ASSESSING THE IMPACT OF SECOND PILLAR COMPONENT ON OLD AGE PENSION IN LITHUANIA

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Abstract. *The aim of the study was is to evaluate the impact of a privately accumulated second pillar component on old-age pension. This evaluation is based on quantitative, statistical data and qualitative analysis of pension accumulation results in second pillar during the years 2004–2012. Three groups of different monthly wage size (low, medium, and high) earners are analyzed by calculating the accumulated amounts and old-age pension values of persons who joined and who did not join the second pillar pension funds in 2004 and who retired in the beginning of 2013. The pension reform success (or failure) is evaluated from the point of view of old age pension beneficiaries by comparison of gain or loss of all three groups of participants due to participation in second pillar pension funds. The results show that due to the longer life expectancy the capital accumulated by women in the second pillar does not exceed the present value of loss in the pay-as-you-go system. The comparison of "official" annuities exposes a more optimistic result for both genders of participants of fully funded private second pillar pension funds, but is not confirmed by commercial annuities.*

Key words*: old-age pension, private second pillar pension funds, pension reform*

Introduction

The *fully funded* second pillar of the Lithuanian pension system was introduced from the 1 January 2004. From that date, the pension reform was begun to implement by allowing to establish second pillar pension funds (based on the *fully funded* approach). Before this date, Lithuanian pensions had been based solely on the first (*pay-as-you-go*) pillar.

The approach to the pension reform in Lithuania was not much different from that in many other post-communist countries (Poland, Hungary, etc.) where pension systems had been reformed earlier. The second pillar was based on personal *fully funded* accounts of

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participants who were allowed to pay part of their obligatory pension insurance contribution into their personal account instead of paying a full contribution into the general social insurance fund. The third pillar was also based on personal accounts but was not related to obligatory social insurance contributions. The participants could make voluntary savings to their retirement with some tax advantages. Both *fully funded* pillars were managed by private pension accumulation companies who proposed several pension funds with different investment strategies. As one of the Lithuanian specifics, it should be mentioned that participation in the second pillar was fully voluntary: residents insured for a full pension (before retirement age) were allowed to decide themselves whether they remained in the first (*pay-as-you go*) pillar or shared participation in both pillars (most of other reform countries had required obligatory participation in the second pillar for certain age groups and/or had banned participation from a certain age). It should be noted, that at the end of 2012 more than 1 million participants, or 96 per cent of residents insured for a full pension participated in *fully funded* second pillar pension funds.

The legal acts of the reform were based on the Concept of Pension System Reform approved by Lithuanian Government on 26 April 2000 and the White Book on Pension Reform also approved by Government on 25 October 2000. According to these documents, the main aim of the pension reform was declared as follows: "To change the pension system in a way that the income of people above the retirement age would be higher than now (but redistribution in the system would be reduced)". The other aims as financial sustainability (balancing the social insurance pension system in a way that it should perform in coming years without financial deficit), encouraging savings in the country, and reducing tax avoidance were also declared (Dėl pensijų sistemos reformos koncepcijos, 2000).

The aims, implementation, and some results of the reform were analyzed in several publications (Lazutka, 2008; Jankauskienė, Medaiskis, 2009–2012, Gudaitis, 2009–2013).

In this paper, we intend to add one important aspect of pension reform success (or failure) analysis, i.e. to evaluate from nine years of the *fully funded* system performance perspective whether it was rational or not for certain groups of insured persons to join the second pillar. In order to do this, we compare the old-age pension values of low, medium, and high monthly wage earners who joined and who did not join the second pillar in 2004 and who retired in the very beginning of 2013.

The paper is structured as follows. Firstly, we describe how the Lithuanian old-age pension is calculated and how it is reduced in case when an insured person transfers part of the mandatory insurance contributions into the second pillar pension funds. Secondly, we compare old-age pension values reduced due to participation in the second pillar with non-reduced ones. Then we analyze the investment performance of private second pillar pension funds by calculating the net investment return during the period 2004–2012 and evaluate the amount accumulated in the *fully funded* second pillar. Finally, a comparison is performed and the conclusions are drawn.

1. Old-age pension calculation analysis

An old-age social insurance (*pay-as-you-go*) pension is granted under two conditions: retirement age and obligatory record of pension insurance contributions. The retirement age is now coherently increased to 65 years by 2 months per year for men and four months per year for women starting from 62.5 years for men and 60 years for women from 2012. The required contributory period is at least 15 years. The old-age social insurance pension is calculated from three components:

$$Pension = Main + Supplement + Earnings\text{-}related\ part \quad (1)$$

The so-called "main" part of the pension is designed as a flat-rate redistributive component dependent on the years of insurance. It is calculated according to the formula:

$$Main = \alpha \cdot 1.1 \cdot B. \quad (2)$$

In this formula, B is the basic pension. The value of the basic pension is discretionarily approved by the Lithuanian Government. Currently, it is LTL 360[1]. The multiplier 1.1 means that 110% of the basic pension is taken into account. This multiplier was introduced in 2008 when the Lithuanian Government decided to increase the main part of the pension but could not increase the basic pension itself[2]. The multiplier α is equal to contributory years acquired by a person, divided by 30 obligatory years, but it never exceeds 1. For example, if a person has 20 contributory years, the multiplier α is equal to 2/3; if a person has 30 or more years of insurance, the multiplier is equal to 1.

The "supplement" was introduced in 2007 when it was decided to increase the influence of working years on the pension amount. From that time, 3 per cent of the basic pension for every year of insurance above 30 years is added to the pension amount:

$$Supplement = 0.03 \cdot (S\text{-}30) \cdot B, \text{ if } S > 30. \quad (3)$$

The earnings-related part (hereinafter ERP) of a social insurance pension is the only part dependent on the work income of a retired person before retirement. The calculation of this part is based on a simple idea: 0.5 per cent of the monthly average wage W_t of a person is added to the monthly pension:

$$ERP = 0.005 \cdot W_1 + 0.005 \cdot W_2 + \ldots + 0.005 \cdot W_n. \quad (4)$$

Bearing in mind that the values of $W_1, W_2, \ldots, W_n$ are not comparable in the year of retirement (n), these values are related to the average wage in the country. For a more

[1] € 104.26. Exchange rate is fixed by currency board approach: 1 € is equal to 3.4528 LTL.

[2] The reason was that an increased amount of the basic pension may consequently increase not only the expenditures for social insurance pensions (what was possible to do from social insurance system revenues), but also expenditures for social assistance pensions financed from the general tax. In this case, Lithuanian Government could not find appropriate means.

precise approach, at the initial version of the pension law, instead of the average wage W_t, the so-called "insured income" D_t was used, i.e. the average income from which social insurance contributions of all insured persons were paid or based on (sickness, unemployment insurance benefits, etc.)[3]. Then the formula changes into:

$$ERP_T = 0.005 \cdot (W_1 / D_1) \cdot D_T + 0.005 \cdot (W_2 / D_2) \cdot D_T + ... + 0.005 \cdot (W_n / D_n) D_T. \quad (5)$$

The values of $k_t = W_t / D_t$ are pension points (coefficients) earned by a person in a year t, so the whole formula may be written as

$$ERP = 0.005 \cdot (k_1 + k_2 + ... + k_n) \cdot D_T. \quad (6)$$

So, the earnings-related part is equal to the sum of collected coefficients (or "pension points") $k_1 + k_2 + ... + k_n$ multiplied by 0.5 per cent of the current insured income D_T of the month T of pension payment. The advantage of this approach is that all retired persons with the same coefficients receive the same earnings-related part of pensions with no difference when they retired.

According to the law, if the average of coefficients $(k_1 + k_2 + ... + k_n) / n$ exceeds 5, only the value 5 is applied for the earnings-related part calculation. The limit aims for a stronger redistribution within the pension system. This argument seems very doubtful (especially bearing in mind that the redistributive role is played by the main part and by the supplement of pensions).

As mentioned above, every resident before the official retirement age, who had been insured in the full pension insurance from 2004 could voluntarily choose to transfer part of the pension insurance contributions into a personal second pillar account managed by the selected pension accumulation company.

Once the decision to join the *fully funded* system was taken, there were no way back to the full *pay-as-you-go* system. This principle was justified by arguments of the financial stability of pension funds as well the *pay-as-you-go* system. Nevertheless, recently this principle has been abolished because the second pillar was reformed and new participation rules were established. Participants of the second pillar in 2013 may once more decide if they wish to stay in the second pillar since 2014. The details of this reform are not discussed in this paper because our main aim is to evaluate the results of participation in the years before 2013. For details, see D. Jankauskienė, T. Medaiskis (2012); Pensijų sistemos reformos... (2012).

The percentage of the contribution to be directed into a personal account has been changing year by year (see Table 1) and was up to a maximum of 5.5 per cent. Initially, it was intended to stay at this level of transfer into the second pillar rate, but due to the

[3] After several amendments, the insured incomes now are discretionarily approved by Government and are not based on the average income of insured persons.

economic crisis, in order to ensure the income of the current pensioners, in the beginning of 2009 the rate was decreased to 3 per cent and from the 2nd half of 2009 to 2 per cent. It was expected to return back to the 5.5 per cent transfer rate after recession, but now these plans are abolished, and the new modified system is legislated.

TABLE 1. **Contribution rates to second pillar pension funds (in per cent from income taxable by social insurance contribution)**

	2004	2005	2006	2007-8	2009	2010	2011	2012	2013
Employee's part	2.5	2.5	2.5	2.5	3.0 (2.0)	2.0	2.0	1.5	2.5
Employer's part		1.0	2.0	3.0	0	0	0	0	0
Total	2.5	3.5	4.5	5.5	3.0 (2.0)	2.0	2.0	1.5	2.5

Source: Pensijų sistemos reformos...(2012).

Participation in the second pillar pension fund allowed a person to accumulate an additional pension capital, but his/her social insurance old-age pension was reduced taking into account the proportion of the contributions transferred to the personal second pillar pension account. The main part and the supplement of social insurance *pay-as-you-go* pension was left intact. The earnings-related component was decreased proportionally by the social insurance contributions paid to the personal second pillar pension account and the years of participation in the second pillar pension system. This rule for the first time was proposed and analysed by T. Medaiskis, A. Morkūnienė (2004).

The earnings-related component of the old-age pension of a second pillar participant is calculated with reduced coefficients as follows:

$$ERP_T = 0.005 \cdot (k_1 + k_2 + ... + k_{m-1} + d_m k_m + d_{m+1} k_{m+1} + ... + d_n k_n) \cdot D_T. \quad (7)$$

If a person joined a private *fully funded* second pillar system from the year m with the contribution rate r_m, and the pension insurance contribution rate for the supplementary part of the old-age pension was R_m, then the earnings-related component for this year of participation is proportionally reduced by $d_m = (R_m - r_m) / R_m$. For example, in 2010, the contribution rate for the supplementary part of the old-age pension was approved by law as 9.3 per cent. A participant of the second pillar transfers 2 per cent into his / her personal account, hence his / her coefficient of this year k_{2010} is reduced by $d_{2010} = (9.3–2) / 9.3 = 0.785$, i.e. by 21.5 per cent. The reduction rates are presented in Table 2.

As the private *fully funded* second pillar system is intended to provide accumulation for the old-age pension, disability and survivor benefits are left within the *pay-as-you-go* social insurance system. This means that if second pillar pension fund participants would become disabled, then they are entitled to the full (not reduced) social insurance pension and retain their savings' account until retirement.

TABLE 2. **Social insurance contribution and reduction rates**

Year	Full social insurance contribution rate into old-age earnings-related part (%) R_m	Transfer into second pillar rate (%) r_m	Reduction rate
2004	10.5	2.5	0.762
2005	10.6	3.5	0.670
2006	10.5	4.5	0.571
2007	9.9	5.5	0.444
2008	9.3	5.5	0.409
2009	9.3	2.5	0.731
2010	9.3	2.0	0.785
2011	9.3	2.0	0.785
2012	9.3	1.5	0.839

Sources: Legal acts of years 2004–2012 on approval of the State Social Insurance budget indicators; author's calculations.

2. Impact of participation in private second pillar pension funds on participants' old-age social insurance pension

In this section, there will be examined the differences of values of social insurance old-age pensions for the non-participants of private second pillar pension funds and for participants of private second pillar pension funds, who joined the private second pillar system in January 2004 and retired in January 2013. We select three groups with different earnings in this period.

Three scenarios with a different size of monthly wage earners are analysed. The first group are minimal monthly wage earners, the second group are average monthly gross (before tax) wage earners, and the third group are relatively high wage earners (3 times higher than gross average monthly wage). The wages of the first two groups are presented in Table 3 according to data of Statistics Lithuania. As is shown by the calculations (Table 3), a minimal wage earner due to participation in the second pillar pension funds has lost LTL 11.65 of old age social insurance pension per month. An average wage earner due to participation in the second pillar pension funds has lost LTL 31.80, and a high wage earner has lost LTL 95.40 per month. These figures are not much informative themselves, but are more interesting when compared with the gains (or losses) of the mentioned groups in the second pillar personal accounts.

A comparison is presented below and may be performed in two ways. Firstly, we might calculate the present value of the lost part of the old-age social insurance pension during the expected life period of retired person in the first *pay-as-you-go* system and then to compare this value with the accumulated amount in the private *fully funded* second pillar system. If the accumulated capital exceeds the present value of the loss, then the participation in the private *fully funded* second pillar pension funds shall be recognised as successful.

TABLE 3. **Earnings-related part of old-age pension acquired in 2004–2012 (in LTL) by three groups of potential second pillar participants**

		A. Minimal wage earner			B. Average wage earner			C. High wage earner		
Year	Insured income (LTL)	Monthly gross wage	Coefficient (non participant)	Coefficient (participant)	Monthly gross wage	Coefficient (non participant)	Coefficient (participant)	Monthly gross wage	Coefficient (non participant)	Coefficient (participant)
2004	931	483.33	0.5192	0.3955	1234.75	1.3263	1.0105	3704,25	3.9788	3.0315
2005	1037	525.00	0.5063	0.3391	1358.45	1.3100	0.8774	4075.35	3.9299	2.6323
2006	1148	575.00	0.5009	0.2862	1585.38	1.3810	0.7891	4756.13	4.1430	2.3674
2007	1344	650.00	0.4836	0.2149	1891.48	1.4073	0.6255	5674.43	4.2220	1.8765
2008	1445	800.00	0.5536	0.2262	2256.78	1.5618	0.6381	6770.33	4.6853	1.9144
2009	1488	800.00	0.5376	0.3931	2156.55	1.4493	1.0597	6469.65	4.3479	3.1791
2010	1488	800.00	0.5376	0.4220	2072.58	1.3929	1.0933	6217.73	4.1786	3.2800
2011	1488	800.00	0.5376	0.4220	2117,58	1.4231	1.1171	6352.73	4.2693	3.3512
2012	1488	820.83	0.5516	0.4627	2154,23	1.4477	1.2142	6462.70	4.3432	3.6427
Sum of coefficients 2004–2012			**4.7281**	**3.1618**		**12.6994**	**8.4250**		**38.0981**	**25.2750**
Earnings-related part of monthly pension acquired in 2004–2014 (LTL)			**35.18**	**23.52**		**94.48**	**62.68**		**283.45**	**188.05**
The difference (LTL)				**–11.66**			**–31.80**			**–95.40**

Source: author's calculation according to data of Statistics Lithuania and State Social Insurance Board.

Secondly, the annuity might be calculated according to the accumulated amount in private *fully funded* second pillar pension funds and compared with the monthly loss in the first pillar, based on *pay-as-you-go* principles. If the annuity amount exceeds the loss, then the participation in private *fully funded* second pillar pension funds shall be recognised as successful (at least in the initial period of receiving pension).

In the case of the first approach, it should be taken into account that social insurance pensions are indexed. For this reason, the loss of LTL 31.80 per month in the year 2013 may turn into the loss of a much bigger amount in later years. As Lithuania has no strict rule of pensions indexation, we assume that the rate of increase of the earnings-related part of a pension will be more or less overlapped by the discount rate for the calculation of the present value of future payments (for example, based on the consumer price index). Then, the calculation of the present value of old-age social insurance pension payments is simply equal to the monthly value product today and the pensioner's life expectancy (in months).

In January 2013, men retired at the age of 62 years and 10 months and women at the age of 60 yens and 8 months. Life expectancy of men is 197 months at the age of 60 and 164 months at the age of 65. Life expectancy of women is 272 months at the age of 60 and 223 months at the age of 65 (Demografijos metraštis, 2012). By linear approximation, we have evaluated the life expectancy of men at the retirement age as 178 months and of women as 265 months.

The present values of the reduced parts of social insurance pensions calculated according to this approach are presented in Table 4. It should be mentioned that losses may be higher or lower depending on the pension indexation policy and discount rates used for calculations. Attention also should be paid to the fact that due to the bigger life expectancy women loose more than men.

TABLE 4. **Approximate present values (in LTL) of reduction of the earning-related parts of old-age social insurance pensions in 2004–2012 due to participation in second pillar pension funds**

Group of earners	Man	Women
A. Minimal wage earners	-2074	-3088
B. Average wage earners	-5660	-8427
C. High wage earners	-16982	-25282

Source: author's calculation.

3. Analysis of accumulation results in the private fully funded second pillar pension system

In Lithuania, private second pillar pension funds are divided into several groups depending on the investment strategy. This allows monitoring, evaluating, and comparing investment results of second pillar pension funds with a similar investment risk. Most

of the second pillar pension funds are "mixed": assets of second pillar pension funds are invested into high investment risk asset classes (e.g., equities) and less risky asset classes (e.g., government bonds). The differentiation of investments into high investment risk asset classes (equities) is the simplest way for diving pension funds into different groups. According to the data of the Bank of Lithuania (Lietuvos bankas, 2013) and the Lithuanian Investment and Pension Funds Association (Lietuvos investicijų ir pensijų fondų asociacija, 2013) second pillar pension funds, depending on the share of investments into equities, are divided into four groups:

- conservative pension funds (assets under management (hereinafter AUM) are not invested into equities);
- pension funds investing a small part into equities (up to 30 per cent of AUM are invested into equities);
- pension funds investing a medium part into equities (30–70 per cent of AUM are invested into equities);
- pure equity pension funds (up to 100 per cent of AUM are invested into equities).

The second pillar pension funds' differentiation according to the investment risk level is presented in Table 5.

TABLE 5. **Second pillar pension funds' breakdown according to investment risk**

Second pillar pension fund group	Investment risk	Number of pension funds	Number of pension accumulation companies offering at least one pension fund in a group
Conservative	Very low	10	9
Small part into equities	Low	4	4
Medium part into equities	Medium / high	11	9
Pure equity	High / Very high	5	5
Total:		**30**	**-**

Source: authors' calculation according to data of the Central Bank of Lithuania.

The table shows that second pillar pension funds, according to the investment risk level, are uneven. As it is mandatory by the law, each pension accumulation company offers at least one conservative pension fund. Moreover, each market player is offering at least one pension fund investing a medium part into equities. However, only 5 out of 9 pension accumulation companies are offering pure equity pension funds, and only 4 pension accumulation companies are offering pension funds which invest a small part of AUM into equities.

Second pillar pension funds' investment results are monitored continuously since the start of the pension reform in Lithuania. Pension fund's unit price change is the main indicator used for investment performance evaluation. Pension fund's unit price change

shows how much the pension fund participant's assets have increased or decreased during a certain period. The pension fund unit price change is calculated by the formula:

$$\Delta P_f = \frac{P_l - P_i}{P_i} \times 100\%, \tag{8}$$

here ΔP_f – pension fund unit price change during the period;
P_l – pension fund unit price in the end of the period;
P_i – pension fund unit price in the beginning of the period.

It should be noted that pension fund unit price change is the most widely publically used indicator for evaluating pension fund investment results. However, the pension fund unit price change indicator takes into account the pension fund assets management fee, but does not take into account the premium fee applied by the pension fund. Therefore, the pension fund's unit price change does not fully reveal the real investment value change over time. It is appropriate to calculate the second pillar pension fund net investment return by comparing the social insurance contribution sum transferred to the second-pillar pension funds with the assets accumulated in the pension funds. All applicable fees (contribution fee and asset management fee) are taken into account by calculating net investment returns. In the paper, the net investment return is calculated by the formula:

$$G = \sum_{t=1}^{l} k_t \times P_t, \tag{9}$$

here G – pension fund net investment return during the period t;
l – the number of periods in which contributions are received to the pension funds;
k_t – the number of pension fund units which are bought during one investment period;
P_t – the pension fund unit price in the end of the period.

k_t is calculated by the formula:

$$k_t = \frac{I_t - M_t}{P_t}, \tag{10}$$

k_t – the number of pension fund units, bought during one investment period;
P_t – pension fund unit price in the end of the period;
I_t – the sum of contributions transferred to a pension fund during the period;
M_t – the contribution fee average of pension funds allocated to the same investment risk category.

Investment results in the second pillar of three groups of participants defined above (minimal, average, and three times average wage earners) were analysed according to the following assumptions:

- The accumulation period in private second pillar pension funds is evaluated from the second pillar pension funds' investment management inception (from 15 June

2004 till 31 December 2012). If a second pillar pension fund is established after 15 June 2004, then it is assumed, that aparticipant accumulates assets from the pension fund establishment time;

- all second pillar pension funds (30 in total) which were operating on 31 December 2012 are analysed and compared;
- the second pillar pension fund fees and their size, which were in force on 31 December 2012, are applicable for the whole analysed period;
- social insurance contributions to the second pillar pension funds are transferred on a quarterly basis from 15 June 2004 till 31 March 2010. From 1 April 2010, social insurance contributions are transferred on a monthly basis on the fifteenth day of the month. It is assumed that social insurance contributions are converted into pension fund investment units on the same day as they were accepted to the fund. If the second pillar pension fund investment units' price is not calculated on the day when social insurance contributions are received (e.g., weekend day, public holidays, etc.), it is assumed that social insurance contributions are converted into fund units on the nearest day for which the pension fund unit price is known;
- contribution rates are used as described in Table 2 above;
- the arithmetic average of the net investment results for the second pillar pension funds belonging to the same group is calculated.

The results are summarized in Table 6. They show that in some pension fund groups the accumulated amount was less than the amount of contributions transferred to pension funds (the net investment return was negative). Also, it should be mentioned that the investment unit price change does not reflect the real ratio of the transferred social insurance contributions to the pension fund with the accumulated capital amount. Therefore, the participant, in order to calculate the amount by which the accumulated capital differs (higher or lower) from the transferred premium sum shall not rely entirely on the widely publicly used investment unit price change indicator.

The analysis of conservative pension funds' performance results has shown that the net investment return was positive during the two thirds of the analyzed period. This means that during this period the pension fund participants accumulated a capital higher than the transferred social insurance contributions into the second pillar pension fund account. The fluctuations of the accumulated capital values in conservative pension funds are minimal as compared with other second pillar pension fund groups which invest assets in higher investment risk asset classes.

The analysis of the results of pension funds which invest a small part into equities showed that the net investment return was positive during 5/6 of the analyzed period; funds which invested a medium part into equities had a positive return during 2/3 of the period.

TABLE 6. **Accumulated amount (LTL) and net investment return (per cent) in 2004–2012 by three groups of the participants of private second pillar pension funds**

Pension fund group	A. Minimal monthly wage earner in Lithuania			B. Average monthly wage earner in Lithuania			C. High (3 times higher than average) monthly wage earner		
	Transferred amount	Accumulated amount	Net investment result	Transferred amount	Accumulated amount	Net investment result	Transferred amount	Accumulated amount	Net investment result
Conservative	2249	2670	18.7%	6,513	7,587	16.5%	19540	22587	15.6%
Small part into equities	2249	2816	25.2%	6,513	7,998	22.8%	19540	23819	21.9%
Medium part into equities	2249	2563	14.0%	6,513	7,421	14.0%	19540	22267	14.0%
Pure equity	2249	2186	-2.8%	6,513	6,320	-3.0%	19540	18963	-3.0%

Source: authors' calculation according to data of Statistics Lithuania and Central Bank of Lithuania.

Different results were observed in the pure equity pension funds' group. The net investment return of these funds was positive only during 2/5 of the analyzed period. High investment risk pension funds can generate high negative investment results. Moreover, pure equity pension funds have much higher investment values' fluctuations as compared with lower risk pension fund groups. In the beginning of the accumulation period, such negative fluctuations have no significant effects on the participants' accumulated assets. However, in the last stages of the accumulation period, such fluctuations can significantly reduce the accumulated capital of the participants.

In Lithuania, by the law, a pension accumulation company is obliged to propose the participant to switch to the conservative pension fund when 7 years are left until his / her retirement age. Taking into account the fact that part of the pension fund participants have a low financial literacy (LR Vertybinių popierių komisija, 2009–2010; Heinz, Žvinienė 2009) or are passive in making decisions on personal finance management (Jurevičienė, Gausienė 2010; Kindurys 2011), only an offer to transfer the accumulated capital to a second pillar pension fund with a conservative investment strategy might be not a sufficient action.

In conclusion, the net investment return analysis of private second pillar pension funds has shown that pension funds investment management in general shall be assessed as positive and effective, especially taking into account that during 2004–2012 financial markets faced one the highest crises in the last century and the frustrations of asset class values were very high. However, periods with a negative investment return were observed, and they were more appropriate to high investment risk pension funds (the pure equity pension funds group).

For the participants who are near the retirement age (5–7 years left before the retirement), sudden frustrations can affect the accumulated capital very negatively. Transformation from the Life-Style pension fund system to "Life-Cycle" pension system would be one of the solutions for the problem. In the Life Cycle pension fund system, the investment risk would be ongoing and gradually reduced by reinvesting part of accumulated capital from high investment risk assets classes (e.g., equities) to low investment risk asset classes (government bonds, money market instruments) when the participant would be closer to the retirement age. The participant would not make a decision when to change the pension fund and to which investment strategy (and investment risk) to switch, and the pension accumulation company would make it instead of the participant.

4. The comparison from the view of the second pillar pension fund participant's income

The evaluation of the accumulated amount in the second pillar pension funds presented in the previous sections allows to compare this amount with the present value of reduction

of the earning-related parts of the old age pension approximately evaluated in Section 2 (Table 4) for the three groups of wage earners. The results are presented in Tables 7–9.

As is seen from the results, in all three groups of wage earners the accumulated amount in all pension funds exceeds the evaluated present value of the lost part of social insurance pensions for men, but is smaller for women. This difference is explained by a longer life expectancy for women: on, average they receive a reduced social insurance old age pension during a much longer period than men, hence their expected loss is bigger, but the accumulated pension capital is the same as in the case of men. The results also allow to conclude that for all three groups of wage earners most successful was the participation in pension funds investing a small part into equities: the gain of men in these funds is the biggest and the loss of women the smallest.

TABLE 7. **Gain or loss of minimal wage earner participant of second pillar pension funds in LTL**

Pension fund group	Accumulated amount	Reduction of earning-related parts of old-age social insurance pensions (evaluated present value)		Gain / loss (-) if person has participated in second pillar pension system	
		Men	Women	Men	Women
Conservative	2670	2074	3088	596	-418
Small part into equities	2816	2074	3088	742	-272
Medium part into equities	2563	2074	3088	489	-525
Pure equity	2186	2074	3088	112	-902

Source: author's calculation.

TABLE 8. **Gain or loss of the average wage earner participant of second pillar pension funds in LTL**

Pension fund group	Accumulated amount	Reduction of earning-related parts of old-age social insurance pensions (evaluated present value)		Gain / loss (-) if a client has participated in the second pillar pension system	
		Men	Women	Men	Women
Conservative	7587	5660	8427	1927	-840
Small part into equities	7998	5660	8427	2338	-429
Medium part into equities	7421	5660	8427	1761	-1006
Pure equity	6320	5660	8427	660	-2107

Source: autho'rs calculation.

TABLE 9. **Gain or loss of high wage earner participant of second pillar pension funds in LTL**

Pension fund group	Accumulated amount	Reduction of earning-related parts of old-age social insurance pensions (evaluated present value)		Gain / loss (-) if client has participated in second pillar pension system	
		Man	Woman	Man	Woman
Conservative	22587	16982	25282	5605	-2695
Small part into equities	23819	16982	25282	6837	-1463
Medium part into equities	22267	16982	25282	5285	-3015
Pure equity	18963	16982	25282	1981	-6319

Source: author's calculation.

Another way to compare the gain or loss of participants of the second pillar pension funds, as it was stated above (Section 2), is a comparison of annuities in *pay-as-you-go* and *fully funded* systems.

According to Lithuanian law, a participant of the second pillar is obliged to buy annuity if its "basic" amount exceeds 50 per cent of the basic pension. In order to apply this rule, the Bank of Lithuania, at least once per year, approves the values of "basic" annuities (Lietuvos banko valdybos nutarimas, 2012). Tables 10–12 present a comparison of annuities calculated according to this rule of the Bank of Lithuania with the reduced part of the old age social insurance pension (see Table 3). Despite the fact that annuity is calculated according to the *unisex* approach, it is still different for men and women because of the different retirement age (in the tables it is assumed 63 years for men and 61 for women as a closest approach to the statutory age in the beginning of 2013).

TABLE 10. **Annuity gain or loss of minimal wage earner participant of second pillar pension funds in LTL**

Pension fund group	Accumulated amount	Basic annuity per month		Gain / loss per month (compared to 11.66 LTL)	
		Men (63)	Women (61)	Men (63)	Women (61)
Conservative	2670	15.49	14.65	3.83	2.99
Small part into equities	2816	16.34	15.45	4.68	3.79
Medium part into equities	2563	14.87	14.06	3.21	2.40
Pure equity	2186	12.69	11.99	1.03	0.33

Source: author's calculation.

A comparison of the basic annuities obtained for the accumulated capital in *fully funded* private second pillar pension funds, with losses in the *pay-as-you-go* old-age pension system, is favorable for all groups of participants in all types of private pension funds. The different result than in the case of the presented above comparison may be explained by the *unisex* approach applied in the calculation of annuities. The loss of the

TABLE 11. **Annuity gain or loss of average wage earner participant of second pillar pension funds in LTL**

Pension fund group	Accumulated amount	Basic annuity per month		Gain / loss per month (compared to 31.80 LTL)	
		Men (63)	Women (61)	Men (63)	Women (61)
Conservative	7587	44.03	41.63	12.23	9.83
Small part into equities	7998	46.41	43.88	14.61	12.08
Medium part into equities	7421	43.06	40.72	11.26	8.92
Pure equity	6320	36.67	34.67	4.87	2.87

Source: author's calculation.

TABLE 12. **Annuity gain or loss of high wage earner participant of second pillar pension funds in LTL**

Pension fund group	Accumulated amount	Basic annuity per month		Gain / loss per month (compared to 95.40 LTL)	
		Men (63)	Women (61)	Men (63)	Women (61)
Conservative	22587	131.07	123.92	35.67	28.52
Small part into equities	23819	138.22	130.68	42.82	35.28
Medium part into equities	22267	129.21	122.17	33.81	26.77
Pure equity	18963	110.04	104.04	14.64	8.64

Source: author's calculation.

women is overridden by the gain of the men; as gain is bigger than loss (except pure equity pension funds, see Tables 7–9) then the positive average result is obtained. On the other hand, the basic annuity calculation rule approved by the Bank of Lithuania is only a "criterial" rule. It just states the threshold of the accumulated pension capital when it is required that a participant must buy an annuity (instead of taking a lump sum). The basic annuities calculated according to the rule of the Bank of Lithuania are not obligatory to insurance companies providing annuities. Table 13 compares the basic and the commercial annuities proposed in the Lithuanian market for a person at the age of 62 years. The essential difference should be noticed: commercial annuities are smaller by around 25 per cent; a participant's loss in the *pay-as-you-go* system is bigger than the annuities proposed in the market.

TABLE 13. **Comparison of basic and commercial annuities (case of pure equity pension funds) for a 62 years old person in LTL**

	Accumulated amount	Basic annuity	Commercial annuity
Minimal wage earner	2186	12.33	9.29
Average wage earner	6,320	35.64	27.00
High wage earner	18,963	106.93	81.18

Source: author's calculation.

The evaluations presented in the article do not allow to state definitely that participation in second pillar pension funds during the years 2004–2012 was successful or unsuccessful from the point of view of retirement income of the participants. The differences in the income of the participants and non-participants are not big enough to draw definite conclusions. As the amounts accumulated by the majority of participants are below the threshold of obligatory annuity, the lump-sum payments dominate in the market. This is why the first comparison of the accumulated pension capital and the loss in the *pay-as-you-go* system seems today more informative and discloses the gain of male participants and the loss of female ones. A comparison of annuities exposes a more optimistic result for both male and female participants, but it is based only on the "theoretical" calculation of annuities which are not confirmed in the real, very small, market of annuities (only one company and 112 cases, according to Bank of Lithuania, data of May 2013). On the contrary, the commercial calculation of annuities rather results in the loss of part of income at retirement due to participation in the second pillar *fully funded* system.

Conclusions

The participants of the second pension pillar in 2004–2012 have accumulated the pen

Periods with a negative investment return were observed in all groups of pension funds, but they were more appropriate to high investment risk pension funds (pure equity pension funds group). The sudden frustrations can affect the accumulated capital of the participants who are near the retirement age very negatively. In order to avoid this effect, the transformation from the Life-Style pension fund system to the Life-Cycle pension system would be one of the solutions.

A comparison of the accumulated pension capital with losses in the *pay-as-you-go* system showed that in all analyzed groups of wage earners the accumulated amount in all *fully funded* private second pillar pension funds exceeds the evaluated present value of the lost part of social insurance pensions for men, but it is lower for women. This difference is explained by a longer life expectancy of women: on average, they receive a reduced social insurance old age pension during a much longer time than men, hence their expected loss is bigger, but the accumulated pension capital is the same as in case of men. As the accumulated capital of the majority of participants is below the threshold of obligatory annuity, the lump-sum payments dominate in the market, and the first comparison of the accumulated pension capital and the loss in *pay-as-you-go* system seems today more informative and reveals the gain of male participants and the loss of female ones.

A comparison of the so-called "basic" annuity payout from the accumulated amount with losses in the *pay-as-you-go* system is favourable for all groups of participants in all types of pension funds, at least at the beginning of the payment period. The different result than in the case of the previous comparison may be explained by the unisex approach applied in the calculation of annuities. The loss of women is overridden by the gain of men; when the gain is bigger than the loss (except for pure equity pension funds), then a positive average result is obtained. It also should be noted that the loss in the *pay-as-you-go* system is dependent on the expected pension indexation policy; while the annuity of second pillar participant is fixed, the corresponding amount paid to a non-participant may increase, and then a gain after a few years may turn into a loss.

The "Basic" annuity is not obligatory for commercial annuity providers. It serves only as a definition of threshold when annuity instead of lump-sum payment is obligatory. The Lithuanian annuity market makes only very first steps in its development. Currently, there is only one service provider in the market, and the number of participants who are obliged to buy the annuity is very small. Annuity payouts proposed by this provider are by about 25 per cent lower than the "basic" ones, hence the commercial calculation of annuities currently results in the loss of part of income at retirement due to participation in the second-pillar *fully funded* system.

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