⁵⁰ Olivieri, A. (2001). Uncertainty in mortality projections: an actuarial perspective. *Insurance: Mathematics and Economics*, 29, 2, 231-245

⁵¹ Thatcher, R., Kannisto, V., Andreev, K. (2002). The Survivor Ratio Method for Estimating Numbers at High Ages. *Demographic Research*, 6, 1, 1-18

⁵² Olivieri, A., Pitacco, E. (2005). La valutazione nelle assicurazioni vita. *Profili attuariali*. EGEA, Milano

⁵³ Olivieri, A., Pitacco, E. (2003). Solvency requirements for pension annuities. *Journal of Pension Economics and Finance*, 2, 2, 127-157

⁵⁴ Coppola, M., Di Lorenzo, E., Sibillo, M. (2000). Risk sources in a life annuity portfolio: decomposition and measurements tools. *Journal of Actuarial Practice*, 8 (1,2) 43-61

⁵⁵ Lin, Y., Cox, S.H. (2005). Securitization of mortality risks in life annuities. *Journal of Risk and Insurance*, 72, 227-252

⁵⁶ Cairns, A.J.G., Blake, D., Dowd, K. (2006). Pricing death: Frameworks for the valuation and securitisation of mortality risk. *CRIS Discussion Paper Series - 2006.IV*, University of Nottingham

⁵⁷ Ryan, R.J., Fabozzi, F.J. (2003). The Pension Crisis Revealed. *The Journal of Investing*, 12.3, 43-48

⁵⁸ Parker, G. (1997) Stochastic analysis of the interaction between investment and insurance risks. *North American Actuarial Journal*, 1, 2, 55-84

⁵⁹ Cairns, A.J.G., Parker, G. (1997). Stochastic pension fund modelling. *Insurance: Mathematics and Economics*, 21, 43-79

⁶⁰ Blake, D., Cairns, A., Dowd, K. (2001). PensionMetrics: stochastic pension plan design and value-at-risk during the accumulation phase. *Insurance: Mathematics and Economics*, 29, 187-215

Blake, D., Cairns, A.J.G., Dowd, K. (2003). Pensionmetrics II: Stochastic pension plan design during the distribution phase. *Insurance: Mathematics & Economics*, 33, 29-47

⁶¹ Haberman, S. (1997). Stochastic investment returns and contribution rate risk in a

components both rate of return and contribution rate.

The actuarial valuation of national pension systems is strictly linked to the forecasting of national population and the related fertility, migration and mortality trends. For useful introductions to demographic modeling with literature, see for example Hyndman and Booth⁶². A classic contribution to population projections is that of Leslie⁶³. The United Nations apply traditional methods to forecast periodically national populations.⁶⁴ Raftery et al. minimize the forecasting error of traditional approach via Bayesian techniques.⁶⁵ Analyses of the Lithuanian case are proposed by Klyvien⁶⁶ and Alho⁶⁷.

4.2 Methodology

In this section we present a model for the estimation of future cash flows of a national pension system, depending on demographic, financial and regulatory variables. We start, therefore, with a discrete, age-structured model of population growth based on demographic variables of mortality, fertility and migration. The model estimates the life dynamics of national population divided by gender and age and follows the traditional matrix

defined benefit pension scheme. Insurance: Mathematics and Economics, 14, 127-139

⁶² Hyndman R.J., Booth H. (2006): Stochastic population forecasts using functional data models for mortality, fertility and migration. ANU Working Papers in Demography, No. 99, 2006.

⁶³ Leslie, P.H. (1945) "The use of matrices in certain population mathematics". Biometrika, 33(3), 183–212.

Leslie, P.H. (1948) "Some further notes on the use of matrices in population mathematics". Biometrika, 35(3–4), 213–245.

⁶⁴ United Nations (1956). Manual III. Methods for population projections by sex and age (United Nations publication, Sales No. 56.XIII.3).

⁶⁵ Rafterya A.E., Lib N., Ševčíková H., Gerlandb P., Heilighb G.K. (2012): Bayesian probabilistic population projections for all countries. PNAS, August 28, 2012, vol. 109, no. 35, 13915–13921.

⁶⁶ Klyvien, V. (2004). The Public Debt and the Problem of Population Ageing in Lithuania (April 1, 2004). Available at SSRN: <http://ssrn.com/abstract=2070664>

⁶⁷ Alho, J.M. (2002). Stochastic forecast of the Lithuanian population 2001–2050. Project Report. Helsinki: The Research Institute of the Finnish Economy.

approach of Leslie⁶⁸ and the population projection methods of the United Nations.

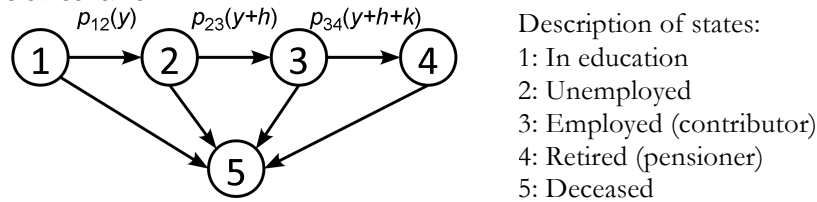
Our next step is to analyze the working conditions of national population. We find initial contributors and pensioners and we forecast their life dynamics. Each year, new cohorts of workers enter in the pension system, while some existing cohorts fulfill the pension requirements and retire. We calculate for each cohort of workers the cash inflows for contributions to the pension scheme, and for each cohort of pensioners the cash outflows from the scheme. The annual difference between total contributions and pensions determines the pension balance. Finally, we study the evolution of the pension scheme through its cumulated annual balances.

4.3 Life cycle representation

We estimate the uncertain life evolution of an individual through a multistate Markov chain (see Fig. 1). Each state represents a univocally identified working condition, which varies according to age: in education, unemployed; employed; retired; deceased. The stochastic variable is the time spent on each state. Also, the permanence in the states ‘employed’ and ‘retired’ will be associated to cash flows related, respectively, to contributions paid or to pension received.

For the purposes of this paper, the model is presented as a projection tool. Hence, the components of demographic change (mortality, fertility and migration) are assumed to remain constant throughout the projection period.

Figure 1. Markov chain representing the life cycle of a member of the pension scheme.



⁶⁸ Leslie, P.H. (1945) "The use of matrices..." op. cit., and Leslie, P.H. (1948) "Some further notes..." op. cit.

The $p_{ij}(y)$ in the Markov chain represents the probability of transition from state i to state j at year y . An individual can move to a greater state exclusively after fixed time periods (0, h or k time units) depending on the state itself. The parameter h represents the expected years of unemployment in the life of an individual. For simplicity, we assume a once-and-for-all unemployment period, which happens in life between the education and the working periods. The parameter k represent the years of working before retirement (i.e. the years of contribution to the public pension system). At any given time, an individual can only be in one state. Moving to a greater state can happen exclusively after fixed time periods (1, h or k time units) depending on the state itself. State 5 can be reached from any other previous state and represents the end of life.

4.4 Demographic model

We calculate the evolution of population divided by gender, age and working conditions, with the following formulae. Let $POP_{sx}(y)$ represent the national population of gender $s=\{F, M\}$ and age x , alive at year y . For $x \geq 1$, we estimate the national population as:

$$POP_{sx}(y) = POP_{sx-1}(y-1) \cdot \left[1 - \frac{q_{sx-1}(y-1) + q_{sx}(y-1)}{2} - \frac{m_{sx-1}(y-1) + m_{sx}(y-1)}{2} \right],$$

where $q_{sx}(y)$ and $m_{sx}(y)$ represent, respectively, the mortality rate and the net migration rate at year y of individuals with gender s and age x .

For $x = 0$, we estimate the national newborn population as:

$$POP_{sx=0}(y) = \sigma_s \cdot \sum_x [\Phi_x \cdot POP_{s=Fx}(y-1)],$$

where $POP_{s=Fx}(y)$ is the national population of females aged x at year y , the value Φ_x is the annual fertility rate of women aged x , and σ_s is the share of newborn babies of gender $s=\{F, M\}$, with $\sigma_F = 1 - \sigma_M$.

Let $N_{sxa}(y)$ represent the population of members of the pension system alive at year y of gender s , age x and seniority in the system a . Given a population of existing members $N_{sxa}(y)$ with $a > 1$, we estimate its evolution as:

$$N_{s\ x\ a}(y) = N_{s\ x-1\ a-1}(y-1) \cdot \left[1 - \frac{q_{s\ x-1}(y-1) + q_{s\ x}(y-1)}{2}\right],$$

where $q_{s\ x}(y)$ represents the mortality rate at year y of individuals with gender s and age x .

We estimate new members as follows. We assume that all new contributors enter in the pension system at age $x = \bar{x}$ and we estimate the population of new contributors $N_{s\ x\ a}(y)$ with $a = 1$ and $x = \bar{x}$ as:

$$N_{s\ x=\bar{x}\ a=1}(y) = \sum_x [POP_{s\ x}(y-1) \cdot \alpha_{s\ x} \cdot (1 - \beta_{s\ x})] - \sum_{x\ a} N_{s\ x\ a}(y-1),$$

where $\alpha_{s\ x}$ and $\beta_{s\ x}$ represent, respectively, the activity rate and the unemployment of population with gender s and age x . The preceding formula tends to keep unchanged over time the activity and unemployment rates among the population.

4.5 Financial model

Let $c_{gsxa}(y)$ be the average contribution of type g paid at year y by a member of sex s , age x and working seniority a , determined as:

$$c_{gsxa}(y) = \gamma_{gxay} \cdot R_{gsxa}(y)$$

where γ_{gxay} and $R_{gsxa}(y)$ represent respectively the contribution rate and the expected financial amount (i.e. gross income) for the determination of the contribution type g due at year y by an individual of sex s , age x and seniority a . Then, the annual cash flows at year y for contributions to the pension system is equal to:

$$C_y = \sum_g \sum_s \sum_x \sum_a c_{gsxa}(y) \cdot N_{sxa}(y),$$

$$\forall (x, a) \in N \times N - \{x > \hat{x}_{dsy} \wedge a \geq \hat{a}_{dsy}\},$$

where \hat{x}_{dsy} and \hat{a}_{dsy} represent respectively the retirement requirements of age and seniority, in force at year y , for members of sex s to be entitled to a benefit of type b . Thus, the $N_{sxa}(y)$ considered in the previous equation are cohorts of active members. The term $c_{gsxa}(y)$ is the average contribution of type g paid at year y by an individual of sex s , age x and seniority in the pension system a . The term $g \in G$ represents a generic contribution of all the existing types of contributions G .

The annual pension disbursement at year y is equal to:

$$B_y = \sum_d \sum_s \sum_x \sum_a b_{dsxa}(y) \cdot N_{sxa}(y),$$

$$\forall (x, a) \in N \times N: \{x > \hat{x}_{dsy} \wedge a \geq \hat{a}_{dsy}\},$$

where \hat{x}_{dsy} and \hat{a}_{dsy} represent the retirement requirements of age and seniority, in force at year y , for members of sex s to be entitled to a benefit of type d . Thus, the $N_{sxa}(y)$ considered in the previous equation are cohorts of retired members of the pension system alive at year y of gender s , age x and seniority a . The term $b_{dsxa}(y)$ is the average benefit of type d received at year y by a pensioner of sex s , age x and working seniority a . The term $d \in D$ represents a generic benefit of all the existing types of benefits D .

Let V_y represent the cumulated balance of the pension system, which we model with the following recursive equation:

$$V_y = V_{y-1} \cdot (1 + r_y) + C_y - B_y - E_y$$

where r_y is the nominal annual interest rate on public debt, C_y , B_y and E_y represent respectively the amounts of contribution income, pension disbursement and administrative expenses generated in the year y . All of the cash flows are assumed to take place at the end of each year.

5. The evolution of Lithuanian public pension system

5.1. Technical assumptions

We estimated the financial dynamics of the Lithuanian public pension system in the period 2012-2051 and the effects of demographic, economics and regulatory variables. We considered the current reform of second pillar

system, exposed in section 3.5, which require workers to choose among three different contributive options. We adopted the forecasting model described in section 4, under the following assumptions.

Demographic hypothesis:

- Population of Lithuanian pensioners and contributors at 1 January 2012, divided by sex, age and seniority, estimated from data of Lithuanian Official Statistics Portal.
- Future entrants determined according to the model stated in section 4. New contributors enter in the pension system at age 25.
- Mortality rates assumed equal to values in 2011, estimated from Lithuanian life expectancy tables published by Lithuanian Official Statistics Portal. Net migration rate assumed equal to zero.

Financial hypotheses:

- Annual pension balance equal to collected contributions minus pensions minus the eventual governmental subsidy to 2nd pillar accounts.
- We do not consider any management costs nor costs of public debt.
- Inflation rate equal to European Central Bank long-term objective, thus equal to 2,00%.

Contributions:

- Two types of contributions determined in accordance with Lithuanian regulations: to 1st pillar public pension system and to 2nd pillar pension system.
- Total contribution rate on gross income in period 2004-13 equal to 26,3%, divided between 1st pillar and 2nd pillar systems according to regulations at the time.
- Contribution rates from 2014 determined according to the three alternative regimes exposed in section 3.5, which we summarize:
 - A) contribution rate to 1st pillar equal to 24,3% in years 2014-19 and to 22,8% from 2020. Contribution rate to 2nd pillar equal to 2% in years 2014-19 and to 3.5% from 2020.
 - B) Contribution rate to 1st pillar equal to 24,3% in years 2014-19 and to 22,8% from 2020. Contribution rate to 2nd pillar equal to 3% in years 2014-15, to 4% in years 2016-19 and to 5.5% from 2020. Additional

governmental subsidy to 2nd pillar of 1% of average national salary in years 2014-15 and of 2% from 2016.

C) Contribution rate to 1st pillar equal to 26,3% of gross income; no contribution to 2nd pillar system.

- We assume in each of the preceding scenarios A, B or C that all workers opt for the same 2nd pillar contributory regime.

- Annual gross incomes, for each cohort of same sex and age, equal to average values in 2010 published by the Lithuanian Official Statistical Portal, appreciated at nominal GDP growth rate in 2011-2012 and at 3,00% for the following years.

Old-age insurance public pensions:

- Benefits paid to pensioners who retired before the 1st of January 2012 estimated according to average values in 2012, published on Lithuanian Official Statistics Portal.

- Pensioners who retire after the 1st of January 2012 get an old-age insurance pension consisting of three components: a basic sum; a supplement based on working seniority; an earnings-related part, calculated with an accounting unit ("points") system and reduced proportionally to second pillar contributions.

- Pensions after the 1st of January 2012 estimated for each cohort of members by gender and age, according to current regulations.

- All pensions are appreciated annually at inflation rate. Each cohort of contributors retires immediately after fulfilling requirements. We do not consider benefit reversion to survivors.

Second pillar pension:

- Existing workers at 1-1-2012, have contributed to the 2nd pillar system for various years: workers with age 29 or older have contributed since 2004; workers with age between 22 and 28 have contributed since their 21 years of age. All other workers enters in the 2nd pillar system since 2012.

- Second pillar pension funds generate 3.00% annual returns in period 2004-13 (as their average I.R.R. in same period, published by Lithuanian Central Bank) and 3.65% returns from 2014 (as the interest rate on Lithuanian bonds in August 2013, published by European Central Bank).

- Annuities calculated at retirement by applying to the accrued

contributions the regulatory conversion rates for 2012, fixed by Lithuanian Central Bank.

- We assume that accrued contributions are converted in annuities for every cohort of new pensioners. Notably, contributors whose annuity would not reach the basic pension are forced by law to receive the accrued contributions as a lump sum instead of annuity payments; however, contributors could buy the annuity in a developed and competitive 3rd pillar market.

5.2 Results

The three alternative contributory scenarios of second pillar regimes, described in sections 3.5 and 5.1, have been separately analyzed and results are shown in figures 2-7. Results reveal the long-term tendency to sustainability of Lithuanian pension system. However, the state budget should bear an initial negative balance and the consequent public debt interests. The rebalancing of the system happens at a cost of low pension payments, especially for older cohorts of current workers.

Negative pension balances are initially observable in every scenario, and their persistence can vary notably. If all contributions flowed into the first pillar public system, as in scenario C, the pension balance would turn positive in 2017. Conversely, if the Government subsidized every second pillar private account, as in scenario B, the pension balance would turn positive in 2025.

Future positive pension balance of scenario B suggests that the public subsidy to second pillar accounts is mainly covered by the same generations of taxpayers that can benefit from it. However, the younger cohorts of workers can benefit from the subsidy more than the older ones. The choice of investing in second pillar reduces by law the earning-related part of workers' public pension. Such reduction is, *ceteris paribus*, linearly proportional to time and computed according to the accounting unit ("points") system. Vice versa, investment returns do not grow linearly but exponentially over time (in other words, returns accrue at increasing pace). Then, cohorts that are close to retirement may find convenient to contribute only to first pillar because their investments, which have a short time-to-maturity, may not overcompensate the reduction in the public pension. For example, cohorts aged 55 have almost the same initial pension

amount in scenario A (with current second pillar contribution) and in scenario B (without second pillar contribution, from 2014); such result is depicted in figures 3 and 7. Risk-averse individuals may decide to contribute only to first pillar also to avoid any investment risk.

Quantitative results should be considered with caution, because the model cannot capture the risk of abrupt demographic and economic changes. Improvements in accuracy can be obtained with wider statistical data. However, a complete risk assessment of the Lithuanian pension system would require stress testing and percentile analyses. In future research, we intend to analyze and quantify long-term demographic and financial risks with stochastic methods.

6 Conclusions

The paper has presented the Lithuanian pension system, its reforms and an evaluation of its sustainability in the light of current economic and demographic trends. The quantitative analysis reveals its long-term tendency towards financial equilibrium, albeit at a cost of initial negative balances to be covered with public budget. The system may expose workers to risks of poverty and social exclusion because of low pension payments. The problem is higher for old workers, which can benefit less from second pillar pension savings. Article analysis leads to the following conclusions:

1. The key policy is to rebuild the trust in public social insurance schemes and in private funded pension schemes. Participants of the private and public pension system should be constantly and clearly notified of the obtained pension rights.

2. Therefore, the concept of social security should cover public state security schemes, state funded second pillar pensions and all private funded or occupational pension schemes. Social insurance pension calculation of the replacement rate should comprise not only public pensions but statutory private quasi/mandatory funded pensions (second and third pillar).

3. The challenges for the Lithuanian pension system is ageing population (especially low fertility rate), low employment rate, low pension's benefits, poverty of older persons, no clear indexation rules, emigration and growth of the pension expenditures.

4. Pension system has to respond directly to the changes in the structure of society and must be very closely related to the flexibility of labor

relations (part-time or half-day employment, opportunities for longer and less interrupted contributory careers, the positive returns from financial markets, more lifelong learning etc.), creation of better working conditions and the changing the approach of employers towards older workers.

5. It is necessary to intensify the pension system's reform in Lithuania because of sharpening of the demographic and social changes. The main goals should be: to encourage and extend employment (especially for the older workers, women and young persons), to revise all social security system benefits; to balance the budget of the social security fund and to introduce pension reserve fund; to decrease pension funds administrative costs; to introduce pension benefits indexation rules; to reform unemployment system and to reduce the early retirement pension system (introducing flexible retirement); to introduce an automatic adjustment mechanisms; to maintain the balance between revenues and expenses in the pension system.

Figure 2. Forecasting of Lithuanian public pension system in scenario A, with current 2nd pillar contribution rates (years 2012-51, nominal values in million Litas).

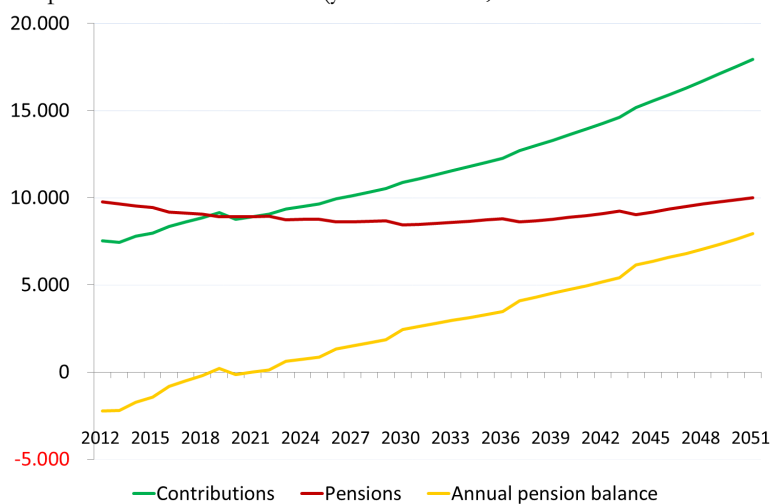


Figure 3. Average monthly pension for different age cohorts of females and males in scenario A with current 2nd pillar contribution rates (real values in Litas at 2012 prices).

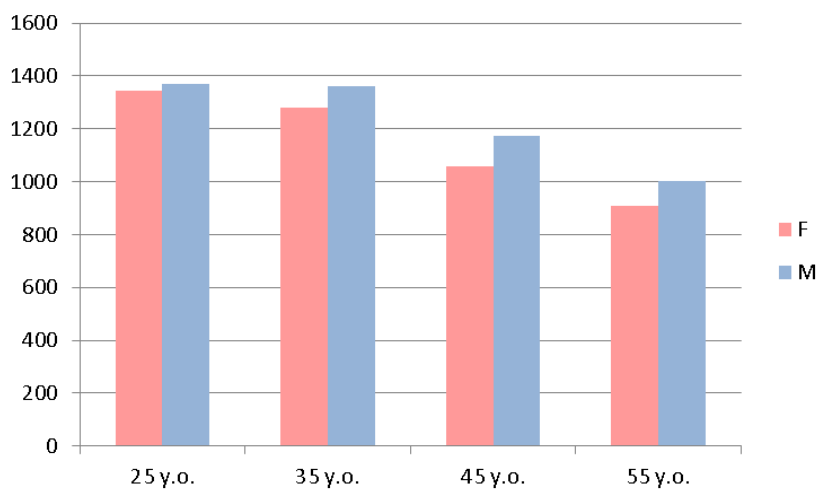


Figure 4. Lithuanian public pension system in scenario B, with higher contribution rates and public subsidy to 2nd pillar (years 2012-51, nominal values in million Litas).

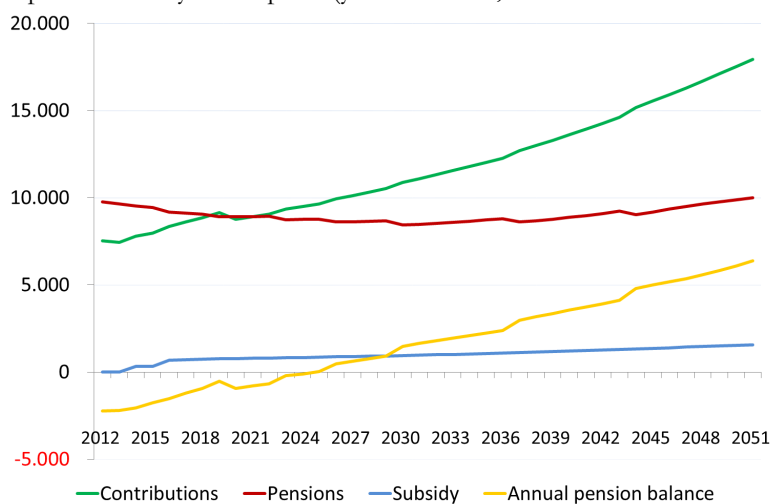


Figure 5. Average monthly pension for different age cohorts of females and males in scenario B, with higher contribution rates and public subsidy to 2nd pillar (real values in Litas at 2012 prices).

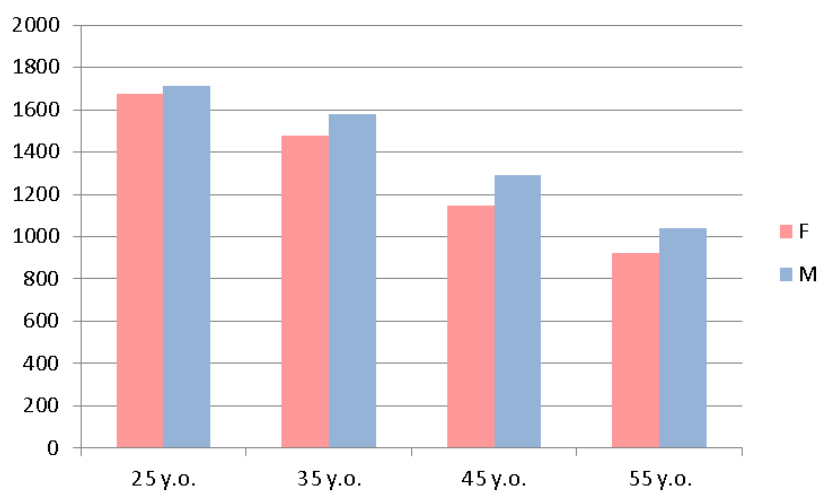


Figure 6. Forecasting of Lithuanian public pension system in scenario C, with exit from 2nd pillar system (years 2012-51, nominal values in million Litass).

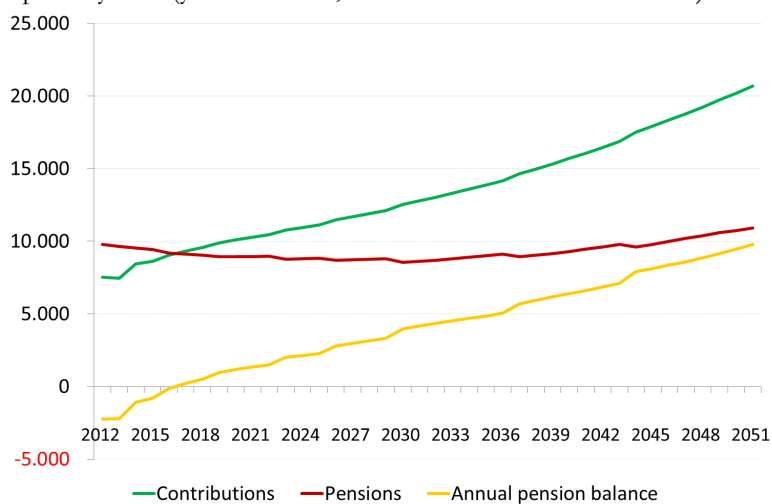
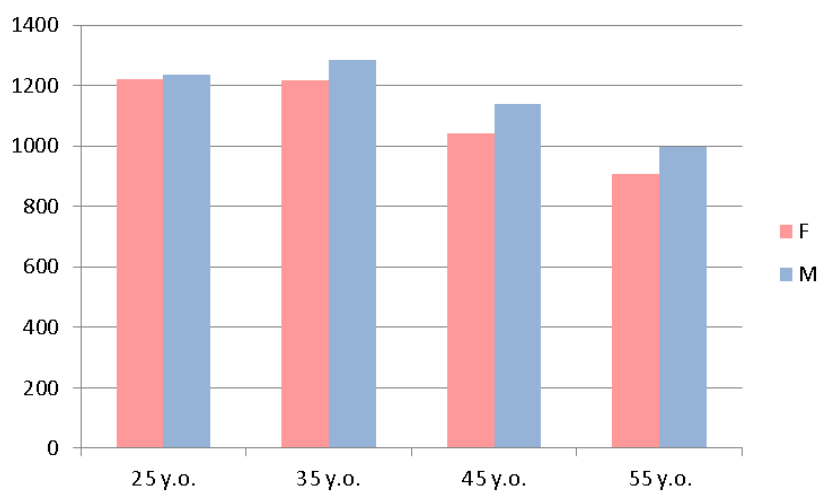


Figure 7. Average monthly pension for different age cohorts of females and males in scenario C, with exit from 2nd pillar system (real values in Litass at 2012 prices).



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