# FEE POLICY ANALYSIS OF DEFINED CONTRIBUTION PENSION SCHEMES

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## Abstract

*The paper focuses on costs and fees of private pension schemes and formation of fee policy in general by using the value chain approach. It also examines consequences of fee policy on total savings in a private pension scheme and performs a sensitivity analysis of changes on fees to the relative rate of savers´ returns. The aim of the paper is to express fee policy burden of a variety of financial products provided in defined contribution pension schemes. The ambition of the paper is to solve the question of fees significance as the main determinant that influences real added value of savings schemes provided by the private sector. This paper identifies parameters defining a typical saver and charges paid during the period of saving.*

***Key words:*** *defined contribution pension scheme, fee policy, simulation, charge ratio.*

## 1. Introduction

The structure and levels of pension fund fees and expenses in the European industry is the outcome of many years of evolving dynamics between local European and cross-border market participants, banks and other financial product distributors, investor needs and their behavior, and regulatory guidance. Many IOPS (International Organisation of Pension Supervisors) member countries have reformed their public pension systems in the last three decades. These reforms have, in some cases, implied a radical shift from pay as you go systems, (which have been rendered financially unsustainable due to rising life expectancies), to mandatory fully-funded define contribution pension schemes. The fees and charges imposed upon pension funds are of great interest and importance to pension supervisory authorities as they have a significant impact on the amount of retirement income delivered to individuals, particularly in the case of define contribution pension schemes. Yet administrative fees are charged for services in different ways. The diverse charges and the specific details involved in every single case make it impossible to directly compare administrative charges nationally and internationally.

The adequacy of retirement income is a central goal of all pension arrangements. In individual account (defined contribution) private pension systems, retirement income depends on accumulated contributions, the investment returns earned by these contributions and the fees that are charged to individuals by the pension providers. Contributions in mandatory

private pension systems are usually stipulated in reform legislation. Therefore, accumulating adequate savings requires high returns and low fees.

Pension providers charge fees in mandatory individual account pension systems to cover different kinds of operating costs. There are the costs of marketing the plan to potential participants, collecting contributions, sending contributions to investment fund managers, keeping records of accounts, sending reports to participants, investing the assets and converting account balances to annuities and paying annuities.

This paper discusses fee structure and level of charges applied by pension companies operating on private pension markets. On the amount of pension payable from the pension saving has a significant impact recovery rate of savings. Higher recovery rate ultimately means greater accumulation of saver savings and even more annuity pension. It is alco related to the sustainability of the pay-as-you-go pension system.

Theory as well as some empirical studies suggests that 1 % annual charges are likely to reduce final pension pot on individual account balances by around 20 % on average over 40 year saving horizon (Whitehouse, 2000). Central and Eastern Europe (CEE) countries which implemented private define contribution saving schemes (DC pension scheme) have typically relied on price controls to keep charges in check. Our paper attempts to fill the gap in our knowledge and summarizes what is known on charges and costs after the second pillar introduction. We apply standard reduction in assets approach suggested by several asset management and pension finance seminal studies.

The objective of the paper is evaluation of fee policy burden related to a variety of financial products provided in define contribution pension schemes. The ambition of paper is to solve the question of fees significance as the main determinant that influence on the real added value of savings schemes provided by the private sector.

Analyzing the impact of fees applied in define contribution pension schemes requires to define the structure and level of particular fees applied. Second task is to define a saving scheme model which incorporates the fee structure and presents expected value of savings with and without the fees. Last part of the research is to estimate the cumulative impact of fees using charge ratio or sometimes called “reduction in assets (premium)”.

To perform simulations using historical returns, we apply a moving block historical simulation method.

The paper is organized as follows. The next Section 2 discusses the knowledge drawn from existing literature on fees and charges applied in private define contribution pension schemes. Section 3 presents fee structure and applied methodology for examining the effect of fees from the point of individual retirement account. Section 4 discusses the emerging understanding regarding impact of fees on a final level of pension pot and presents preliminary conclusions and emerging lessons.

## 2. Literature Review

The basic assumption for pension reforms in Central and Eastern Europe (CEE) countries was, except to lower the pressure on public pay as you go (PAYG) schemes, that it would prove more attractive to the contributors, who would be more willing to contribute to their own funds than to the public system (Dobronogov and Murthi, 2005). The costs of administering individual pension accounts may be high, especially in systems which are fairly decentralized and operate on the lines of the retail financial services industry (Murthi et al., 2001). When passed on as fees, high costs may substantially lower the return on pension saving, thus reducing the attractiveness of the second pillar and, in the extreme, exposing individuals to poverty in old age. In addition, most second-pillars provide some form of

public guarantee (e.g. through a minimum pension or a minimum rate of return provision), so costs and fees affect the size of governments' contingent liabilities.

There are a number of publications that examine fees in individual account define contribution pension schemes around the world (e.g. Whitehouse, 2000; Dobronogov and Murthi, 2005). Two important conclusions can be drawn from the results of these studies. One is that significant economies of scale may be attained in the administration of pension funds, and the other is that there are large differences in fees across countries and pension plans. Given the significant fee differences across pension funds and the huge cumulative impact of additional charges, reduction of accumulated capital due to the fee policy implied by pension providers should receive more attention. The paper does not present details of the reforms or the functioning of the define contribution pension schemes in particular countries; rather it focuses on drawing conclusions regarding charges and costs. We follow the literature and use the term "charges" or "fees" to refer to costs paid by savers for the administration and management of their second-pillar individual retirement saving accounts.

### 2.1 Fee Structure of Private Defined Contribution Pension Schemes

Generally speaking, fees applied in the asset industry can be either fixed or variable. Fixed fee is characterized by the fact that the price does not depend neither on the level of contribution nor on the fund. One of the advantages of fixed fee is that the price is easy for savers to understand and compare, and, as the amount collected by pension companies increases with the number of contributors. However, this design is considered to be regressive and, consequently, elicits a negative effect on workers with lower incomes, as it is impossible to generate cross subsidies between subscribers with higher income and those with lower income (Yermo, 2005; Tapia and Yermo, 2008). Variable fees may take the form of a percentage of the flow, of either payments or contributions, or of the stock, as a percentage of the amount managed or as a percentage of the cumulative assets turnover. Variable fee on the flow (usually shown as a % of contribution or accumulated assets) is the most common and is found in most of private define contribution schemes analyzed in our paper.

Variable fees charged to the contribution keep a direct relationship with collection fees and guarantee an even flow of revenue for pension companies. However, the main criticisms of this type of fee are that it generates a lack of incentives for better investments and punishes heavily those savers with high levels of contributions. Additionally, pension companies do not collect revenues from people who do not contribute, but pension companies would still have to bear the cost of administering these people‘s funds. Variable fees tied to the value of savings accumulated on individual retirement account follow the same advantages for pension companies, while at the same time equally impacting savers based on their value of saving account.

A performance fee is commonly calculated as a percentage of investment returns, either over realized or unrealized excess returns (or both). The rationale for performance fees is that they provide an incentive for professional fund managers to generate positive excess returns. Performance fees therefore typically create a skewed – call option like – incentive structure. As the professional manager typically only profits from positive excess returns but do not suffer from losses, it may incentivize to take excessive risks to generate high returns (Goetzmann et al., 2003).

Additionally, pension companies may also charge exit fees when workers transfer their individual accounts to another pension company. Exit fees may be fixed or operate on a sliding scale with loyalty being rewarded with lower fees on exit (Yermo, 2005; Tapia and Yermo, 2008).

The structure of fees adopted in the countries under our analysis is fairly complex; however there are similarities in the technical calculation allowing us to compare their impact. Countries typically permit a range of fees and charges, including:

a) up-front fee (entry fee, contribution fee);
b) management fee (asset management fee);
c) custodian fees;
d) fee on investment returns (performance fee);
e) exit fees (switching fees, redemption fees);

We are aware of limitation of the presented list and understand that this is not the comprehensive list of fees that can be applied in the private define contribution pension schemes. For a more literature presenting types of fees, we refer to Yermo, (2005), Tapia and Yermo (2008) or Hernandez and Stewart (2008).

Most of the CEE countries, including Slovakia, have established maximum limits on the fees that pension funds can charge to ensure that administrative costs do not reduce the retirement income of participants. The problem with set maximum limits on fees is the risk that governments set the wrong ceiling. Too high a limit would be ineffectual. Too low a ceiling might mean that fund managers could not cover their costs. This will restrict competition and choice. It could even lead to the failure of weaker providers, undermining public confidence in the system (Tapia and Yermo, 2008). There is also evidence that charge ceilings can become de facto charge minima as well. This implies that price competition, beyond meeting the regulatory requirement, might be limited, at least in the short term. Understanding this regulatory risk in setting fee limits is one of the areas of our research interest.

### 2.2 Impact of Fees on Accumulated Savings

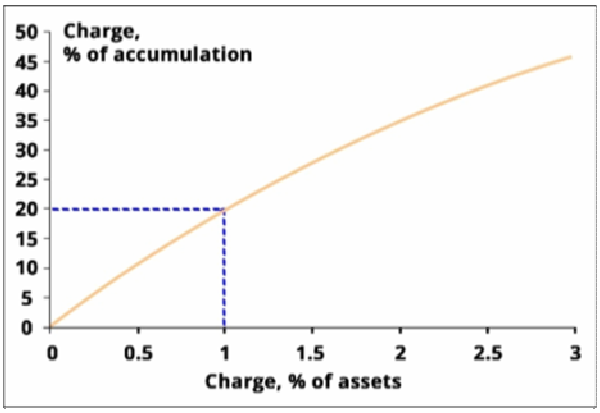
The amount by which the accumulated savings are reduced is known as the charge ratio. Charge ratio measures the impact that any type of administrative charge can have on the final balance (for example after 40 years) of an individual retirement account compared to the hypothetical amount of savings that could be obtained if no administrative fees were charged at all (Hernandez and Stewart, 2008). This measure has been used to compare administrative charges in Latin America and in other countries with privately managed retirement savings accounts (Whitehouse, 2000).

The other comparative indicator referred to in this report is the equivalent fee rate. This measure is related to the charge ratio but stated as an annual ratio for comparative purposes. The relationship between these two measures is shown in Figure 1, which compares in the horizontal axis the charge as a percentage of assets (or reduction in yield) and in the vertical axis the charge ratio (or reduction in assets), which shows the effect this charge would have on the final pension value (the charge ratio).

Figure 1 shows that even low charges on assets build up over the long period of a pension investment can reduce the pension value substantially. For example, a charge on assets of 1 % can reduce the value of the pension by around 20 % (Whitehouse, 2001). However, we claim that taking into account the fee structure and stochastic aspect of some charges (especially the success fee), charge ratio is higher than originally though.

We also assume that the slope of curve is not concave as originally presented by Hernandez and Stewart (2008). Having in mind the impact of particular fees on accumulated savings, if management or success fees play dominant role in a pension provider fee structure, we claim that the curve is convex (see also Šebo and Virdzek, 2013).

Figure 1 Relationship between charge ratio and equivalent fee




Source: Whitehouse (2001)

Another aspect of fees is their impact on economic behavior of agents. While the behavior of asset managers under the different fee structure is quite known, behavior of demand side actors is usually tied to the taxation theory. Tax theory recognizes the income substitution effect (see for example Šebo et al., 2014). Under the effect, saver is motivated to avoid the tax by substituting the higher taxed goods by lower taxed substitutes. This behavior should be, however, considered suboptimal for saving schemes (Šebo and Virdzek, 2013).

Income effect is directly tied to the decreasing level of accumulated savings. Taking into account cumulative effect of charges, the overall impact of applied fee structure could decrease the accumulated savings to a level close to poverty. However, these wider socio-economic aspects should be analyzed in a connection to the default options set in legislature. In our study, we do not pay attention to this significant aspect of private define contribution schemes and refer to many existing studies on this topic (see for example Salou et al., 2012; Šebo et al., 2014).

## 3. Research Methodology and Data

Analyzing the impact of fees applied in define contribution pension schemes requires to define the structure and level of particular fees applied. Second task is to define a saving scheme model which incorporates the fee structure and presents expected value of savings with and without the fees. Last part of the research is to estimate the cumulative impact of fees using charge ratio or sometimes called “reduction in assets (premium)”.

In our research, we compare impact of these fees (presented in table 1) on total savings. We are aware of changes in fee structure and level of fees during last 10 years. For our research, we used the most recent fees identified in the national legislation. Table 1 presents the fee structure applied by pension funds providers in Slovakia in 2016.

Table 1: Fee structure of pension funds providers in pillar II

| Fee structure | Size |
|---|---|
| Management fee $(F^M)$ | 0,30 % p.a. of AuM charged daily |
| Depository fee $(F^D)$ | 0,035 % p.a. of AuM charged daily |
| Performance fee $(F^P)$ | 10,00 % HWM principle (High-Water Mark) |
| Entry fee $(F^E)$ | 1,00 % of new contributions |

Source: the authors.

Further, we design a model of saving scheme, where individual as well as policy parameters are set. Individual parameters are connected to the defining the level of salary used

as a contribution base and level of monthly contributions. Even if we understand the random nature of income influenced by permanent and transitory shocks, for comparison and in order to control for impact of fees, we used static input variables for life-cycle income path.

In order to define retirement wealth in form of accumulated savings $(S_T)$ we have created a savings model were an individual deposits once a month a $\tau_t$-part of his monthly salary $w_t$ adjusted for impact of entry fees $(F_t^E)$ to a pension fund for a period of *t (1,…,T)*. The budget-constraint equations read as follows:

$$S_{t+1} = S_t\left(r^F(t,t+1)\right) + \frac{w_{t+1}\tau_{t+1}}{1+F_t^E} \tag{1}$$

where $r^F(t,t+1)$ are the net after management, custodian and performance (if applied) fees monthly returns of pension fund in the time interval $[t;t+1)$.

Gross monthly returns $(r)$ are generated using 96,5 years of daily historical data on equity returns in US. The data for historical equity returns for Dow Jones since January 1900 till June 2016 were retrieved from the Federal Reserve Economic Data database of Federal Reserve Bank of St. Louis (FRED, 2016).

However, the returns are presented as "net of fees", which means that we have to calculate the fess that are applied directly to the value of the assets under management of a respective pension fund. These ongoing charges cover management fee and custodian fee $(F_t^{M,D})$ and performance fee $(F_t^P)$. In order to express the impact of ongoing fees on the value of savings, we can simply reduce the monthly return by ongoing fees charged to the pension fund assets. If the pension fund assets are redistributed by the number of issued pension units, that the impact of ongoing management fees (management and custodian) on a monthly return (change in the value of one pension unit) can be expressed as follows:

$$r_t^{F^{M;D}} = r_t^s - \frac{F^M + F^D}{n^Y} \tag{2}$$

where $n^Y$ is 12 representing months per year for which the returns are generated.

The last fee that is usually applied is a performance fee. This fee rewards the pension fund manager for achieving positive returns if certain conditions are met. If the return for a tested period is negative, than the success fee usually equals 0. If the return for a tested period is positive, performance fee can be charged by pension fund manager. To calculate the performance fee, we need to create additional variable accommodating the value of pension fund assets. Pension fund assets are distributed on individual retirement accounts based on the number of pension units. Each pension unit is evaluated on a periodical basis, which gives a current (or accounting) value of pension unit (*CVPU*). Logically, the value of one pension unit is than subject to achieved investment returns and ongoing fees. Formula for the returns after ongoing fees and impact of performance fee $(r_t^F)$ can be calculated as follows:

$$r_t^F = \frac{r_t^{F^{M;D}}}{1+\left(F^P\left(\frac{CVPU_{t-1}(1+r_t^{F^{M;D}})}{\max CVPU_{t-m}}-1\right)\right)} \tag{3}$$

where $\max CVPU_{t-m}$ represents the maximum (highest) value of *CVPU* looking *m* periods backward. In our analysis, parameter *m* is set to 36 months (3 years).

In order to express the impact of fee structure on accumulated savings, we adapt two ratios:

1. Total Fee Ratio (Paid fees as a % of final value of accumulated assets);
2. Charge ratio (Final value of accumulated assets without existence of fees divided by final value of accumulated assets with the existence of fees).

To perform simulations using historical returns, we apply a moving block bootstrapping (MBB) method (Vogel and Shallcross, 1996). The basic idea of the block bootstrap is closely related to the i.i.d. nonparametric bootstrap. Both procedures are based on drawing observations with replacement. In the block bootstrap, instead of relying on single observations, blocks of consecutive observations are drawn. This is done to capture the dependence structure of neighbored observations. This method allowed us to overcome the problem with capturing close relations among inflation, bond returns, and many other macroeconomic parameters influencing other parts of the model (life-cycle income) during the whole savings period. It has been shown that this approach works for a large class of stationary processes. The blocks of consecutive observations are drawn with replacement from a set of blocks. By construction, the bootstrap time series has a nonstationary (conditional) distribution.

The moving blocks bootstrap is a simple resampling algorithm, which can replace the parametric time series models, avoiding model selection and only requiring an estimate of the moving block length (*l*). In our case, the block length (*l*) is 40 consecutive years, i.e. the full career and saving (investment) horizon of an individual saver. For each unit of a block bootstrap, a vector of variables is defined. Pulling consecutive block of data out from the database of 94 years of monthly data of variables, each block (*k*) than consists of variable observations $(X_{k-1+1}), j = 1,...,l$ . Then the simulation is performed for each block (*k*). In total we have performed 1000 simulations for each of defined country specific fee policies using the same blocks and simulation sequences (simulation seeds). Simulations are performed in the MS Excel environment using Palisade @RISK software allowing us to define the model and control for additional input variable.

In order to control for impact of fee policy on a final value of savings, we assume that a hypothetical saver contributes for a 40-year long working carrier uninterruptedly. The monthly wage $(w_t)$ is growing by CPI index and the contribution $(\tau_t)$ is at 4 %. At the same time, we assume that a saver continuously saves in the selected fund and performs no switching during the saving period.

The results are presented in form of histograms, where the impact of fee policy applied to the final value of savings is presented in form of charge ratio using formulas above.

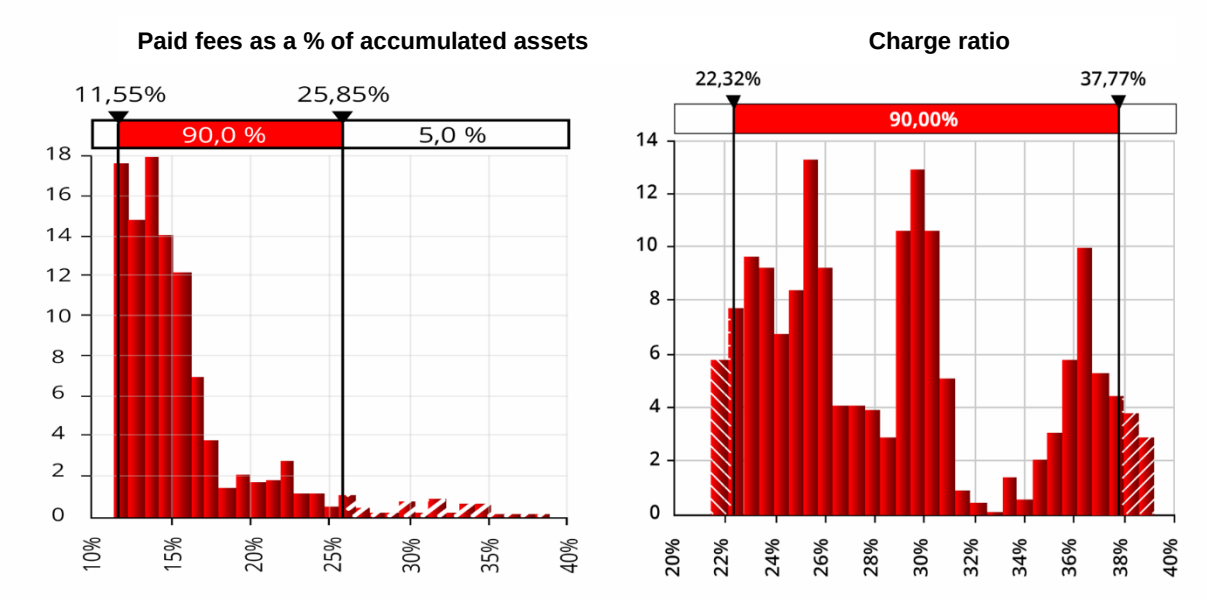
## 4. Results and Discussion

The results are presented according to analyzed specific fee policies. We conclude that under the defined methodology, the proportion of paid fees on accumulated assets, and respective charge ratio, varies significantly with mean of 15,82%, 28,84% respectively. Detailed results are presented in Figure 2.

One can see the vastly different distribution when considering two approaches. Leptokurtic distribution skewed to the right when considering the paid fees as a % of accumulated assets is in a steep contrast to the charge ratio distribution. The difference in values and distributions can be analyzed further by looking at particular fees (see Table 2).

Interesting finding is the impact of performance fee on a total amount of accumulated assets, where it surpassed even the management fee deemed to have the highest impact. On the other hand, performance fee is highly sensitive to the returns and if the portfolio returns would assume different distribution of returns, impact of performance fee would differ significantly. More detailed analysis using sensitivity tests is required to understand the dependence of performance fee on other aspects, like returns´ distribution, reset period (*m*) and length of saving period (see suggestions of Goetzmann et al., 2003).

Figure 2: Paid fees and respective charge ratio




Source: the authors.

Table 2: Impact of particular fees on accumulated assets

| Output | Min | Mean | Max | 5% | 95% |
|---|---|---|---|---|---|
| Paid fees as a % of accumulated assets | 11.42% | 15.84% | 38.98% | 11.55% | 25.93% |
| Charge ratio | 21.49% | 28.84% | 39.22% | 22.32% | 37.77% |
| Management fee | 1.96% | 4.14% | 8.49% | 2.39% | 6.46% |
| Depository fee | 0.20% | 0.41% | 0.85% | 0.24% | 0.65% |
| Performance fee | 6.74% | 10.75% | 28.02% | 7.44% | 18.36% |
| Entry fee | 0.19% | 0.54% | 1.62% | 0.24% | 1.12% |

Source: the authors.

Further on, we analyzed the impact of particular fees on a final value of accumulated assets. We have controlled for particular fees and tested their impact on final value of accumulated assets using the ratio of paid fees as a % of final value of accumulated assets (Yusof and Ibrahim, 2013). In order to test the impact of particular fees, we used the uniform probability distribution, where the level of management fee was set between 0 % and 2 % p.a. Similarly, we used the uniform probability distribution for the performance fee with minimum set at 0 % and maximum at 20 % p. a. Uniform distribution was also used for the entry fee, where the level of charges was set between 0% and 2% of new contributions. Finally, we than analyzed the cumulative effect of the fee structure, where all fees have been applied using uniform distribution. We exercised 10000 simulations using MBB method for generating monthly returns.

Our analysis shows that even if a uniform distribution is used for randomly generating level of particular fees, their impact is not uniformly distributed. The only uniformly distributed impact of fees could be seen by Entry fee and using the Charge ratio to analyze the impact of fees. Logically, uniform distribution of entry fee impact on final accumulated savings could have been expected, which proves the validity of the model and ability of the Charge ratio to explain the real impact of fees on accumulated savings.

Management fee type, e.g. the type of fee applied on a regular basis based on the value of savings (NAV), has significantly higher impact on a saver´s savings regardless of a pension fund performance. It means that even a marginal change in management fee will have a

significant impact on the total value of savings. Even contribution fee does not have such a significant impact on savers savings as a management fee. Every small change of management fee has influenced and advised on a significant change on accumulate savings. Other fees can trustee of the pension fund used as a tool for competitiveness, because significant changes levy down will not affect significantly the saver savings.

Table 3: Paid fees and charge ratio

| | Mean | Median | Std.Dev | 5th | 95th | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|
| MANAGEMENT FEE | | | | | | | |
| Total Fee Ratio | 14,177% | 12,532% | 10,097% | 1,213% | 33,319% | 0,8321 | 3,3537 |
| Charge ratio | 26,679% | 25,365% | 16,843% | 2,344% | 55,291% | 0,2809 | 2,1054 |
| PERFORMANCE FEE | | | | | | | |
| Total Fee Ratio | 10,969% | 10,068% | 7,705% | 0,966% | 24,466% | 1,1015 | 5,1082 |
| Charge ratio | 19,204% | 17,844% | 12,769% | 1,677% | 42,801% | 0,5493 | 2,6597 |
| ENTRY FEE | | | | | | | |
| Total Fee Ratio | 0,3478% | 0,2762% | 0,2926% | 0,0266% | 0,9439% | 1,4906 | 5,5920 |
| Charge ratio | 1,0135% | 1,0101% | 0,5891% | 0,0999% | 1,9368% | 0,0140 | 1,8002 |
| CUMULATIVE EFFECT | | | | | | | |
| Total Fee Ratio | 25,79% | 24,06% | 13,48% | 7,05% | 50,04% | 0,9175 | 4,5249 |
| Charge ratio | 48,65% | 46,79% | 23,24% | 13,92% | 90,18% | 0,5008 | 3,0573 |

Source: the authors.

The second finding is that widely used Total Expense Ratio (Total Cost Ratio) as a ratio for expressing the fees paid on an investment turns out to be a misleading indicator. We have used similar approach when calculating Total Fee Ratio that presents the impact of fees on accumulated assets (savings) over the 40-year saving horizon. However, Total Fee Ratio omits the cumulative effect of charges over time and thus does not take into account unrealized performance due to the existence of fees. Therefore, using Total Fee Ratio as a similar indicator to Total Expense Ratio or Total Cost Ratio can significantly underestimate the real impact of fees on the final value of investment (accumulated assets).

## Conclusion

Results of the analysis suggest that the detriment to savers is even bigger than the findings of Hernandez and Stewart (2008). So we conclude that 1% of fees (equivalent ratio) applied on the NAV (AuM) on an annual basis exceeds significantly Hernandez and Stewart (2008) proclaimed charge ratio of 20 % over the 40-years saving period. Detailed sensitivity analysis of particular fees presents management fee with significant impact on the savings.

Another interesting approach would be continuing with investigation of mutual relationship among various fees and returns. We do not intend to replicate existing studies which cover the asset management side (for example Alda and Ferruz, 2012), instead we plan to investigate the demand side and policy implications for the political risk associated with the existence of second pillars in CEE countries.

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