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Economic Studies and Analyses
Ekonomické studie a analýzy

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Manuel M. MOLINA-LOPÉZ, Pilar MELENDO-MATÍAS:**

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Under an Ownership and Management Perspective
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Editorial

Editorial

JAROSLAV VOSTATEK

Dear readers,

Issue 1 of Volume 11 of our journal includes four papers from different sections of economics, within the broad context of the social sciences, three of them using econometrics and IT solutions.

Our first article was elaborated by three Spanish economists (Gonzalo Sanz-Magallón-Rezusta, Manuel M. Molina-López, Pilar Melendo-Matías), two of whom are engaged at a prestigious private Catholic San Pablo CEU University in Madrid (founded in 1993) and the third at the Carlos III University in Madrid. The name of their article, *Economies of Scale in Private and Charter Spanish Schools Under an Ownership and Management Perspective*, covers the Spanish material that they analyse, but the coverage of the paper is much wider – the overview of the literature includes many results of analyses of economies of scale in primary and secondary education abroad, almost exclusively from the US, published in American scientific journals. The question is, of course, the comparability of American and Spanish primary and secondary schools. The article attracted my attention to such an extent that I considered it useful to learn more about the concepts of Spanish and American primary and secondary education; both concepts are based on the right (of parents) to choose the type of school their children attend. An essential difference between the US and (post-Franco) Spanish schools is noticeable with the charter schools: whereas in the US, the public support of religious schools is impossible (it is contradictory to the Constitution), in Spain, charter schools (*concertados*) are religious schools (with few exceptions), namely Catholic schools.

Our second article, *Digital Possibilities of Internal Audit*, was written by Václav Kupec (University of Finance and Administration). The paper proves the high digital potential of internal audit in the sphere of marketing, which is an important part of business management, including the formation of the firm's strategy. The results that are presented draw on the Delphi analysis of significant risks (information risk, strategic risk, risk of inefficiency, legislative risk). This analysis is followed by possible approaches to digital audit which can effectively detect the aforementioned risks.

Our third article, *The Value of the Firm in Dependence on Technological Shocks – the Czech Republic Case*, was written by Petr Makovský (University of Economics in Prague and Czech Technical University in Prague). The author proves, using the data sample of the Czech economy, that the neoclassical theory of investment does not sufficiently explain the market value of Czech firms. He uses a range of sophisticated methods to discover the impact of technological shocks on this market value under Czech conditions.

Our final article, *Czech Public and Occupational Pension Schemes and Reforms*, was written by Jaroslav Vostatek (University of Finance and Administration). This article aspires primarily

to present an analysis of the Czech Beveridgean public pension pillar as exploitable for its paradigm reform. The reform is necessary because of the complexity of this pillar which makes it unclear for its participants; a simple technical reform is nevertheless feasible. Quite unnecessarily, it is not permitted to set up occupational retirement schemes, which complicates the social security of special professions.

In the section *From New Economic Literature* you will find a review of the book by Jean Pisani-Ferry: *The Euro Crisis and its Aftermath*. Our reviewer is Mojmír Helísek (Vice-President of the University of Finance and Administration).

Jaroslav Vostatek

Scientific Editor of the ACTA VŠFS journal

Vážení čtenáři,

první číslo již 11. ročníku našeho časopisu obsahuje čtyři vědecké příspěvky z různých oblastí ekonomie, v širokém kontextu společenských věd; tři z nich využívají ekonometrie a IT.

Náš první příspěvek vypracovali tři španělští autoři (Gonzalo Sanz-Magallón-Rezusta, Manuel M. Molina-López, Pilar Melendo-Matías), z nichž první dva vyučují na prestižní soukromé, katolické univerzitě CEU San Pablo (Svatý Pavel) v Madridu (založené v roce 1993) a třetí z nich pracuje na madridské Univerzitě Carlose III. Název jejich příspěvku *Úspory z rozsahu v soukromých a charterových španělských školách na pozadí vlastnictví a managementu* postihuje analyzovaný španělský materiál, nicméně záběr článku je mnohem širší – v přehledu dosavadních studií na dané téma se uvádí mnoho výsledků analýz úspor z rozsahu v základním a středním školství v zahraničí, téměř výhradně z USA, publikovaných v tamních odborných časopisech. Otázkou je porovnatelnost amerických a španělských podmínek. Článek mne zaujal do té míry, že jsem považoval za účelné se více seznámit s koncepcí španělského a amerického základního a středního školství; obě koncepce vycházejí z práva (rodičů) na volbu typu školy pro své děti. Podstatný rozdíl mezi USA a Španělskem (po odstranění frankistického režimu) je patrný u charterových škol: zatímco v USA je vyloučena státní podpora církevních škol (je v rozporu s ústavou), ve Španělsku jsou tamní charterové školy (concertados) až na výjimky školami církevními, konkrétně katolickými.

Druhý příspěvek *Digitální možnosti interního auditu* napsal Václav Kupec (Vysoká škola finanční a správní). Článek prokazuje vysoký digitální potenciál interního auditu v oblasti marketingu, který je významnou součástí řízení podniků, včetně tvorby strategie firmy. Prezentované výsledky využívají metodu DELPHI k analýze významných rizik (informační riziko, strategické riziko, riziko neefektivnosti, legislativní riziko). Poté následuje rozbor přístupů k digitálnímu auditu, který může efektivně odhalit zmíněná rizika.

Třetí příspěvek *Hodnota firmy v závislosti na technologických šocích – zkušenosti z České republiky* napsal Petr Makovský (Vysoká škola ekonomická v Praze a České vysoké učení technické). Autor dokazuje na vzorku údajů z české ekonomiky, že neoklasická teorie investování dostatečně nevysvětluje tržní hodnotu českých firem. K nalezení efektů technologických šoků na tržní ocenění firem v českých podmínkách používá řady sofistikovaných metod.

Poslední příspěvek *České veřejné a zaměstnanecké penze a jejich reformy* napsal Jaroslav Vostatek (Vysoká škola finanční a správní). Aspirací článku je především analýza stávajícího českého beveridgeovského veřejného penzijního pilíře, využitelná pro jeho paradigmatickou reformu. Nezbytnost reformy je dána již samotnou složitostí tohoto pilíře, která jej činí nesrozumitelným pro jeho účastníky; jednoduchá technická reforma je přitom snadno proveditelná. Zcela zbytečně není umožněno zakládat zaměstnanecké penzijní fondy, což komplikuje systém zabezpečení speciálních profesí.

V oddíle *Z nové ekonomické literatury* naleznete recenzi knihy, kterou sepsal Jean Pisani-Ferry a která nese název *The Euro Crisis and its Aftermath* (Krise eura a její dozvuky). Naším recenzentem je Mojmír Helisek, prorektor Vysoké školy finanční a správní.

Jaroslav Vostatek

Vědecký redaktor časopisu ACTA VŠFS

Economies of Scale in Private and Charter Spanish Schools Under an Ownership and Management Perspective¹

Úspory z rozsahu v soukromých a charterových španělských školách na pozadí vlastnictví a managementu

GONZALO SANZ-MAGALLÓN-REZUSTA, MANUEL M. MOLINA-LÓPEZ,
PILAR MELENDO-MATÍAS

Abstract

This paper investigates economies of scale in primary and secondary Spanish schools, distinguishing between ownership (private/charter school) and management (non-religious/religious). We have used the *Survey of Private Education Funding* and considered both the number of students per school unit (class) and the total number of students enrolled at the school. The overall results show that unit cost per student in smaller centres is around 45% higher than the average and nearly 20% lower than the average in schools with between 1,000 and 1,400 students enrolled. These larger schools had the lowest overall cost per student. As far as ownership is concerned, private schools show an average cost per pupil around 20% higher than charter schools, due to their higher average cost per teacher and lower student unit/teacher ratio. In both private and charter schools, size also influences a school's economic performance, private schools being more greatly affected. The possible influence of school size and class size on Spanish student performance in PISA 2009 is also studied.

Keywords

economies of scale, cost, efficiency, school organisation

JEL Codes

H7; I2; M21

Abstrakt

Článek zkoumá úspory z rozsahu ve španělských školách prvního a druhého stupně s rozlišením vlastnictví (soukromé/charterové školy) a managementu (necírkevní/církevní). Využíváme "Přehledu financování soukromého vzdělávání" a bereme v potaz jak počet studentů na školní jednotku (třída), tak také celkový počet studentů zapsaných na škole. Celkové výsledky ukazují, že jednotkové náklady na studenta v malých sídlech jsou okolo 45 % vyšší než průměr a téměř o 20 % nižší než průměr ve školách, v nichž je zapsáno 1 000 – 1 400 studentů. Tyto větší školy měly nejnižší celkové náklady na studenta. Pokud jde o vlastnictví, soukromé školy vykazují průměrné náklady na žáka asi o 20 % vyšší, než

¹ A previous version of this paper was presented at the Spanish Association of Economics of Education Conference held in Badajoz in 2016. The authors appreciate the feedback received.

charterové školy, a to v důsledku jejich vyšších průměrných nákladů na učitele a nižšího počtu studentů na učitele. V obou školách, soukromých i charterových, má velikost také vliv na jejich ekonomickou výkonnost, přitom jsou tímto více ovlivněny soukromé školy. Předmětem analýzy je také možný vliv velikosti školy a třídy na výkonnost španělských studentů vykazovanou v PISA 2009.

Klíčová slova

úspory z rozsahu, náklady, efektivnost, školní organizace

Introduction

The optimisation of resources and the pursuit of economic efficiency have become indispensable in the current economic climate. In this context, economies of scale, which are characterised by generating a cost reduction per unit of input while output increases (Mankiw 2001), are the most decisive factor. It should be pointed out that some events that are not under the control of the company may generate economies of scale. It is thus clear that productive factors are those that decrease the average cost per unit while production increases, being directly related to increasing production capacity and the savings they provide in terms of costs.

Economies of scale are usually considered in reference to industrial firms, but can also be applied to service companies such as hospitals (Ramirez 1992; Riha et al. 2013) or schools. In the educational field, economies of scale have been of special interest in the cases of for-profit and charter schools (Rosenfeld 1977; Butler & Monk 1985; Roomkin & Weisbrod 1999; Andrews et al. 2002). Nevertheless, the topic of economies of scale has not been treated in depth in the field of economy of education (Tholkes & Sederberg 1990; Leithwood & Jantzi 2009).

Most existing studies have looked at ways in which private schools can minimise costs, focusing primarily on the existing investigation in the US. Although education is a basic service of our welfare system, these profit schools are private companies that seek to minimise costs, and it may be useful for them to achieve economies of scale. Other studies have analysed the effects on government-financed private schools (charter schools) and public schools (Butler & Monk 1985; Andrews et al. 2002; Ketchum & Slate 2012).

The total number of students enrolled is one of the most frequently studied variables when investigating economies of scale in the educational sector (Rosenfeld 1977; McGuffey & Brown 1978; Butler & Monk 1985; Andrews et al. 2002; Riha 2013). This criterion should not be analysed in isolation, because other aspects of a school's organisation can also have a decisive influence (Morris 1964; Faber 1966; McGuffey & Brown 1978; Lubienski 2001; McEwan 2001; Lubienski 2005).

What is more, the differences between religious and non-religious schools have not been considered when talking about ways schools can minimise costs (Lubienski 2005). This paper will analyse the characteristics of primary and secondary private schools when trying to minimise costs, distinguishing between private and charter schools, and also considering whether the school is run by a religious entity or a corporation. For this

purpose, microdata reflecting the financial situation of the Spanish private school sector will be analysed.

1 School characteristics and their contribution to economies of scale

The number of students enrolled is one of the most frequently studied aspects of economies of scale in this field. There is, however, little agreement about the most suitable number in terms of increasing profits. Butler and Monk (1985) conducted one of the first analyses of economies of scale and efficiency of public schools in New York State. They made a distinction between small districts, with fewer than 2,500 students, and large districts, with over 2,500. The results showed that significant economies of scale were achieved when the number of students increased. Nevertheless, this only occurred in small districts, and within them, specifically in smaller schools. Previously, Turner and Thrasher (1970), in a study that included schools with up to 3,000 students, also noted that the cost per student was at its lowest after reaching 1,000 students enrolled. According to these data, Fox (1981) maintained that the ideal size of a school was between 1,000 and 2,000 students, due to the fact that schools with fewer than 1,000 students had a higher cost per pupil.

Nevertheless, Monk (1987) concluded that after reaching 400 registrations, schools did not benefit from economies of scale. Similarly, Andrews et al. (2002) observed that economies of scale were achieved in districts with between 2,000 and 4,000 students, but never in those with more than 6,000. At this level of enrolment, the opposite effect, diseconomies of scale, was observed. Chakraborty et al. (2000) concluded, after studying public schools in Utah districts, that economies of scale existed in larger districts and schools and that cost reduction may be achieved when the number of students enrolled increases.

As far as the relation between rural schools and economies of scale is concerned, several analyses have been made. Tholkes and Sederberg (1990) reviewed studies looking at economies of scale and rural schools, taking into account different aspects that tend to affect rural communities. Hickey (1969) presented consolidation of schools as the best way to achieve more efficient administration. Rosenfeld (1977) concluded that larger unified schools were found to have a larger percentage of costs defined as administrative costs than smaller unified schools.

In order to explain the schools' cost reduction factors, Morris (1964) hypothesised that larger schools offer broader educational programmes which, according to him, could be behind the cost reduction per student. Like previous authors, he found that schools with fewer than 500 students had a higher cost per student than larger ones. However, this figure reached a low point when the total number of students enrolled reached 1,000. Bowles and Bosworth (2002), after analysing 17 schools in a district of Wyoming, concluded that an increase of 10% in school size leads to a decrease of 2% in total cost.

Most studies focus on the relationship between total cost and school size (Andrews et al. 2002; Newman et al. 2006) without considering other school factors. Related to this issue,

it is important to point out that these analyses of economies of scale can be subjected to various types of bias. Other researchers have taken a different view of economies of scale, focusing on other factors that may influence them, such as the organisation of the school (Huang and Howley 1993; Ketchum & Slate 2012).

Lubienski (2001) discovered that smaller schools had disadvantages in the field of innovation in comparison to the largest ones. According to his study, charter schools have the ability to encourage innovation in education. After a review of practices in these schools, he concluded that large schools use innovation in organisational terms: however, the strategies used in the classroom did not reflect this. The conclusion emphasised that when having to choose between innovation opportunities in education or pedagogical and curricular strategies, the latter prevail. Later, Lubienski (2005) suggested that for-profit schools spent part of their organisational resources on marketing strategies instead of redirecting them to students or faculty. Due to the private nature of these organisations and the competitive pressures they are subjected to, these for-profit schools develop marketing strategies rather than structural and organisational reforms.

Another aspect that could influence economies of scale is directly linked to the size of the facilities (Lubienski 2005). McGuffey and Brown (1978) analysed the relationship between school size and the cost of use of the facilities. They found that large schools made better use of their space and incurred lower operational costs than small schools.

As for-profit schools and charter schools seek financial profit, it is important to analyse whether this has any impact on student academic performance. This issue has been studied by several authors (Monk 1987; Huang & Howley 1993; Greenwald et al. 1996; Chakraborty et al. 2000).

Ramirez conducted a review of the available literature on this topic in 1992 and found that the differences between academic progress made by students in small and large schools were not significant. Nevertheless, there have been dissenting conclusions in both directions. Cotton (1996) reviewed 31 studies which identified the relationship between school size and academic achievement. He concluded that the best size for primary schools was between 300 and 400 students and between 400 and 800 for secondary schools. Greenwald et al. (1996), after reviewing 60 studies, concluded that academic performance was inversely related to the size of the school. Once again, academic performance was better in smaller schools. Ketchum and Slate (2012) analysed the relationship between the size of secondary schools and the academic achievement of students with financial problems in the state of Texas between 2005-06 and 2010-11. They concluded that these students had better marks in smaller schools, considering the ideal size to be between 600 and 900 students.

Nevertheless, it would seem that no clear conclusion has been reached. Some authors have come to the opposite conclusion, maintaining that students have better academic achievement in large schools (Morris 1964; Rosenfeld 1977; Huang & Howley 1993; Greeney & Slate 2012). Slate and Jones (2007) examined the relationship between school size (small, fewer than 400 students, medium, between 800 and 1,199, and large, 1,200 students or more) and the performance of Hispanic students in Texas. Analysing the

results of tests in different subjects, students enrolled in large schools had better marks in algebra and history, but students from small schools did better in English and Biology. Riha et al. (2013) repeated the study relating the size of the school (small between 100-499 students, 500-999 medium and large from 1,000 students) to the academic performance of the Texas Hispanic students from 8th grade between 2005-06 and 2009-10. The results corroborated previous study data, showing that the academic performance of students in larger schools was better. Similar conclusions were obtained by Huang and Howley (1993). After applying a multivariable regression analysis, in which they included not only school size variables but also others such as school resources, school environment and academic background, they concluded that students' academic achievement in small schools was worse than in large schools. Iatarola et al. (2008) studied the effect of small schools on student achievement in New York City, reaching similar conclusions.

Greeney and Slate (2012) analysed the relationship between school size and other variables (class attendance, dropout rates and rate of completion of studies) in Texas Hispanic students between 2003-04 and 2008-09. They concluded that there were no significant differences in the cases of school size, class attendance and dropout rate. Nevertheless, completion rate was higher if these students were enrolled in small schools.

2 Objectives and methodology

The main purpose of this study is to determine the existence of economies of scale and the effects of size in primary and secondary for-profit and charter schools in Spain. Private schools are those owned by a legal person or a company, while charter schools are private corporations supported with public funds under regulation in Spanish law (L.O.D.E. 1985).

According to the sample, the following aspects were analysed:

- Estimate of the minimum efficient school size.
- Analysis of what kind of entity (corporation or religious entity) manages schools better in terms of cost.
- Study of regional disparities in Spain in relation to average school size and costs per student.

That is why the main objective is to analyse the relationship between the number of students enrolled in the centre and its cost function, distinguishing between for-profit and charter schools, as well as by the school management (corporation or religious entity) and the characteristics of the region in which the school is located. The optimal number of students enrolled (threshold) will be also studied.

The analysis will be based on microdata from the *Statistics of Financing and Expenditure of Non-university Private Education in 2009-2010*, prepared by the National Statistics Institute (INE), a sample which contains information for 7,559 Spanish private and charter schools.

In Spain, the different stages taught by schools are kindergarten, primary education, secondary education and high school (*bachillerato*). The earliest, preprimary stage of education (kindergarten) is usually provided by specialised centres, such as nursery schools, as this stage is not offered by many schools.

The sample has been divided between preprimary centres and the rest, which include primary, secondary and high school education. This second sample of the mean is the one chosen for the present study.

Several linear regressions were applied in the analysis. The independent variable chosen was the number of students at the school and the dependent ones were the total costs of the centre, spending on transportation, fungible material costs, educational personnel costs, non-teaching staff costs, canteen expenses, living expenses and cleaning services. The applied equation was:

$$A_i = C + \beta_{1ALUMNO} + \beta_{2ALUMNO*ALUMNO} + u_i \quad (1)$$

where A_i is the dependent variable, $\beta_{1ALUMNO}$ the number of students at the school and $\beta_{2ALUMNO*ALUMNO}$ the squared number of students.

At the same time, and although it is not the main objective of this research, the relationship between the results obtained by students in PISA 2009 and school size was also analysed using the Hanushek production function (1979). A multilevel regression was applied (Choi et al. 2013; Agasisti 2013), estimating the results using the techniques recommended in the *Data Analysis PISA OECD Manual* (2009), which involves making estimates from five plausible values and eighty replicates of each student.

PISA 2009, whose sample includes 25,887 fifteen-year-old Spanish students, incorporates different variables that can affect student achievement. The assessed competencies are mathematics, science and reading. PISA 2009 is characterised by large international participation (74 countries compared to 32 in 2000) and a greater consolidation of the regional analysis, allowing a broad comparison within the country. Thus, in PISA 2000, Spain participated as a single state sample, while in 2009 all except three regions took part.

3 Average size of Spanish schools

As there are no specific statistics which would make an international comparison of average school size possible, we used the information contained in PISA 2009. From the values of each country according to this source, we identified five groups of countries according to the size of their schools. The function of k-means clusters from the IBM SPSS statistical software version 19 was used, as shown in Table 1.

Spain is situated within the largest group formed by 29 countries including Japan, Germany and Belgium, and with an average value of 657 students per school. Groups of countries with smaller schools, 473 students on average, include most of the Nordic

countries (Denmark, Sweden and Finland), while at the opposite pole are the three regions of China, Thailand and UAE, with an average value of about 2,500 students per school. Other Asian economies such as India, Malaysia and Singapore, together with the US, are in the group of countries with an average school size of around 1,400 students.

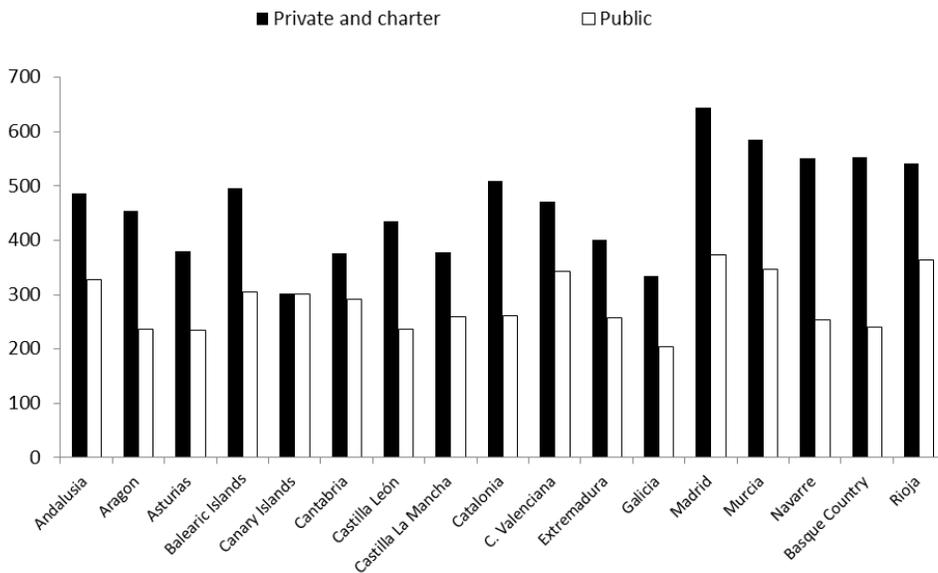
Table 1: Average school size by country: PISA 2009

	<i>N</i>	<i>Min.</i>	<i>Max.</i>	<i>Mean</i>	<i>Std. deviation</i>
<i>Denmark. Moldova. Latvia. Slovenia. Czech Republic. Finland. Sweden. Iceland. Norway. Poland. Liechtenstein. Greece</i>	12	275.7	473.4	403.6	68.0
<i>Israel. Kazakhstan. Kyrgyzstan. Serbia. Japan. Azerbaijan. Miranda - Venezuela. Italy. Peru. Germany. Belgium. Spain. Jordan. Trinidad and Tobago. Switzerland. Malta. Croatia. Lithuania. Hungary. Bulgaria. Georgia. Ireland. Indonesia. Albania. Argentina. Austria. Estonia. Russian Federation. Slovak Republic</i>	29	512.5	796.6	656.9	87.4
<i>New Zealand. Korea. Chile. UK. Brazil. Panama. Canada. Hong Kong-China. Netherlands. Australia. Uruguay. Portugal. Turkey. Romania. Tunisia. Mexico. Montenegro. Costa Rica. Mauritius</i>	19	805.8	1188.1	993.3	102.4
<i>Qatar. Colombia. Singapore. United States. Luxembourg. India. Malaysia</i>	7	1273.3	1485.9	1375.5	64.7
<i>Chinese Taipei. Macao-China. Thailand. UAE. Shanghai China</i>	5	1697.1	2534.5	1944.2	335.5

Source: own calculations using PISA 2009 (OECD) data.

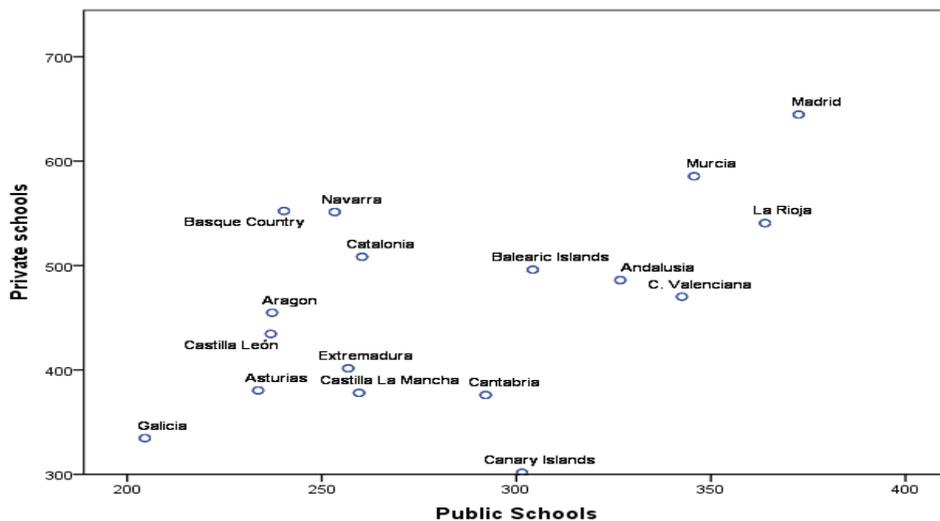
A second characteristic related to the size of Spanish schools is the major differences found among public schools, with a size around 30% smaller than private ones (Figure 1). The correlation between the size of private and public schools according to region is significant at a level of 95% (Figure 2). The average size of private schools related to regional incomes shows a positive and significant correlation at the 95% level, but it is independent of other variables that, a priori, could affect it, such as the total population of the region, population density, area, number of municipalities or average temperature (Table 2).

Figure 1: Comparative average size of Spain's public and private schools by region: Number of students



Source: own calculations based on statistics from the Spanish Ministry of Education, Culture and Sports for public and private centres INE. Data relating to 2011/12.

Figure 2: Comparison of Spain's public and private school size by region: Number of students



Source: own calculations based on statistics from the Spanish Ministry of Education, Culture and Sports for public centres and from the Spanish National Statistics Institutes for private ones. Significant at a level of 95%.

Table 2: Partial correlation between regional school size and regional indicators

		Average school size	GDP p.c. 2012	Population	Area	Density	Number of municipalities	Temperature
Average school size	Pearson correlation	1,00						
	p. value							
GDP p.c. 2012	Pearson correlation	0,59*	1,00					
	p. value	0,01						
Population	Pearson correlation	0,26	0,11	1,00				
	p. value	0,32	0,64					
Area	Pearson correlation	-0,24	-0,30	0,42	1,00			
	p. value	0,36	0,22	0,07				
Density	Pearson correlation	0,48	-0,27	-0,28	-0,35	1,00		
	p. value	0,05	0,27	0,25	0,14			
Number of municipalities	Pearson correlation	-0,11	-0,09	0,29	0,84**	-0,29	1,00	
	p. value	0,68	0,72	0,26	0,00	0,26		
Temperature	Pearson correlation	0,14	-0,50*	0,14	-0,25	0,48*	-0,33	1,00
	p. value	0,58	0,03	0,58	0,31	0,04	0,20	

** Significance at 95%; * Significance at 90%

Source: own elaboration from the Spanish National Statistics Institutes.

4 Results

4.1 Influence of school size on students: PISA results

The literature reviewing the efficiency of the education system has attempted to identify the variables which have an influence. One of the most common ways to study efficiency in education involves the production function of education defined by Hanushek (1979), where the output of the educational process of a student is measured in a particular school (A_{ij}) based on a series of school inputs (S_{ij}), the socioeconomic characteristics of the student (B_{ij}), the influence of peers (P_{ij}) and the innate abilities of the student (I_{ij}). The production function would be:

$$A_{ij}=f(S_{ij}, B_{ij}, P_{ij}, I_{ij}) \quad (2)$$

Using this equation, the effect of school size on student performance in the PISA 2009 tests of mathematics, both in public and private schools will be shown, performing the following multilevel regression (Agasisti 2013):

$$A_{ij} = \alpha_j + \beta_1 \text{ESCS} + \varepsilon_{ij}$$

$$\alpha_j = Y_0 + \beta_2 \text{SCSIZE} + \beta_3 \text{PRIVATE} + \beta_4 \text{LARGECITY} + \beta_5 \text{CLASSSIZE} + \beta_6 \text{MU_ESCS} + \mu_{i,j} \quad (3)$$

where A_{ij} is the result obtained in mathematics by student i at school j , conditioned by socioeconomic background (βESCS) and several fixed effects of the school (α_j).

SCSIZE represents school size, measured by the number of students enrolled, MU_ESCS includes the average ESCS of the school or “peer effect”; CLASSSIZE measures the number of students in the classroom of student i ; PRIVATE indicates school ownership; and LARGECITY shows whether the school is located in a city with a population of more than 100,000. These last two variables have been coded, taking the value 0 when the school is public, and 1 when it is private, and 0 if the city has a population below 100,000 and 1 when it is higher, respectively.

The analysis shows that all the variables, with the exception of PRIVATE, are good predictors of the dependent variable (significance of 95% or higher). School size has a slightly negative influence on student performance in these tests. In contrast, and paradoxically, the relationship between class size and results in mathematics is positive. Students in larger classrooms obtain better results. This could be explained by a quality or reputational effect of the school, with the more popular schools in Spain usually trying to fill their classes to the maximum level. Finally, schools located in large cities also obtained better results in the PISA 2012 test.

Table 3: Influence of school size on student achievement in maths: PISA 2009

Variable	B	Std. error	df	T	p value	Lower bound	Upper bound
<i>Intercept</i>	469.51	3.72	1,450.77	126.22	0.000	462.21	476.80
<i>ESCS</i>	22.17	0.77	795.20	28.87	0.000	20.66	23.68
<i>MU_ESCS</i>	24.05	2.75	892.36	8.74	0.000	18.65	29.46
<i>SC Size</i>	-0.01	0.00	908.00	-3.19	0.002	-0.02	0.00
<i>Private School</i>	-2.17	2.90	859.84	-0.75	0.462	-7.86	3.53
<i>Large City</i>	6.78	2.75	816.85	2.46	0.014	1.38	12.18
<i>Class Size</i>	1.96	0.10	21,574.44	20.52	0.000	1.78	2.15

Source: own elaboration from PISA 2009.

4.2 Influence of school size on average costs

First, a descriptive analysis of the main economic indicators of the school was performed. The indicators were distributed into ten groups or deciles of schools, according to the number of students enrolled. The sample shows the average values of the main indicators

and unit costs by groups of schools depending on size. There is a direct relationship between school and class size, as well as higher expenditure per student in smaller schools.

Table 4: Average cost of schools by size

Deciles	Number of centres	Average students	Students per classroom	Total expense per student	Teachers total expense per student	Non-teachers total expense per student	Rest of expenses per student
1	440	27.3	10.1	11,708.3	5,298.3	3,544.7	2,865.3
2	439	86.7	15.9	7,937.7	4,103.9	2,159.8	1,673.9
3	441	193.7	21.3	4,162.6	2,662.0	552.2	948.3
4	440	279.8	22.1	3,919.6	2,666.3	438.3	815.1
5	436	337.5	24.7	3,581.1	2,603.3	359.9	617.8
6	440	408.0	23.5	3,977.8	2,620.2	438.2	919.5
7	439	591.3	23.3	3,871.3	2,627.7	390.5	853.0
8	440	708.1	24.8	3,746.2	2,534.5	381.5	830.1
9	439	902.5	25.0	3,793.8	2,503.9	394.0	895.9
10	440	1,405.1	25.9	3,873.5	2,436.3	420.4	1,016.8
Total(a) /Average	4,394 (a)	494.0	21.7	5,058.2	3,005.4	907.7	1,145.1

Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

In order to analyse the differences in expenses per student in each school, average expenditure per student was broken down into two components, according to the following equation:

$$E / S = [E / C] \times [C / S] \quad (4)$$

where E represents total expenditure, S the number of students in the school and C the number of classrooms.

To analyse the elasticity of the cost per student related to school size and the shape of the cost curve, these equations were estimated (least squares approach):

$$A_i = c + \beta_1 S + \beta_2 S^2 + u_i \quad (5)$$

where A_i represents the different components of the cost of each school (costs of teachers, non-teaching staff costs and other expenses), S represents the number of students, S^2 the square of the number of students, and u_i includes the error term.

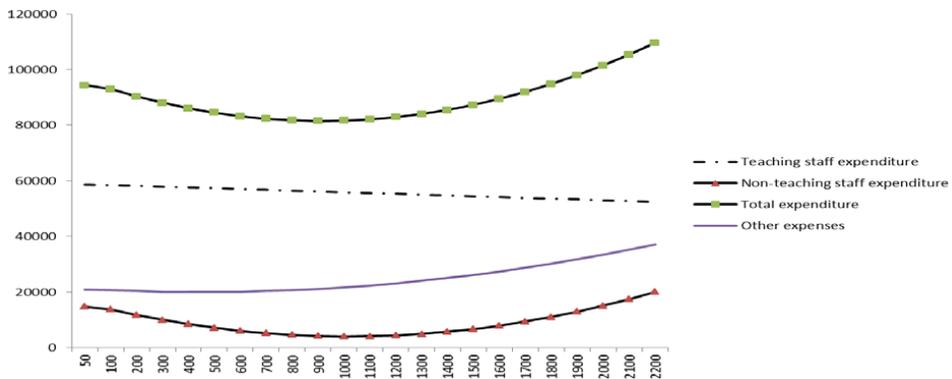
The cost values of each teaching unit (class) according to size (Figure 3) were also calculated. The following equation was estimated:

$$B = c + \beta_1 S + \beta_2 S^2 + u_i \quad (6)$$

where B is the number of students per school unit (class).

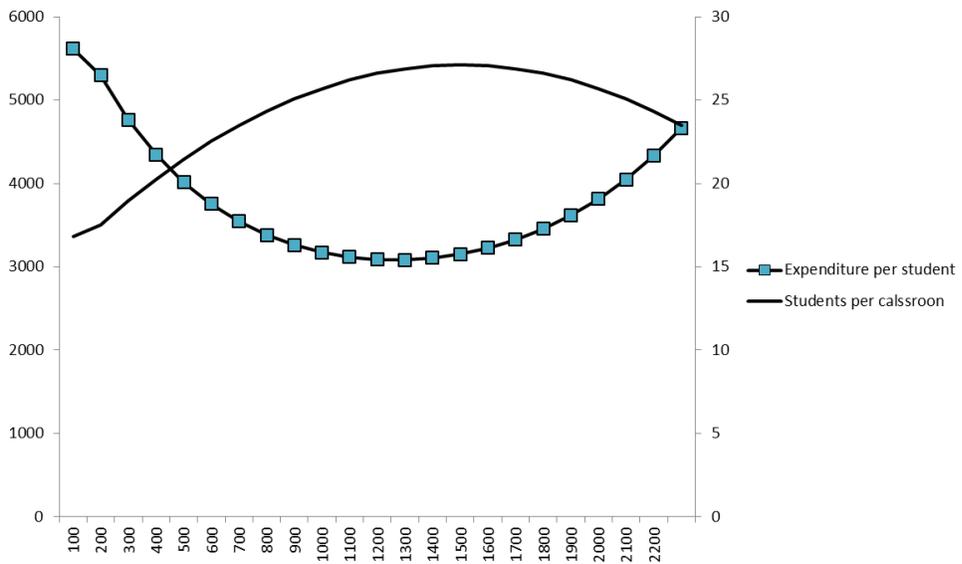
Total cost per student was also calculated (Figure 4). Finally, values for average cost per student, the relative levels of average expenditure for each class and the average number of students per class were expressed in index numbers, with the average of all schools = 100 (Figure 5).

Figure 3: Estimated average classroom costs per student by school size



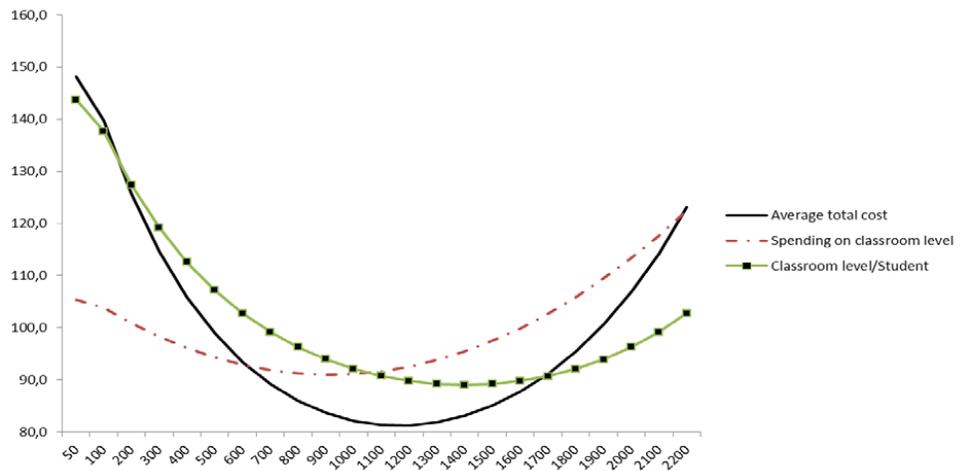
Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

Figure 4: Estimated number of students per classroom and average cost per student by school size



Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

Figure 5: Relative levels of average cost per student, average cost per classroom and average classroom size



Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

There are significant differences in school size depending on the religious or non-religious nature of the school and its ownership (charter or private) determining the average cost per student in each type of school (Table 5):

- a) Costs per student about 10% below the average figure are obtained in religious private schools. This is explained by the lower average cost per school unit and larger number of students per school unit (Table 5).
- b) Non-religious charter schools have a cost per student 9.8% above the average, due to the higher average cost per school unit (4.8%) and lower average number of students per school unit (95.4% from the mean = 100).
- c) Non-religious private schools spend about 25% more per student than the average, due to the fact that they have about 12% fewer students per school unit and an expenditure of 10% more per school unit.
- d) Finally, the expenditure per student of religious private schools is 15.3% above the average figure due to higher spending per school unit.

Table 5: Average costs, school management and ownership

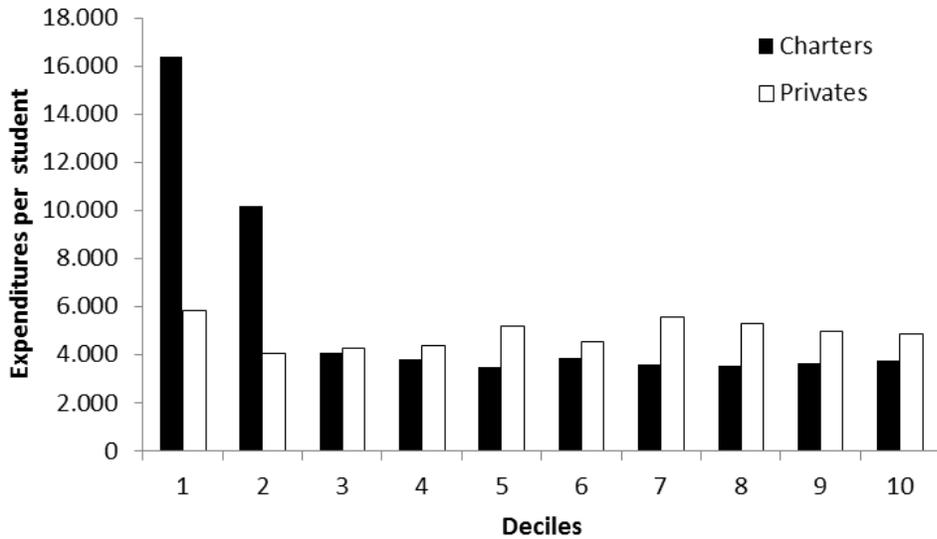
	Number of centres	Number of students	Expenses/ student (euros)	Expenses/ classroom (euros)	Students/ classroom (euros)
Charters (a)	3,470	540.9	3,799	90,364	23.8
Non-religious	1,350	414.3	4,332	96,495	22.3
Religious	2,120	621.5	3,573	87,502	24.5
Private	923	318.5	4,880	101,732	20.8
Non-religious	817	311.5	4,931	101,453	20.6
Religious	106	372.4	4,549	103,725	22.8
Total	4,394	494.0	3,946	92,089	23.3
Charters		109.5	96.3	98.1	101.9
Non-religious		83.9	109.8	104.8	95.4
Non-religious		125.8	90.6	95.0	104.9
Private		64.5	123.7	110.5	89.3
Non-religious		63.1	125.0	110.2	88.1
Religious		75.4	115.3	112.6	97.7

(a) *Because of the possible mixed character (private-subsidised) of some Spanish centres, a school has been treated as a charter school when more than 50% of its classrooms are subsidised.*

Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

Studying the differences in costs per student related to the type of school, it is clear that smaller charter schools have higher unit costs, which is not the case for private ones (Figure 6). This is due to the low number of students per school unit. Nevertheless, it could be possible to maintain this type of charter school because they are funded by the public money. In contrast, from a certain school size, charter schools have lower average costs per student than private schools.

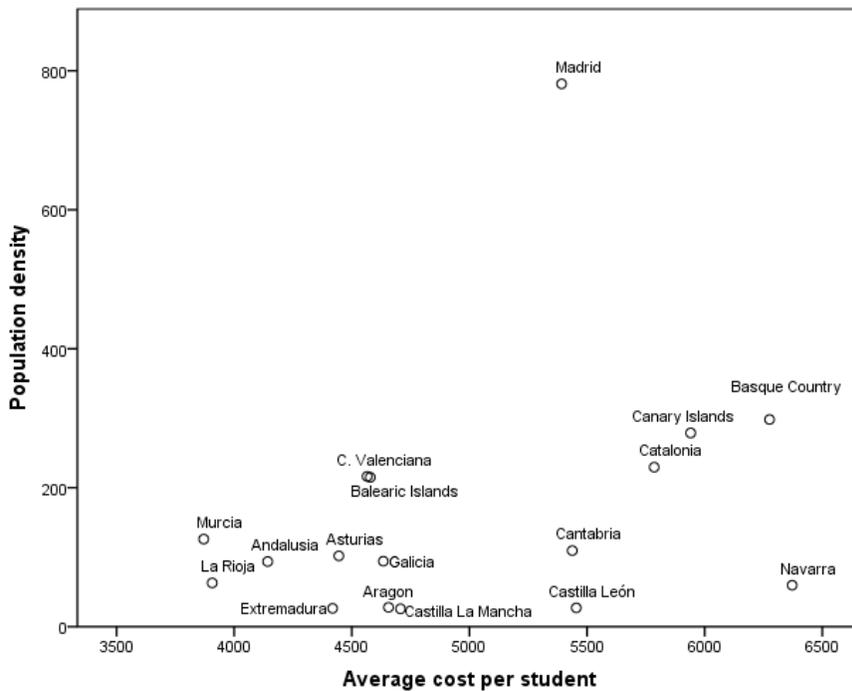
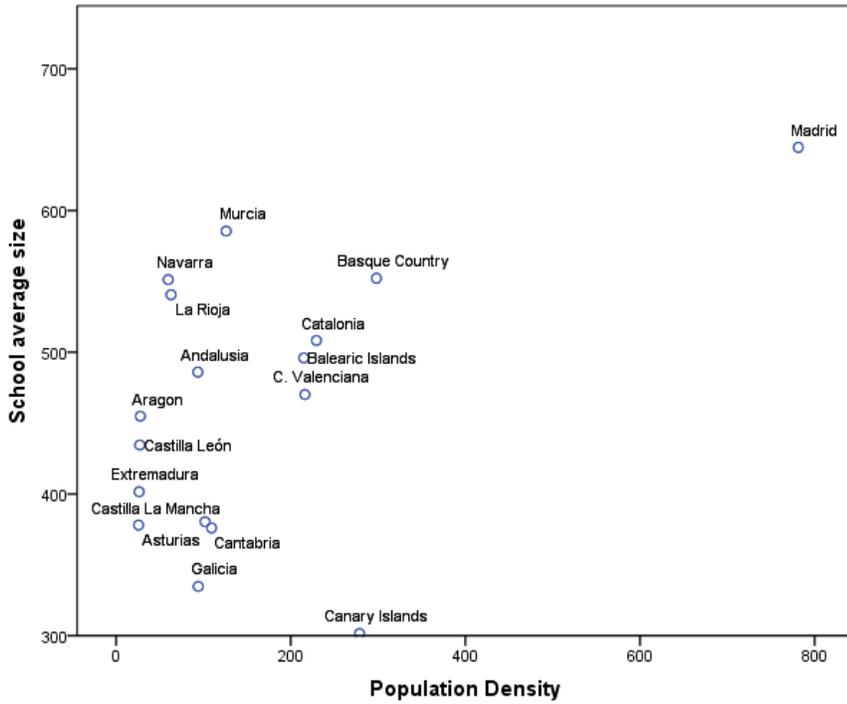
Figure 6: Variation in average cost per student according to size: charter and private schools



Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

When analysing the average size of schools in each region, significant differences were observed. These can, in part, be explained by the different density of population of each region (Figure 7). The estimation of the influence of population density on school size was studied using a linear regression. It concluded that this variable explains 17% of the differences in school size, with a significance level of 95%. However, regional population density and the average cost per student in private schools are independent variables, as shown on the right of Figure 7. Source: own elaboration from *Survey of Private Education Funding* (Spanish National Statistics Institute) and *Population Figures* (Spanish National Statistics Institute).

Figure 7: Relationship between average school size and population density: Spanish regions



5.3 Contribution margin per student by school size

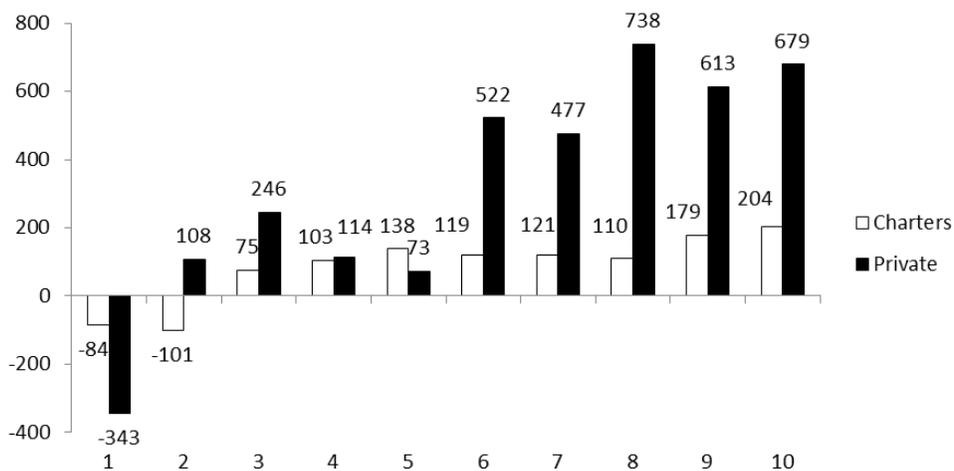
School size is an important determinant factor of profit margin. These data have been obtained from Spanish private and charter schools. In both cases, three categories of school size (small, medium and large) were distinguished. Charter schools in deciles 1 and 2 presented negative results per student of around 100 euros, and in private schools decile 1 also recorded a loss of 343 euros. However, the high value of the standard deviation indicates a significant dispersion of the results (Table 6 and Figure 8). In contrast, larger schools (deciles 8, 9 and 10 in the case of private schools and deciles 9 and 10 in charter schools) showed a positive result of 600/700 euros in private schools, and of 180/200 euros in charter schools. Finally, the medium-sized schools recorded a result per student of between 100-500 euros in private schools and between 75-125 euros in charter schools.

Table 6: Influence of size on current profit margin in charter and private schools: euros per student

Decile	Private				Charter			
	Mean	Standard deviation	Confidence interval at 95%		Mean	Standard deviation	Confidence interval at 95%	
			Lower limit	Upper limit			Lower limit	Upper limit
1	-343.3	2157.1	-619.3	-67.2	-83.8	2226.6	-391.2	223.6
2	108.1	2554.7	-243.7	459.9	-101.2	1407.8	-285.7	83.4
3	245.7	703.6	112.8	378.7	75.5	433.1	28.7	122.2
4	114.5	1198.1	-187.2	416.2	103.3	373.7	65.4	141.2
5	73.1	613.0	-179.9	326.1	137.8	400.9	98.9	176.8
6	522.2	733.8	349.7	694.6	118.9	479.0	69.8	168.0
7	476.6	677.7	296.7	656.4	120.9	378.8	82.8	159.0
8	737.6	864.7	491.9	983.3	110.5	282.4	82.2	138.8
9	612.7	524.2	465.2	760.1	179.1	424.3	136.8	221.3
10	679.4	537.2	528.3	830.4	203.7	389.7	164.7	242.7
Total	156.8	1753.3	43.4	270.2	104.5	751.8	79.4	129.5

Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

Figure 8: Current centre results per pupil (euros) according to deciles formed by school size



Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

Conclusions

Designing educational policies that promote efficiency in the educational system requires knowledge of the effects on performance and the associated costs of different schools and classes sizes. According to the Spanish results in PISA 2009, there is a slightly negative relationship between student performance in these tests and school size. In contrast, paradoxically, the relationship between class size and academic results is positive after controlling for variables such as the size of the city and the influence of the socioeconomic status of the school and the student.

Regarding the impact of school size on average costs, potential savings in costs per student in Spanish private and charter schools have been estimated, using for this purpose the *Statistics of Financing and Expenditure of Non-university Private Education in 2009-2010* microdata, prepared by the INE. The contribution of: a) the lower cost per school unit in larger centres and b) the higher number of students per school unit in such schools were differentiated in the calculation of this potential savings figure.

In terms of average costs per school unit, lower levels were achieved in schools with between 600 and 1,200 students enrolled. These costs were around 8% below the average, meanwhile in schools with fewer than 100 students enrolled, the cost per unit increased by about 5% on average.

The number of students per class is 10% higher when 600 students or more are enrolled. In schools with fewer than 200 students enrolled, this ratio decreases by about 40%. The combined effect of these two factors means that the cost per student is around 45% higher than the average in small schools, and almost 20% below the average in schools

with between 1,000 and 1,400 students enrolled. This kind of school presents, overall, a lower cost per student.

According to ownership, private schools register a cost per student around 20% higher than charter schools, due to the fact that charter schools have a higher cost per teacher and a lower student unit/teacher ratio. There is a higher proportion of small private schools compared to small charter schools. Nevertheless, private schools have lower unit costs, but only slightly above the average, meanwhile in charter schools the smaller class size means an unusually high average cost per student of around 13,000 euros, compared with the average of 3,946 euros.

School size influences the economic performance of charter and private schools. In charter schools, which generally obtain lower profits than private schools, the small ones make a loss of around 100 euros per student on average, compared with large charter schools which make an average profit of approximately 200 euros. The differences in profits in the case of private schools are higher. The small schools make losses of 300 euros, compared to profits of 600-700 euros in large schools.

Finally, the analysis leads to the conclusion that although different population densities of the Spanish regions have an influence on average school size, this influence is limited and independent of the average expenses per student of the region.

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Digital Possibilities of Internal Audit

Digitální možnosti interního auditu

VÁCLAV KUPEC

Abstract

Company management is a highly sophisticated activity which must employ the latest information technologies as ongoing digitisation allows company processes to be managed in a dynamic way, primarily with respect to the fast-changing economic environment. This also applies to internal audit, which helps to ensure flexible transfer of data concerning process deficiencies to the company leadership. The aim of the study is to verify the efficiency of the digital potential of the internal audit in the field of marketing, which forms an important part of company management. The method of the paper includes an analysis of the current theoretical background as well as an analysis of marketing risks and the use of adequate auditing techniques. The proposed system of internal audit, or the use of digital methods, can subsequently be used to predict process deficiencies, and thus contribute to efficient risk management and responsible business conduct.

Keywords

analysis, audit, digital, management, marketing, risk

JEL Codes

G21, M42

Abstrakt

Problematika podnikového managementu je vysoce sofistikovanou činností, ve které je nutné využívat nejnovější informační technologie. Postupující digitalizace totiž umožňuje, aby byly podnikové procesy řízeny dynamicky, obzvláště ve vztahu k rychle se měnícímu ekonomickému prostředí. Tato skutečnost se týká také interního auditu, s jehož pomocí lze zajistit flexibilní přenos dat o procesních nedostatcích směrem k managementu. Cílem příspěvku je proto ověření účinnosti digitálních možností interního auditu v marketingové oblasti, která je významnou součástí firemního řízení. K práci je přitom metodicky přistupováno nejenom rozбором aktuálních teorií, ale také analýzou rizik marketingového odvětví a aplikací vhodných auditních technik. Navrženým systémem interního auditu, respektive využíváním digitálních přístupů, lze následně predikovat procesní nedostatky, a tím je možné přispět k efektivnímu řízení rizik i odpovědnému podnikání.

Klíčová slova

analýza, audit, digitální, management, marketing, riziko

Motto

"These are exciting times for internal auditors, especially those who see themselves as agents of change within their organisation."

David Coderre

Introduction

As management evolves, it also brings about changes in individual methods. Those which are becoming ever more important, primarily in the context of economic changes, include internal audit. Today, internal audit is understood as a modern consultancy service which helps the company leadership (Phillips 2009). Contemporary audit is no longer based on “hard” controlling methods, but focuses more on “soft” consulting activity (Moeller 2011). As with other disciplines, internal audit is now facing new developmental changes which above all reflect the digitisation of the business environment, which in turn offers innovative approaches for auditing and other functions.

According to many theories, the digital environment is creating a new space for both life and business (Herout 2016). Sedláček (2015) has claimed that we are living in a great migration period. He used the phrase “into the digital” to talk about this new situation and explained that work and economy have also moved to the digital sphere following entertainment and relationships. Digitised data stored in company systems and databases create an ever-growing digital environment. This indeed is a very interesting phenomenon, as the real environment will never be able to expand in the same way. Consequently, the above-mentioned points establish the digital world as a new company environment that can be effectively analysed using internal audit.

The theories mentioned in this paper refer to a change in company processes and an increase in auditing functions (Report to the Nations on Occupational Fraud and Abuse, 2014). In the past, it was necessary to check risk areas directly in the different departments. In the last decade, though, extensive centralisation of company processes has taken place and consequently auditing has focused only on some departments. Nowadays, audits can be performed in the form of remote auditing from audit centres independently of where the auditing really takes place. In the future, we can expect auditing of anything to be carried out from anywhere. All this is facilitated by the advancement of modern age digital technologies that are part of what Tóth (2012) has called the century of modern management systems.

The suggested visions were also confirmed by Koontz and Weihrich (2008), who added that successful companies in the 21st century must take advantage of all information technologies. Therefore, internal audit will also have to use digital tools on a massive scale, which will help to improve it in many ways and offer clients higher added value. “Change is occurring at a faster rate than ever, and this change is being driven by technological advances” (Coderre 2009, p. 3). Therefore, this paper focuses on an innovative approach to internal audit in the context of the modern digital environment, as efficient audit has many tools available which may be understood as protective or rescue elements. The aim of the study is to verify the efficiency of the digital potential of the internal audit in the field of marketing, which forms an important part of company management.

1 Bibliographic sources

“The organization’s needs may be determined by identifying and examining the key activities whose effective performances can either make or break it” (Cascarino & Esch

2007, p. 6). Internal audit, which Sawyer (2000) defined as assistance to the company leadership, also helps the company management to identify and study the company's needs. Koontz and Weihrich developed this theory in the following way: "Management is the process of designing and maintaining an environment in which individuals, working together in groups, efficiently accomplish selected aims" (Koontz & Weihrich 2008, p. 5). It is therefore obvious that in the current situation, management has to use all available tools to achieve its goals, including internal audit techniques.

The basic concept of the studied notion which reflects the current demands of managers is defined as follows: "Internal auditing is an independent, objective assurance and consulting activity designed to add value and improve an organisation's operations. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control and governance processes" (Spencer Pickett 2010, p. 2). In the international context, this has also been confirmed by Sawyer, Dittenhofer and Scheiner (2003), Russel (2007), Phillips (2009) and Douglas, Smith and Wood (2009). In the Czech Republic, this issue has been studied primarily by Dvořáček (2003, 2005).

According to the definition above, internal audit focuses mainly on risk management, which is also confirmed by Moeller: "The internal audit activity should monitor and evaluate the effectiveness of the enterprise's risk management system" (Moeller 2011, p. 13). The thesis has been further developed by Spira and Page (2003), Collier and Agyei Ampomah (2008) and Spencer Pickett (2010), who have stressed that auditing must affect all processes across the organisation. In this respect it is also important to define business risk. According to theories by Garvey (2009), this involves a negative event which brings about an undesired change affecting primarily the plans, costs and performance of an organisation.

Different tools can be used for risk management and internal auditing. Various approaches are further discussed in the section on methodology. The aim of this section is to determine auditing techniques which are based on traditional practices by Basu (2006). According to Dvořáček (2003), such tools must be used which will lead to appropriate findings with a strict assessment of costs. The author also pointed out that efficient auditing techniques must be used: "Efficiency can also be improved through the application of advanced technology" (Burrow, Kleindl & Everard 2008, p. 10). Burrow, Kleindl and Everard (2008) added that advanced technologies help in acquiring a competitive advantage, and so this is a good opportunity to implement digital tools in internal auditing.

2 Subject matter and methodology

2.1 Subject matter

Based on a bibliographic search of selected theories (Collier & Agyei Ampomah 2008; Spencer Pickett 2010; Moeller 2011), we can state that internal auditing can be used to verify different company processes. For the purpose of this text, the verified process, or the studied material, is company marketing, which, according to the *Report to the Nations on*

Occupational Fraud and Abuse (2014) represents an environment with a considerable level of risk. Marketing is defined in accordance with Kotler-Armstrong as follows: "The process by which companies create value for customers and build strong customer relationships in order to capture value from customers in return" (Kotler & Armstrong 2010, p. 29). This general concept can be narrowed to company management and marketing strategies as specified by Kašík and Havlíček (2012).

Marketing has been going through developmental changes (Wilson 2002). Therefore, the current tasks internal audit faces include the evaluation of the marketing environment, strategies, organisation, system, efficiency, profitability, mix (Kotler & Armstrong 2010) and other elements of marketing according to the operational demands of the management. "The primary purpose of a marketing audit¹ is to identify problems in ongoing marketing activities and plan the necessary steps to correct these problems" (Ferrell & Hartline 2014, p. 273). Ferrell and Hartline (2014) then applied this theory to marketing strategies.

In this context, Kotler and Keller (2007) advised every company to regularly evaluate concrete processes while at the same time assessing marketing efficiency. "Those companies and divisions that discover marketing weakness through applying the marketing-effectiveness rating review should undertake a more thorough study known as marketing audit" (Kumar & Sharma 2005, p. 41). Thus, we can use marketing auditing to adequately evaluate selected factors (in both the internal and external environment) which affect marketing performance (Proctor 2000) and which can be then directed at market, product and other areas of company risks (Sadgrove 2005).

It is clear that company marketing, which has a significant impact on a company strategy (Kašík and Havlíček 2012), is affected by a number of risks. These include primarily operating risks (Spencer Picket 2010), which Tattam further specified in the following way: "The risk of loss from failed or inadequate processes, people, systems or external events" (Tattam 2011, p. 9). Secondary risks, which have significant links to marketing, are reputational risks. A company's reputation has a strategic value and provides the company with a competitive advantage (Corenlissen 2005). Consequently, reputational risk is understood as an instance when a company's reputation can be damaged (Honey 2009).

2.2 Methodology

The previous section focused on defining the subject matter. The following section looks at the possible methodological approaches to the subject matter in question. The bibliographic search determined the basic approaches to internal audit and defined company marketing. We can further develop these conclusions with a note by Cascarino and Esch (2007), who claimed that business today contains a certain level of risk. Garvey further elaborated on this theory and warned of two possible risks: "The first is

¹ In this paper, the terms "internal audit" and "marketing audit" often merge, as understandings of them are very similar in this context. Internal audit, which focuses on verification of marketing processes, can be either generally called "internal audit" or more specifically "marketing audit".

its occurrence probability. The second is its impact (or consequence) to an engineering system project" (Garvey 2009, p. 4). See Formula 1 (Garvey 2009, p. 9).

$$Risk = F(Probability, Impact) \quad (1)$$

As we have already said, marketing faces several threats. Companies should therefore concentrate on analysing and identifying areas at risk. We can distinguish two types of risk analysis – qualitative and quantitative (Smejkal & Rais 2013). For the purpose of this study, the method is a combination of the two techniques, which allows us to assess the identified risks and determine the frequency with which they occur as well as other risky outcomes. The Delphi method can be used as a concrete analytical approach, as specified by Tarantino: "The Delphi technique is a procedure to obtain a reliable consensus of opinion from a group of experts" (Tarantino 2011, p. 58). The author added that this technique can be used in different management processes.

The Delphi technique (Tarantino 2011) is used for the identification and assessment of potential risks in the marketing environment. The evaluation of probability of occurrence (P) and size of impact (I) (Garvey 2009) is carried out through an estimate by a group of experts for the given period in company management. The given evaluation of the basic set of potential risks can be done in the form of a guided discussion on the basis of which a group of significant threats is determined. This method is applied according to the specific demands of the company's marketing, because, as Tichý (2006) said, specific conditions require specific approaches.

The methodology applied here draws on observations, analyses and embedding of the selected methods, the so-called *best practice* of auditing processes. The study and collection of data was conducted in marketing campaigns with a focus on timely delivery of a communication to the selected sample group, measurement of completeness of the communication, checking of its efficient feedback and compliance with legal requirements. The sample group consisted of a customer segment of a selected company of 232 customers out of a total of 5,378 customers (i.e. 4.31%) that were selected for a marketing campaign. The following generalised visualisations of the results were carried out by a transfer of data through descriptive texts, tables and graphs.

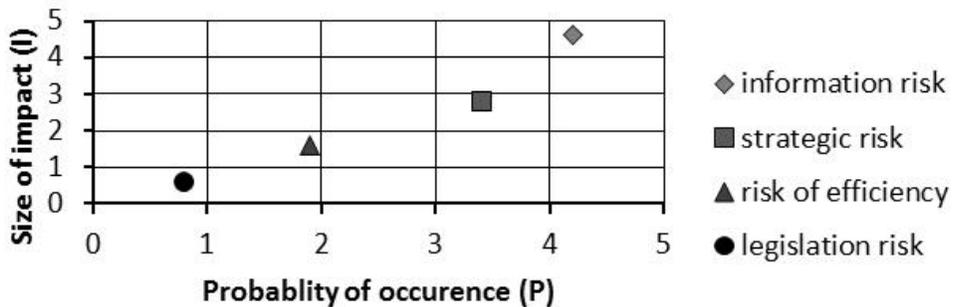
In accordance with the profession-specific theories determined through the bibliographic search, the selected material and the techniques proposed in the methodology, we can proceed to the next part of the text. The aim of the article, as mentioned above, is to verify the efficiency of digital potential of the internal audit in the field of marketing, which forms an important part of company management. The outcomes of this article should extend the literature in the analysed field of study, while practical efficiency is expected to be delivered mainly through the use of the achieved results in the field of internal marketing and risk management with respect to company, or marketing, strategies.

3 Results

Marketing processes are extensive and cover a wide range of specialisations (Proctor 2000; Wilson 2002; Kotler & Armstrong 2010). In order for the article to have universal validity

and for the expected results to be generally applicable, the performed analysis did not focus on specific processes but on factors which have a significant impact on them. The results draw on an analysis of marketing risks and refer to four potential threats. According to their probability of occurrence (P) and size of impact (I) (Garvey 2009) based on the researcher's own conclusions, they are ordered in the following way: information risk, strategic risk, risk of efficiency and legislation risk (see Figure 1).

Figure 1: Map of significant marketing risks



Source: own processing following the method of Ayyub (2014).

Figure 1 shows the results for risks according to the Delphi analysis. Their significance is measured by the probability of occurrence (P) and size of impact (I) on a scale 0 to 5, where 0 points is minimum significance and 5 points is maximum significance.

3.1 Risk analysis

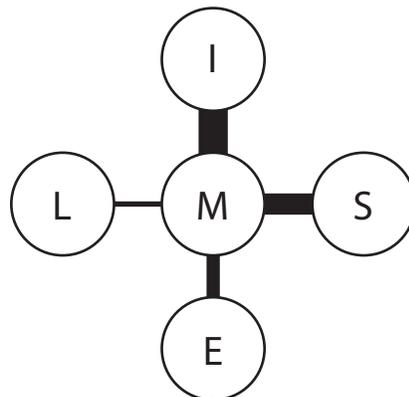
The analysis of the probability of occurrence and size of impact (see Figure 1) shows that the largest risk in marketing processes lies in information, which is defined as actual facts supporting decision-making (Strydom 2004). This suggestion also supports the placement of the threat in the most risky area of the presented map (see Figure 1, sector 5:5). Information serves as the primary input for the further management of company processes, in this case the management of marketing processes (Kupec 2014). Therefore it is necessary to study the attributes of information, which include timeliness, precision and value (Kupec & Kretter 2013). Attention must be paid to the information risk, primarily in the context of the current digital advancement.

The second most significant risk (see Figure 1) is the strategic risk (the position connection of the individual risks is depicted in Figure 2), which is linked to marketing strategies (Kašík & Havlíček 2012; Petrů 2015 a). More specifically, these threats are determined by the choice of markets, stimulation of markets, competitive position or competitive alliances (Jakubíková 2013). Incorrectly set, performed and evaluated strategies have a significant impact on company performance. In the context of auditing, it can be said that this is an ideal area for the application of digital techniques which will allow the company management to carry out the continuous monitoring of principal data.

The set of identified threats further includes the risk of efficiency. "An efficient organisation of modern marketing is distinguished by strong cooperation and customer orientation of all company departments" (Kotler & Keller 2007, p. 764). However, this statement from Kotler and Keller (2007) deals solely with the internal environment of an organisation. With respect to the abovementioned risks, it is therefore necessary to point to the possibility of an efficiency failure in the external environment of an organisation. The risks are linked to the analysed area of strategic risks and can therefore often result in the incorrect choice of target groups, incorrectly selected communication channels or an incorrectly formulated marketing message, for example according to Petrů (2015b). This area then presents another opportunity for digital auditing.

The chain of selected risks is completed with the least significant potential risk – the legislation risk. "Different ethical norms and regulations exist in different countries which affect the supply and primarily the way how to present the supply" (Přikrylová & Jahodová 2010, p. 194). Legislation must be observed not just with the impact on the company's reputation in mind, but primarily with respect to the possible recourse from supervisory and regulatory bodies. In the given case, compliance should be adopted to eliminate the risk, which is defined as an ability to abide by regulations, guidelines and laws (Dvořáček 2003). The level of this risk in general (not according to Figure 1) is rather low in terms of probability of occurrence but not in terms of size of impact.

Figure 2: Position connection of individual risks



where: *M* – company marketing,
I – information risk,
S – strategic risk,
E – risk of efficiency,
L – legislation risk.

Source: own processing according to the method of Tichý (2006).

Figure 2 shows the connection of the basic risks with the audited area, which is positioned in the centre (*M*). Individual connecting lines between risks and the marketing centre

have different width depending on the significance of the selected risks (see *I* as the most significant risk v. *E* as the least significant risk).

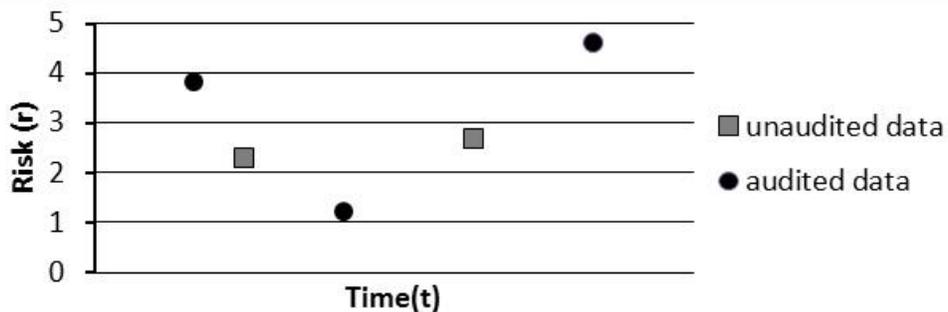
3.2 Digital audit

The risks mentioned in the analysis can be verified using different techniques of internal audit. With reference to the title of the article, though, the main idea lies in the use of information technologies to eliminate risks. In the company environment, these technologies make it possible to detect errors in company processes, focusing either on the security of systems or the protection of systems. Consequently, auditing techniques are not limited to the physical verification of the selected risks but by using an innovative application, the processes can be verified digitally. In this way the processes listed below enhance the verification abilities of the internal audit.

Verification of information risk through audit is directly connected to the attributes of information (timeliness, precision and value). In the observed subjects, the time of dispatching commercial information about a marketing campaign was monitored. This criterion plays a significant role in the appropriate development of the whole campaign, its timing and further links. As part of auditing verification, a limit was set for dispatching the information ($x+10$ days) and consequently the whole course of the campaign process was verified. The results of the experiment proved that 92.3% of communications were dispatched within the given limit. However, 7.7% of communications were outside the limit (before the limit ($x+10$)). Consequently, correction was recommended as early as during the campaign.

Based on the retrieved results, a general conclusion can be drawn with respect to auditing the information risk, to the effect that the described techniques allow internal auditing to monitor selected information online in Managerial Information Systems (MIS) or in Business Intelligence (BI) systems. Specific criteria can be entered in MIS/BI which reduce the whole set of monitored information to the required limit, which includes the normal values of the selected data. Data which fall within the specified limit do not need to be subjected to auditing. However, data which do not meet these requirements will have to be included in the audited sample to be analysed and appropriate recommendations for remedy will have to be suggested (see Figure 3).

Figure 3: Digital verification of information risk



where: t – time,
 r – data risk,
 2 – bottom limit of risk data (r_{min}),
 3 – upper limit of risk data (r_{max}).

Source: own processing.

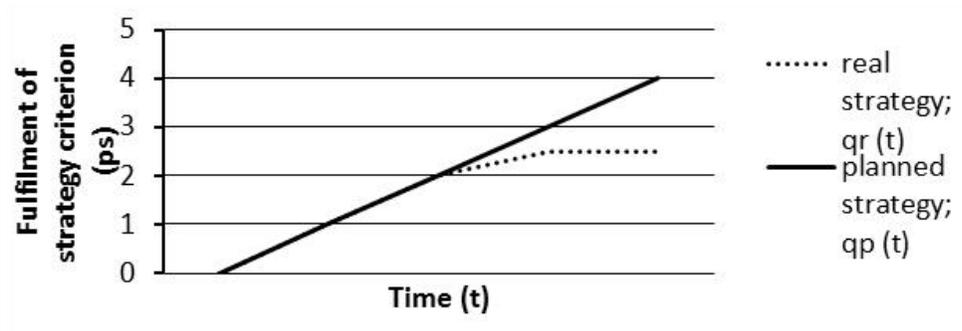
Figure 3 is a scatter diagram of marketing data with different levels of risk. Data which do not have to be audited because they meet all positive criteria are delimited by risk level 2 (r_{min}) and risk level 3 (r_{max}). Other data are digitally included in the audited sample (AS) according to Formula 2.

$$AS \in (0, r_{min}) \cup (r_{max}, \infty) \quad (2)$$

Information risk further merges with strategic risk and is determined through monitoring the observed quantities. Marketing strategies include meeting company goals in the defined period, which can be quantified in MIS/BI. Verification of possibilities to audit the risk was carried out during the monitoring of the completeness of contacting the selected sample. As part of the verification, a limit was set for communications delivered to the selected sample at 98% and consequently the fulfilment of the strategy was audited. The researcher's own experiment revealed that at the final part of the campaign, no communication had been sent to over 25% of customers, which implied a deviation from the set strategy that relied on a delivery of communication to costumers which was balanced in time.

On the basis of these findings, prompt recommendations can be given to remedy the strategy fulfilment in the course of the campaign. This implies that digital auditing using the MIS/BI systems can monitor the continuous fulfilment of selected values and simulate the prediction of the development based on the estimate created by an analysis of trends. As soon as a real deviation from the planned trajectory is detected, the changes must be subjected to audit investigation in order to detect the cause and set relevant auditing recommendations. Verification carried out in this way will prevent negative impacts of marketing strategies and other strategic processes (see Figure 4).

Figure 4: Digital verification of strategic risk



where: t – time,
 ps – fulfilment of strategy,
 t_a – time during which q_p differs from q_r ,
 $q_p(t)$ – planned strategy,
 $q_r(t)$ – real strategy.

Source: own processing.

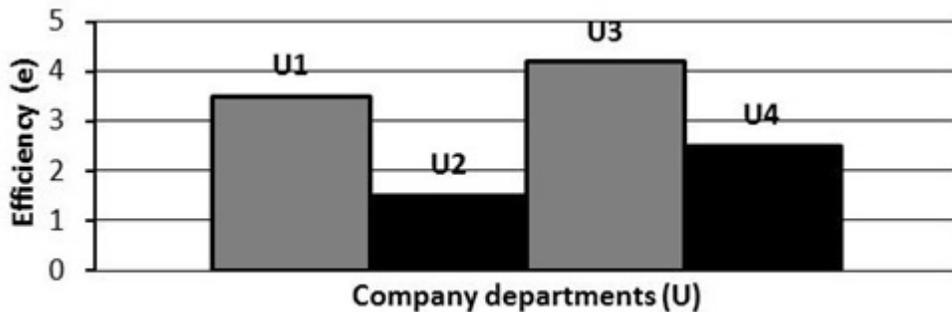
The continuous line in Figure 4 shows the function of the planned marketing strategy ($q_p(t)$) and the dotted line shows the function of the real strategy ($q_r(t)$). As soon as a difference is detected between the real fulfilment and the planned fulfilment (point t_a), the situation can be verified by audit according to Formula 3.

$$\exists t_a \forall t \geq t_a : q_r(t) \neq q_p(t) \quad (3)$$

The following risk, the risk of efficiency, is connected primarily to the monitoring of performance in fulfilling the company's marketing strategies. Verification of auditing possibilities for this issue was piloted on the given sample through monitoring of a business response of a group of customers that received communications during the marketing campaign. Through their response, these customers were supposed to fulfil the company's business plans by concluding contracts to use the selected product. The level of efficiency of fulfilment was set at 80% of the business plan over the course of two months. The audited results showed that throughout the whole experiment the plan was sufficiently fulfilled and therefore no auditing recommendation had to be given.

The results clearly show that the data concerning the realisation, or efficient fulfilment of individual tasks, should also be gathered in the online MIS/BI regime. Setting the optimal level of efficiency, which can differ for each level of performance, will enable the digital monitoring of the fulfilment of individual criteria in real time. The fulfilment of selected criteria indicates the level of risk and the possible time to start audit verification (see Figure 5). However, this does not exclude the possibility of performing audit investigation on a level when the efficiency was met before the limit, as this kind of positive fulfilment can indicate an incorrect setting at the beginning of the process.

Figure 5: Digital verification of risk of efficiency



where: U – company departments (U_1, U_2, U_3, U_4),
 e – efficiency,
 3 – minimal level of efficient fulfilment (e_{min}).

Source: own processing.

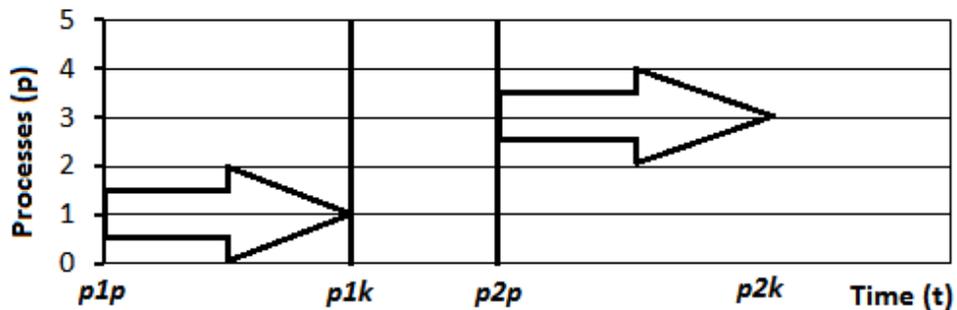
Figure 5 shows different company departments (U_1, U_2, U_3, U_4) which contribute to the fulfilment of the strategy. The limit for the efficient fulfilment of a marketing strategy is delimited by the efficiency level 3 (e_{min}). Departments (U_2, U_4) which do not meet the limit are included in the audited sample (AS) according to Formula 4.

$$\{U_x \in AS \mid e_{Ux} < e_{min}\} \quad (4)$$

Legislation risk is linked to all the previous areas. Experimental testing of auditing possibilities using digital approaches to this issue was linked to the selected sample group and to legislative requirements concerning providing information to customers about product changes in set time periods. The set date of a change in legislation or obligatory communication to customers in time (x), without fail, was monitored in the course of the whole communication process. Information concerning legislation was provided to 100% of customers in the sample group in time. At the same time, the start of the new legislative process with a firmly set expiration date was marked for each customer with respect to continuous monitoring.

Digital monitoring of the legislation risk is obviously one of the most difficult areas, primarily with respect to the fact that it concerns mainly qualitative information which is difficult to evaluate automatically. Monitoring of the legislation risk can be done from external sources by connecting the information systems (IS) of the audited companies to the IS of supervisory and regulatory bodies, which send out notifications about changes in regulations, guidelines and laws. Internally legislative regulations can be monitored in MIS/BI by marking legal force, change etc. so that possible differences in dates in internal and external information systems can be easily checked (see Figure 6).

Figure 6: Digital verification of legislation risk



where: t – time,
 p – legislative processes,
 p_{1p} – start of process no. 1,
 p_{1k} – end of process no. 1,
 p_{2p} – start of process no. 2,
 p_{2k} – end of process no. 2.

Source: own processing.

Figure 6 shows Legislative Process 1 and its start (p_{1p}) and end (p_{1k}) as well as Legislative Process 2 and its start (p_{2p}) and end (p_{2k}). If the two processes do not follow one another, see the difference between p_{1k} and p_{2p} , auditing investigation can be initiated.

The above-mentioned suggestions for auditing processes do not exhaust all of the possibilities regarding how to eliminate marketing process risks. The presented outcomes, however, take into account the current advancement of digital technologies. At the same time, these suggestions reflect a considerable level of development of all company and marketing information. The number of cases like these where internal audit is able to effectively analyse the so-called audit trail (Kupec & Petrů 2014) is growing. Another positive aspect of the presented propositions is that they eliminate the human factor risk. Provided all data is entered correctly, the monitoring and notifications to the internal audit are fully automated.

3.3 Proposed recommendations

Following the findings revealed by the auditing, it is also necessary to formulate recommendations which will eliminate company marketing weaknesses. The following section will therefore focus on how to eliminate deficiencies in company marketing linked to information, strategy, efficiency and legislation in the digital context of the article. Sawyer (2000) pointed out that in this phase of internal audit, it is necessary to discuss proposed recommendations with audited departments, primarily in order to clarify any possible technical discrepancies (Kupec 2012). The following section therefore concentrates on a list of individual auditing recommendations concerning the verified areas.

The findings concerning information risks must be approached carefully, taking into account the fact that this sphere provides data for subsequent company processes. If digital monitoring shows that the set limits have been exceeded (see Formula 2), the reasons why it happened must be discovered in order to eliminate possible impacts on other areas. Therefore, the auditing recommendation concerns the regular monitoring of selected information and their crosschecking using more sources with respect to the timeliness, precision and value of information. These measures can also be taken online in MIS/BI by electronic projection of information from several sources over one another. This will highlight possible deviations and make it easier for companies to manage risks.

Discrepancies between marketing strategies and real fulfilment are yet another finding which calls for rectification and monitoring. As soon as digital techniques announce any changes in the fulfilment of marketing values, or diversion from expected trends (see Formula 3), the situation must be amended in an appropriate manner. Here, auditing recommendations will concern the continuous and online assessment of the fulfilment of the strategy so that the defined strategies can be upheld with minimal deviations. This is where the high added value of digital techniques lies, thanks to which it is possible to follow the fulfilment of the plan in real time. Evaluation of marketing documents should be done on a regular basis, which, however, is often not the case.

The suggestions to eliminate risks of efficiency aim at overcoming problems with the fulfilment of individual marketing tasks. So while strategic risks are addressed as one area, under this concept, risks of efficiency concern individual issues. Auditing recommendations therefore focus on the elimination of the impact of any differences between the planned and actual fulfilment of marketing targets (see Formula 4). If targets are not met or the planned values are exceeded, this state must be analysed, criteria adjusted in real time and their changes also be incorporated in the overall marketing strategy. This approach will consequently help companies to efficiently fulfil their business plans.

Recommendations concerning legislation cannot be viewed as an independent aspect. Risks in this area can be dealt with through the cooperation of all company units. With respect to the suggested recommendations and the fact that legislation is present in the whole company structure, auditing recommendations should aim at establishing a unified digital hub for monitoring changes in legislation. Consequently, under such arrangements, all involved departments can enter information and cooperate in a responsible manner so that they are able to process all regulations, guidelines and laws coming from both external and internal information systems. The proposed method will consequently allow companies to apply crucial legislation policies.

The presented auditing recommendations are purposely only of a general nature, so that they can be further adjusted in accordance with each company's individual needs. The intention of the article was to present an overview of the possible ways to eliminate marketing risks with regard to digital technologies. Until now, auditing approaches have been confined primarily to physical verification of issues at-risk, which is demanding mainly with respect to the required capacity, time and financial costs. The automated monitoring of selected processes and subsequent activities undertaken by internal audit

can partly replace these methods, while at the same time achieving more efficient results in reducing certain risks.

4 Discussion

The presented results need to be confronted with other theories which will allow a balanced picture to be presented. In general, it can be said that digital methods of internal audit are important for managers, primarily with regard to marketing issues. This claim can be supported by theories by Kumar and Sharma (2005), who presented the following view on the subject matter: "The objective of the marketing audit is to identify marketing problem areas and to recommend a corrective plan with a view to improve the organization's overall marketing effectiveness" (Kumar & Sharma 2005, p. 36). Marketing effectiveness can be achieved by the application of digital techniques in internal audit.

The suggested methods for eliminating information risks are linked to the precise targeting of auditing techniques and the selection of a particular sample group for auditing verification. As Coderre (2009) claimed, it is on the basis of a study of a sample group that internal auditors arrive at their conclusions with regard to the whole process. A digital selection in accordance with the presented method will enable auditors to focus exclusively on preselected areas which either meet or do not meet the given criteria. Unlike in case of traditional selection by physical methods, the suggested digital method is clearly faster, more precise and efficient, according to Dvořáček (2003) and in this way it is in line with the changing trends in management.

The monitoring of strategies can be internally audited under the presented concept, primarily with regard to analysing trends and marketing information. Each strategy has to be planned beforehand, and if such a project is transferred to electronic systems with a link to MIS/BI systems, its realisation can be followed online and in this way, possible strategic differences can be monitored. Blatná (2004) confirmed that marketing analyses designed in this way can be statistically evaluated through trend analyses. The suggested method, which monitors only collected data on strategy fulfilment, is also in line with theories presented by Anderson et al. (2009), who pointed to the efficient use of selected information by management.

In regard to the risk of efficiency, the auditing possibilities depend on a strategic process. The main stages of the project are the importance of defining criteria, their continuous monitoring, real-time application and adequate auditing intervention. From the point of view of profession-specific auditing operations, the feasibility of application of this intention follows from theories concerning the Six Sigma auditing technique by Dvořáček (2005). Dvořáček (2005) claimed that as soon as we are able to measure potential deficiencies in a process, we are also able to offer methodical recommendations on how to eliminate these deficiencies. On the other hand, he also points out that evaluation of information can be quite demanding. And finally, the importance of analysing the presented information was suggested by Boone and Kurtz (2011), who saw the aforementioned techniques as a comparative advantage.

The suggested management of the legislation risk using digital methods and its subsequent monitoring using auditing techniques is one of the possible ways to approach these issues from the point of view of marketing. The importance of analysing the legislation sphere has been confirmed by Boone and Kurtz (2011), who included it among five basic attributes of the macroeconomic environment. The suggested auditing of qualitative information is a highly sophisticated activity which serves primarily as prevention (Dvořáček, 2003). A similar link between information databases is definitely not an exhaustive way to deal with this area; however, it is an accessible method which contributes to the successful management of risks in the legislation sphere.

Finally, we can say that internal audit can achieve better added value for the company management if digital methods are used, with respect to three basic attributes, the time of their implementation, accuracy of their results and cost efficiency, as important standards used for the evaluation of individual projects in firms (Hejduková & Kureková 2016). It is obvious that digital techniques can be used primarily in the preparatory phase of auditing, which consequently reduces the time needed for the verification itself. Sharma (2010) confirmed that meticulous preparation is essential and claimed that an audit without proper preparation rarely succeeds in providing the necessary recommendations. Consequently, the preparatory phase in the application of digital methods enables better orientation during the actual auditing.

Conclusions

This article has analysed the internal audit of company marketing in the digital environment. The aim of the study is to verify the efficiency of the digital potential of internal audit in the field of marketing, which forms an important part of company management. The presented results draw on the Delphi analysis of significant risks, which are ordered according to the probability of occurrence and size of impact as follows: information risk, strategic risk, risk of efficiency and legislation risk (see Figure 1). This analysis was followed by possible approaches to digital audit which can effectively detect the aforementioned threats (see Formulas 2, 3, 4). Finally, expert recommendations on how to eliminate the detected risks were presented. On the basis of the summarised results, we can conclude that the presented methods of digital audit in the marketing environment will allow the efficient management of company strategies. Modern audit can benefit from using digital techniques which can detect flaws in company processes.

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The Value of the Firm in Dependence on Technological Shocks – the Czech Republic Case

Hodnota firmy v závislosti na technologických šocích – zkušenosti z České republiky

PETR MAKOVSKÝ

Abstract

The article presents an innovative interpretation of the relationship between firm value and technological shocks. The motivation comes from the theory of technological shocks and their effects on the economy. We tried to confirm the hypothesis of neoclassical technology of the firm regarding the relationship between firm value and investment amount (interconnected with the interest rate). The relationship was empirically tested using a sample of data for the last 16 years (quarterly data). The Solow residuals represent the technological shocks and the PX index is an approximation of the firms' value. The model explaining the rate of growth of the PX index in dependence on the Solow residuals is confirmed, but the linear coefficient is negative. However, it is close to zero value, which means that there is no dependence between the observed variables. The falsification of the neoclassical firm approach is argued using the Czech economy as an open small economy with high interdependence on the financial sector. Due to the presented solution, we secondly tried to explain the evolution in the firms' value using autoregressive methods. We ran GARCH tests in order to gain a proper model of the PX index's rate of growth behaviour. The most appropriate model was the GARCH (2,1) model. Moreover, we made a forecast of the volatility of the PX index. The theoretical values of the forecast fit the empirical data we observed. Furthermore, we discuss the features of the model on two levels: the whole time horizon of observations (quarterly horizon 1999-2015, 85 observations) and the post-crisis horizon (quarterly 2010-2015, 25 observations).

Keywords

technological shocks, GARCH, firm value, volatility, time series analysis, variance

JEL Codes

E22, G17

Abstrakt

Článek přibližuje inovativní interpretaci vztahu mezi hodnotou firmy a technologickými šoky. Prvotní motivaci jsme získali na základě závěrů teorie technologických šoků a jejich dopadu na ekonomiku. Primární testovaná hypotéza je sestavena na závěrech neoklasické teorie firmy a vypovídá o vztahu mezi hodnotou firmy a investicí do fyzického kapitálu (i na základě vývoje úrokové míry). Samotný vztah byl v příspěvku testován na vzorku dat české ekonomiky za posledních 16 let (kvartální data). Jako aproximaci technologického šoku uvažujeme vývoj Solowových reziduí, aproximací hodnoty firem v ČR je vývoj indexu PX. Model, který vysvětluje tempo růstu indexu PX za pomoci vývoje Solowových reziduí je možno sestavit. Nicméně lineární koeficient regrese je negativní. Hodnota koeficientu

je velmi blízko nule, což značí spíše nezávislost hodnoty firem v ČR na technologickém pokroku. Falzifikace primární hypotézy je argumentována českou ekonomikou jako malou otevřenou ekonomikou s významnou mírou propojenosti vzhledem k zahraničnímu i vnitřnímu finančnímu sektoru. Na základě představených závěrů jsme nabídli alternativní hypotézu, která vysvětluje hodnotu firmy na vzorku dat české ekonomiky autoregresním přístupem GARCH. Provedli jsme několik testů typu GARCH, abychom získali uspokojivý model vývoje indexu PX (hodnoty firem). Nejvhodněji se jeví GARCH (2,1). Tento model uspokojivěji vysvětluje vývoj hodnoty firem v ČR než technologické šoky. Navíc jsme představeným modelem provedli předpověď volatility indexu PX a nyní můžeme konstatovat, že teoretické předpovědi modelu odpovídají empirickým pozorováním v současnosti. Dále jsme diskutovali vlastnosti modelu ve dvou rovinách. Zaprvé v kontextu celého vzorku dat (kvartálně od roku 1999 do roku 2015, 85 pozorování), zadruhé na vzorku dat po krizi v roce 2008 (kvartálně od 2010 do roku 2015, 25 pozorování).

Klíčová slova

technologické šoky, GARCH, hodnota firmy, volatilita, analýza časových řad, rozptyl

Introduction

Pastor and Veronesi (2005) have provided conclusions on the explanation of technological shocks. Technological shocks influence parts of the economy in different ways. There is a lag in the "old economy"'s absorption of technological shocks in comparison with that of the "new economy". This is why we observe technological bubbles. According to previous theory, the technological shock explanation is consistent with the goal to maximise firm value. We are interested in the dependence of firm value on technological shocks. More particularly, this means the technological progress. In this article we assume there to be little difference between technological shock and technological progress (or regression).

The main purpose of this article is to evaluate the verification of the neoclassical theory of investment using a data sample for the Czech Republic economy, and if this relationship is falsified, to find an alternative.

In the following analysis we assume the firms' value in the Czech Republic to be approximately the same as the value of the PX index (the index of the Prague stock exchange market). On the other side, the technological shocks are measured in the form of Solow residuals. The primary hypothesis is that an increase in technological progress causes an increase in firms' value in the economy. If this is falsified, we expect the alternative hypothesis to hold about the value of firms being dependent on the previous values of the firms.

Further connected literature has been interested in the interdependency between the financial sector and real economy processes (Wickens 2012) or in modelling of volatility of financial variables (Cipra 2008). The contemporary state of research of primary hypotheses and alternatives more or less consists of two methodological areas. The first is the meaning and explanation of pure economic theory, and the second is the time series analysis approach, which concentrates on variable modelling and forecasting (sometimes on the equilibrium state between confirmation of variables).

The presented relationships of both approaches have been empirically tested using data samples for various financial time series across various economies, for instance analysis of the Czech Republic case of the FOREX market (Pošta 2012a, 2012b). The theoretical solutions have been argued on the basis of the C-CAPM model (consumption-based) and these arguments were discussed in Cochrane (2009). It is important to state that for small open economies, according to these empirical results, the risk premium dependency is weakened. There is a space for other explanatory variables, for example technological progress.

1 Methodology – economic theory analysis

In this study we used the theoretical conclusions of pure macroeconomic theory and time series analysis. First we found a suitable approximation for firm value: the rate of growth of the PX index. Technological progress is most appropriately simulated with the evolution of the so-called Solow residuals. These are calculated from the production function of the economy, assuming standard features.

Here we prefer the real business cycle theory (Lucas 1975), which is why we assume the potential product growth is the same as the real GDP growth. So here we see the basis of our analysis. We need to calculate the real GDP and subtract the influence of the input factors (labour, physical capital). Then we achieve the residuals, which represent technological progress. This is standard usage of the growth accounting equation (Solow 1988). Although the approach is said to be obsolete, in many way it is much more useful than the variety of innovation indices, in which we observe subjective biases. Solow residuals are gained from nominal GDP rates, gross fixed capital formation, evolution of labour amount and the deal of valued physical to GDP. The Solow residuals are achieved from Equation 1.

$$y_t = \psi_t + w * l_t + (1 - w)k_t \quad (1)$$

where y_t is the rate of growth of real GDP, ψ_t is the Solow residuum in a particular year, w is the deal of labour force (financial value) to the nominal GDP, the growth rate of the labour force and, k_t is the growth rate of physical capital (gross fixed capital). Then $(1-w)$ is the deal of capital to nominal GDP. Although modern mainstream theory does not reject the growth accounting equation (Equation 1) alternatives have appeared for technology progress measurement, for instance Mihola and Wawrosz (2014).

The dependency between firm value (rate of growth of the PX index) and technological shocks (relative change in the Solow residuals) is theoretically based on the pure theory of the firm. The value of the firm is the sum of future discounted economic profits. The value of the firm (Pindyck 1986) is calculated according to Equation 2:

$$VoF_t = \sum_{j=0}^{\infty} E_t \beta^j \pi_{t+j} \quad (2)$$

where VoF is the value of the firm, E_t is the expectation in time, β_j is the discount factor in time from t , and π_{t+j} is the future economic profits. As there is an increase in physical investment, this is interconnected with lower interest rates. This low general interest rate forms the discount factor in an inverse way. This is why we expect that higher technological progress leads to lower interest rates and this also leads to higher value of the firm according to Equation 2.

2 Methodology – time series analysis

The second part of our analysis concerns time series analysis. The alternative method for modelling the value of the firm for our purposes is autoregressive conditional heteroscedasticity (ARCH). There are many ARCH-based approaches (Bollerslev, Engle & Nelson 1994). These methods provide both the regression equation for the mean value and the variance regression equation. The ARCH approach uses the lagged value of the “white noise” stochastic process to explain the value of contemporary variance. Thus the ARCH method belongs to the autoregressive time series analysis methods (Box-Jenkins methodology). The generalised ARCH (GARCH) further expands the analysis on the lagged value of conditional variance.

ARCH (q) is the stochastic process following Equation 3:

$$\sigma_t^2 = \omega + \sum_{i=1}^q \alpha_i \varepsilon_{t-i}^2 \quad (3)$$

where $\alpha_i > 0$, $\omega \geq 0$ for all $i > 0$.

The stationary condition is that all of the roots of the polynomial equation are inside the unit circle. Unconditional variance of the stochastic process ε_t does not differ through time, moreover it provides unconditional homoscedasticity. The prediction ARCH(q) in horizon h is calculated according to Equation 4.

$$\sigma_{t+h/t}^2 = \hat{\omega} + \sum_{i=1}^q \hat{\alpha}_i \varepsilon_{t+h-i/t}^2 \quad (4)$$

Here the $\varepsilon_{t+i/t}^2 = \sigma_{t+i/t}^2$ for all $i > 0$, but when $\varepsilon_{t+i/t}^2 = \varepsilon_{t+i}^2$ for all $i \leq 0$.

In contrast with the ARCH procedure, the GARCH approach is a modification of the previous model with delayed conditional variance (Nelson, 1990). It is useful to calculate GARCH when there are many parameters α in ARCH (for high q). The ARCH has its useful features using higher q . With knowledge of this we prefer the GARCH (1,1) approach to ARCH.

It is necessary to state that the presented time series methods provide a useful statistical confirmation, but the meaning is more technical than empirical. In other words, conclusions based on the explicit explanation of autoregressive-based methods are more difficult to draw, but this has been explained in the further literature (Makovský 2014). There is an advantage for the economic meaning of problem-solving.

3 Data

In order to provide the empirical analysis we used a data sample of the variables from 1997 to 2015 in the Czech Republic economy. We modified the data into quarterly data which are each the moving averages of 60 observations. This time series was transformed into differences of logarithm. For small changes, this is an appropriate approximation for the relative change of the variable – the rate of growth of the PX index or the percentage evolution of the Solow residuals. Moreover, the logarithmic transformation provides better features for the linear regression model which we wanted to use (mainly stationary). The data sample for the PX index was gained from the database of the Prague Stock Exchange. Other variables were gained from the Czech Statistical Office. Finally, for all the variables we removed the seasonality from the time series using the Hodrick–Prescott filter (Hodrick & Prescott, 1997). The dataset is structured according to Table 1. Readers may be surprised that for many quarters we see negative technological shocks (negative contribution). As far as we are aware, our calculation has no mistakes, but there might be differences from the official statistics, in which there are many adjustments. Moreover, we used the gross physical capital formation not the physical capital evolution. We used quarterly data and avoided seasonality in order to be able to find the relationship to the financial data of the PX index. Nevertheless the main purpose of this article is to verify whether there is any relationship between the rates of growth. This means that a small increase (connected with an official adjustments) in all the values in the data series does not matter. The complete dataset can be found in Annex 1.

Table 1: Data for analysis

	T (quarter)	nGDP (bn CZK)	wages + salaries (bn CZK)	L (amount of labor)	W	K (amount of capital)	rate of growth nGDP	rate of inflation (%)	rate of growth rGDP	rate of growth L	rate of growth K	Technologic progress (%)	PX index	rate of growth PX
1997	Q1	439.6	177.9	nGDP	0,40	136098	0,076	7,162	0,482	-2,463	-0,901	-2,360	579,3	-0,011
	Q2	484.6	204.6	2374345	0,42	149910	0,075	6,596	0,944	0,336	1,811	-3,141	569,5	-0,040
	Q3	502.3	196.8	2335886	0,39	154169	0,076	9,860	-2,291	0,045	-2,810	-3,652	510,9	-0,041
	Q4	526.8	218	2438651	0,41	185612	0,083	10,100	-1,849	0,382	7,018	-3,866	532,8	-0,023
1998	Q1	484	191.9	2265713	0,40	155940	0,101	13,299	-3,195	-2,249	14,579	-3,043	501,4	-0,034
	Q2	541.2	210.2	2428820	0,39	158020	0,117	12,690	-0,994	2,294	5,410	-0,916	479,0	-0,024
	Q3	554.5	204.9	2266195	0,37	161173	0,104	9,511	0,875	-2,983	4,543	0,096	467,5	-0,015
	Q4	562.8	230.2	2440186	0,41	177652	0,068	7,478	-0,643	0,063	-4,289	0,449	426,8	-0,009
2015	Q1	1 035.4	427.4	2298923	0,41	247738	0,053	0,126	5,172	-0,094	4,876	-0,473	966,9	0,001
	Q2	1 121.4	443.5	2383449	0,40	279688	0,052	0,654	4,512	2,438	10,114	-1,136	1002,8	0,003
	Q3	1 141.6	440.9	2198483	0,39	298686	0,045	0,391	4,139	1,769	8,828	-0,725	1018,6	-0,005
	Q4	1 173.9	475.1	2332938	0,40	327069	0,049	0,126	4,769	3,285	8,737	-0,353	1008,9	-0,009

Source: own calculations in MS EXCEL

Notice: All input data are gained from the CZSO database. We found the real GDP growth rate on the basis of the quarterly nominal value of GDP by the expenditure method and the quarterly average of the inflation rate (year-on-year moving average). The growth rate of capital was obtained on the basis of the evolution of gross fixed capital formation and the rate of change in the workforce, based on the number of recalculated employees by hours worked. The labor force share on the GDP in individual quarters was based on the nominal GDP structure based on the income method. The share of capital on the product is a complement to one of the labor force share on the product.

4 Economic analysis

Table 2 presents the descriptive statistics. There are two variables in the relative changes, rate of growth of the PX index (vPX) and relative change in the Solow residuum (vS). We see that the mean value is stable (non-zero). The PX index increases in a stable way, but the relative change in the Solow residuals decreases. Both movements are less than a 0.2% change. The standard deviation is greater in the vPX variable than in the vS.

Table 2: Descriptive statistics

	Mean	Median	Maximum	Minimum	Std. dev.	Skewness	Kurtosis	Jarque-Bera	P-value
vPX	0.015009	0.001120	0.129519	-0.069180	0.049490	0.741026	2.749616	7.812967	0.020111
vS	-0.139416	-0.308511	4.127763	-3.866459	1.889717	0.208883	2.683534	0.869815	0.647324

Source: own calculations in Eviews

When the best prediction of stochastic variable is its present value, then the stochastic process is called martingale. The random walk stochastic process is less restrictive than the martingale process. In the case of martingale, we assume independence of the iid (identically independent distribution) residuals from the AR process, but the conditional variance is not iid. We are able to predict the future conditional variance from the previous variance. This assumption is broken for the random walk stochastic process (Cuthbertson & Nitzsche 2005).

Here we observe a well-known fact from the financial markets. We are able to reject the null hypothesis of normality for the vS (represents the real sector). But the same hypothesis cannot be rejected normality for vPX (this does not mean that the vPX follows normal distribution).

An unsatisfactorily high level of autocorrelation appears in the relative changes of the analysed variables. Better input data features are gained through transformation into logarithms: then we can use the logarithmic differences. These are approximately the same as the relative changes. The primary transformation of the PX index is clear. The problem appeared in the case of the Solow residuals. These are sometimes negative. We had to sum to all values of variable its minimum. This drift is avoided through following differentiation. Table 3 shows more from the analysis of the process (PX is the PX index, firm value; S is the Solow residuum, technological process).

Table 3: Series statistics

	$\ln PX_t - \ln PX_{t-1}$ (vPX)	$\ln S_t - \ln S_{t-1}$ (vS)
Correlogram	No autocorrelation for first and second lagged values	No autocorrelation
Augmented Dickey-Fuller test	Does not have a unit root	Does not have a unit root
Jarque-Bera test	55.828 (p-value: 0.000)	334.2148 (p-value: 0.000)

Source: own calculations in Eviews

Both analysed time series are stationary. We were able to run the regression analysis in order to analyse the interdependence between the rate of growth of the PX index and the percentage change in the Solow residuals. Neither of these time series have a unit root and they are not auto correlated. We provide the regression analysis maximally to the second lagged values (two quarters).

Table 4: Regression analysis

	$vPX=c(1)+c(2)*vS$	$vPX=c(1)+c(2)*vS(-6)$	$vS=c(1)+c(2)*vPX$
C(1)	0.0722 (p-value:0.5744)	0.0093(p-value:0.468)	0.0149(p-value:0.73)
C(2)	-0.042 (p-value:0.2199)	-0.075 (p-value:0.0286)	-0.479(p-value:0.22)
DW statistics	1.483033	1.641415	1.226960
Prob. (F-statistics)	0.219892	0.028606	0.219892

Source: own calculation in Eviews

We do not present the solution for the first value lagged relationship. It provides more or less similar results to the second lagged relationship. Now we provide a few comments on the solutions presented in Table 4. Here we can see that the inverse relationship is not confirmed. According to the statistics, technological progress is not a function of firm value. We are further able to generalise the presented statement for the lagged values modification.

To sum up the analysis, we see that a non-delayed relationship between firm value and technological progress is, in the data sample for the Czech economy, falsified. We are not able to reject the null hypothesis for the constant to be zero. The same result appears for the linear regression coefficient. Firm value is not a function of the present technological progress.

But there are different solutions for the analysis of lagged variables. We are not able to reject the null hypothesis for the constant to be zero again. But we do reject the null hypothesis for the linear regression coefficient at a statistical significance of 5%. The value of this linear coefficient is -0.075 (the value for the first lagged situation is close at -0.07). Firm value is a function of the lagged technological progress (for a half year). The regression formula is described in Equation 5. The Durbin–Watson statistics achieve a suitable value. This speaks for the non-auto-correlated regression residuals. Furthermore, the F-statistics bring conclusions on the suitability of the regression model at all. The

interconnection between Equations 2 and 5 is that an increase in technological progress leads to an increase in investment in physical capital, which causes an increase in future economic profits and in the value of the firm. The data observation fits the following empirically tested Equation 5:

$$VoF(\%) = -0,07 * Tech.progress(\%) \quad (5)$$

Using the data sample for the Czech Republic, we have drawn a conclusion about the negative influence of technology shocks on firm value. According to our analysis, a percentage increase in technology leads to a 0.07% decrease in firms' value in the Czech Republic. Our primary hypothesis on the positive dependence of firm value on technology shocks is rejected. The primary hypothesis is built on the idea that a positive shock in technology leads to an increase in firms' investment in physical capital. These investments are essentially interconnected with the lowering of the general interest rate. Finally, this lower interest rate increases the present value of the total discounted sum of economic profits. We must repeat the conclusion that there is a negative dependence between the variables. More generally, according to the almost null value of the coefficient, there is no relationship between the analysed variables.

We need to further discuss the primary assumptions of the linear regression. These are the a) metric valued endogenous variable, b) metric valued exogenous variables, c) absence of multicollinearity, d) elimination of observed outliers in the data, e) linear relationship between the variables, f) normal distribution for all the variables, g) homogeneity in variance (homoscedasticity). In the presented analysis, some of these assumptions are confirmed (linearity through decadic logarithm linearisation), but some do not fit completely (for instance the normality assumption). These problems are connected with the inappropriate usage of linear regression in economic dynamics studies.

5 Time series analysis

In order to provide a more useful solution to our problems, we used autoregressive methods. As was presented in the theoretical section, we used the method of autoregressive conditional heteroscedasticity (ARCH) or generalised autoregressive conditional heteroscedasticity. In other words, we have tried to explain the evolution of the PX index (rate of growth in the PX index) using the (G) ARCH methodology. The starting point in this following analysis is the Box-Jenkins methodology, which assumes that the evolution of a time series is explained through the stochastic process with the random part.

For the volatility modelling we used the autoregressive conditional heteroscedasticity (ARCH), which is useful in the evolution of financial risk and uncertainty in a time series. A more simple explanation is the linear regression of conditional variance. The conditional variance is a function of the delayed squares of the residuals of the stationary autoregressive process. The delayed conditional variance is added in generalised ARCH (GARCH).

The persistence of variance is explained with the additional assumption of the autocorrelation function being hyperbolic (long memory process). The shock influences the variance in the long term. The conditional variance relies on the input conditions, no matter how far the prognosis is.

Non-linear models are able to foresee the asymmetric effect. This means that the impacts of positive and negative shocks on the variance are different. Let us explain this using implicit contracts. These assume firms to be risk neutral, while consumers are risk averse (Mankiw 2014). In this section we try to create a model of the volatility of the PX index. This is built in consequence to the discovery of the falsification of the previous hypothesis on firms' dependency on the technological progress.

First we calculated the autocorrelation function and PACF function of the logarithmic difference of the PX index (dIPX), which is approximately the rate of return of the PX index. This was done in order to gain the appropriate level of lag. The Eviews output gives information about autocorrelation through a graphical solution and the so-called Q-statistics (p-value 0.058). For the dIPX evolution, we are not able to falsify the hypothesis of no autocorrelation for the lags up to two.

The second-level lag in the autocorrelation results in the volatility model GARCH (1,1). Moreover, this specification does not contradict the practical experience. A smart money trader predicts volatility based on the information of volatility in the previous period and further on newly gained innovative information. If the yield is abnormal in both directions, the trader takes a new volatility estimation for the following period. GARCH (1,1) is also useful in explaining volatility clustering. This means that higher changes in volatility last for a longer time and the probabilistic distribution is leptokurtic (Cont 2007).

Here, we wish to make a few comments about the result of testing the GARCH (1,1) on the empirically observed data. The mean value is not confirmed at the value of 0.01544% at a 5% level of statistical significance as presented in Figure 1. The mean value is the null value as we have seen from the previous analysis.

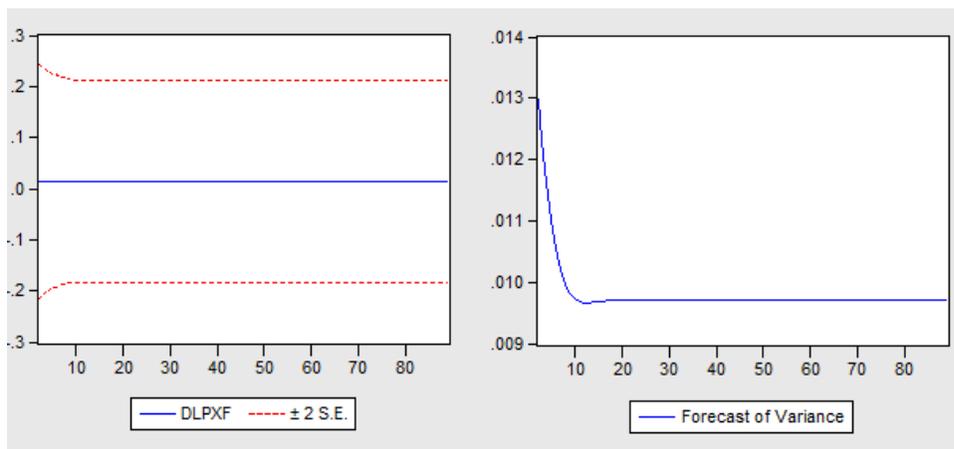
The variance equation falsifies the constant and GARCH term at a 5% statistical significance. Moreover, the ARCH term is verified. Now, according to our previous analysis from the autocorrelation analysis we ran the test up to the second lag. The results are presented in Table 2 (Annex 2).

The lagged analysis provides a better solution. Once again we falsified the non-zero mean value. But the ARCH terms are verified and the GARCH term up to the first lag is also verified at a suitable level of statistical significance. The second lag GARCH term is falsified.

In contrary with the conclusions from the previous "economic" analysis, we have been able to create a model explaining the evolution of the rate of growth in the PX index (firms' value in the Czech economy in the last 15 years). The previous statement is an alternative which is confirmed in the data sample for the Czech Republic's economy upon the rejection of the primary hypothesis.

Volatility is dependent on the volatility in the previous period (previous quarter) and on the random part of stochastic processes. The whole analysis is made in a range from 1999 to 2015 (quarterly data, 85 observations). Here in Figure 1 we tried to use the model for forecasting future evolutions in volatility. We made a prognosis for one year (4 observations). At the time of creating this contribution, we were able to gain the data for half of 2016 and compare. The forecast for the four periods of 2016 predicted stable volatility. For those who might argue with the wide spread between the four times' standard deviations, we need to highlight that there is a percentage analysis. The spread is then much smaller and appropriate.

Figure 1: Forecast of PX volatility based on the GARCH (2,2) model for 2016

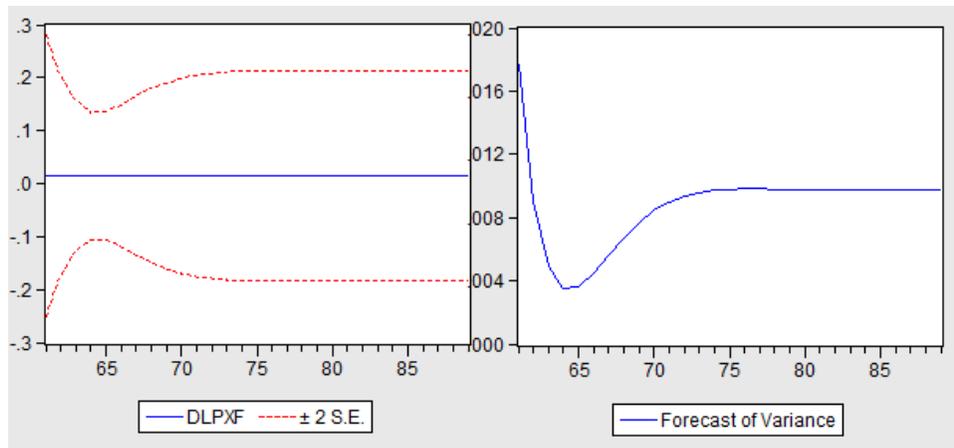


Source: own calculations in Eviews

In Figure 2 we present the forecast of PX volatility of the GARCH (2,2) model, which considers the just post-crisis period (2010 to 2015, 25 observations). The model is based on the whole period analysed. It is not confirmed in the post-crisis period data (insufficient amount of observation).

The output for the post-crisis data predicted a decrease in volatility in the first post-crisis year (2009) and an increase in the second post-crisis year (2011). For the rest of period the forecast predicts stable volatility at 0.8%.

Figure 2: Forecast of PX volatility based on the GARCH (2,2) model for 2016 – post-crisis period



Source: own calculations in Eviews

The alternative hypothesis is confirmed. We have found a useful explanation of firm value. Remember that the pure economic theory of capital was falsified in the data sample for the Czech Republic economy. In contrast with the previous falsification of the primary hypothesis, we verified the alternative explanation of firm value by its previous values and random factor (white noise). This GARCH methodology provided a useful solution and we made a prediction for the whole year 2016 (four quarters). The main purpose of this article has been achieved. According to the results of our research, we prefer the time series analysis, mainly GARCH (2,2), to the neoclassical theory of capital for the future prediction of the value of firms in the Czech Republic economy. This idea is based even on the evolution during the economic crisis in 2008.

Conclusions

The main purpose of this article was to evaluate the verification of the neoclassical theory of investment using a data sample for the Czech Republic economy, and if this relationship was falsified, to find an alternative. We were particularly interested in the effects of technological shocks on firm value. In order to achieve this goal, we tested the primary hypothesis that an increase in technological shock causes an increase in firms' value in the economy. According to pure economic theory, firm value is dependent on technological progress. We calculated the Solow residuals from the nominal GDP evolution and tried to explain the evolution in the rate of growth of the PX index (approximation for firm value). Based on this empirical data sample from 1999 to 2015, we were able to gain the regression model (no spurious regression). The problem is the negative value of the linear coefficient where we expected a positive value. The primary hypothesis of this article is thus rejected. It is necessary to mention that the coefficient is about small percentage values. We have falsified the original hypothesis on the dependence of firm value on technological progress. But we are able to make the statement that there is no relationship between

technological progress and firm value. This statement is arguably due to the Czech Republic being a small open economy in which there are other factors than just real factors.

The main goal of this article is achieved in the statement of the falsification of the relationship. A useful evaluation should contain alternatives. An alternative for the firms' value explanation is its dependence on the previous values of firms. This alternative hypothesis was tested using the GARCH methodology (models explaining the volatility of a time series). The presented conclusions are connected with the evolution of the international financial sector. In order to provide an alternative research method for the presented problem, we ran GARCH tests, meaning that we were interested in the time series analysis of the evolution of the PX index.

The autoregressive methodology GARCH provides a useful solution for the PX index (approximation for the firms' value). We confirmed the GARCH (2,1) model. The volatility of the rate of growth of the PX index is explainable with its previous volatility (the GARCH term) and with not up to three lagged values of the stochastic process "white noise".

Furthermore, we ran forecasts for 2016 (4 quarters observations) using the presented model on first the whole dataset and secondly on the dataset involving the post-crisis period (2010 to 2016). In the first half of 2016 we are able to confirm the theoretical values of the GARCH volatility forecast using the actual values of the volatility.

Finally, although we rejected the primary hypothesis, the alternative relationship was confirmed. The firms' value volatility (PX index rate of growth) is explained with the previous values of volatility and the stochastic process called white noise. The presented model built on the data sample of 1999q1 to 2015q4 predicts the stable volatility for 2016q1 to 2016q2, which fits the observed volatility. We observed martingale behaviour of the PX rate of growth.

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Appendix 1

T	T (quarter)	nGDP (mid CZK)	wages +salaries (mid. CZK)	L (amount of la)	W (%)	K (amount of Capital)	rate of nGDP (%)	rate of inflation (%)	rate of nGDP (%)	rate of L (%)	rate of K (%)	Technologic progress (%)	PX index	Rate of growth PX (%)
2005	Q1	748169	301131	2244128	0,402	202255	0,077395079	1,631	6,109	3,087	5,286	-0,265	970,651	0,112
	Q2	816100	319755	2357820	0,392	232846	0,082296149	1,553	6,677	2,496	7,876	-0,919	1144,876	0,082
	Q3	823330	323815	2110089	0,393	230170	0,060457939	1,853	4,193	2,142	7,288	-1,373	1158,516	0,052
	Q4	870373	354496	2232445	0,407	256548	0,045116475	2,394	2,117	0,078	7,590	-1,316	1327,391	0,056
2006	Q1	797802	323376	2298728	0,405	219956	0,06633929	2,833	3,801	2,433	8,752	-1,100	1403,704	0,029
	Q2	870410	342995	2294343	0,394	236785	0,066548217	2,897	3,758	-2,692	1,692	-0,959	1532,591	0,019
	Q3	896437	345783	2110322	0,386	239984	0,088794287	2,895	5,984	0,011	4,264	-2,167	1401,840	-0,001
	Q4	942482	381880	2271696	0,405	286226	0,082848388	1,491	6,794	1,758	11,568	-3,128	1423,911	0,017
2007	Q1	882421	353927	2321185	0,401	264926	0,106065164	1,547	9,059	0,977	20,445	-3,477	1558,773	0,014
	Q2	949243	371302	2339194	0,391	272323	0,090569961	2,466	6,591	1,955	15,009	-3,236	1667,011	-0,008
	Q3	976901	374791	2126216	0,384	274900	0,089759793	2,491	6,485	0,753	14,549	-2,964	1826,965	-0,027
	Q4	1023254	413234	2301001	0,404	320243	0,085701371	4,762	3,808	1,290	11,885	-2,710	1782,596	-0,053
2008	Q1	926672	390484	2338911	0,421	287716	0,050147265	7,364	-2,349	0,764	8,602	-2,218	1831,455	-0,056
	Q2	1014549	401015	2411508	0,395	288023	0,068797979	6,767	0,113	3,091	5,765	-0,647	1529,384	-0,069
	Q3	1039324	397976	2235738	0,383	287439	0,063899003	6,665	-0,275	5,151	4,561	0,393	1608,038	-0,041
	Q4	1034801	427374	2327473	0,413	302154	0,011284588	4,564	-3,435	1,150	-5,649	1,407	1393,169	-0,056
2009	Q1	929368	383943	2317023	0,413	254033	0,002909336	2,163	-1,872	-0,936	-11,707	1,696	855,647	-0,032
	Q2	980926	387882	2367413	0,395	256036	-0,033140834	1,411	-4,725	-1,829	-11,106	0,722	723,556	0,052
	Q3	987262	379975	2151086	0,385	262793	-0,050092175	0,245	-5,254	-3,786	-8,574	0,181	901,689	0,093
	Q4	1024271	416761	2254060	0,407	290610	-0,01017587	0,433	-1,451	-3,154	-3,821	-0,191	1106,720	0,048
2010	Q1	914538	377961	2341325	0,413	234033	-0,015957081	0,665	-2,261	1,049	-7,873	-0,730	1136,475	0,002
	Q2	1000113	390410	2393712	0,390	254611	0,019560089	1,166	0,790	1,111	-0,557	-1,308	1169,467	-0,005
	Q3	1004700	394692	2127038	0,393	275386	0,017662991	1,933	-0,166	-1,118	4,792	-1,634	1191,555	-0,013
	Q4	1034300	425989	2239016	0,412	301975	0,009791354	2,095	-1,116	-0,667	3,911	-1,223	1161,760	-0,020
2011	Q1	933307	388179	2371954	0,416	239686	0,020522931	1,733	0,320	1,308	2,415	-0,652	1164,304	-0,018
	Q2	1012128	402675	2393930	0,398	258857	0,012013642	1,793	-0,591	0,009	1,668	-0,336	1238,631	-0,021
	Q3	1017894	402461	2093999	0,395	268779	0,013132278	1,733	-0,419	-1,553	-2,399	0,008	1239,275	-0,038
	Q4	1059182	432428	2246635	0,408	301670	0,02405685	2,399	0,007	0,340	-0,101	-0,337	1035,605	-0,043
2012	Q1	954584	401352	2357115	0,420	243732	0,022797429	3,665	-1,385	-0,626	1,688	-0,327	894,920	-0,011
	Q2	1016849	410327	2329392	0,404	258154	0,00466443	3,397	-2,931	-2,696	-0,272	0,164	986,102	0,019
	Q3	1016439	408397	2037982	0,402	262999	-0,001429422	3,264	-3,407	-2,675	-2,150	0,606	895,724	-0,002
	Q4	1053738	443392	2270927	0,421	287225	-0,005139815	2,803	-3,317	1,081	-4,788	0,927	932,275	0,019
2013	Q1	941608	401285	2260677	0,426	230138	-0,01359356	1,764	-3,124	-4,091	-5,577	1,294	989,709	0,012
	Q2	1015585	415031	2326379	0,409	242963	-0,001243056	1,523	-1,648	-0,129	-5,884	1,051	1008,580	0,000
	Q3	1034183	415610	2111926	0,402	260252	0,017457024	1,221	0,525	3,628	-1,044	0,745	950,239	-0,005
	Q4	1085733	442601	2258534	0,408	291438	0,030363335	1,115	1,921	-0,546	1,467	0,923	947,803	0,008
2014	Q1	983311	411234	2301089	0,418	236220	0,044289131	0,200	4,229	1,788	2,643	0,777	997,105	0,009
	Q2	1066281	424121	2326713	0,398	253998	0,049918028	0,200	4,792	0,014	4,542	0,319	1006,351	-0,002
	Q3	1092149	422891	2160266	0,387	274458	0,056050041	0,594	5,011	2,289	5,459	-0,177	1011,273	-0,004
	Q4	1119145	454084	2258734	0,406	300788	0,03077368	0,648	2,429	0,009	3,208	-0,323	975,612	-0,006
2015	Q1	1035402	427392	2298923	0,413	247738	0,052975101	0,126	5,172	-0,094	4,876	-0,473	966,939	0,001
	Q2	1121364	443450	2383449	0,395	279688	0,05165899	0,654	4,512	2,438	10,114	-1,136	1002,798	0,003
	Q3	1141631	440940	2198483	0,386	298686	0,045307005	0,391	4,139	1,769	8,828	-0,725	1018,619	-0,005
	Q4	1173927	475102	2332938	0,405	327069	0,048949868	0,126	4,769	3,285	8,737	-0,353	1008,945	-0,009

Appendix 2

Table 1: Output from GARCH (1,1) analysis in Eviews

Dependent Variable: DLPX
 Method: ML - ARCH (Marquardt) - Normal distribution
 Date: 06/20/16 Time: 12:18
 Sample (adjusted): 2 85
 Included observations: 84 after adjustments
 Convergence achieved after 16 iterations
 Presample variance: backcast (parameter = 0.7)
 GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.015444	0.011886	1.299386	0.1938

Variance Equation

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.003919	0.003032	1.292371	0.1962
RESID(-1)^2	0.369381	0.141168	2.616616	0.0089
GARCH(-1)	0.354039	0.336038	1.053568	0.2921

R-squared	-0.004407	Mean dependent var	0.008122
Adjusted R-squared	-0.042072	S.D. dependent var	0.110961
S.E. of regression	0.113272	Akaike info criterion	-1.569513
Sum squared resid	1.026435	Schwarz criterion	-1.453760
Log likelihood	69.91956	Hannan-Quinn criter.	-1.522982
Durbin-Watson stat	1.460381		

Source: own tests in the Eviews

Table 2: Output from GARCH (2,2) analysis in Eviews

Dependent Variable: DLPX
 Method: ML - ARCH (Marquardt) - Normal distribution
 Date: 06/20/16 Time: 12:35
 Sample (adjusted): 2 85
 Included observations: 84 after adjustments
 Convergence achieved after 7 iterations
 Presample variance: backcast (parameter = 0.7)
 GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*RESID(-2)^2 + C(5)*GARCH(-1) + C(6)*GARCH(-2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.014190	0.008135	1.744157	0.0811

Variance Equation

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.001295	0.000697	1.857444	0.0632
RESID(-1)^2	0.466113	0.104477	4.461406	0.0000
RESID(-2)^2	-0.375880	0.101240	-3.712773	0.0002
GARCH(-1)	0.898373	0.149538	6.007642	0.0000
GARCH(-2)	-0.121822	0.096043	-1.268406	0.2047

R-squared	-0.003026	Mean dependent var	0.008122
Adjusted R-squared	-0.067323	S.D. dependent var	0.110961
S.E. of regression	0.114636	Akaike info criterion	-1.537226
Sum squared resid	1.025024	Schwarz criterion	-1.363597
Log likelihood	70.56351	Hannan-Quinn criter.	-1.467429
Durbin-Watson stat	1.462391		

Source: own tests in the Eviews

Czech Public and Occupational Pension Schemes and Reforms

České veřejné a zaměstnanecké penze a jejich reformy

JAROSLAV VOSTATEK

Abstract

The Czechoslovak communist retirement protection scheme resembled the Bismarckian earnings-related pensions, with new benefits close to final salaries and with their insufficient indexation. The aim of this paper is to evaluate the reform processes in Czechia and the potential for a simple technical reform that would make the public retirement schemes understandable and efficient. In the process of the transition to capitalism under liberal Czech governments, the prevailing concept of the public retirement scheme changed to a Beveridge model of pensions not being related to previous wages. The insufficient valorisation of bend points was the main method of this transition. Modern international pension theory recommends the separation of a solidary pillar and an earnings-related pillar. After the Czech "small" pension reform, a basic technical reform may be simply realised, resulting in a higher flat-rate pension and an NDC pension insurance scheme, convenient to parties with programmes based on three basic welfare regimes. The introduction of occupational pension schemes is necessary to reflect the specifics of arduous occupations.

Keywords

retirement pension, welfare regimes, occupational pension schemes, pension pillars, Bismarck system, Beveridge system

JEL Codes

H55, J26, H 53, H24

Abstrakt

Československý komunistický systém důchodového zabezpečení připomínal bismarckovské penze závislé na výdělku, s nově přiznanými dávkami blízkými výdělkům v předdůchodovém věku a s jejich nedostatečnou indexací. Cílem příspěvku je zhodnocení reformních procesů v Česku a analýza potenciálu jednoduché technické reformy, která by učinila veřejný penzijní systém srozumitelným a efektivním. V procesu přechodu ke kapitalismu za českých liberálních vlád došlo ke změně převažujícího konceptu veřejných penzí na Beveridgeův systém penzí nezávislých na předchozích výdělcích. Hlavní metodou tohoto přechodu byla nedostatečná valorizace redukčních hranic. Moderní mezinárodní penzijní teorie a politika doporučuje oddělení solidárního penzijního pilíře a pilíře s penzemi závislými na výdělku. Po „malé“ důchodové reformě lze snadno provést základní technickou reformu veřejných penzí, spočívající v přechodu na poměrně významný rovný důchod a na sociální starobní pojištění typu NDC, která by vyhovovala stranám, majícím program založený na třech základních sociálních modelech. Zavedení zaměstnaneckých penzí je nezbytné k zohlednění specifík fyzicky náročných zaměstnání.

Klíčová slova

starobní důchod, sociální modely, zaměstnanecké penze, penzijní pilíře, Bismarckův systém, Beveridgeův systém

Introduction

The aim of this article is to compare the Czech system of public and occupational pension schemes with internationally recognised pension theory and policy and then formulate fundamental reform proposals that could be used by Czech political parties and future Czech governments. We base our assumptions on the summary of elementary pension policies across the world and apply them using Esping-Andersen's welfare regimes theory (1990) regarding the issue of pensions. We extend the scale of "his" pension regimes from three to four by using Bovenberg and Ewijk's (2012) typology, while retaining the terminology of Esping-Andersen, and adding the neoliberal welfare regime which has been developed since the 1990s. We assume that the selection of a welfare regime is a result of public choice in the sense of modern public policy. Ideally, each pension system should be based on one of the four welfare regimes. This is particularly significant for Czechia, where the pension system has undergone many transformations since 1990 without an attempt to introduce a comprehensive welfare regime, albeit in the basic pension pillar.

The first part of the article will deal with the development tendencies of pension theory and policy, in the context and respecting the four welfare regimes and main typologies of pensions systems and pillars. The second section then focuses on the evaluation of reforms of the Czech public pensions from the systemic point of view. The third section will deal with potential reform alternatives to the existing "pension insurance". In discussions and preparation of reforms, the NDC (notional/non-financial defined contribution) scheme had a very specific role and is analysed in the fourth section. The fifth and sixth sections deal with occupational pension schemes – the theory and Czech policies. In the last section, we show that the creation of a comprehensive and comprehensible system of public and occupational pension schemes is relatively very easy under the current circumstances, if modern and proved pension policies are applied.

1 Pension welfare regimes

From the general theory perspective, it would be ideal if every individual provided for themselves for old age. However, this does not work, and the theory only explains that this is the result of a certain "myopia" in the actions of people and, objectively, also the unpredictability of how long we will stay alive (longevity risk). The willingness to purchase an old-age pension for life under "standard market conditions" is very low, and the generally recognised "failure" of this market is an intrinsic part of it. In principle, old-age security within the family is non-existent in a modern society and neither is a "child pension" project under which full public pensions should only be provided to parents of three and more children and a proportional share to parents of one or two children (Sinn 2004) a viable solution.

The classic liberal welfare regime works only with general social assistance provided by municipalities, charities or the state. Everything else is an exception to the general rule. These exceptions may include annuities of military personnel or civil servants. General public pensions are as out of the question as any other motivation for taking out personal pensions. The brilliant advocates of an “absolute” liberal order have even strongly opposed occupational pension schemes (and other employee benefits, particularly the provision of medical care or health insurance to employees) – as by doing this we would depart from the economic optimum, and products that do not correspond to their individual preferences are forced upon employees as a result.

The modern liberal welfare regime is based on the cognition that “freedom and choice” do not work much in reality. It is practical to take care of the elderly (voters) much more and better than using the final social protection benefit – general social assistance. The provision of a means-tested pension – naturally a “non-contributory”, tax-financed benefit – is a minority alternative in modern liberal welfare regimes. An example of such a means-tested pension is the “Age Pension” in Australia providing – together with means-tested supplements and rent allowance – an income exceeding the poverty line used in the EU (60% of income median) even for the poorest senior citizens.

The majority, fully prevailing alternative of the modern liberal welfare regime is the provision of a universal, flat-rate old-age pension to all residents who have reached the fixed statutory retirement age. Under identical circumstances, the flat-rate pension is financially more demanding for the state, but it is much less demanding on administration and in a way, it is fairer, as it is a pension for everyone. Except for the retirement age, the only “tested” matter is the period of residence in the given country. The pension of immigrants is reduced: e.g. in the Netherlands, 40 years of residence is required for a full flat-rate pension of 30% of national average earnings (NAE).

The “Superannuation” in New Zealand may serve as an example of a flat-rate pension, financed from taxes and providing an income exceeding the poverty line according to the OECD (50% of the income median). The flat-rate pension for two seniors living together is usually determined using the “65 at 65” rule – at 65 years of age the couple is entitled to an after-tax pension of 65% of net NAE. Thus, as of 1 April 2017, a couple receives \$1,363.20 for two weeks, \$1,200.60 after tax. The pension of a single senior is by 32% higher than the pension of a couple divided by two. Therefore, the economies of scale for couples are reflected.

The British state pension is more complicated and significantly lower: following the recent increase (at the expense of the state second pension) it amounts to 26-27% of net NAE. From the model perspective, an important complication in the British system is the existence of national insurance contributions (NICs), which were originally introduced after World War Two in the form of a head tax paid by employees regardless of their amount of earnings. This concept was recommended by the Beveridge Commission; Beveridge, as a liberal, put an emphasis on insurance: ‘It is, first and foremost, a plan of insurance – of giving in return for contributions benefits up to subsistence level, as of right and without means test, so that individuals may build freely upon it’ (Beveridge 1942). With the later introduction of the state earnings-related pension scheme (with an

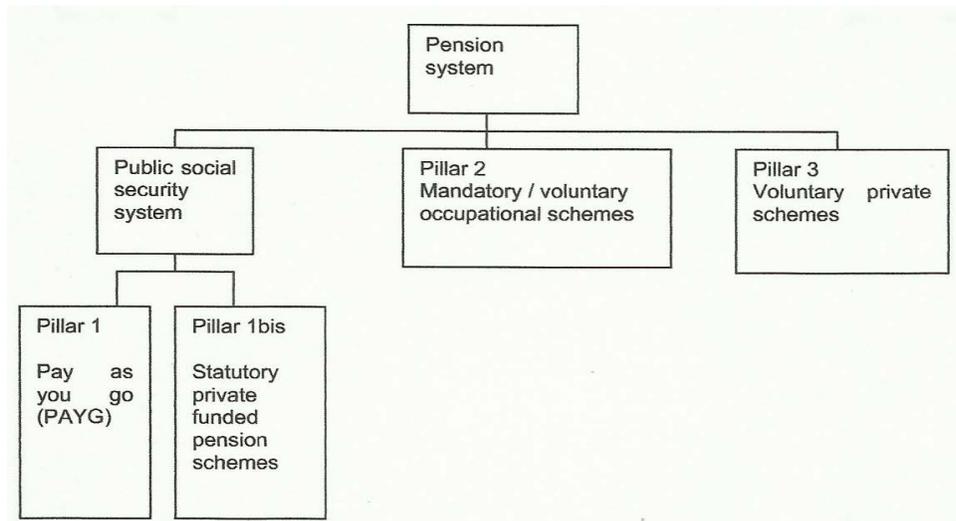
option of contracting-out to an occupational pension scheme) NICs were transformed to a percentage payroll tax that does not have an entirely logical construction. Currently, employees pay NICs of 12% from wages over £157 weekly and 2% from wages over £866 weekly. The employer pays NICs of 13.8% from wages over £157 weekly. The British tax commission headed by Mirrlees (2011) recommended to merge income tax and NICs. In relation to pensions, it is more than interesting that when the retirement age (65 years) is reached, NICs are no longer paid. NICs represent the second-largest British tax channel, yielding over 22% of tax revenue.

Public pensions that are not earnings- or income-related are often internationally recognised as belonging to the Beveridge model; the Bismarck model with fully earnings-related pensions is its exact opposite. The OECD progressivity index is designed to summarise in a single number the relationship between pension in retirement and earnings when working. The results show variation from 100 in pure basic schemes (such as Ireland and New Zealand) to zero in Hungary. The average index across OECD countries is 39. Regional differences are striking, with the index averaging 82 in the Anglophone countries: public pensions are strongly progressive. In Southern European countries, by contrast, it averages 23, indicating a very strong link between earnings and pension benefits (OECD, 2015).

Flat-rate pensions have existed in many countries. They are a basic alternative to current solidary pension pillars. Liberal countries have established other pension pillars that cannot be automatically considered part of the modern liberal model. A modern liberal model can also be characterised as a social-liberal model; social pension insurance or quasi-mandatory systems of occupational pension schemes should not be prevalent in the model.

The conservative (Christian-democratic) pension welfare regimes represent a mix of different concepts of pension protection – for different social groups, proportionally to their specific position (“performance”) and relevant needs. These include both the protection of civil servants by the “retirement salary”, generally at the level of the pre-retirement salary, and originally low workers and higher clerks' disability, survivor and old-age pensions from systems of social insurance in the private sector, as well as voluntary occupational pension schemes. Even though there has been a significant integration of the largest systems of social insurance which existed in parallel in the relevant countries, significant differences between social groups persist. Even today, some social groups (e.g. freelancers or the self-employed) do not have a mandatory social pension insurance. Different occupational pension schemes, representing the second pension pillar, are an intrinsic part of the conservative model. The third pillar is personal pensions, supported by the state e.g. by applying one of the tax theories, according to which contributions to pension savings should be deducted from the income tax base and payments under these savings schemes should be fully taxed. This is a system of a “deferred” income tax, in short EET (with the contributions being exempt from tax /E/, yields not taxed /E/, pay-outs fully taxed /T/).

Figure 1: Classification of pension systems



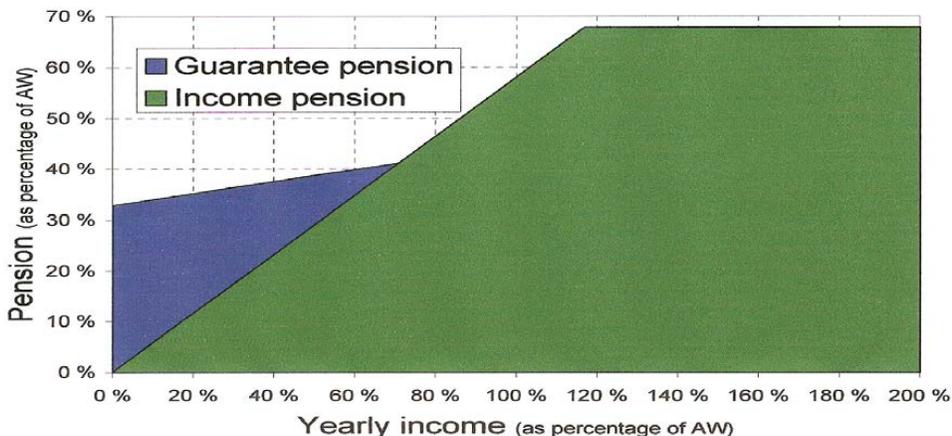
Source: Eichhorst et al. (2011)

It is typical of conservative (Christian-democratic) welfare regimes that they comprise no solidary pension pillar – flat-rate pensions or means-tested pensions. We can encounter tested pensions, for example, in Germany, however they are strictly classified as social assistance benefits, not benefits under the pension system. The Bismarck model is typical of a conservative pension system, even though Bismarck introduced in Germany old-age pensions as an additional benefit in workers' social disability insurance that were very low – and predominantly flat-rate, also owing to a flat state contribution. In this pension scheme, disability pensions prevailed in the Western Germany as late as the 1950s, when Adenauer started the concept of old-age pensions sufficiently replacing previous earnings (while reflecting the lower consumption of the elderly). The Adenauer concept of old-age pensions from the social insurance of employees (clerks and workers) thus created little room for occupational and personal pensions. Half a century later, the German policy has changed: today, it should achieve the same by using all three above mentioned pillars, currently with an emphasis on occupational schemes.

Regarding the three model pension pillars in the conservative (Christian-democratic) welfare regime, the EU uses a classification of pension systems (see Figure 1) that tries to merge what others (and we) consider non-mergeable – solidary pensions are added to the first pillar (flat-rate and means-tested pensions) and the whole is referred to as public pensions. They include both Bismarck- and Beveridge-type pensions. It is even more peculiar that renowned authors have added mandatory private pension schemes introduced partially in almost every postcommunist country to this pillar. (Just as well as referring to them as “Bs” of the first pillar: pillar 1 bis.) Such a classification may encompass all of the European systems of old-age pensions; however, it does not reflect the significant differences between them.

Social-democratic pension welfare regimes have developed from the original liberal systems (based on a flat-rate pension) by adding a universal social insurance pillar built on the equivalence between the paid premiums and assessed old-age pensions. With this concept (ideology) the solidary state pension pillar must be designed to protect adequately low-income senior citizens (not only employees), residing in the given country over an extended period (and not requiring long-term care). An appropriate benchmark would be the at-risk-of-poverty rate used in the EU. A social-democratic model is oriented towards providing earnings-related pensions for middle-income employees. The solidary pension pillar is closely related to this insurance pillar, e.g. in Sweden or Norway, the amount of the “guarantee pension” is determined while considering the amount of the NDC type insurance pension. Housing benefit for seniors is a significant supplement to solidary pensions – in fact, it is a second component of the solidary pension pillar, important for the elimination of poverty of the elderly. In countries with a policy of this type, quasi-mandatory systems of occupational pensions covering more than 90% of employees based on collective agreements, agreed either at national or sectorial level, play a key role. Similarly to the liberal regime, the social-democratic welfare regime refuses state support of the third pension pillar and other financial products. In the social-democratic model, the role of the personal pensions pillar is entirely marginal.

Figure 2: Norwegian Income pension (NDC) and Guarantee pension (43 years of insurance, percentages of NAE)



Source: Christensen et al. (2012)

In conservative (Christian-democratic) and social-democratic systems, social pension insurance dominates with occupational pensions mostly taking a significant role. The role of a solidary pillar represents the significant structural difference between these two social models (systems). The original version of the social-democratic model included a flat-rate pension (with social insurance being a superstructure); the modern version is centred around social insurance and the solidary pillar predominantly includes the income-tested old-age pension, a direct supplement to the insurance pillar. Figure 2 illustrates the coexistence of modern NDC social insurance, herein referred to as income pension, and the NDC pension-tested pension (guarantee pension) in Norway. In 2014, the minimum pension under this two-pillar-system amounted to approx. 31% of NAE (OECD, 2015) for

singles. Senior housing benefits are common follow-up allowances in these systems (all-income-tested once a year), granted for one year.

The public pensions in social-democratic welfare regimes knowingly combine the Bismarck and Beveridge models. In this regard, there is a clear effort to achieve high efficiency while maintaining relatively high equity.

Neoliberal pension models place an emphasis on mandatory private pension savings regulated by the state. The economics of these pension savings assumes high investment yields that would also cover the high margins of private providers of pension savings or insurance. If the yield for the client were on average e.g. 5% annually (inflation-adjusted), then the accumulation factor after 40 years of saving with this interest rate would be more than three. Thus, the client would receive three times what they had put into the system. The neoliberal concept seems a radical solution to the pension problem related to population ageing. To support the privatisation of social old-age insurance schemes, the so-called Aaron rule, which compares arithmetically the interest yield of private savings in the funded system with the growth of total wages in the pay-as-you-go financed state insurance pillar in the given country, was used. Even though Aaron (1997) did not recommend the privatisation of public pensions, under the given conditions in the given country – when Aaron's rule is applied – either a funded or pay-as-you-go system may seem more advantageous.

In times of intensive globalisation, the appreciation of pension savings has been rather high – and for this reason (not only private) pension funds were much advantaged. Thus, premiums of e.g. 17% from wages could “generate” pensions averaging around 70% of final wages, in the case of life-long employment. In contrast, in a pay-as-you-go financed insurance system, the same premiums may generate pensions at the level of 30-35% of wages. Chile was the pioneer in the privatisation of segmented systems of social pension insurance where the private pension companies promised pensions of 70% of wages for a contribution of 10% from wages; in practice, it may have been more important for switching to the new system that following the opt-out, employees had higher net wages by 11% on average – because of the lower premiums/contributions in the new system. The option to use a funded system must always be analysed in detail in the specific economic conditions of the given period. However, this is not accepted by neoliberal pension theory – as according to this theory the private sector has an absolute prevalence over social insurance and also autonomous (non-profit) occupational funds in the provision of old-age pensions.

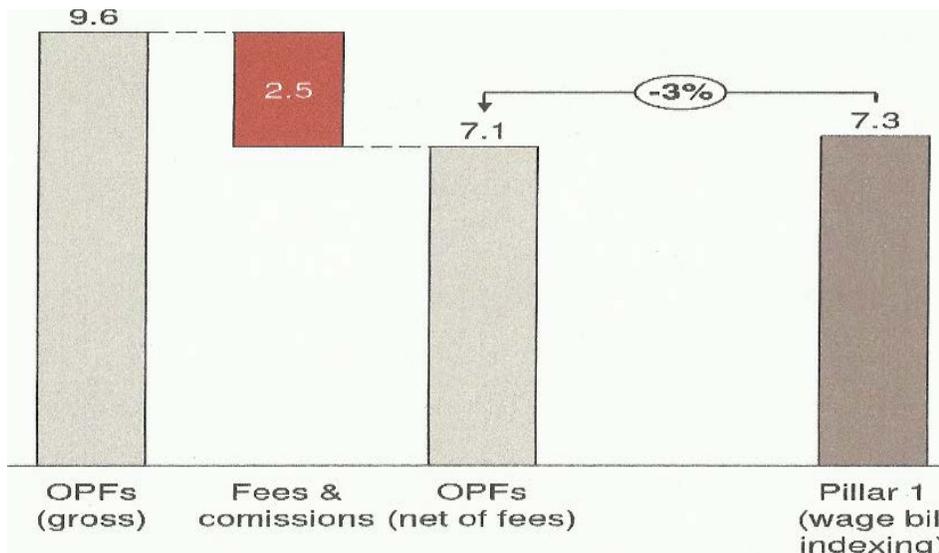
The emphasis on the strict separation of the solidary and insurance pillars is a certain contribution of the neoliberal pension theory of the World Bank (James et al. 1994). The state can be the only provider of the solidary pillar. At the same time, the private sector can find its use in the funded system only.

Mandatory private pension savings were designed by the World Bank as the “second” (first by relevance) pension pillar. The reason given by the World Bank was not primarily an ideological one, but a factual one – with reference to the high negative investment yields of public pension funds in the 1980s in Peru, Turkey, Zambia and so on, these funds

were used in fact by the state for other public purposes. Chile stood at the opposite end, with typical private pension companies that achieved gross investment yields of 12.3% on average, of which clients received 9.2% from the assets annually (James et al. 1994). This presented the entire professional argumentation – with the conclusion that private funds clearly beat public funds. However, serious professional analyses are performed differently. Certainly, investment yields are a significant argument, however they must be monitored over extended periods of time, and particularly in relevant countries and under relevant circumstances. Nevertheless, in the period of 25 years ending in 2007, real average investment yields for balanced portfolios in G7 countries and Sweden reached 7.3% from assets – for pension institutions, real net yield for clients amounted to 5% from their assets. The difference (2.3% from assets annually) represents the total margin of pension funds, including the margin of providers of life annuities (Whitehouse et al. 2009).

Overhead costs are a cardinal problem of private pension systems. The high margins of typical private pension institutions are given by their nature – these are competing systems requiring distribution networks and they must also respect various rules of solvency and caution, which is reflected in the amounts of the old-age pensions provided. Last but not least, the overhead costs of pension companies also include an investment yield for shareholders. The overhead costs of the “pay-out phase” alone (payment of pensions) represents 0.5-1% from assets during the entire period of savings and pay-out from the total of 2.3% annually. At the same time, the comparable costs of non-profit occupational pension funds in the Netherlands are at 0.15% from assets on average.

Figure 3: Internal rates of return on pillar 1 and pillar 2 (OPFs) accounts in Poland



Source: Bielecki (2011)

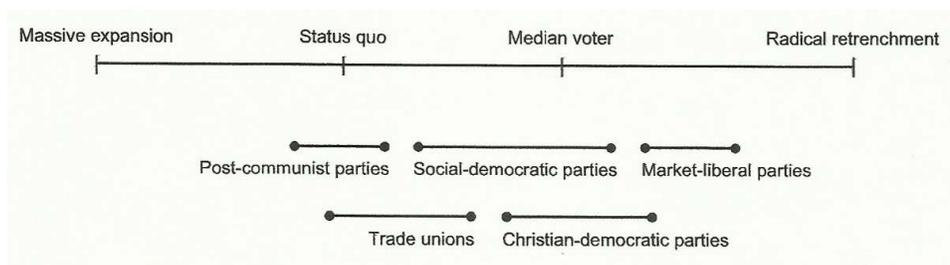
The problem of high margins can be illustrated by the second pension pillar in Poland in 1999-2010: the fees of the Polish private pension companies amounted to 2.5% from assets annually, in the “savings phase” only – see Figure 3. The yields for clients of pension

funds were even lower than the valorisation of client accounts in the first (NDC) pillar; thus, even Aaron's rule "does not work". Of course, one may object that this period covers only the first 12 years of existence of the second pillar, however, client recruitment was very successful, and the contribution to the second pillar stood at 7.3% from wages, in relation to other postcommunist countries, the Polish results were very positive and Poland was barely affected by the crisis. Kaczmarczyk (2014) claimed that the valorisation of client accounts stood at 6.8% in the NDC pillar and 6.6% in the second pillar in 2000-2012. Direct comparison of account valorisation in the private and public systems can only be done if both systems are of the DC (defined contribution) type and if the public NDC system (non-funded, pay-as-you-go financed DC) is sustainable in the long run.

If we wish to compare the overhead costs of private pension schemes and national public pay-as-you-go pension schemes, other than NDC, then we must apply different indicators – the overheads to total expenses ratio or overhead costs per participant. If we do not have this information, we can convert indicative overhead costs of pension funds, expressed as a percentage from assets, to a percentage from paid pensions and other expenses using a coefficient of 20:1. Roughly speaking, 1% from assets is equivalent to 20% from expenses. The overhead costs of state pension schemes are significantly lower than the overhead costs of private pension schemes, with the overhead costs of German social pension insurance provider Deutsche Rentenversicherung, at 1.2% from expenses in 2015, serving as a benchmark. The overhead costs of the Czech Social Security Administration which also operates other branches of social protection (which need relatively higher overhead costs than pensions) amounted to 1.26% from the total expenses in 2014. This implies that the benchmark for a private pension scheme that should fully or partially substitute public pensions is a margin of approximately 0.05% from assets annually. (The Swedish NDC system, which also manages extensive reserve funds, posted overhead costs of 1.11% from total expenses and the account management fee stood at 0.03% from assets annually in 2013.) This value can never be achieved by the private sector, despite potentially substantial state regulation. Thus, the neoliberal concept of the "second" pension pillar is not economically feasible, regardless of other incurred costs – specifically the costs of transition from the pay-as-you-go system to the funded system.

In recent years, it has become more and more evident that the high investment yields from the times of fast globalisation are over. The interest from government bonds has long been on steady decline and in a mid-term perspective, the real yield is negative. Investments in shares tend to return some 3% annually, inflation-adjusted. This approximately corresponds to conditions in the 1950s and 1960s, when funded social insurance systems were economically rationally transformed into pay-as-you-go systems.

Figure 4: Policy positions of typical political parties and trade unions towards pension reform in the context of demographic ageing and fiscal austerity



Source: Schludi (2003)

The selection of a retirement welfare regime continues to be an issue of public choice. The key role here is played by ideology, or general politics. The position of typical political parties and trade unions in some countries in Western Europe is outlined in Figure 4. It also shows the policies of post-communist parties, with trade unions finding themselves somewhere between the political orientation of social-democratic and post-communist parties. Christian-democratic parties are located to the right of social democrats; however, the politics of these parties may significantly overlap. The parties with neoliberal policies, exceptionally social-liberal policies, can be understood under “market-liberal parties”.

In recent decades, pension theory and policy has significantly influenced the development of pension systems in many countries. The urgent need for the clear proliferation of each of the pension pillars is one of the findings. Each pension system should include a solidary pillar – but the question is how it should be designed and what role it should have in the system. The modern liberal pension system is dominated by flat-rate pensions as a tool for removing poverty in old age, supplemented by housing benefit or another means-tested pension.

Neoliberal policy includes mandatory private savings which are, however, more expensive than comparable public pensions, and for this reason the relevant countries put more and more emphasis on fundamental state regulation. At the same time, there has been a drop in gross investment yields, and so neoliberal pension policy may present ideological arguments only, offering private sector provision as an alternative at significantly higher costs.

At present, the pension policies of (Western) social-democratic and Christian-democratic parties are oriented at the “median” voter, or political “centre” respectively. In many aspects, the pension policies of post-communist parties have taken over the role of the social-democratic left, and the policy of large trade unions corresponds to the average of both policies. With a view to the prevailing available analyses of today’s social political systems, Figure 5 may show a relative efficiency and equity of each of the pensions welfare regimes, with the criterion of efficiency being the employment rate; high equity is perceived as a low poverty risk and vice versa (Sapir 2005). However, in practice, this depends to great extent on specific parameters of individual systems, and in this regard, the figure shows

the potential of each welfare regime primarily. Any system can be ruined by the wrong parameters, management or regulation.

Figure 5: Typology of pension welfare regimes

	<i>High Efficiency</i>		
<i>Low equity</i>	Liberal regime	Social-democratic regime	<i>High equity</i>
	Neoliberal regime	Christian-democratic regime	
	<i>Low efficiency</i>		

Source: Author, inspiration from Sapir (2005)

2 Reforms of Czech public pensions

Since 1996, the Czech state pension system has been referred to as “pension insurance”, maybe because we had already had premiums for pension insurance for three years. During the tax reform (1993), premiums for pension insurance were introduced as part of social security premiums; the authors of the tax reform obviously expected the introduction of a comprehensive system of social insurance, with earnings-related benefits, separated from the state budget. The division of payments of social security premiums between employees and employers on a 25:75 ratio was the only departure from this social insurance model – which resulted from previous wage and tax relations, not from a conservative (Christian-democratic) welfare regime (where a 50:50 ratio is usually applied in insurance) or from a social-democratic welfare regime (which has a 0:100 ratio – all premiums are paid by the employer).

We have never introduced a comprehensive model of social pension insurance: since the 1950s, pensions have been and continue to be financed from the state budget and the “renewed” premiums for pension insurance are in principle a pension tax which is, from the systematic point of view, unnecessary. Moreover, there is no “pension account” in the state budget that would regulate expenditure of the state budget on pensions according to the development of the collected pension insurance premiums (MF 2012). The pensions provided under the Act on Pension Insurance are state pensions, being the (largest) public expenditure programme – with all of the potential pros and cons of this arrangement. The practical impact of this is that despite being mandatory state expenditure, the expenditure of the state budget on state pensions may be adjusted (newly announced) annually e. g. in the act on the state budget. If there were a risk of a high state budget deficit, there may be – depending on government policy – reductions in expenditure on pensions; and if this should happen, the annual pension indexation would “be the first to go”.

The social pension insurance systems, which have separate rules on their financing and that which are relatively independent of the government and its fiscal policy in any given year, are an alternative to the system of tax-financed state pensions. In many countries with social pension insurance of the conservative (Christian-democratic) type, these systems are partially subsidised from the state budget, and there may be similar situations in countries with state pensions. However, in some countries, the system of universal social old-age insurance is in principle clearly separated from the state budget, and in crisis situations it is strictly stipulated (by law) as to how the sudden shortage of the receipts from premiums will be reflected in the valorisation of pension entitlements and into the indexations of paid-out pensions. The Norwegian system of social old-age insurance of the social-democratic type is part of the state budget, and for this reason, it is sometimes referred to as a system similar to NDC. (We do not share this opinion, as the design of NDC is critical.)

In the first half of the 1990s, the real value of an average old-age pension dropped by 20-25% in our country. Following the reform in 1996, this value has showed a slow increase. The design of pensions went through many changes during that time, one of them being that since 1996 all pensions consist of two parts: a universal "basic amount" and a partially earnings-related "percentage amount" of the pension.

The basic amount of pensions emerged through their transformation from the previous state compensatory benefit introduced in 1990 as a partial compensation for the increase in consumer prices as a result of the cancellation of subsidies on retail prices ("negative turnover tax"). The percentage amount of the old-age pension adopted the previous technique of reducing higher earnings when calculating the personal assessment base, but applied it more intensively towards pension equalisation, in contrast to in 1989. While previously employee earnings were reduced from the threshold of 75% of NAE, since 1996, the first bend point of CZK 5,000 was applicable, being equal to 52% of NAE. In 1989, the second bend point was at 181% of NAE, and since 1996 at CZK 10,000, i.e. about 103% of NAE. It can be said that the reduction coefficients were almost identical – until the first bend point without reduction, then the earnings exceeding the first bend point were reduced to one third (1989), or 30% (since 1996) and above the second bend point, the reduction was to a mere 10% of the earnings of the insured in both years.

During the first half of the 1990s, the equivalence principle for newly awarded old-age pensions was significantly toned down. While in 1989, these pensions were highly related to final salaries (a full pension based on previous average earnings stood at 85-90% of the net NAE), following the 1996 reform, the same pension for men was earnings-related only in one third and consisted of a percentage amount of the pension, which per se was earnings-related in one half, and a basic amount of the pension which was independent of earnings. Moreover, nobody can now explain why we have had the same basic amount for survivor and disability pensions. Both pension amounts are in fact two types of pension, two benefits. What logic do their parameters follow?

The system of bend points and subsequent reduction coefficients, valid since 1996 for the computation of the percentage amount of the old-age pensions, shows significant similarity to the American public pension scheme. In the US, similar bend points and

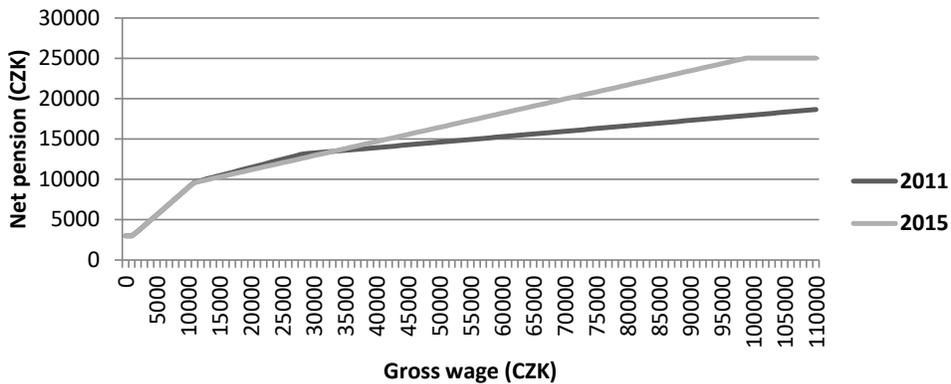
coefficients are used: the first bend point is set at the level of 22% of NAE, the second at 132% and the third at 256% of NAE. For the pension calculation, 90% of earnings are included up to the first bend point, above this bend point 32% and above the second bend point 15% of earnings. Therefore, the reduction coefficients have been very close in the US and Czechia since 1996. The first US bend point standing at the half of the Czech one is the biggest difference. The American system of public pensions is characterised as Beveridgean. The Czech “pension insurance” is of the same type.

In 2010, the Constitutional Court of the Czech Republic ruled as follows: “The complicated design of the pension system is so non-transparent that it is utterly incomprehensible for its addressees” (Constitutional Court 2010). The Court declared the valid bend points and reduction coefficients unconstitutional, as “in their effects, and in combination with other parameters and existing design of the pension system they do not sufficiently guarantee constitutionally granted right to adequate material protection and result in an unacceptable inequality among distinct groups of pension insureds”.

The ruling of the Czech Constitutional Court should be a major lesson learned for the Czech pension policy. The motivation was a complaint by one disabled pensioner about his low replacement rate, in particular 19% of his personal assessment base – which in his opinion was not adequate material protection, which is declared as a right in the Charter of Fundamental Rights and Freedoms. The claimant considered it an absolute inequality, in a situation when the average replacement rate for all old-age and disability pensions amounted to 44%. The Constitutional Court took his point, because since 1996 there had been a system of “public social insurance” in this area. The Court thus inferred the core of the system from the title of the act – on “pension insurance”. Basically, it had no other choice, as neither the law nor the Constitution include a definition of “pension insurance”. We might add that the title of the act should include one more adjective that would differentiate statutory “pension insurance” from private pension insurance. The term public pension insurance or social pension insurance is not legally defined in Czechia, not to mention the collocation “public social insurance”. However, the Court did not refuse the intra-generation redistribution connected with the existence of bend points and reduction coefficients, even though it might have done so with regard to the development of systems of social pension insurance in Europe after World War Two. In this regard, the Constitutional Court might even refuse the existence of the basic amount of the pension, or “allow” it, but then refuse the bend points and reduction coefficients at the percentage amount of the pension. However, the Court did not dare to start such a dramatic revolution in the Czech “pension insurance”. The Court “only” repealed Section 15 of the Act on Pension Insurance, containing the valid bend points used to determine the reduced personal assessment base for the purposes of calculating the percentage amount of the pension, and forced the government to act swiftly. The moral of this case is that the title and content of the act should always match. If we want to have social pension insurance, then the pensions should be in principle dependent on the paid premiums (or on the earnings from which the premiums were paid). From the perspective of modern pension theory and policy, or welfare regimes, a split of the Czech state old-age pensions into two pension pillars – a solidary pension and social pension insurance – would be an adequate solution.

The Nečas government did not opt for a major pension reform but for a change in several parameters of the existing “pension insurance”. Thus, the government implemented a “small” pension reform which reintroduced bend points and subsequent reduction coefficients, setting such parameters in a manner so as to reinforce the principle of equivalence between the amounts of pensions and earnings. The government did so reluctantly (“a coerced step”), as it preferred a different policy – a gradual transition to flat-rate pension, e.g. at CZK 6,500. However, it is fully legitimate to propose (and to enforce using mechanisms of public choice) a flat-rate state pension as a single public system of state pensions, or as one or the two public pension pillars from the perspective of pension theory and policy (standard welfare regimes).

Figure 6: Net pension dependence on gross wage in 2011 and 2015 (45 years of insurance)



Source: author

In principle, during the small pension reform, the second bend point was cancelled, or more precisely, this bend point grew more than threefold: from 109% NAE in 2010 to 400% NAE in 2015, and moreover, it was in fact merged with the earnings threshold of 400% NAE. The key parameter for dependency of the pension on earnings is already the first bend point that has also been newly parametrised, to 44% NAE – see Figure 6. When calculating the percentage amount, earnings above this bend point are included at 26%, below this point 100%. The first bend point with low parameters (44% NAE and inclusion of 26% over 44% NAE) continues to be a decisive factor characterising Czech “pension insurance” as a predominantly non-insurance system of the Beveridge type. After the small pension reform, the percentage amount is slightly more transparent and understandable – due to the factual removal of one bend point. However, in this regard, no major reform has taken place, as solidarity still prevails over the insurance principle in the system of “pension insurance”; the ruling of the Constitutional Court has not been duly respected.

3 Basic alternatives for pension reform

The Czech basic amount at 9% of NAE is a rarity around the world. CZK 2,550 monthly (in 2017) is a significant amount for pensioners, however it is not enough to cover sustenance, not to mention housing needs. From this point of view, the basic amount should either

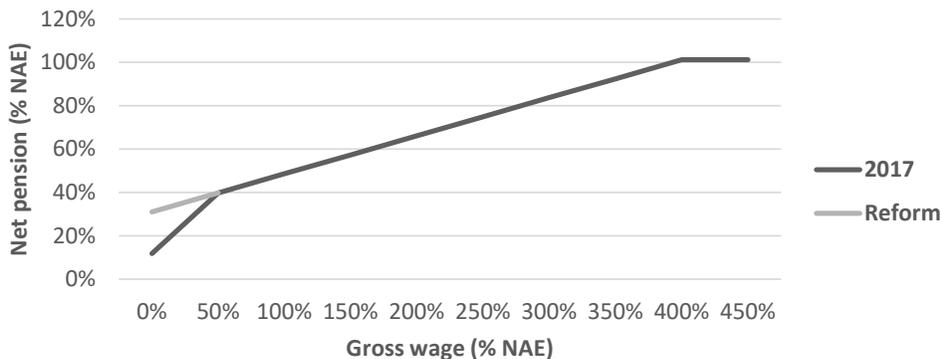
be significantly increased or cancelled – depending on the (public) choice of the pension welfare regime.

The Czech basic amount of pensions is not comparable with base pension amounts in former worker pension insurance systems. The major difference lies in the fact that the former base amount was added to the percentage amount (fully earnings-related, naturally with no reduction applied) in the total undivided amount of the benefit when assessing pensions; the benefit was (or was not) indexed as a single amount. Regardless of what comes next, we should leave the “independent existence” of the basic amount of the pensions. One way or another, the former state compensatory cost-of-living allowance should have been integrated into pensions since 1996 (it was assumed by the government bill on basic pension insurance in 1994), for example, it could have been reflected in bend points and reduction coefficients. As this integration has not been achieved until now, we could or should do this now. And it may be even a “mere” parametric reform of the existing defined benefit system. The minimal alternative would be a mere adding up of the basic and percentage amounts following their calculation for the pension award and subsequent “handling” of the pension as a whole. Pensions of all kinds that are currently paid may be added up (in their entirety) as well. If nothing else, this would make the current indexation of Czech state pensions significantly easier ... and it would become understandable. If discussion regarding the level of solidarity of our current state pensions was encouraged by this, it would only be beneficial.

A significant increase in the basic amount of the old-age pension to the level of a meaningful flat-rate pension, i.e. to at least 20% of NAE, is an alternative to the integration of the current basic amount of the old age pension into the (nonetheless) strongly Beveridgean “percentage amount”. Such parametric reform can be easily carried out in our country – after the small pension reform when the second bend point was in principle cancelled. We may proceed from the calculation of pensions for earnings exceeding the first bend point: we will multiply the percentage assessment rate of 1.5% per year of insurance by the reduction rate of 26% to arrive at: $1.5 * 0.26\% = 0.39\%$. If this 0.39% rate is applied to earnings up to the first bend point, we will arrive at the conclusion that the basic amount must be increased to some 31% of NAE (see Figure 7). The problem at hand (the meaningful adjustment of the calculation of the basic and percentage amounts of the old-age pension) is thus resolved by a simple parametric reform, which would significantly increase the basic amount and remove the bend points. This technical reform would be most beneficial to recipients of low pensions (or, better said, participants with a personal assessment base up to 44% of NAE). The advocates of “respectable” pensions would be happy. The conditions for the award of old-age pensions would remain the same. In addition to this parametric reform, the minimum amount of the percentage amount of pensions (CZK 770 monthly) could be cancelled and the design of the housing benefit for old-age pensioners could be adjusted accordingly. 31% of NAE under conditions of 2017 represents CZK 8,752 which is almost 80% of the at-risk-of-poverty threshold for individuals, and 105% of the same threshold for pensioner couples. After calculating the percentage amount of the pension, this alternative rationalising the calculation of newly awarded old-age pensions would include its “definitive” adding up to the basic amount of the newly awarded old-age pensions and we would further “work” with the total old-age pension only as in the previous alternative. Should anyone be interested

in the implementation of this rationalisation alternative, we would also prepare a new method of calculating other pensions.

Figure 7: Possible simple rationalisation of pension calculation



Source: author

With the abovementioned results of a potential rationalisation of the current basic and percentage amounts of old-age pensions, a radical systemic solution in line with international pension theory and policy comes to mind: remove the basic amount of old-age pensions from the Czech “pension insurance” into a separate solidary pension pillar: transform the basic amount of old-age pensions (only for insureds who will meet other conditions for entitlement to this pension) to a flat-rate pension for all residents of approximately 31% of NAE (conditioned by, for example, at least 40 years of residence for full pension entitlement). The “remaining” universal social pension insurance will then yield a pension of 0.39% for each year of insurance. This proposal is fully in line with current international pension theory and policy.

The said transformation of the basic amount into a flat-rate pension of approximately 31% of NAE for all old-age pensioners or for all residents (with adequate length of stay or tax history in Czechia) is conceived not to principally change the level of solidarity in the existing basic pension pillar, in its combination with the housing benefit and the social assistance benefit. Public choice could modify the said parameters in both possible directions, by either strengthening or reducing the scope of solidarity, or the insurance principle of equivalence.

Under given circumstances, the social-democratic party may choose – for the already paradigmatic pension reform – one of the two alternatives of the social-democratic regime:

- A flat-rate pension for all seniors at approximately 31% of NAE plus social old-age insurance of the NDC type, or in the form of current defined benefit (DB) product.
- A social old-age insurance of the NDC type (or in the DB form) plus an income-tested (“guarantee”) pension, directly connected to the insurance pension, following the Norwegian example above.

We take the liberty to expect support of a fundamental pension reform aimed at the transition to universal social pension insurance – if possible, without any compromises in the form of the existence of a solidary pension pillar, from a conservative (Christian-democratic) party. The social pension insurance may have a form of NDC or (N)DB, including the so-called point system (Germany, also seen in a deformed shape in Slovakia). From the model perspective, we may imagine a departure from existing universal pension insurance – as, even now we have different conditions e.g. for the self-employed; a separate system might have miners and other groups of employees, civil servants etc. At the same time, we may alternatively expect from a conservative (Christian-democratic) party that it would be interested in the development of occupational pension schemes, mainly on a voluntary basis.

Both social-democratic and conservative (Christian-democratic) parties may be recommended NDC as a system of modern social old-age insurance. In line with international experience, we recommend a one-step transition to the NDC system, while maintaining the existing old-age pension entitlements – not only in relation to the current old-age pension recipients, but also to make the greater pension reforms included in the alternative of a transition to the conservative (Christian-democratic) pension model easier. This transition cannot be achieved through gradual parametric reforms.

A modern liberal party can be recommended – as an initial paradigm reform – a transition to a flat-rate pension for all seniors at 31% of NAE plus social pension insurance of the NDC type. Such a programme would be sufficient for one electoral term; from the content perspective, it is a technical reform. In subsequent periods, the parameters could be adjusted to, for example, the development and needs of the economy.

In addition to the mentioned pension reform alternatives, it will be necessary or desirable to reform the housing benefit as well. The introduction of a flat-rate pension would significantly reduce the room for this social benefit. Even today, seniors use this benefit rarely – most of them are not sufficiently informed about it. Housing benefit needs a reform even now – it is neither rational or dignified to file a request for the allowance every quarter. The senior housing benefit should be a separate allowance, awarded and paid by the provider of old-age pensions for one year always, with an obligation to report significant changes during the year – in line with international experience and practice.

In relevant countries, flat-rate pensions are public expenditure programmes which are regularly evaluated with a view to the fulfilment of their role as the basic pension protection of the elderly in the given state. At the same time, the sustainability of this pillar is evaluated, in the broader context of the sustainability of public finances. This is also reflected in potential adjustments of the flat-rate pension parameters.

Across the world, systems of social pension insurance have undergone changes in recent decades that have strengthened links to life-long earnings, up to the NDC scheme with personal client accounts where valorisation of the paid premiums is performed, e.g. according to the development of the volume of nominal salaries in the economy, until the time when such pension entitlements are converted into old-age pensions using actuarial principles. When reconstructing a DB scheme to NDC, the system is significantly

“cleared” from the different, even only politically motivated “innovations” of DB systems, such as dual statutory retirement ages, connected with dual minimum insurance periods. “From a political economy point of view the NDC pension scheme is by far superior to the traditional pension schemes, just for its rule-oriented institutional characteristics. ... traditional parametric approach allows for discretionary measures, whereas the NDC rate of return is generated directly by economic and demographic factors and there is no administrative discretion involved other than what can be applied to fully funded schemes” (Chłoń-Domińczak & Mora 2006).

At the same time, it must be highlighted that NDC – as a system of universal social old-age insurance – is not isolated from public finances. Fiscal policy may thus significantly influence the accumulation phase of this system through specific parameters of the state budget contributions, particularly for non-contributory periods, but also through general subsidies of the social pension insurance system, as seen in Germany or Poland.

4 NDC: parameters and broader context

In June 2004, a team of experts from political parties was established, with Bezděk becoming the coordinator of the Executive Team for the preparation of documents. The main objective of the independent group of experts is to carry out calculations of the pension reform proposals put forward by the political parties. The Social Democrats propose a shift to a notional defined contribution (NDC) PAYG system. The Christian Democrats and Liberals suggest a parametric reform of the PAYG system and a possibility of partially opting out to a FF system. The Civic Democrats support the introduction of a flat-rate pension, while the Communists would like to continue with parametric reforms of the current PAYG system’ (Mora 2005).

Hájek and Samek, the experts from the Czech Social-democratic Party (ČSSD), proposed to introduce NDC gradually in combination with a minimum pension at 29.45% (from 2040 27%) of NAE. The assignment to the Executive Team counted on increasing the retirement age to 65 years of age by 2030 (men), or 2033 (women). In the projection, the team concluded that there would be a drop in the replacement rate to 27% in 2100. The drop is caused in particular by fixing the statutory retirement age in circumstances of continuously extending life expectancy. The team also explicitly noted that it may be possible that people would postpone retirement with the aim of increasing their replacement rate. Thus, there may be cases of people voluntarily extending their real retirement age, which is promoted by the system through its settings. The longer contributory period will thus fully be reflected in the amount of the assessed pension (Bezděk et al. 2005). The text of the following paragraph is as follows: ‘Approximately 60% of newly granted NDC pensions will be in the long run under the poverty line (approximately one quarter of the average salary in the economy)’. This sentence alone only reproduces the preceding text, but it fails to repeat the fundamental assumptions, that it concerns the end of the century and that the main reason for this is the capping of the retirement age. The artificially increased NDC overhead costs to 2.1% from the pension expenditure might be the secondary reason.

The NDC model or the model of any social old-age insurance as such has no relationship to any specified poverty line. However, an NDC pension is fully dependent on how high the premiums are and how long they will be paid for, under the given economic and demographic conditions.

In recent years, Bezděk has tried to disqualify NDC, referring to the analyses of the Executive Team: 'We considered the NDC system as early as in 2005. This system does not simply turn out well in Czech circumstances, because it would result in an enormous range of the pension amounts, and in addition, it would get the majority of people under the poverty line' (Táborský, 2010). However, nowhere in the world does NDC provide an 'enormous range of pension amounts', as in reality reasonable earnings caps are also used here; the World Bank recommends setting the earnings cap at 150-200% NAE. At the same time, NDC gets nobody under the poverty line, as this is not relevant to NDC; solidarity belongs to the solidary pillar. The NDC system cannot "turn out" badly, the NDC can only be fed with improper parameters and supplements, which precisely happened in projections in 2005. Clearly, increasing the retirement age only up to 65 years of age was an incorrect parameter.

Samek and Hájek argued similarly to Bezděk: 'The option to introduce NDC in the Czech Republic was analysed in detail based on the assignment by ČSSD already by the first Bezděk Commission in 2005 when it emerged that the taking of costly compensatory measures in the Czech Republic (e.g. introduction of the minimum pension) would result in the increased number of very low pensions (below the subsistence level) and thereby to the fall of many pensioners into poverty at the time of the pension award. The new Bezděk Commission took this into account and as a result, decided not to recommend the NDC reform to be deployed in the Czech Republic' (Samek & Hájek 2010).

The combination of a pension fully dependent on earnings or paid premiums with a relatively high minimum pension can be deemed problematic – in principle, the link between the pension and earnings disappears with most of the insured. For example, the means-tested pension benefit in the form of the guarantee pension in Norway or Sweden or similarly designed tested pensions e.g. in Finland or Chile, which obviously do not pose the practical problems argued by Bezděk, are something different. At the same time, 55% of pensioners in Sweden receive a guarantee pension, and in Australia the means-tested pension is received by 75% of the elderly. NDC and other products of social old-age insurance with fully earnings-related pensions may not pose problems in combination with the solidary pillar.

The assignment of the pension reform by ČSSD in 2005, evaluated by the Bezděk team, did not sufficiently correspond to the then state of the art and recommendations by the World Bank. For these reasons, the result arrived at by Bezděk team is irrelevant even today. NDC is a superior product. The second Bezděk Commission was dominated by lobbyists – and they clearly defied the transparent NDC with a relatively low premium rate: they preferred the current non-transparent Czech "pension insurance". The worse are public pensions, the more easily they explain that mandatory private pension savings, based on the principle of equivalence, must be introduced. The treatment of NDC system by the Bezděk team

proves that every model of public (and private) pensions may fail, if it is fed (knowingly or unknowingly) with inappropriate parameters.

The NDC products and schemes have been extensively verified in practice in many countries, among others Sweden, Poland and Italy (Holzmann et al. 2012). Its advantage is that it basically automatically reflects the ageing of population in the amounts of the newly awarded pensions – using actuarial methods, smooth adjustments of pension mortality tables – and thus also the conversion rates used to convert the assets in the personal account into life pensions as a result. The automatic stabilisation mechanism (in excess of actuarial methods) may well provide stability to the NDC system under changing economic conditions (e.g. in times of economic downturn); however, it is already inconsistent with the social-democratic welfare regime (Hippe 2007) – paid (nominal) pensions cannot be reduced under this regime. A strict stabilisation mechanism is applied in Sweden and is currently under review; however, this NDC alternative apparently corresponds with a social-liberal model. In Norway, the NDC system is part of the state budget and the problem is automatically ruled out. The effort to introduce an automatic stabilisation mechanism of the given type would clearly slow down the start of the Czech pension reform, aimed to remedy the “pension insurance”, either towards a “two-pillar” state system of the social-democratic type or towards a “single-pillar” social pension insurance of the abovementioned Christian-democratic type.

Any rationalisation or paradigm pension reform of the Czech public pensions must include the reform of premiums for (social) pension insurance; the new rate must correspond to the chosen welfare regime. We may imagine that the reform of premiums would be undertaken in advance, as part of the labour income tax reform. The taxation of the super-gross wage was also introduced in advance, and the decision regarding the neoliberal pension reform (at least about its basic parameters) had not been made, nor had the necessary one-step wage reform corresponding to the transfer of payment of all premiums to employees been prepared. However, the conditions for the introduction of social-democratic, Christian-democratic and modern liberal models of the financing of public pensions are much easier, as we have a low income tax rate for working activities, and low total premiums paid by employees – moreover, the premiums for health and social insurance may be “swapped” between employees and employers.

The tax reform needed for the rationalising pension reform, consisting of the transition to a flat-rate pension at 31% of NAE and a social old-age NDC scheme, is the easiest one. It follows from our calculations that this reform would only entail reducing the premiums for pension insurance by 11% from the wage, which by coincidence, is today's total rate of premiums for health and pension insurance paid by employees. Thus, there could be even more extensive rationalisation of premiums – “swapping” premiums for health insurance of 4.5% from the wages for premiums for pension insurance of 4.5% from the wage between the employee and the employer and subsequent compensation for the premiums of 11% from the wages paid by the employee, with wage income tax with an increased rate by 11% from the gross wages and simultaneous transition from the taxation of super-gross wages (15%) to the taxation of gross salary (equivalent rate of 20.1%) – so that the total rate of wage income tax would newly amount to 31.1% from the wages, which corresponds to a common level of personal income taxes in Western

countries. The result of this “manoeuvre” would be payments of premiums exclusively by the employer, at the current amount. This tax reform is fully compatible with the social-democratic model of financing social pension insurance, and will not “hurt” others.

It cannot be ruled out that the transition to the NDC system supplemented by a means-tested pension, e.g. following the Norwegian example, will be more “demanding” on premium rates for NDC pension insurance under the same circumstances. However, at present, it is not useful at this point to elaborate a specification, because the public pension system also includes disability and survivor pensions, the concepts of which have not been dealt with. This is crucial if political parties and movements show a principal interest in a rationalising or paradigm pension reform, not to mention that each reform is subject to, for example, coalition negotiations, in which other conditions and objectives of the reform can be set, also in a much broader context.

The implementation of the outlined Christian-democratic pension reform appears to be a more difficult one – it would be a gradual transition to a system of social pension insurance, without a stand-alone solidary pillar. However, we recommend changing the paradigm only into the future – actually, the NDC system can specifically achieve that, and existing pension entitlements would be transferred to the balance of a personal account and the newly accrued insurance contributions would have a corresponding rate. The existing premium rate (28%) should be sufficient here – and in the future, standard corrections will be made anyway. If we were to follow the German example, then the state could finance some solidary elements in social pension insurance, or may even set limits on the total amount of premiums, and replace the missing funds in the social pension insurance scheme by subsidies from the state budget as a result. Regarding the related pension reform, we can imagine that with the current mind-set in the relevant political party, the party would agree to the integration of all premiums paid by the employee into the income tax, and that it would not require a one-off increase of gross wages by half of the needed premiums for social and health insurance (as it would be suitable for a conservative welfare regime). This tax reform also allows an increase in family benefits, including tax credits for children – we consider this to be meaningful and rational, as opposed to the idea of introducing differentiation of premiums for pension insurance by the number of sustained children. As the Germans officially say, family policy is not the job of pension insurance. The reflection of the costs of bringing up children in the design of income tax is fully in line with the Christian-democratic model of this taxation.

5 Occupational pensions and welfare regimes

Occupational pensions are an independent pension pillar in both the social-democratic and conservative (Christian-democratic) pension welfare regimes. In Friedman's “pure” liberal model, occupational systems of all kinds are excluded as a non-effective waste of money – from the perspective of this economic school of thought, individual protection according to the needs and means of an individual is optimal. Employees should protect themselves for old age from their wages. However, in reality, the markets are not ideal in all aspects and it can be explained that liberal politicians in the West also “tolerate” the existence of occupational pensions. Neoliberals place occupational pensions among “private” pension

systems together with personal pensions: for them, it is crucial for there to be mandatory private pension savings, originally in the systemic form of a hard compulsion, then also as a soft compulsion. To push through their theories, neoliberals have altered facts, including that Swiss mandatory occupational pensions (with very strong state regulation and the substantial importance of autonomous pension funds) were declared an alternative to the system of mandatory personal pensions; at the same time, moreover, in the exemplary Chile, the opt-out – voluntarily leaving the public pension system, without an option to return, with a significant role of intermediaries – was the main method of compulsion. Our “pure” liberal, the first Czech Prime Minister Klaus, refused occupational pension insurance for primarily ideological reasons.

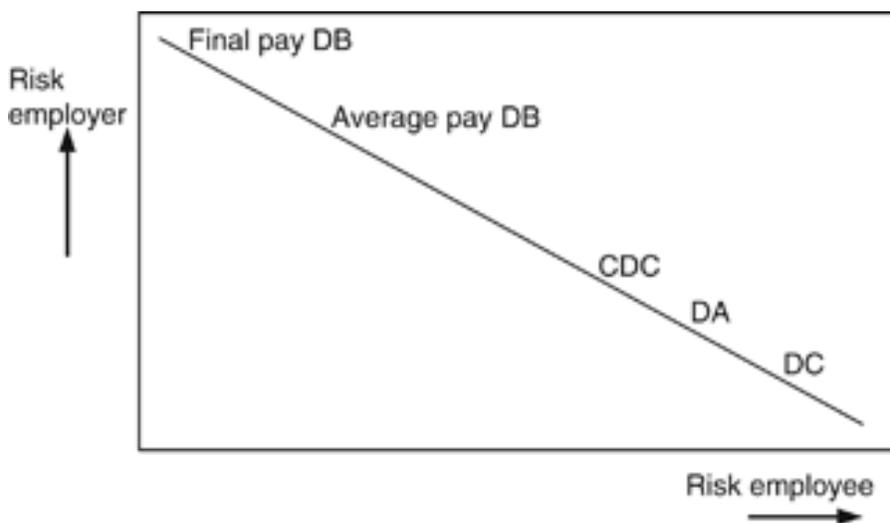
In classic occupational systems of the DB type, the employer or relevant autonomous pension fund is responsible for the fulfilment of pension liabilities. Frequently, these systems are underfunded – they do not have sufficient reserves to cover all future pension entitlements in the sense of actuarial science. In Germany, there is a wide range of occupational pension schemes, with a pension promise, backed by book reserves matched only by company assets, being the most significant system. In many countries, in the spirit of (the prevailing) neoliberalism, there has been a transition to occupational DC systems, in which the employer becomes a “mere” contributor into the system and the investment risk is fully transferred to the employees, in such a form that the employees “may” (or must, in reality) choose from several funds with different model levels of investment risk. Overall, the transition from DB to DC schemes is in line with globalisation tendencies and is relatively beneficial when moving from one employer to another, taking all pension savings that might be used for other purposes to some extent. In the US, the prevailing practice is even such that when leaving the company, the employee may transfer their savings to their individual retirement account. With these reforms, or gradual transformations, there has been a reduction of the overall extent of occupational pensions in these countries – the coverage has reduced from 60% to 50% of employees and rates of contributions of employers in DC systems are about half of those in DB systems on average. The trade unions and some liberal politicians (former British Pensions Minister Webb) do not like these tendencies, and the developments (negotiations) in relevant countries tend towards the application of combined DB/DC systems.

DB products automatically include life-long pensions. In contrast, DC-type systems strictly separate the savings phase (investments) and (a potential) payment of an annuity: the pension savings are accumulated in the personal client account, and upon reaching retirement age, the client may ask for annuitisation of the capital in their account. Historically, occupational pensions “involve” the payment of pension: the transition to a DC system creates conditions not to use annuities as part of the pension system, or pillar, respectively. Usually, this is the common practice, unless – in exceptional cases – stipulated otherwise by state regulation or the agreement of employer and trade union associations. The Netherlands is an exception of this kind, where DB occupational pensions continue to prevail (approximately 90% of participants in this pension pillar have them) and where participants in the DC-type systems must be paid life-long pensions. These old-age pensions are on average 70% of the previous wage of the employee. In addition, there is a flat-rate pension benefit for residents on reaching the age of 65 that

in principle guarantees 70% of the net minimum wage in the Netherlands (Schouten & Robinson 2012), which is approximately 30% of NAE.

The quasi-mandatory Dutch model of occupational pensions has aroused the interest of theoreticians and politicians in many countries. The reason is also that since the beginning of this century, there have been modifications of DB systems of these pensions, and these changes accelerated following the drop in investment yields across the entire world, resulting in the pressure to increase contribution rates for occupational pensions, which would be unbearable for the sphere of business. The main modification has been a limit on current contribution rates being put on the DB system (in 2012, the total average contribution rate was approximately 17.5% from the wages, 11.3% from the wage being paid by the employer) and subsequent partial transition of the investment risk (and risk of long life expectancy) to employees and pensioners. In 2013 the nominal paid-out pensions were even reduced. This – in the opinion of many authors – led to the creation of a combined DB + DC system, or the establishment of a stand-alone collective pension system (Bovenberg & Nijman 2009). There may be a variety of these combined products, or systems – depending on whether the products are closer to DB or DC, or are “somewhere in between”. The two alternatives of these combined products are shown in Figure 8: one product is designated as CDC (collective DC), and the second as DA (defined ambition). The DB product is presented in two alternatives: the historically first product is derived from the final earnings, the newer DB product calculates the pension from the average whole-life (valorised) earnings.

Figure 8: Risk profile of pension products



Source: Schouten and Robinson (2012)

A clear majority of Dutch occupational pensions are collective schemes – in one system, everyone is secured by a single product – no one may select the “fund” and everybody is in one pension fund. This is a classic model of occupational pensions. Limiting or “defining”

the contribution rates to occupational pensions has its systemic logic – these rates cannot be significantly, or “endlessly” increased, with a view to the competitiveness of the (Dutch) economy. A mere limit of the contribution (premium) rate represents a partial shift of the systemic risk to clients; however, as such, it does not mean a change in the insurance technique including the calculation of the pension amount. It is “only” a parametric reform of the DB system. In principle, such reforms may occur “automatically”, according to the degree of matching of retirement entitlements by pension fund assets; we may assume that basically there will always be negotiations between representatives of employees and employers.

6 Occupational pensions: Czech policy

The system of occupational pensions was refused in our country by the Klaus government, not only for ideological reasons, but also due to concerns regarding asset-stripping under the conditions of the insufficient infrastructure of the state regulation of financial institutions. Later rightwing governments continued to refuse occupational pensions, to the extent that there was conflict with the EU that pushed a single EU market in (fully funded) occupational pensions by the so-called Pension Directive (Directive 2003/41/EC on the activities and supervision of institutions for occupational retirement provision / IORPs/). In principle, the Czech government won this conflict, despite implementing the directive by law (amendment to act in 2011) on the activities of institutions of occupational pension insurance from the EU member states ... in the territory of the Czech Republic; with the reservations that these institutions may not be established in Czech territory and they are not entitled to a licence even if they meet all conditions. The state supervision (Czech National Bank) granted the registration, for example, to The VF Corporation UK Pension Plan; however, the activities of this institution are not clear.

The aim of the EU Pension Directive was to develop a single market in pension funds doing business under standard rules of comparable financial institutions – and thus to help to reduce overhead costs. (Therefore, the directive does not concern the main German system of occupational pensions with book reserves only.) Based on this directive, pan-European pension funds should be established, at the level of large international business groups. The resulting effects of the Pension Directive have been insignificant: in 2014 there were 75 active pan-European funds. A review of the directive has been prepared for some years. However, there may be a more significant problem than the EU officials might admit.

From previous times, we have had “retirement pay” and other benefits under special pension systems for professional military personnel, members of the security forces and firemen. In 2004, these occupational pensions were supplemented by an “annuity for the former President of the Republic”, originally designed as “Lex Havel” (as a former dissident, he would have had a low old-age pension, which was in stark contrast with his merits regarding the establishment of the new democratic Czechoslovakia). The annuity of an ex-President is CZK 50,000 monthly; it is not related to their “standard” old-age pension. The annuity resembles a life insurance *sui generis* that corporations purchase for their top managers according to the classic rules of occupational pensions.

The Czech retirement pay is intended for:

- former members of the Police of the Czech Republic, Fire Rescue System of the Czech Republic, Customs Office of the Czech Republic, Prison Services of the Czech Republic, General Inspection of Security Corps, Security Intelligence Service and Office for International Relationships and Information,
- former military personnel of the Army of the Czech Republic.

The basic concept and design of the retirement pay for these two groups of state employees is identical; however the parameters of the “basic amount” and “supplement” of the retirement pay are rather different (God knows why): the basic amount for the first group after 15 years of service amounts to 5%, while for soldiers it is 20% of the average gross salary (GS). The “supplement” is provided for each additional year of service: for the 16th-20th years of service by 6.2% GS for the first group and 3% GS for soldiers; from the 21st year by 2.5%, or 2% GS and from the 27th year of service for the first group and for soldiers already from the 25th year of service, there is a 1% GS supplement. The gross salary is calculated from the salary for the last calendar year, or for the last three calendar years, if this is more beneficial for the recipient of the retirement pay.

The retirement pay is undoubtedly an occupational pension intended for the abovementioned groups of state employees, with financing from standard budgetary expenditures of the relevant departments, as it is common in the civil servant type of conservative pension welfare regime. The retirement pay is designed as a retirement old-age pension, its amount is fully dependent on the final salary and no retirement age is set. The previous “service pay” was paid until reaching the retirement age (of men) of 60 years, and had a character of “a pre-retirement pension” similarly to the temporary supplementary pension of federal employees (FERS Supplement) in the US. Moreover, the current Czech retirement pay is tied to the old-age pension from the basic “pension insurance”: it is paid in a reduced or zero amount once the old-age pension is awarded; if higher, in the amount of the difference between the retirement pay and old-age pension.

The current effort of some of our politicians to reduce unilaterally the retirement age of miners and other professions distorts the existing universal pension system; higher pensions for miners are requested at the expenses of others. Of course, money comes first after all, and we may analyse, for example, the amount of miners' wages and conclude that the wages do not adequately reflect the increased occupational hazards; it would surely be interesting, but we would go back to the previous system where the communist elite (of the more and more problematic quality) tended to decide everything centrally. The system as a whole did not prove successful, and the wages and pensions of miners were no exception in this regard. Whether we like it or not, in large measure this must be left on the market, on the responsibility and agreement of social partners. All miners know and knew (or should have known) what they were going into – and after all, it is always about who paid and spent what, and alternatively whether there is or is not an extreme situation that the industry or company cannot handle alone. Additional increases of pension entitlements may only be part of a phase-out programme of the given industry or region, but not part of a universal pension insurance system. As part of this potential programme, money could be “poured into” a NDC or FDC social insurance (to the pension

accounts of miners), if we had such a system in place. (How many things can a good flexible basic pension system be good for!)

The proposals for the differentiation of the otherwise universal pension protection system, or for subsidising the pensions of miners or similar professions, should definitely be supplemented by analysis of the contributions of the employer for the supplementary pension insurance and private life insurance of miners and similar professions in the last two decades. Since 1995, for example, the Miner Pension Fund Ostrava has been active: in 2005 it had 19,000 clients – employees of the OKD Mining Co. for the most part. The shareholders of the Miner Pension Fund, OKD and Trade Union of Workers in Mining Industry, Geology and Oil Industry sold the fund to the ČSOB Group. It was declared that OKD would continue to provide contributions to supplementary pension insurance to its employees who were clients of the fund, in the same amount as previously (Tománek 2005). The clients of this fund had assets of approximately CZK 1 billion at that time. The Miner Pension Fund Ostrava merged with ČSOB Penzijní fond Progres plc at the end of 2006.

The most suitable solution for the pensions of miners and similar professions is the occupational pension. We may refer to the existing special pension systems for professional military personnel, members of security forces and firemen. The general reasoning for the existence of these special schemes is identical – dangerous and arduous professions are reflected in lower life expectancy. These pension schemes should be financed from contributions by the employers and employees (Zaidi & Whitehouse 2009). The extent to which occupational pension schemes are or should be used is a matter of the pension welfare regime, or the functioning of the labour market.

In developed Western countries, there has been a significant differentiation of systems of occupational pensions: in some countries, the original voluntary and differentiated system, related to segmented systems of basic pension protection, has been kept in principle (Germany, conservative system); in other countries, occupational pensions have become quasi-mandatory on a collective basis (the Netherlands, Sweden, Finland, social-democratic orientation) or have in a way become mandatory based on workplace pensions (Australia, the UK, strongly regulated neoliberalism, or social-liberal system); and last but not least, we have experienced a mix of occupational and personal pensions with robust tax support (the US, neoliberalism). Thus, the differentiation of occupational pensions is also in principle given by state social policy: the choice of pension welfare regime. The collective systems (products) incline towards a segmented social insurance and achieve significantly higher pensions under identical conditions. More or less, neoliberal policy is connected with the high margins of providers of private savings and annuities with an effort to regulate products and to use the entire system of occupational pensions to reduce the overhead costs, to a great extent in line with behavioural economics; this system also tends to include state pension companies as providers of low-cost pensions savings (NEST in the UK).

In our country, occupational pension schemes may, with a relative ease, provide additional protection for hazardous professions, such as mining or the armed forces where the universal pension insurance may be (albeit subjectively) deemed insufficient, for example

regarding a universal retirement age. From the perspective of universalism, we may say mockingly that all exceptions are unnecessary, as social insurance also comprises disability insurance – and it is questionable whether the special needs of miners or soldiers, for example, are (and how) covered by disability, accident or survivor or funeral insurance. It is like this, however: special pension systems also exist in our country, specifically in the form of the abovementioned special retirement pay for professional military and police personnel and firemen, and it is also common abroad. A typical and significant feature of these supplementary systems is the fact that they are financed (fully or to a great extent) by employers, and are fully reflected in the costs of relevant businesses and institutions – the financing is transparent and there is also pressure for economic rationality related to the fact that contributions to social security are part of labour costs and may thus influence, for example, the coal market in the given country or region. Such occupational systems may also serve as a defence against the potentially endless requirements of different, more “risky” professions for pension benefits in the (originally) universal basic pension system. In principle, occupational pensions must be negotiated by employees (or trade unions) with employers – preferably as part of collective bargaining. This policy should be fully supported by parties with social-democratic and Christian-democratic orientation, too.

The major amendment of the Act "on institutions of occupational pension insurance from the EU member states ... in the territory of the Czech Republic" in line with the spirit of the EU Pension Directive may pose a major political issue. These institutions should be allowed to have establishments in the Czech territory, and at the same time, the government should declare that it would be meaningful to establish such institutions directly in our country, mostly in the form of autonomous pension funds providing a single product of a collective type, with a clearly defined ambition in the broadest sense of the word. The subject-matter of the debate may be, for example, the tax regime of occupational pensions – in line with (potential) differences between the social-democratic and Christian-democratic models. Here, it would be useful to clarify beforehand the issue of taxation of (all) pensions which we neglect in this paper.

The “pre-retirement pension” (*předdůchod*) is a slang term for an option to receive a temporary pension from the supplementary pension savings, including the whole state support, up to five years earlier, before the client reaches the statutory retirement age for entitlement to the old-age pension. The minimum amount of a monthly pre-retirement pension is set at 30% of NAE (2017: CZK 8,100). For the term during which the pre-retirement pension is paid (2-5 years), the state pays premiums for health insurance for the client, if the client is no longer employed. When the “pre-retirement pension” is received, one may work, and before filing the request for the old-age pensions, the participant decides whether they want to include income from work from the period when they were receiving the pre-retirement pension.

The idea to introduce the “pre-retirement pension” originated in the trade union headquarters (ČMKOS), with the main purpose being to create an additional mandatory private system of pension protection for miners and those in other physically demanding professions, or for professions classified under the relevant hygienic regulations into the categories III. and IV. of hazard. This should concern approximately 350,000 to 400,000

employees. The contributions to pre-retirement pensions (with payment up to 5 years) ought to be paid by employers (with state support) into a special account with a private pension fund. Therefore, these should be mandatory occupational pensions for a selected group of professions, paid out before the proper old-age retirement, provision reserved for private pension companies. Such a system can be envisaged, and there are some alternatives abroad; generally speaking, an autonomous pension fund or the state could or should be the provider.

The concept of pre-retirement pension approved by the government and parliament has resulted from the tripartite agreement, but there was not much left of the ČMKOS proposal. The pre-retirement pension is not mandatory and applies to all participants in supplementary pension savings. Low volumes of savings in the accounts of pension companies pose major limitations; for a pre-retirement pension for 5 years, one must have at least CZK 486,000 (for 2 years at least CZK 194,400). Therefore, Prouza (2012) rightfully referred to pre-retirement pensions as another scam. Hájková wrote of a “sexy façade”: “At first glance, the setting of pre-retirement pension seems attractive. Just imagine, you can retire five years before reaching the retirement age. If you find yourself in a demanding situation after losing a job or due to worsened physical conditions, you sort things out with a relative ease by applying for a pre-retirement pension. ... Another sexy feature of pre-retirement pensions is the fact that from the health insurance perspective, you will be considered ‘state insured’ and you would not pay health insurance premiums for the term of the pre-retirement. The state will pay for you.” However, her final words are very illustrative: “Originally, the pre-retirement pension should have been intended for those who are not able to work until retirement age due to their physically demanding profession. Now, it will be available to everyone, only if they have enough money. However, this will probably not concern those who work hard (and often earn low wages), which significantly limits their opportunities to generate significant savings) in professions with high physical demands.” (Hájková 2012).

Because of pre-retirement pensions, the “retirement age” has also become more complicated in the third pension pillar: instead of a single and understandable retirement age of 60 years, the age was set using the following formula for individual years of birth: statutory retirement age for men participating in “pension insurance” in the given calendar year less 5 years (in 2017: 58 years + 2 months). This ought to follow the logic of pre-retirement pensions, but this logic would gradually dissipate, because the increasing statutory retirement age of men will reach 65 years and the lower retirement age for the pre-retirement pension would reach 60 years, the current valid early retirement age. Then the original arguments for pre-retirement pensions would become utterly pointless. Based on the proposal of the Association of Pension Companies, the link of the “retirement age” in the supplementary pension savings to the increasing statutory retirement age of men was cancelled – and we returned to 60 years. Nothing would happen if we only reduced this age to 58 years “because of miners” and then it would be clear to everyone that the existing concept of the Czech “pre-retirement pensions” is a bad joke. As of 30 September 2016, 1,585 pre-retirement pensions were paid out. Our recommendation is simple: Do not provide new pre-retirement pensions – it is an unnecessary complication. Occupational pensions cannot be replaced by anything in this regard.

Preferably, occupational pensions should be provided by single-product autonomous pension funds. Outsourcing is possible, of course. In our conditions, it is useful to prepare a sample pension plan and fund compliant with the Pension Directive.

Conclusions

Czechoslovak pensions were highly earnings-related. The reform of 1996 confirmed the liberal policy aiming to equalise pensions. The Executive Team for the reform preparation (2005) analysed each of the political parties' reform concepts. The NDC system proposed by the Social-democratic Party was not sufficiently compliant with the internationally recommended concept and lobbyists keep abusing it to this day, as the fundamental rationalisation of the current Czech system of public pensions prevents them from promoting the neoliberal concept of personal pensions. Discussions of the NDC system confirm that every pension system can be "killed" by improper parameters.

In principle, Czechia has a universal public pension "system" financed from the state budget, which is non-transparent and is in fact an incomprehensible mix of solidary and insurance pillars that may not fall under any standard welfare regime. A rationalisation (technical) reform of this pension pillar in pursuit of its transparency is relatively easy: a) introduce a flat-rate pension at approximately 31% of average national earnings, b) create a universal social pension insurance financed from premiums. Lobbyists and advocates of the "diversification" of the current system of "pension insurance" have strongly opposed any similar rationalisation. Refusal of a paradigm, albeit technical reform of public pensions is and continues to be part of neoliberal policy, or a token of clientelism, as if they were following the thesis "the worse the better": the worse the public pensions, the more mandatory private pension savings are needed, because they are related to equivalence (not solidarity).

There is already a "space" for occupational pensions with regard to the existence of arduous occupations. Autonomous pensions funds cannot be seated in our country, even though they are the easiest solution for specific sectors of the economy (e.g. the mining industry). Their introduction should primarily be strongly supported by the trade unions, as this is part of their "job description".

Generally, it is true that each political party should incline towards one of the pension welfare regimes – and a (potential) government coalition should seek to implement a major rationalising reform based on independent analyses of the current situation of the Czech pension system. A social-democratic party should support universal NDC social insurance, a solidary pension pillar, including annual housing benefit for seniors, and occupational pensions based on collective agreements. A modern liberal party should be oriented towards a flat-rate pension supplemented by a means-tested benefit for seniors (including housing benefit) and respect the existence of a supplementary pillar of social insurance or occupational pensions. The conservatives (Christian democrats) should support fully earnings-related social pension insurance, supplemented by occupational pensions and last but not least by a more effective social assistance benefit for seniors and annual housing benefit for the elderly. Other parties should in principle choose any of these concepts

(modern liberal, social-democratic or Christian-democratic). The neoliberal pension welfare regime should “satisfy” only a few (involved) private financial companies; it is ineffective from the point of view of the national economy.

The minimum programme, suitable for all parties and movements, is the rationalisation of the existing system, which is desirable for the sake of the comprehensibility of the system. This includes the removal of the two pension “amounts” that exist in parallel, and the merger of the wage income tax and premiums paid by employees which is facilitated by the current prevalent solidarity in the Czech pension “insurance” (which is *contradictio in adiecto*). If the parties and movements represented in Parliament find the courage to implement a paradigm reform of Czech public pensions then we may – in line with international recommendations – advise a transition to a modern system of NDC social insurance. Gradual, parametric reforms of defined benefit systems of social pension insurance usually bring nothing, because the energy required for the reform is “spent” in endless debates about the reform of individual parameters.

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On the European Sovereign Debt Crisis, or Why not Leave the Euro Area

O evropské dluhové krizi aneb proč neopouštět eurozónu

MOJMÍR HELÍSEK

Jean Pisani-Ferry: *The Euro Crisis and its Aftermath*. Oxford University Press, Oxford 2014. 206 pp.

The book will grab your attention with the title “The Euro Crisis” alone. What is the crisis all about? Is the euro going through a period of crisis? How is the crisis manifesting itself? Are investors showing distrust in the euro; are they getting rid of the euro? As the reader will learn in the very first pages, it is not a “euro crisis” in the sense of a “currency crisis”. By the “euro crisis”, the author means the “European sovereign debt crisis”.

The book consists of four parts. The first part primarily deals with the creation of the euro, with the first chapter dealing with the emergence of the debt crisis itself. The second part describes the first decade of existence of the European currency and the emergence of the imbalances leading to the crisis. The third part discusses the response of policy-makers to the crisis since 2010, and describes, among other matters, why the indebted countries should not leave the euro area. The fourth part offers options on how to reform the euro area and put an end to the crisis.

The title of the first part, “Bare-Bones Utopia”, signals the author's unbiased attitude towards a single European currency. The first chapter of this part describes the growing difference between the Northern and Southern regions of the euro area. While the Northern states have been increasing savings, the Southern states have been increasing debt. This resulted in the debt crisis, to which the euro area responded by introducing safety mechanisms. The following chapter starts with the following: ‘The euro was the last utopia of the 20th century... It was something that had never been created before: a currency that did not rely on a state or on a commodity’. The euro was implemented despite the warnings of academic economists that Europe is not an optimal currency area. Why? For three reasons. First, exchange rate volatility ceased to exist and competitive devaluations with it. Second, a single monetary policy with single interest rates resulted in reduced strong movements of capital between countries. The third reason was a political one, being the condition that German unification (and making Germany stronger as a result) could only happen if European integration was made closer by introducing a single currency.

The next chapter of this part explains the conditions under which the European Central Bank (ECB) was established. Germany agreed that it would only share the single currency on condition that this currency was subject to the German model of monetary policy. The first requirement was that the ECB, following the example of the Bundesbank, would be fully independent, as opposed to, for example, the Banque de France, which was merely a branch

of the Ministry of Finance. The second requirement was the determination of the monetary policy objective as price stability, and not for example exchange rate regulation on top of that, as proposed by France.

The remaining chapters of this part deal with the discussions held before the introduction of the euro. What should the political arrangement of the future euro area be? Should it be a federation of nation-states or a political union? The euro was eventually created without significant political foundations. It was logically bereft of any mechanism for solidarity between countries. Nor was the creation of the euro accompanied by improved economic cooperation. Therefore, the author calls the euro “the orphan currency”.

The second part of the book has the title “Crises Foretold, Unexpected Crises”. The opening chapter of the book describes the economic development of Germany in the first ten years following the introduction of the euro. In the beginning, Germany was a country with a sharp current account deficit in the balance of payments, while France posted a strong surplus. At the end of the period, it was the other way around, the reason being internal structural changes. Germany adopted a drastic reform of the labour market (Agenda 2010); consumption grew slowly and savings posted fast growth. The introduction of the euro and removal of the foreign exchange risk facilitated the circulation of these savings in the euro area (from the North to the South) and the emergence of external deficits and surpluses as a result. The German economy also influenced the anti-inflationary monetary policy of the European Central Bank. The low German inflation, which had a significant impact on average inflation in the euro area, led to the ECB’s low interest rates. With low interest rates, credit in the South (particularly Greece, Spain and Portugal) was not held in check.

The debt crisis sprang up in spring 2010 when the negotiations started between Greece and three major players (the “Troika”), the European Commission, International Monetary Fund (IMF) and ECB regarding the provision of debt relief to the Greek government. The crisis exposed other two dangers. First, it was not only about public debt. In the case of Ireland and Spain, the private sector, more specifically, the default of banks, was the main reason behind the debt. Second, a debt crisis can emerge quickly, as was the case with these two countries which had posted low public finance deficits for many years. In Spain (which is dealt with in a separate chapter), low interest rates resulted in an increased demand for mortgage loans and a bubble in the real estate market.

Rather surprisingly, the author claims that France is the country to “celebrate” most the introduction of the euro, for three reasons. First, the euro put France on par with Germany; second, the euro helped to weaken the international role of the US dollar, which had been systematically criticised by France; third, it was the success of a ten-year French diplomatic effort. However, neither France nor Italy could keep public debt down. The final chapter of this section deals with the financial markets. It has an apt title: “The Dogs that Did Not Bark”. Market judgement could still be expressed by interest rates on long-term government bonds. Interest rates should have continued to reflect risk. However, this was not the case, for three reasons. First, the euro’s first decade was dominated by the search for yield. Second, assessing a state’s long-term solvency is costly. Third, investors believed that in the unlikely event of crisis, the euro area’s member states would put together some type of rescue operation.

The third part of the book, entitled “Agonies of Choice”, deals with responses to debt crisis. First, it describes the debt relief provided to Greece by the IMF and via EU mechanisms (the European Financial Stability Facility and European Stability Mechanism). The author explains the reasons for this aid: ‘The leaders were aware that the stability of their own financial systems ... crucially depended on the fate of countries that, until then, had seemed economically insignificant’. Thus the aid continued. Ireland, Portugal, Cyprus and Spain followed. One can only agree with Pisani-Ferry’s explanation.

In the next phase of the debt crisis, when aid had been provided by both the IMF and the EU, the following issue arose at the turn of 2010/2011: should private creditors (banks) also be involved in the financial aid by writing-off a portion of government debts? The so-called debt restructuring (also referred to as “private-sector involvement”) was declined, mostly, under the influence of the ECB. The ECB’s arguments were threefold: government bonds must be considered more reliable than private bonds; fear of contagion – Ireland, Portugal and other countries would proceed in the same manner; debt restructuring is a developing-country syndrome – it must not be connected with a serious state. In the case of Greece, a compromise in the form of reducing interest rates from official loans, the provision of further loans and a call to private creditors to extend the maturity of loans was adopted. A partial write-off of receivables in the private sector (banks) occurred in 2013 with regard to the state debt of Cyprus.

The following chapter describes the spread of the debt crisis into other countries, particularly France and Italy. By “debt crisis” the author means the development of interest rates: spreads vis-à-vis interest rates on German bonds were on the rise. In addition, a massive capital outflow from banks in the South of Europe occurred; banks from the North preferred to deposit their surplus liquidity in the ECB. In the chapter “Redemption Through Austerity”, the author goes on to describe further steps aiming to resolve the debt crisis. More specifically, he means the “Fiscal Compact” of 2011 (with the UK and the Czech Republic being the only states not to join) and the long-term refinancing operations (LTRO) programme announced by the ECB.

The final chapter of this section reflects on so-called “internal devaluation”. Countries with high production costs (Greece, Ireland, Portugal, Spain, Italy and France to name a few) may not compete with Germany and other Northern European countries. If they had their own national currency, they could devalue it. However, this is not possible now. If they want to improve their competitiveness, there must be a drop in prices and wages in their economies. Both Latvia and Ireland employed this method successfully. But they are small open economies. However, Greece and Portugal are closed economies. In addition, large economies such as Spain, Italy and France have a low share of export to GDP.

This raises the issue as to whether it would not be better for some countries to leave the euro area. Pisani-Ferry explains four obstacles to leaving the euro area. First, there are *legal obstacles*.¹ The Treaty of Lisbon specifies conditions for leaving the European Union, not

¹ *Since the 19th century, 67 monetary unions have collapsed. In this connection, the author also mentions Slovakia, which was in union with the Czech Republic ‘until Czech prime minister Vaclav Klaus pushed them out.’*

the euro area. It is not clear whether a country that has left the euro area may continue to be a member of the EU. Second, there are *technical obstacles*, such as printing new bank notes, the reconfiguration of IT systems and so on. Third, the *economic obstacles* of leaving the euro area are the most critical ones. A country that introduced a new national currency would have an intention to perform controlled devaluation. However, the credibility of such a currency would be extremely low, and its significant devaluation may occur. This would result in price increases and the massive impoverishment of households and firms, and also a strong rise in interest rates. Fourth, there are *financial obstacles*. As of now, all existing assets and liabilities are denominated in euro. Newly, they would be redenominated in the new currency – or not. There are no established legal principles for converting financial assets into another currency. If debts are still payable in euro, and the devaluation of the new currency will take place, debts will grow unbearably. In my view, these four explanations for why not to leave the euro area are the greatest contribution of the reviewed book. The author also does not recommend splitting the euro area in two parts – “neuro” and “sudo”. The collapse of the euro area would result in the greatest turmoil since the end of World War Two.

The fourth and last part of the book offers “The Repair Agenda”. The first chapter of this part deals with the unequal development of countries from the North and South (including France). The countries in the South are less competitive, more indebted (both with regard to public and private debt) and produce less added value. What should the monetary policy of the ECB be? An expansive policy would depreciate the euro exchange rate and support export from the countries in the South. However, at the same time, this would result in investors’ distrust towards European assets. Fiscal policy seeks a solution on how to deal with the requirements of low deficit and debt on one side and the support of the private sector on the other. Transfers through “Structural and Cohesion Funds” from the EU budget may be one potential solution. Funds from the European Investment Bank and European Bank for Reconstruction and Development that may help with for example privatisation programmes can also be used to support development in countries in the South.

A description of two models for reducing the unemployment and external deficit of Southern countries is also worth noting. The first model is the *agglomeration model*. This consists of the concentration of manufacturing and other economic activities in certain areas to which people would move for work. This would have to be accompanied by the unification of social rights (particularly pension protection), free movement of capital, and finalisation of a full banking union. This would naturally lead to big differences in GDP per capita. The *rebalancing model* is the second model. In this case, the work would move to the people. Structural Funds would be used to revitalise the South. There would be a convergence in GDP per capita, and at the same time a lower average GDP per capita across the entire euro area. The author concludes that regardless of the current financial problems, the euro area is confronted with deeper choices about its type of economy.

The next chapter deals with a description of how the banking union (which should reduce the risk of banking crises) was created. The author also deals with an option to issue “eurobonds”. These are government bonds that would be issued and guaranteed by a debt agency, the liabilities of which would be guaranteed collectively by the euro area countries. This is followed by an analysis of the EU budget, to which member states make

a contribution of 1% of GDP. This budget has no stabilisation function, as opposed to the US federal budget. The author notes that the attitude of European leaders is unclear in this regard. A short chapter deals with the international position of the euro. The last chapter ("Governance Reform") notes that Europe's governance is ineffective. It is not an executive, but an institutional problem, as the Maastricht Treaty was not drafted to deal with crises. The author also asks the question: should the euro area have a federative arrangement? Answer: In the long run this would certainly be the most fitting solution.

In the Conclusion, the author formulates questions addressed (implicitly) to European leaders. First: is the euro area willing to extend the integration of labour, product and capital markets? Second: is the euro area willing to fundamentally redesign its fiscal system and introduce risk sharing? Third: is it willing to allow redistribution through a transfer mechanism? Fourth: is the euro area willing to implement an institutional reform that would result in more effective decision-making? These questions were raised by the euro crisis. The future of the euro area is dependent on how they are resolved.

The former minister of finance of the USA, Larry Summers, evaluates the book using the following words: 'This is must-reading for anyone who cares about Europe's future'. We may fully agree with his opinion.

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Editorial

Editorial

JAROSLAV VOSTATEK

Dear readers,

Issue 1 of Volume 11 of our journal includes four papers from different sections of economics, within the broad context of the social sciences, three of them using econometrics and IT solutions.

Our first article was elaborated by three Spanish economists (Gonzalo Sanz-Magallón-Rezusta, Manuel M. Molina-López, Pilar Melendo-Matías), two of whom are engaged at a prestigious private Catholic San Pablo CEU University in Madrid (founded in 1993) and the third at the Carlos III University in Madrid. The name of their article, *Economies of Scale in Private and Charter Spanish Schools Under an Ownership and Management Perspective*, covers the Spanish material that they analyse, but the coverage of the paper is much wider – the overview of the literature includes many results of analyses of economies of scale in primary and secondary education abroad, almost exclusively from the US, published in American scientific journals. The question is, of course, the comparability of American and Spanish primary and secondary schools. The article attracted my attention to such an extent that I considered it useful to learn more about the concepts of Spanish and American primary and secondary education; both concepts are based on the right (of parents) to choose the type of school their children attend. An essential difference between the US and (post-Franco) Spanish schools is noticeable with the charter schools: whereas in the US, the public support of religious schools is impossible (it is contradictory to the Constitution), in Spain, charter schools (*concertados*) are religious schools (with few exceptions), namely Catholic schools.

Our second article, *Digital Possibilities of Internal Audit*, was written by Václav Kupec (University of Finance and Administration). The paper proves the high digital potential of internal audit in the sphere of marketing, which is an important part of business management, including the formation of the firm's strategy. The results that are presented draw on the Delphi analysis of significant risks (information risk, strategic risk, risk of inefficiency, legislative risk). This analysis is followed by possible approaches to digital audit which can effectively detect the aforementioned risks.

Our third article, *The Value of the Firm in Dependence on Technological Shocks – the Czech Republic Case*, was written by Petr Makovský (University of Economics in Prague and Czech Technical University in Prague). The author proves, using the data sample of the Czech economy, that the neoclassical theory of investment does not sufficiently explain the market value of Czech firms. He uses a range of sophisticated methods to discover the impact of technological shocks on this market value under Czech conditions.

Our final article, *Czech Public and Occupational Pension Schemes and Reforms*, was written by Jaroslav Vostatek (University of Finance and Administration). This article aspires primarily

to present an analysis of the Czech Beveridgean public pension pillar as exploitable for its paradigm reform. The reform is necessary because of the complexity of this pillar which makes it unclear for its participants; a simple technical reform is nevertheless feasible. Quite unnecessarily, it is not permitted to set up occupational retirement schemes, which complicates the social security of special professions.

In the section *From New Economic Literature* you will find a review of the book by Jean Pisani-Ferry: *The Euro Crisis and its Aftermath*. Our reviewer is Mojmír Helísek (Vice-President of the University of Finance and Administration).

Jaroslav Vostatek

Scientific Editor of the ACTA VŠFS journal

Vážení čtenáři,

první číslo již 11. ročníku našeho časopisu obsahuje čtyři vědecké příspěvky z různých oblastí ekonomie, v širokém kontextu společenských věd; tři z nich využívají ekonometrie a IT.

Náš první příspěvek vypracovali tři španělští autoři (Gonzalo Sanz-Magallón-Rezusta, Manuel M. Molina-López, Pilar Melendo-Matías), z nichž první dva vyučují na prestižní soukromé, katolické univerzitě CEU San Pablo (Svatý Pavel) v Madridu (založené v roce 1993) a třetí z nich pracuje na madridské Univerzitě Carlose III. Název jejich příspěvku *Úspory z rozsahu v soukromých a charterových španělských školách na pozadí vlastnictví a managementu* postihuje analyzovaný španělský materiál, nicméně záběr článku je mnohem širší – v přehledu dosavadních studií na dané téma se uvádí mnoho výsledků analýz úspor z rozsahu v základním a středním školství v zahraničí, téměř výhradně z USA, publikovaných v tamních odborných časopisech. Otázkou je porovnatelnost amerických a španělských podmínek. Článek mne zaujal do té míry, že jsem považoval za účelné se více seznámit s koncepcí španělského a amerického základního a středního školství; obě koncepce vycházejí z práva (rodičů) na volbu typu školy pro své děti. Podstatný rozdíl mezi USA a Španělskem (po odstranění frankistického režimu) je patrný u charterových škol: zatímco v USA je vyloučena státní podpora církevních škol (je v rozporu s ústavou), ve Španělsku jsou tamní charterové školy (concertados) až na výjimky školami církevními, konkrétně katolickými.

Druhý příspěvek *Digitální možnosti interního auditu* napsal Václav Kupec (Vysoká škola finanční a správní). Článek prokazuje vysoký digitální potenciál interního auditu v oblasti marketingu, který je významnou součástí řízení podniků, včetně tvorby strategie firmy. Prezentované výsledky využívají metodu DELPHI k analýze významných rizik (informační riziko, strategické riziko, riziko neefektivnosti, legislativní riziko). Poté následuje rozbor přístupů k digitálnímu auditu, který může efektivně odhalit zmíněná rizika.

Třetí příspěvek *Hodnota firmy v závislosti na technologických šocích – zkušenosti z České republiky* napsal Petr Makovský (Vysoká škola ekonomická v Praze a České vysoké učení technické). Autor dokazuje na vzorku údajů z české ekonomiky, že neoklasická teorie investování dostatečně nevysvětluje tržní hodnotu českých firem. K nalezení efektů technologických šoků na tržní ocenění firem v českých podmínkách používá řady sofistikovaných metod.

Poslední příspěvek *České veřejné a zaměstnanecké penze a jejich reformy* napsal Jaroslav Vostatek (Vysoká škola finanční a správní). Aspirací článku je především analýza stávajícího českého beveridgeovského veřejného penzijního pilíře, využitelná pro jeho paradigmatickou reformu. Nezbytnost reformy je dána již samotnou složitostí tohoto pilíře, která jej činí nesrozumitelným pro jeho účastníky; jednoduchá technická reforma je přitom snadno proveditelná. Zcela zbytečně není umožněno zakládat zaměstnanecké penzijní fondy, což komplikuje systém zabezpečení speciálních profesí.

V oddíle *Z nové ekonomické literatury* naleznete recenzi knihy, kterou sepsal Jean Pisani-Ferry a která nese název *The Euro Crisis and its Aftermath* (Krise eura a její dozvuky). Naším recenzentem je Mojmír Helisek, prorektor Vysoké školy finanční a správní.

Jaroslav Vostatek

Vědecký redaktor časopisu ACTA VŠFS

Economies of Scale in Private and Charter Spanish Schools Under an Ownership and Management Perspective¹

Úspory z rozsahu v soukromých a charterových španělských školách na pozadí vlastnictví a managementu

GONZALO SANZ-MAGALLÓN-REZUSTA, MANUEL M. MOLINA-LÓPEZ,
PILAR MELENDO-MATÍAS

Abstract

This paper investigates economies of scale in primary and secondary Spanish schools, distinguishing between ownership (private/charter school) and management (non-religious/religious). We have used the *Survey of Private Education Funding* and considered both the number of students per school unit (class) and the total number of students enrolled at the school. The overall results show that unit cost per student in smaller centres is around 45% higher than the average and nearly 20% lower than the average in schools with between 1,000 and 1,400 students enrolled. These larger schools had the lowest overall cost per student. As far as ownership is concerned, private schools show an average cost per pupil around 20% higher than charter schools, due to their higher average cost per teacher and lower student unit/teacher ratio. In both private and charter schools, size also influences a school's economic performance, private schools being more greatly affected. The possible influence of school size and class size on Spanish student performance in PISA 2009 is also studied.

Keywords

economies of scale, cost, efficiency, school organisation

JEL Codes

H7; I2; M21

Abstrakt

Článek zkoumá úspory z rozsahu ve španělských školách prvního a druhého stupně s rozlišením vlastnictví (soukromé/charterové školy) a managementu (necírkevní/církevní). Využíváme "Přehledu financování soukromého vzdělávání" a bereme v potaz jak počet studentů na školní jednotku (třída), tak také celkový počet studentů zapsaných na škole. Celkové výsledky ukazují, že jednotkové náklady na studenta v malých sídlech jsou okolo 45 % vyšší než průměr a téměř o 20 % nižší než průměr ve školách, v nichž je zapsáno 1 000 – 1 400 studentů. Tyto větší školy měly nejnižší celkové náklady na studenta. Pokud jde o vlastnictví, soukromé školy vykazují průměrné náklady na žáka asi o 20 % vyšší, než

¹ A previous version of this paper was presented at the Spanish Association of Economics of Education Conference held in Badajoz in 2016. The authors appreciate the feedback received.

charterové školy, a to v důsledku jejich vyšších průměrných nákladů na učitele a nižšího počtu studentů na učitele. V obou školách, soukromých i charterových, má velikost také vliv na jejich ekonomickou výkonnost, přitom jsou tímto více ovlivněny soukromé školy. Předmětem analýzy je také možný vliv velikosti školy a třídy na výkonnost španělských studentů vykazovanou v PISA 2009.

Klíčová slova

úspory z rozsahu, náklady, efektivnost, školní organizace

Introduction

The optimisation of resources and the pursuit of economic efficiency have become indispensable in the current economic climate. In this context, economies of scale, which are characterised by generating a cost reduction per unit of input while output increases (Mankiw 2001), are the most decisive factor. It should be pointed out that some events that are not under the control of the company may generate economies of scale. It is thus clear that productive factors are those that decrease the average cost per unit while production increases, being directly related to increasing production capacity and the savings they provide in terms of costs.

Economies of scale are usually considered in reference to industrial firms, but can also be applied to service companies such as hospitals (Ramirez 1992; Riha et al. 2013) or schools. In the educational field, economies of scale have been of special interest in the cases of for-profit and charter schools (Rosenfeld 1977; Butler & Monk 1985; Roomkin & Weisbrod 1999; Andrews et al. 2002). Nevertheless, the topic of economies of scale has not been treated in depth in the field of economy of education (Tholkes & Sederberg 1990; Leithwood & Jantzi 2009).

Most existing studies have looked at ways in which private schools can minimise costs, focusing primarily on the existing investigation in the US. Although education is a basic service of our welfare system, these profit schools are private companies that seek to minimise costs, and it may be useful for them to achieve economies of scale. Other studies have analysed the effects on government-financed private schools (charter schools) and public schools (Butler & Monk 1985; Andrews et al. 2002; Ketchum & Slate 2012).

The total number of students enrolled is one of the most frequently studied variables when investigating economies of scale in the educational sector (Rosenfeld 1977; McGuffey & Brown 1978; Butler & Monk 1985; Andrews et al. 2002; Riha 2013). This criterion should not be analysed in isolation, because other aspects of a school's organisation can also have a decisive influence (Morris 1964; Faber 1966; McGuffey & Brown 1978; Lubienski 2001; McEwan 2001; Lubienski 2005).

What is more, the differences between religious and non-religious schools have not been considered when talking about ways schools can minimise costs (Lubienski 2005). This paper will analyse the characteristics of primary and secondary private schools when trying to minimise costs, distinguishing between private and charter schools, and also considering whether the school is run by a religious entity or a corporation. For this

purpose, microdata reflecting the financial situation of the Spanish private school sector will be analysed.

1 School characteristics and their contribution to economies of scale

The number of students enrolled is one of the most frequently studied aspects of economies of scale in this field. There is, however, little agreement about the most suitable number in terms of increasing profits. Butler and Monk (1985) conducted one of the first analyses of economies of scale and efficiency of public schools in New York State. They made a distinction between small districts, with fewer than 2,500 students, and large districts, with over 2,500. The results showed that significant economies of scale were achieved when the number of students increased. Nevertheless, this only occurred in small districts, and within them, specifically in smaller schools. Previously, Turner and Thrasher (1970), in a study that included schools with up to 3,000 students, also noted that the cost per student was at its lowest after reaching 1,000 students enrolled. According to these data, Fox (1981) maintained that the ideal size of a school was between 1,000 and 2,000 students, due to the fact that schools with fewer than 1,000 students had a higher cost per pupil.

Nevertheless, Monk (1987) concluded that after reaching 400 registrations, schools did not benefit from economies of scale. Similarly, Andrews et al. (2002) observed that economies of scale were achieved in districts with between 2,000 and 4,000 students, but never in those with more than 6,000. At this level of enrolment, the opposite effect, diseconomies of scale, was observed. Chakraborty et al. (2000) concluded, after studying public schools in Utah districts, that economies of scale existed in larger districts and schools and that cost reduction may be achieved when the number of students enrolled increases.

As far as the relation between rural schools and economies of scale is concerned, several analyses have been made. Tholkes and Sederberg (1990) reviewed studies looking at economies of scale and rural schools, taking into account different aspects that tend to affect rural communities. Hickey (1969) presented consolidation of schools as the best way to achieve more efficient administration. Rosenfeld (1977) concluded that larger unified schools were found to have a larger percentage of costs defined as administrative costs than smaller unified schools.

In order to explain the schools' cost reduction factors, Morris (1964) hypothesised that larger schools offer broader educational programmes which, according to him, could be behind the cost reduction per student. Like previous authors, he found that schools with fewer than 500 students had a higher cost per student than larger ones. However, this figure reached a low point when the total number of students enrolled reached 1,000. Bowles and Bosworth (2002), after analysing 17 schools in a district of Wyoming, concluded that an increase of 10% in school size leads to a decrease of 2% in total cost.

Most studies focus on the relationship between total cost and school size (Andrews et al. 2002; Newman et al. 2006) without considering other school factors. Related to this issue,

it is important to point out that these analyses of economies of scale can be subjected to various types of bias. Other researchers have taken a different view of economies of scale, focusing on other factors that may influence them, such as the organisation of the school (Huang and Howley 1993; Ketchum & Slate 2012).

Lubienski (2001) discovered that smaller schools had disadvantages in the field of innovation in comparison to the largest ones. According to his study, charter schools have the ability to encourage innovation in education. After a review of practices in these schools, he concluded that large schools use innovation in organisational terms: however, the strategies used in the classroom did not reflect this. The conclusion emphasised that when having to choose between innovation opportunities in education or pedagogical and curricular strategies, the latter prevail. Later, Lubienski (2005) suggested that for-profit schools spent part of their organisational resources on marketing strategies instead of redirecting them to students or faculty. Due to the private nature of these organisations and the competitive pressures they are subjected to, these for-profit schools develop marketing strategies rather than structural and organisational reforms.

Another aspect that could influence economies of scale is directly linked to the size of the facilities (Lubienski 2005). McGuffey and Brown (1978) analysed the relationship between school size and the cost of use of the facilities. They found that large schools made better use of their space and incurred lower operational costs than small schools.

As for-profit schools and charter schools seek financial profit, it is important to analyse whether this has any impact on student academic performance. This issue has been studied by several authors (Monk 1987; Huang & Howley 1993; Greenwald et al. 1996; Chakraborty et al. 2000).

Ramirez conducted a review of the available literature on this topic in 1992 and found that the differences between academic progress made by students in small and large schools were not significant. Nevertheless, there have been dissenting conclusions in both directions. Cotton (1996) reviewed 31 studies which identified the relationship between school size and academic achievement. He concluded that the best size for primary schools was between 300 and 400 students and between 400 and 800 for secondary schools. Greenwald et al. (1996), after reviewing 60 studies, concluded that academic performance was inversely related to the size of the school. Once again, academic performance was better in smaller schools. Ketchum and Slate (2012) analysed the relationship between the size of secondary schools and the academic achievement of students with financial problems in the state of Texas between 2005-06 and 2010-11. They concluded that these students had better marks in smaller schools, considering the ideal size to be between 600 and 900 students.

Nevertheless, it would seem that no clear conclusion has been reached. Some authors have come to the opposite conclusion, maintaining that students have better academic achievement in large schools (Morris 1964; Rosenfeld 1977; Huang & Howley 1993; Greeney & Slate 2012). Slate and Jones (2007) examined the relationship between school size (small, fewer than 400 students, medium, between 800 and 1,199, and large, 1,200 students or more) and the performance of Hispanic students in Texas. Analysing the

results of tests in different subjects, students enrolled in large schools had better marks in algebra and history, but students from small schools did better in English and Biology. Riha et al. (2013) repeated the study relating the size of the school (small between 100-499 students, 500-999 medium and large from 1,000 students) to the academic performance of the Texas Hispanic students from 8th grade between 2005-06 and 2009-10. The results corroborated previous study data, showing that the academic performance of students in larger schools was better. Similar conclusions were obtained by Huang and Howley (1993). After applying a multivariable regression analysis, in which they included not only school size variables but also others such as school resources, school environment and academic background, they concluded that students' academic achievement in small schools was worse than in large schools. Iatarola et al. (2008) studied the effect of small schools on student achievement in New York City, reaching similar conclusions.

Greeney and Slate (2012) analysed the relationship between school size and other variables (class attendance, dropout rates and rate of completion of studies) in Texas Hispanic students between 2003-04 and 2008-09. They concluded that there were no significant differences in the cases of school size, class attendance and dropout rate. Nevertheless, completion rate was higher if these students were enrolled in small schools.

2 Objectives and methodology

The main purpose of this study is to determine the existence of economies of scale and the effects of size in primary and secondary for-profit and charter schools in Spain. Private schools are those owned by a legal person or a company, while charter schools are private corporations supported with public funds under regulation in Spanish law (L.O.D.E. 1985).

According to the sample, the following aspects were analysed:

- Estimate of the minimum efficient school size.
- Analysis of what kind of entity (corporation or religious entity) manages schools better in terms of cost.
- Study of regional disparities in Spain in relation to average school size and costs per student.

That is why the main objective is to analyse the relationship between the number of students enrolled in the centre and its cost function, distinguishing between for-profit and charter schools, as well as by the school management (corporation or religious entity) and the characteristics of the region in which the school is located. The optimal number of students enrolled (threshold) will be also studied.

The analysis will be based on microdata from the *Statistics of Financing and Expenditure of Non-university Private Education in 2009-2010*, prepared by the National Statistics Institute (INE), a sample which contains information for 7,559 Spanish private and charter schools.

In Spain, the different stages taught by schools are kindergarten, primary education, secondary education and high school (*bachillerato*). The earliest, preprimary stage of education (kindergarten) is usually provided by specialised centres, such as nursery schools, as this stage is not offered by many schools.

The sample has been divided between preprimary centres and the rest, which include primary, secondary and high school education. This second sample of the mean is the one chosen for the present study.

Several linear regressions were applied in the analysis. The independent variable chosen was the number of students at the school and the dependent ones were the total costs of the centre, spending on transportation, fungible material costs, educational personnel costs, non-teaching staff costs, canteen expenses, living expenses and cleaning services. The applied equation was:

$$A_i = C + \beta_{1ALUMNO} + \beta_{2ALUMNO*ALUMNO} + u_i \quad (1)$$

where A_i is the dependent variable, $\beta_{1ALUMNO}$ the number of students at the school and $\beta_{2ALUMNO*ALUMNO}$ the squared number of students.

At the same time, and although it is not the main objective of this research, the relationship between the results obtained by students in PISA 2009 and school size was also analysed using the Hanushek production function (1979). A multilevel regression was applied (Choi et al. 2013; Agasisti 2013), estimating the results using the techniques recommended in the *Data Analysis PISA OECD Manual* (2009), which involves making estimates from five plausible values and eighty replicates of each student.

PISA 2009, whose sample includes 25,887 fifteen-year-old Spanish students, incorporates different variables that can affect student achievement. The assessed competencies are mathematics, science and reading. PISA 2009 is characterised by large international participation (74 countries compared to 32 in 2000) and a greater consolidation of the regional analysis, allowing a broad comparison within the country. Thus, in PISA 2000, Spain participated as a single state sample, while in 2009 all except three regions took part.

3 Average size of Spanish schools

As there are no specific statistics which would make an international comparison of average school size possible, we used the information contained in PISA 2009. From the values of each country according to this source, we identified five groups of countries according to the size of their schools. The function of k-means clusters from the IBM SPSS statistical software version 19 was used, as shown in Table 1.

Spain is situated within the largest group formed by 29 countries including Japan, Germany and Belgium, and with an average value of 657 students per school. Groups of countries with smaller schools, 473 students on average, include most of the Nordic

countries (Denmark, Sweden and Finland), while at the opposite pole are the three regions of China, Thailand and UAE, with an average value of about 2,500 students per school. Other Asian economies such as India, Malaysia and Singapore, together with the US, are in the group of countries with an average school size of around 1,400 students.

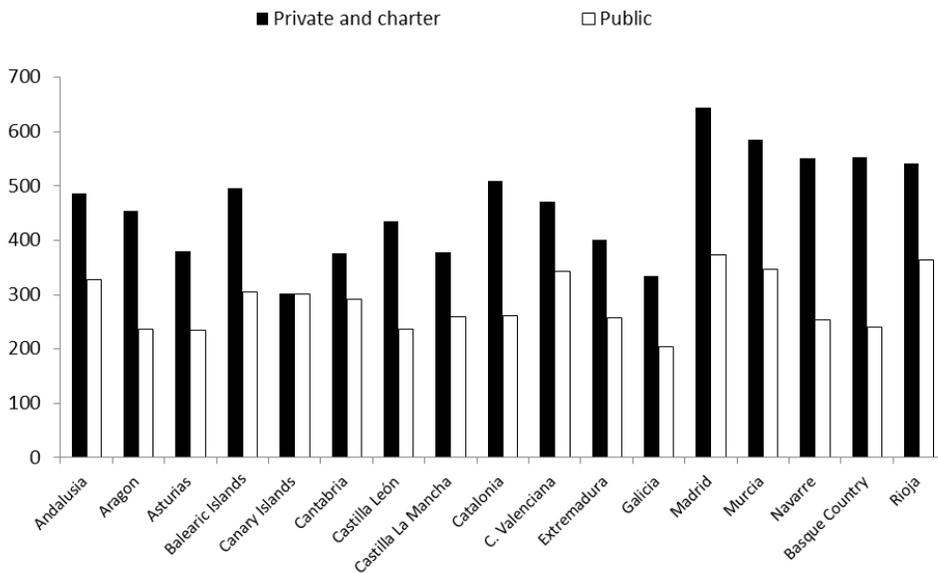
Table 1: Average school size by country: PISA 2009

	<i>N</i>	<i>Min.</i>	<i>Max.</i>	<i>Mean</i>	<i>Std. deviation</i>
<i>Denmark. Moldova. Latvia. Slovenia. Czech Republic. Finland. Sweden. Iceland. Norway. Poland. Liechtenstein. Greece</i>	12	275.7	473.4	403.6	68.0
<i>Israel. Kazakhstan. Kyrgyzstan. Serbia. Japan. Azerbaijan. Miranda - Venezuela. Italy. Peru. Germany. Belgium. Spain. Jordan. Trinidad and Tobago. Switzerland. Malta. Croatia. Lithuania. Hungary. Bulgaria. Georgia. Ireland. Indonesia. Albania. Argentina. Austria. Estonia. Russian Federation. Slovak Republic</i>	29	512.5	796.6	656.9	87.4
<i>New Zealand. Korea. Chile. UK. Brazil. Panama. Canada. Hong Kong-China. Netherlands. Australia. Uruguay. Portugal. Turkey. Romania. Tunisia. Mexico. Montenegro. Costa Rica. Mauritius</i>	19	805.8	1188.1	993.3	102.4
<i>Qatar. Colombia. Singapore. United States. Luxembourg. India. Malaysia</i>	7	1273.3	1485.9	1375.5	64.7
<i>Chinese Taipei. Macao-China. Thailand. UAE. Shanghai China</i>	5	1697.1	2534.5	1944.2	335.5

Source: own calculations using PISA 2009 (OECD) data.

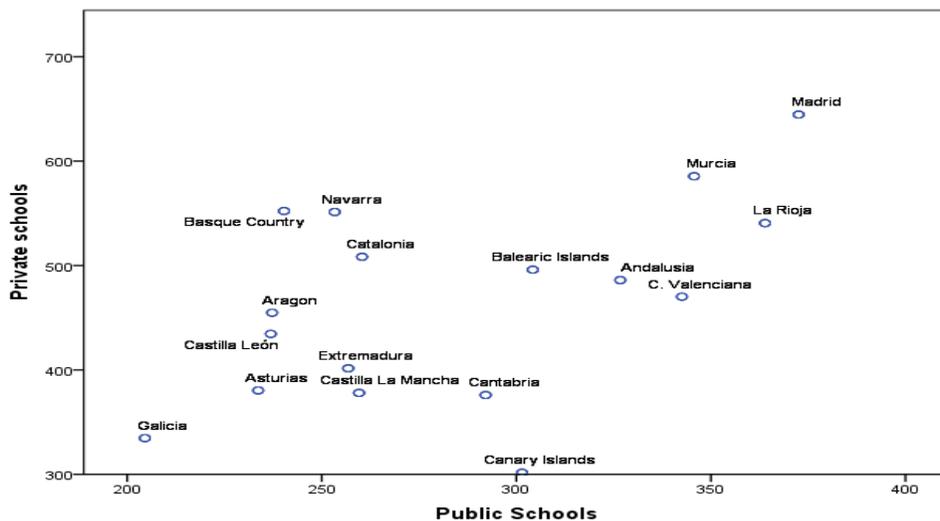
A second characteristic related to the size of Spanish schools is the major differences found among public schools, with a size around 30% smaller than private ones (Figure 1). The correlation between the size of private and public schools according to region is significant at a level of 95% (Figure 2). The average size of private schools related to regional incomes shows a positive and significant correlation at the 95% level, but it is independent of other variables that, a priori, could affect it, such as the total population of the region, population density, area, number of municipalities or average temperature (Table 2).

Figure 1: Comparative average size of Spain's public and private schools by region: Number of students



Source: own calculations based on statistics from the Spanish Ministry of Education, Culture and Sports for public and private centres INE. Data relating to 2011/12.

Figure 2: Comparison of Spain's public and private school size by region: Number of students



Source: own calculations based on statistics from the Spanish Ministry of Education, Culture and Sports for public centres and from the Spanish National Statistics Institutes for private ones. Significant at a level of 95%.

Table 2: Partial correlation between regional school size and regional indicators

		Average school size	GDP p.c. 2012	Population	Area	Density	Number of municipalities	Temperature
Average school size	Pearson correlation	1,00						
	p. value							
GDP p.c. 2012	Pearson correlation	0,59*	1,00					
	p. value	0,01						
Population	Pearson correlation	0,26	0,11	1,00				
	p. value	0,32	0,64					
Area	Pearson correlation	-0,24	-0,30	0,42	1,00			
	p. value	0,36	0,22	0,07				
Density	Pearson correlation	0,48	-0,27	-0,28	-0,35	1,00		
	p. value	0,05	0,27	0,25	0,14			
Number of municipalities	Pearson correlation	-0,11	-0,09	0,29	0,84**	-0,29	1,00	
	p. value	0,68	0,72	0,26	0,00	0,26		
Temperature	Pearson correlation	0,14	-0,50*	0,14	-0,25	0,48*	-0,33	1,00
	p. value	0,58	0,03	0,58	0,31	0,04	0,20	

** Significance at 95%; * Significance at 90%

Source: own elaboration from the Spanish National Statistics Institutes.

4 Results

4.1 Influence of school size on students: PISA results

The literature reviewing the efficiency of the education system has attempted to identify the variables which have an influence. One of the most common ways to study efficiency in education involves the production function of education defined by Hanushek (1979), where the output of the educational process of a student is measured in a particular school (A_{ij}) based on a series of school inputs (S_{ij}), the socioeconomic characteristics of the student (B_{ij}), the influence of peers (P_{ij}) and the innate abilities of the student (I_{ij}). The production function would be:

$$A_{ij}=f(S_{ij}, B_{ij}, P_{ij}, I_{ij}) \quad (2)$$

Using this equation, the effect of school size on student performance in the PISA 2009 tests of mathematics, both in public and private schools will be shown, performing the following multilevel regression (Agasisti 2013):

$$A_{ij} = \alpha_j + \beta_1 \text{ESCS} + \varepsilon_{ij}$$

$$\alpha_j = Y_0 + \beta_2 \text{SCSIZE} + \beta_3 \text{PRIVATE} + \beta_4 \text{LARGECITY} + \beta_5 \text{CLASSSIZE} + \beta_6 \text{MU_ESCS} + \mu_{i,j} \quad (3)$$

where A_{ij} is the result obtained in mathematics by student i at school j , conditioned by socioeconomic background (βESCS) and several fixed effects of the school (α_j).

SCSIZE represents school size, measured by the number of students enrolled, MU_ESCS includes the average ESCS of the school or “peer effect”; CLASSSIZE measures the number of students in the classroom of student i ; PRIVATE indicates school ownership; and LARGECITY shows whether the school is located in a city with a population of more than 100,000. These last two variables have been coded, taking the value 0 when the school is public, and 1 when it is private, and 0 if the city has a population below 100,000 and 1 when it is higher, respectively.

The analysis shows that all the variables, with the exception of PRIVATE, are good predictors of the dependent variable (significance of 95% or higher). School size has a slightly negative influence on student performance in these tests. In contrast, and paradoxically, the relationship between class size and results in mathematics is positive. Students in larger classrooms obtain better results. This could be explained by a quality or reputational effect of the school, with the more popular schools in Spain usually trying to fill their classes to the maximum level. Finally, schools located in large cities also obtained better results in the PISA 2012 test.

Table 3: Influence of school size on student achievement in maths: PISA 2009

Variable	B	Std. error	df	T	p value	Lower bound	Upper bound
<i>Intercept</i>	469.51	3.72	1,450.77	126.22	0.000	462.21	476.80
<i>ESCS</i>	22.17	0.77	795.20	28.87	0.000	20.66	23.68
<i>MU_ESCS</i>	24.05	2.75	892.36	8.74	0.000	18.65	29.46
<i>SC Size</i>	-0.01	0.00	908.00	-3.19	0.002	-0.02	0.00
<i>Private School</i>	-2.17	2.90	859.84	-0.75	0.462	-7.86	3.53
<i>Large City</i>	6.78	2.75	816.85	2.46	0.014	1.38	12.18
<i>Class Size</i>	1.96	0.10	21,574.44	20.52	0.000	1.78	2.15

Source: own elaboration from PISA 2009.

4.2 Influence of school size on average costs

First, a descriptive analysis of the main economic indicators of the school was performed. The indicators were distributed into ten groups or deciles of schools, according to the number of students enrolled. The sample shows the average values of the main indicators

and unit costs by groups of schools depending on size. There is a direct relationship between school and class size, as well as higher expenditure per student in smaller schools.

Table 4: Average cost of schools by size

Deciles	Number of centres	Average students	Students per classroom	Total expense per student	Teachers total expense per student	Non-teachers total expense per student	Rest of expenses per student
1	440	27.3	10.1	11,708.3	5,298.3	3,544.7	2,865.3
2	439	86.7	15.9	7,937.7	4,103.9	2,159.8	1,673.9
3	441	193.7	21.3	4,162.6	2,662.0	552.2	948.3
4	440	279.8	22.1	3,919.6	2,666.3	438.3	815.1
5	436	337.5	24.7	3,581.1	2,603.3	359.9	617.8
6	440	408.0	23.5	3,977.8	2,620.2	438.2	919.5
7	439	591.3	23.3	3,871.3	2,627.7	390.5	853.0
8	440	708.1	24.8	3,746.2	2,534.5	381.5	830.1
9	439	902.5	25.0	3,793.8	2,503.9	394.0	895.9
10	440	1,405.1	25.9	3,873.5	2,436.3	420.4	1,016.8
Total(a) /Average	4,394 (a)	494.0	21.7	5,058.2	3,005.4	907.7	1,145.1

Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

In order to analyse the differences in expenses per student in each school, average expenditure per student was broken down into two components, according to the following equation:

$$E / S = [E / C] \times [C / S] \quad (4)$$

where E represents total expenditure, S the number of students in the school and C the number of classrooms.

To analyse the elasticity of the cost per student related to school size and the shape of the cost curve, these equations were estimated (least squares approach):

$$A_i = c + \beta_1 S + \beta_2 S^2 + u_i \quad (5)$$

where A_i represents the different components of the cost of each school (costs of teachers, non-teaching staff costs and other expenses), S represents the number of students, S^2 the square of the number of students, and u_i includes the error term.

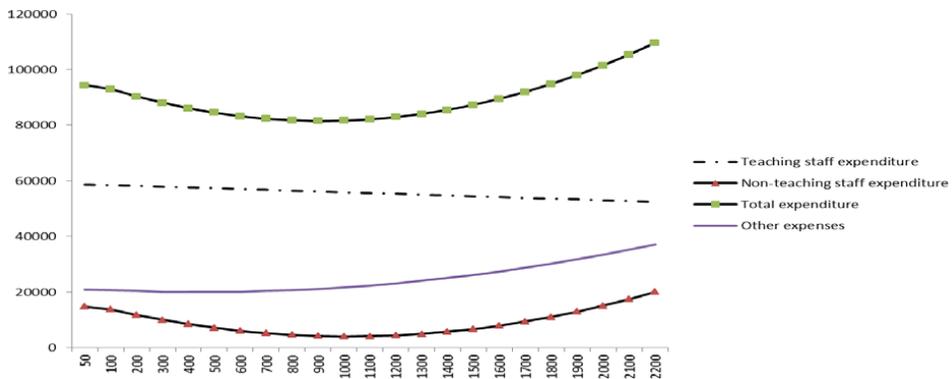
The cost values of each teaching unit (class) according to size (Figure 3) were also calculated. The following equation was estimated:

$$B = c + \beta_1 S + \beta_2 S^2 + u_i \quad (6)$$

where B is the number of students per school unit (class).

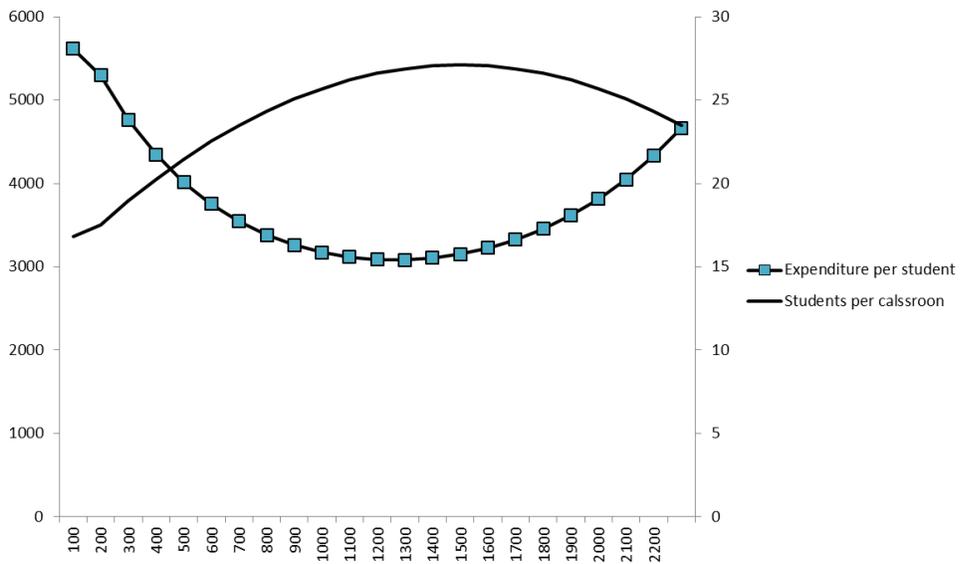
Total cost per student was also calculated (Figure 4). Finally, values for average cost per student, the relative levels of average expenditure for each class and the average number of students per class were expressed in index numbers, with the average of all schools = 100 (Figure 5).

Figure 3: Estimated average classroom costs per student by school size



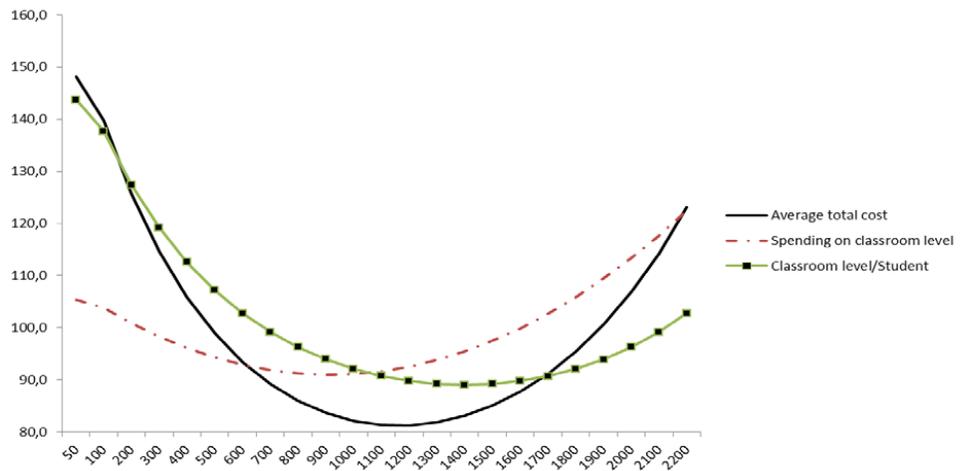
Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

Figure 4: Estimated number of students per classroom and average cost per student by school size



Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

Figure 5: Relative levels of average cost per student, average cost per classroom and average classroom size



Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

There are significant differences in school size depending on the religious or non-religious nature of the school and its ownership (charter or private) determining the average cost per student in each type of school (Table 5):

- a) Costs per student about 10% below the average figure are obtained in religious private schools. This is explained by the lower average cost per school unit and larger number of students per school unit (Table 5).
- b) Non-religious charter schools have a cost per student 9.8% above the average, due to the higher average cost per school unit (4.8%) and lower average number of students per school unit (95.4% from the mean = 100).
- c) Non-religious private schools spend about 25% more per student than the average, due to the fact that they have about 12% fewer students per school unit and an expenditure of 10% more per school unit.
- d) Finally, the expenditure per student of religious private schools is 15.3% above the average figure due to higher spending per school unit.

Table 5: Average costs, school management and ownership

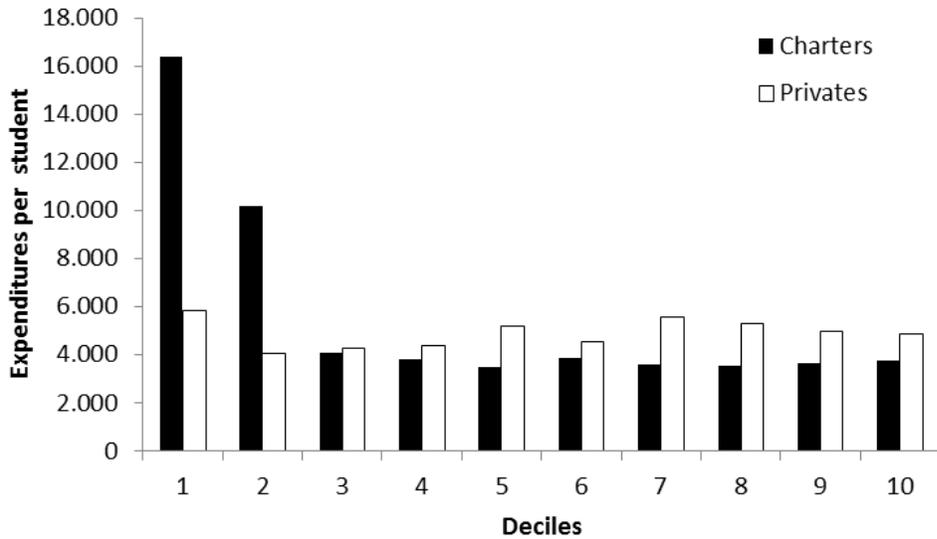
	Number of centres	Number of students	Expenses/ student (euros)	Expenses/ classroom (euros)	Students/ classroom (euros)
Charters (a)	3,470	540.9	3,799	90,364	23.8
Non-religious	1,350	414.3	4,332	96,495	22.3
Religious	2,120	621.5	3,573	87,502	24.5
Private	923	318.5	4,880	101,732	20.8
Non-religious	817	311.5	4,931	101,453	20.6
Religious	106	372.4	4,549	103,725	22.8
Total	4,394	494.0	3,946	92,089	23.3
Charters		109.5	96.3	98.1	101.9
Non-religious		83.9	109.8	104.8	95.4
Non-religious		125.8	90.6	95.0	104.9
Private		64.5	123.7	110.5	89.3
Non-religious		63.1	125.0	110.2	88.1
Religious		75.4	115.3	112.6	97.7

(a) *Because of the possible mixed character (private-subsidised) of some Spanish centres, a school has been treated as a charter school when more than 50% of its classrooms are subsidised.*

Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

Studying the differences in costs per student related to the type of school, it is clear that smaller charter schools have higher unit costs, which is not the case for private ones (Figure 6). This is due to the low number of students per school unit. Nevertheless, it could be possible to maintain this type of charter school because they are funded by the public money. In contrast, from a certain school size, charter schools have lower average costs per student than private schools.

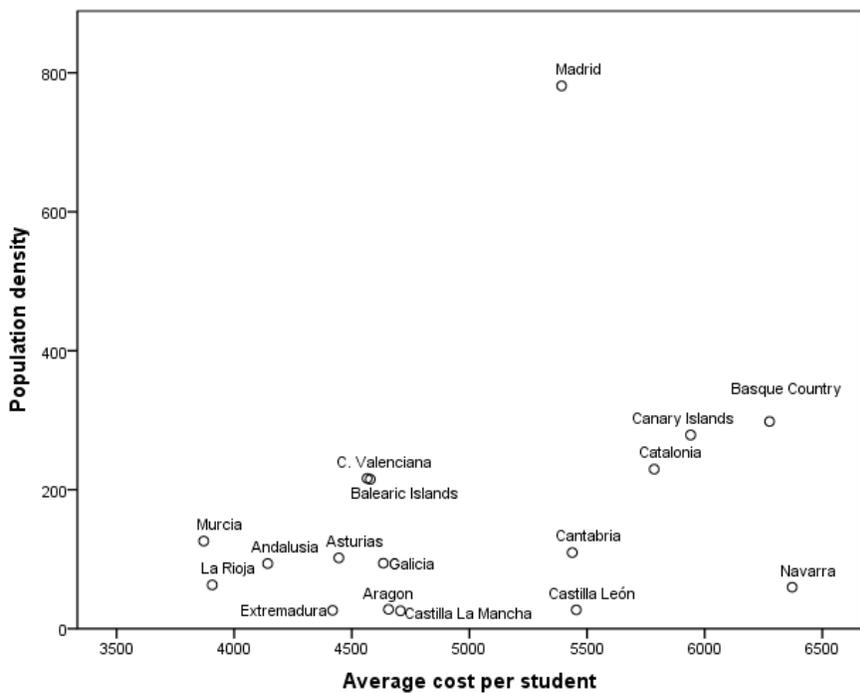
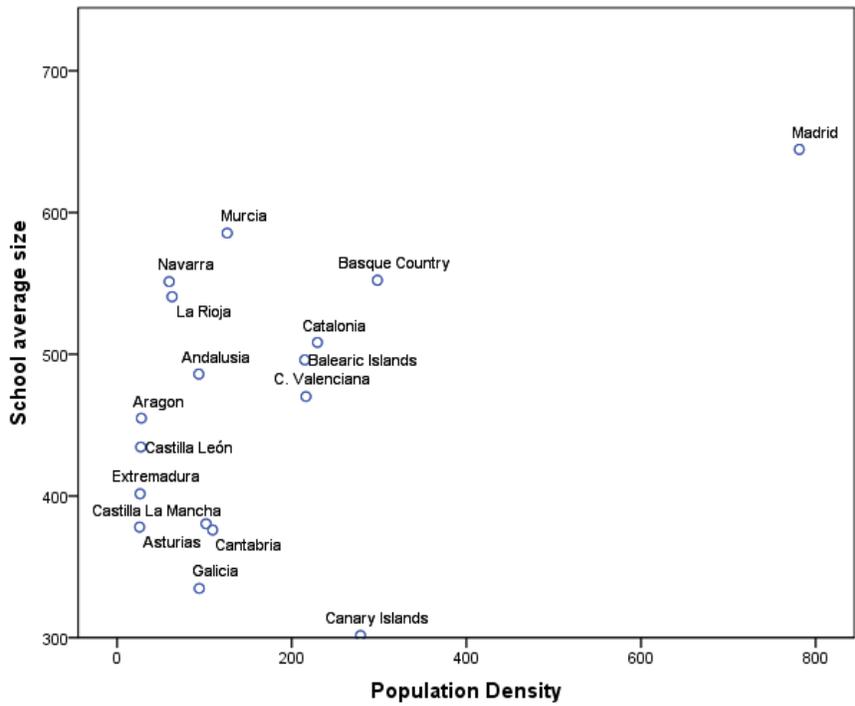
Figure 6: Variation in average cost per student according to size: charter and private schools



Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

When analysing the average size of schools in each region, significant differences were observed. These can, in part, be explained by the different density of population of each region (Figure 7). The estimation of the influence of population density on school size was studied using a linear regression. It concluded that this variable explains 17% of the differences in school size, with a significance level of 95%. However, regional population density and the average cost per student in private schools are independent variables, as shown on the right of Figure 7. Source: own elaboration from *Survey of Private Education Funding* (Spanish National Statistics Institute) and *Population Figures* (Spanish National Statistics Institute).

Figure 7: Relationship between average school size and population density: Spanish regions



5.3 Contribution margin per student by school size

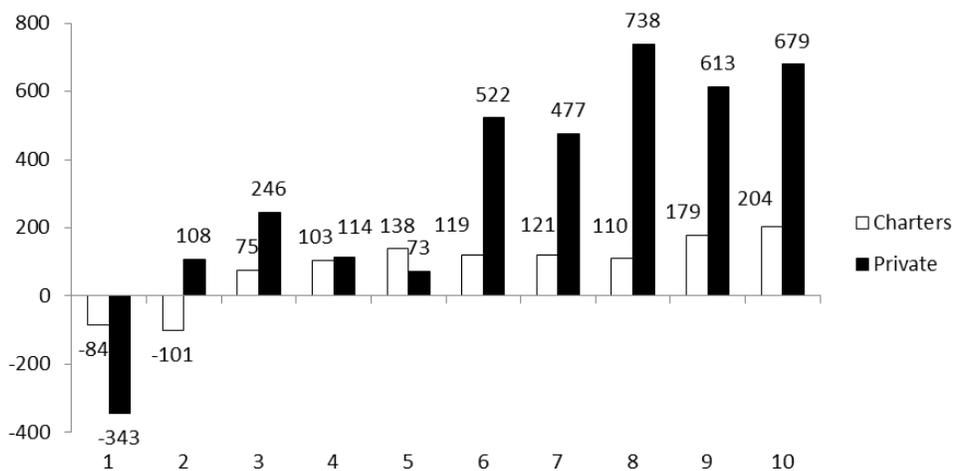
School size is an important determinant factor of profit margin. These data have been obtained from Spanish private and charter schools. In both cases, three categories of school size (small, medium and large) were distinguished. Charter schools in deciles 1 and 2 presented negative results per student of around 100 euros, and in private schools decile 1 also recorded a loss of 343 euros. However, the high value of the standard deviation indicates a significant dispersion of the results (Table 6 and Figure 8). In contrast, larger schools (deciles 8, 9 and 10 in the case of private schools and deciles 9 and 10 in charter schools) showed a positive result of 600/700 euros in private schools, and of 180/200 euros in charter schools. Finally, the medium-sized schools recorded a result per student of between 100-500 euros in private schools and between 75-125 euros in charter schools.

Table 6: Influence of size on current profit margin in charter and private schools: euros per student

Decile	Private				Charter			
	Mean	Standard deviation	Confidence interval at 95%		Mean	Standard deviation	Confidence interval at 95%	
			Lower limit	Upper limit			Lower limit	Upper limit
1	-343.3	2157.1	-619.3	-67.2	-83.8	2226.6	-391.2	223.6
2	108.1	2554.7	-243.7	459.9	-101.2	1407.8	-285.7	83.4
3	245.7	703.6	112.8	378.7	75.5	433.1	28.7	122.2
4	114.5	1198.1	-187.2	416.2	103.3	373.7	65.4	141.2
5	73.1	613.0	-179.9	326.1	137.8	400.9	98.9	176.8
6	522.2	733.8	349.7	694.6	118.9	479.0	69.8	168.0
7	476.6	677.7	296.7	656.4	120.9	378.8	82.8	159.0
8	737.6	864.7	491.9	983.3	110.5	282.4	82.2	138.8
9	612.7	524.2	465.2	760.1	179.1	424.3	136.8	221.3
10	679.4	537.2	528.3	830.4	203.7	389.7	164.7	242.7
Total	156.8	1753.3	43.4	270.2	104.5	751.8	79.4	129.5

Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

Figure 8: Current centre results per pupil (euros) according to deciles formed by school size



Source: own elaboration from Survey of Private Education Funding (Spanish National Statistics Institute).

Conclusions

Designing educational policies that promote efficiency in the educational system requires knowledge of the effects on performance and the associated costs of different schools and classes sizes. According to the Spanish results in PISA 2009, there is a slightly negative relationship between student performance in these tests and school size. In contrast, paradoxically, the relationship between class size and academic results is positive after controlling for variables such as the size of the city and the influence of the socioeconomic status of the school and the student.

Regarding the impact of school size on average costs, potential savings in costs per student in Spanish private and charter schools have been estimated, using for this purpose the *Statistics of Financing and Expenditure of Non-university Private Education in 2009-2010* microdata, prepared by the INE. The contribution of: a) the lower cost per school unit in larger centres and b) the higher number of students per school unit in such schools were differentiated in the calculation of this potential savings figure.

In terms of average costs per school unit, lower levels were achieved in schools with between 600 and 1,200 students enrolled. These costs were around 8% below the average, meanwhile in schools with fewer than 100 students enrolled, the cost per unit increased by about 5% on average.

The number of students per class is 10% higher when 600 students or more are enrolled. In schools with fewer than 200 students enrolled, this ratio decreases by about 40%. The combined effect of these two factors means that the cost per student is around 45% higher than the average in small schools, and almost 20% below the average in schools

with between 1,000 and 1,400 students enrolled. This kind of school presents, overall, a lower cost per student.

According to ownership, private schools register a cost per student around 20% higher than charter schools, due to the fact that charter schools have a higher cost per teacher and a lower student unit/teacher ratio. There is a higher proportion of small private schools compared to small charter schools. Nevertheless, private schools have lower unit costs, but only slightly above the average, meanwhile in charter schools the smaller class size means an unusually high average cost per student of around 13,000 euros, compared with the average of 3,946 euros.

School size influences the economic performance of charter and private schools. In charter schools, which generally obtain lower profits than private schools, the small ones make a loss of around 100 euros per student on average, compared with large charter schools which make an average profit of approximately 200 euros. The differences in profits in the case of private schools are higher. The small schools make losses of 300 euros, compared to profits of 600-700 euros in large schools.

Finally, the analysis leads to the conclusion that although different population densities of the Spanish regions have an influence on average school size, this influence is limited and independent of the average expenses per student of the region.

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Digital Possibilities of Internal Audit

Digitální možnosti interního auditu

VÁCLAV KUPEC

Abstract

Company management is a highly sophisticated activity which must employ the latest information technologies as ongoing digitisation allows company processes to be managed in a dynamic way, primarily with respect to the fast-changing economic environment. This also applies to internal audit, which helps to ensure flexible transfer of data concerning process deficiencies to the company leadership. The aim of the study is to verify the efficiency of the digital potential of the internal audit in the field of marketing, which forms an important part of company management. The method of the paper includes an analysis of the current theoretical background as well as an analysis of marketing risks and the use of adequate auditing techniques. The proposed system of internal audit, or the use of digital methods, can subsequently be used to predict process deficiencies, and thus contribute to efficient risk management and responsible business conduct.

Keywords

analysis, audit, digital, management, marketing, risk

JEL Codes

G21, M42

Abstrakt

Problematika podnikového managementu je vysoce sofistikovanou činností, ve které je nutné využívat nejnovější informační technologie. Postupující digitalizace totiž umožňuje, aby byly podnikové procesy řízeny dynamicky, obzvláště ve vztahu k rychle se měnícímu ekonomickému prostředí. Tato skutečnost se týká také interního auditu, s jehož pomocí lze zajistit flexibilní přenos dat o procesních nedostatcích směrem k managementu. Cílem příspěvku je proto ověření účinnosti digitálních možností interního auditu v marketingové oblasti, která je významnou součástí firemního řízení. K práci je přitom metodicky přistupováno nejenom rozбором aktuálních teorií, ale také analýzou rizik marketingového odvětví a aplikací vhodných auditních technik. Navrženým systémem interního auditu, respektive využíváním digitálních přístupů, lze následně predikovat procesní nedostatky, a tím je možné přispět k efektivnímu řízení rizik i odpovědnému podnikání.

Klíčová slova

analýza, audit, digitální, management, marketing, riziko

Motto

"These are exciting times for internal auditors, especially those who see themselves as agents of change within their organisation."

David Coderre

Introduction

As management evolves, it also brings about changes in individual methods. Those which are becoming ever more important, primarily in the context of economic changes, include internal audit. Today, internal audit is understood as a modern consultancy service which helps the company leadership (Phillips 2009). Contemporary audit is no longer based on “hard” controlling methods, but focuses more on “soft” consulting activity (Moeller 2011). As with other disciplines, internal audit is now facing new developmental changes which above all reflect the digitisation of the business environment, which in turn offers innovative approaches for auditing and other functions.

According to many theories, the digital environment is creating a new space for both life and business (Herout 2016). Sedláček (2015) has claimed that we are living in a great migration period. He used the phrase “into the digital” to talk about this new situation and explained that work and economy have also moved to the digital sphere following entertainment and relationships. Digitised data stored in company systems and databases create an ever-growing digital environment. This indeed is a very interesting phenomenon, as the real environment will never be able to expand in the same way. Consequently, the above-mentioned points establish the digital world as a new company environment that can be effectively analysed using internal audit.

The theories mentioned in this paper refer to a change in company processes and an increase in auditing functions (Report to the Nations on Occupational Fraud and Abuse, 2014). In the past, it was necessary to check risk areas directly in the different departments. In the last decade, though, extensive centralisation of company processes has taken place and consequently auditing has focused only on some departments. Nowadays, audits can be performed in the form of remote auditing from audit centres independently of where the auditing really takes place. In the future, we can expect auditing of anything to be carried out from anywhere. All this is facilitated by the advancement of modern age digital technologies that are part of what Tóth (2012) has called the century of modern management systems.

The suggested visions were also confirmed by Koontz and Weihrich (2008), who added that successful companies in the 21st century must take advantage of all information technologies. Therefore, internal audit will also have to use digital tools on a massive scale, which will help to improve it in many ways and offer clients higher added value. “Change is occurring at a faster rate than ever, and this change is being driven by technological advances” (Coderre 2009, p. 3). Therefore, this paper focuses on an innovative approach to internal audit in the context of the modern digital environment, as efficient audit has many tools available which may be understood as protective or rescue elements. The aim of the study is to verify the efficiency of the digital potential of the internal audit in the field of marketing, which forms an important part of company management.

1 Bibliographic sources

“The organization’s needs may be determined by identifying and examining the key activities whose effective performances can either make or break it” (Cascarino & Esch

2007, p. 6). Internal audit, which Sawyer (2000) defined as assistance to the company leadership, also helps the company management to identify and study the company's needs. Koontz and Weihrich developed this theory in the following way: "Management is the process of designing and maintaining an environment in which individuals, working together in groups, efficiently accomplish selected aims" (Koontz & Weihrich 2008, p. 5). It is therefore obvious that in the current situation, management has to use all available tools to achieve its goals, including internal audit techniques.

The basic concept of the studied notion which reflects the current demands of managers is defined as follows: "Internal auditing is an independent, objective assurance and consulting activity designed to add value and improve an organisation's operations. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control and governance processes" (Spencer Pickett 2010, p. 2). In the international context, this has also been confirmed by Sawyer, Dittenhofer and Scheiner (2003), Russel (2007), Phillips (2009) and Douglas, Smith and Wood (2009). In the Czech Republic, this issue has been studied primarily by Dvořáček (2003, 2005).

According to the definition above, internal audit focuses mainly on risk management, which is also confirmed by Moeller: "The internal audit activity should monitor and evaluate the effectiveness of the enterprise's risk management system" (Moeller 2011, p. 13). The thesis has been further developed by Spira and Page (2003), Collier and Agyei Ampomah (2008) and Spencer Pickett (2010), who have stressed that auditing must affect all processes across the organisation. In this respect it is also important to define business risk. According to theories by Garvey (2009), this involves a negative event which brings about an undesired change affecting primarily the plans, costs and performance of an organisation.

Different tools can be used for risk management and internal auditing. Various approaches are further discussed in the section on methodology. The aim of this section is to determine auditing techniques which are based on traditional practices by Basu (2006). According to Dvořáček (2003), such tools must be used which will lead to appropriate findings with a strict assessment of costs. The author also pointed out that efficient auditing techniques must be used: "Efficiency can also be improved through the application of advanced technology" (Burrow, Kleindl & Everard 2008, p. 10). Burrow, Kleindl and Everard (2008) added that advanced technologies help in acquiring a competitive advantage, and so this is a good opportunity to implement digital tools in internal auditing.

2 Subject matter and methodology

2.1 Subject matter

Based on a bibliographic search of selected theories (Collier & Agyei Ampomah 2008; Spencer Pickett 2010; Moeller 2011), we can state that internal auditing can be used to verify different company processes. For the purpose of this text, the verified process, or the studied material, is company marketing, which, according to the *Report to the Nations on*

Occupational Fraud and Abuse (2014) represents an environment with a considerable level of risk. Marketing is defined in accordance with Kotler-Armstrong as follows: "The process by which companies create value for customers and build strong customer relationships in order to capture value from customers in return" (Kotler & Armstrong 2010, p. 29). This general concept can be narrowed to company management and marketing strategies as specified by Kašík and Havlíček (2012).

Marketing has been going through developmental changes (Wilson 2002). Therefore, the current tasks internal audit faces include the evaluation of the marketing environment, strategies, organisation, system, efficiency, profitability, mix (Kotler & Armstrong 2010) and other elements of marketing according to the operational demands of the management. "The primary purpose of a marketing audit¹ is to identify problems in ongoing marketing activities and plan the necessary steps to correct these problems" (Ferrell & Hartline 2014, p. 273). Ferrell and Hartline (2014) then applied this theory to marketing strategies.

In this context, Kotler and Keller (2007) advised every company to regularly evaluate concrete processes while at the same time assessing marketing efficiency. "Those companies and divisions that discover marketing weakness through applying the marketing-effectiveness rating review should undertake a more thorough study known as marketing audit" (Kumar & Sharma 2005, p. 41). Thus, we can use marketing auditing to adequately evaluate selected factors (in both the internal and external environment) which affect marketing performance (Proctor 2000) and which can be then directed at market, product and other areas of company risks (Sadgrove 2005).

It is clear that company marketing, which has a significant impact on a company strategy (Kašík and Havlíček 2012), is affected by a number of risks. These include primarily operating risks (Spencer Picket 2010), which Tattam further specified in the following way: "The risk of loss from failed or inadequate processes, people, systems or external events" (Tattam 2011, p. 9). Secondary risks, which have significant links to marketing, are reputational risks. A company's reputation has a strategic value and provides the company with a competitive advantage (Corenlissen 2005). Consequently, reputational risk is understood as an instance when a company's reputation can be damaged (Honey 2009).

2.2 Methodology

The previous section focused on defining the subject matter. The following section looks at the possible methodological approaches to the subject matter in question. The bibliographic search determined the basic approaches to internal audit and defined company marketing. We can further develop these conclusions with a note by Cascarino and Esch (2007), who claimed that business today contains a certain level of risk. Garvey further elaborated on this theory and warned of two possible risks: "The first is

¹ In this paper, the terms "internal audit" and "marketing audit" often merge, as understandings of them are very similar in this context. Internal audit, which focuses on verification of marketing processes, can be either generally called "internal audit" or more specifically "marketing audit".

its occurrence probability. The second is its impact (or consequence) to an engineering system project" (Garvey 2009, p. 4). See Formula 1 (Garvey 2009, p. 9).

$$Risk = F(Probability, Impact) \quad (1)$$

As we have already said, marketing faces several threats. Companies should therefore concentrate on analysing and identifying areas at risk. We can distinguish two types of risk analysis – qualitative and quantitative (Smejkal & Rais 2013). For the purpose of this study, the method is a combination of the two techniques, which allows us to assess the identified risks and determine the frequency with which they occur as well as other risky outcomes. The Delphi method can be used as a concrete analytical approach, as specified by Tarantino: "The Delphi technique is a procedure to obtain a reliable consensus of opinion from a group of experts" (Tarantino 2011, p. 58). The author added that this technique can be used in different management processes.

The Delphi technique (Tarantino 2011) is used for the identification and assessment of potential risks in the marketing environment. The evaluation of probability of occurrence (P) and size of impact (I) (Garvey 2009) is carried out through an estimate by a group of experts for the given period in company management. The given evaluation of the basic set of potential risks can be done in the form of a guided discussion on the basis of which a group of significant threats is determined. This method is applied according to the specific demands of the company's marketing, because, as Tichý (2006) said, specific conditions require specific approaches.

The methodology applied here draws on observations, analyses and embedding of the selected methods, the so-called *best practice* of auditing processes. The study and collection of data was conducted in marketing campaigns with a focus on timely delivery of a communication to the selected sample group, measurement of completeness of the communication, checking of its efficient feedback and compliance with legal requirements. The sample group consisted of a customer segment of a selected company of 232 customers out of a total of 5,378 customers (i.e. 4.31%) that were selected for a marketing campaign. The following generalised visualisations of the results were carried out by a transfer of data through descriptive texts, tables and graphs.

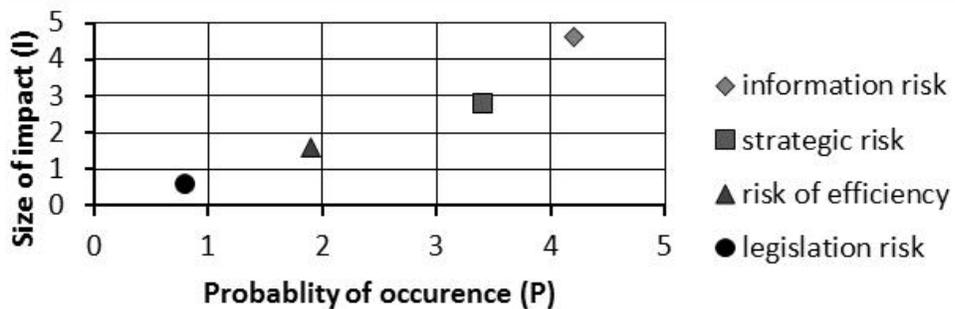
In accordance with the profession-specific theories determined through the bibliographic search, the selected material and the techniques proposed in the methodology, we can proceed to the next part of the text. The aim of the article, as mentioned above, is to verify the efficiency of digital potential of the internal audit in the field of marketing, which forms an important part of company management. The outcomes of this article should extend the literature in the analysed field of study, while practical efficiency is expected to be delivered mainly through the use of the achieved results in the field of internal marketing and risk management with respect to company, or marketing, strategies.

3 Results

Marketing processes are extensive and cover a wide range of specialisations (Proctor 2000; Wilson 2002; Kotler & Armstrong 2010). In order for the article to have universal validity

and for the expected results to be generally applicable, the performed analysis did not focus on specific processes but on factors which have a significant impact on them. The results draw on an analysis of marketing risks and refer to four potential threats. According to their probability of occurrence (P) and size of impact (I) (Garvey 2009) based on the researcher's own conclusions, they are ordered in the following way: information risk, strategic risk, risk of efficiency and legislation risk (see Figure 1).

Figure 1: Map of significant marketing risks



Source: own processing following the method of Ayyub (2014).

Figure 1 shows the results for risks according to the Delphi analysis. Their significance is measured by the probability of occurrence (P) and size of impact (I) on a scale 0 to 5, where 0 points is minimum significance and 5 points is maximum significance.

3.1 Risk analysis

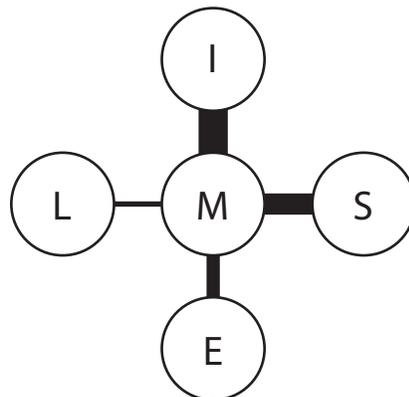
The analysis of the probability of occurrence and size of impact (see Figure 1) shows that the largest risk in marketing processes lies in information, which is defined as actual facts supporting decision-making (Strydom 2004). This suggestion also supports the placement of the threat in the most risky area of the presented map (see Figure 1, sector 5:5). Information serves as the primary input for the further management of company processes, in this case the management of marketing processes (Kupec 2014). Therefore it is necessary to study the attributes of information, which include timeliness, precision and value (Kupec & Kretter 2013). Attention must be paid to the information risk, primarily in the context of the current digital advancement.

The second most significant risk (see Figure 1) is the strategic risk (the position connection of the individual risks is depicted in Figure 2), which is linked to marketing strategies (Kašík & Havlíček 2012; Petrů 2015 a). More specifically, these threats are determined by the choice of markets, stimulation of markets, competitive position or competitive alliances (Jakubíková 2013). Incorrectly set, performed and evaluated strategies have a significant impact on company performance. In the context of auditing, it can be said that this is an ideal area for the application of digital techniques which will allow the company management to carry out the continuous monitoring of principal data.

The set of identified threats further includes the risk of efficiency. "An efficient organisation of modern marketing is distinguished by strong cooperation and customer orientation of all company departments" (Kotler & Keller 2007, p. 764). However, this statement from Kotler and Keller (2007) deals solely with the internal environment of an organisation. With respect to the abovementioned risks, it is therefore necessary to point to the possibility of an efficiency failure in the external environment of an organisation. The risks are linked to the analysed area of strategic risks and can therefore often result in the incorrect choice of target groups, incorrectly selected communication channels or an incorrectly formulated marketing message, for example according to Petrů (2015b). This area then presents another opportunity for digital auditing.

The chain of selected risks is completed with the least significant potential risk – the legislation risk. "Different ethical norms and regulations exist in different countries which affect the supply and primarily the way how to present the supply" (Přikrylová & Jahodová 2010, p. 194). Legislation must be observed not just with the impact on the company's reputation in mind, but primarily with respect to the possible recourse from supervisory and regulatory bodies. In the given case, compliance should be adopted to eliminate the risk, which is defined as an ability to abide by regulations, guidelines and laws (Dvořáček 2003). The level of this risk in general (not according to Figure 1) is rather low in terms of probability of occurrence but not in terms of size of impact.

Figure 2: Position connection of individual risks



where: *M* – company marketing,
I – information risk,
S – strategic risk,
E – risk of efficiency,
L – legislation risk.

Source: own processing according to the method of Tichý (2006).

Figure 2 shows the connection of the basic risks with the audited area, which is positioned in the centre (*M*). Individual connecting lines between risks and the marketing centre

have different width depending on the significance of the selected risks (see *I* as the most significant risk v. *E* as the least significant risk).

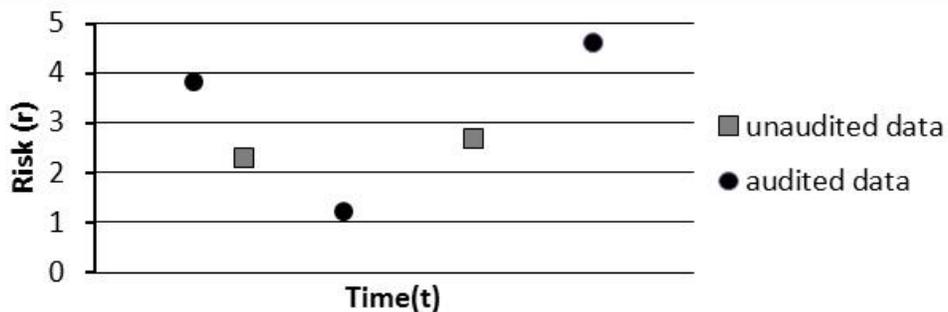
3.2 Digital audit

The risks mentioned in the analysis can be verified using different techniques of internal audit. With reference to the title of the article, though, the main idea lies in the use of information technologies to eliminate risks. In the company environment, these technologies make it possible to detect errors in company processes, focusing either on the security of systems or the protection of systems. Consequently, auditing techniques are not limited to the physical verification of the selected risks but by using an innovative application, the processes can be verified digitally. In this way the processes listed below enhance the verification abilities of the internal audit.

Verification of information risk through audit is directly connected to the attributes of information (timeliness, precision and value). In the observed subjects, the time of dispatching commercial information about a marketing campaign was monitored. This criterion plays a significant role in the appropriate development of the whole campaign, its timing and further links. As part of auditing verification, a limit was set for dispatching the information ($x+10$ days) and consequently the whole course of the campaign process was verified. The results of the experiment proved that 92.3% of communications were dispatched within the given limit. However, 7.7% of communications were outside the limit (before the limit ($x+10$)). Consequently, correction was recommended as early as during the campaign.

Based on the retrieved results, a general conclusion can be drawn with respect to auditing the information risk, to the effect that the described techniques allow internal auditing to monitor selected information online in Managerial Information Systems (MIS) or in Business Intelligence (BI) systems. Specific criteria can be entered in MIS/BI which reduce the whole set of monitored information to the required limit, which includes the normal values of the selected data. Data which fall within the specified limit do not need to be subjected to auditing. However, data which do not meet these requirements will have to be included in the audited sample to be analysed and appropriate recommendations for remedy will have to be suggested (see Figure 3).

Figure 3: Digital verification of information risk



where: t – time,
 r – data risk,
 2 – bottom limit of risk data (r_{min}),
 3 – upper limit of risk data (r_{max}).

Source: own processing.

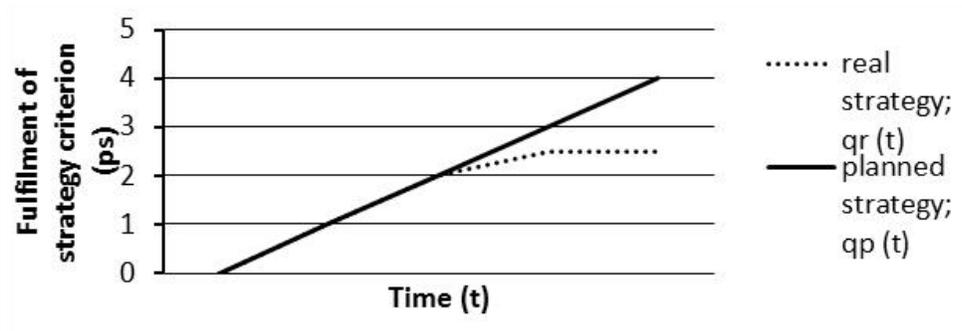
Figure 3 is a scatter diagram of marketing data with different levels of risk. Data which do not have to be audited because they meet all positive criteria are delimited by risk level 2 (r_{min}) and risk level 3 (r_{max}). Other data are digitally included in the audited sample (AS) according to Formula 2.

$$AS \in (0, r_{min}) \cup (r_{max}, \infty) \quad (2)$$

Information risk further merges with strategic risk and is determined through monitoring the observed quantities. Marketing strategies include meeting company goals in the defined period, which can be quantified in MIS/BI. Verification of possibilities to audit the risk was carried out during the monitoring of the completeness of contacting the selected sample. As part of the verification, a limit was set for communications delivered to the selected sample at 98% and consequently the fulfilment of the strategy was audited. The researcher's own experiment revealed that at the final part of the campaign, no communication had been sent to over 25% of customers, which implied a deviation from the set strategy that relied on a delivery of communication to costumers which was balanced in time.

On the basis of these findings, prompt recommendations can be given to remedy the strategy fulfilment in the course of the campaign. This implies that digital auditing using the MIS/BI systems can monitor the continuous fulfilment of selected values and simulate the prediction of the development based on the estimate created by an analysis of trends. As soon as a real deviation from the planned trajectory is detected, the changes must be subjected to audit investigation in order to detect the cause and set relevant auditing recommendations. Verification carried out in this way will prevent negative impacts of marketing strategies and other strategic processes (see Figure 4).

Figure 4: Digital verification of strategic risk



where: t – time,
 ps – fulfilment of strategy,
 t_a – time during which q_p differs from q_r ,
 $q_p(t)$ – planned strategy,
 $q_r(t)$ – real strategy.

Source: own processing.

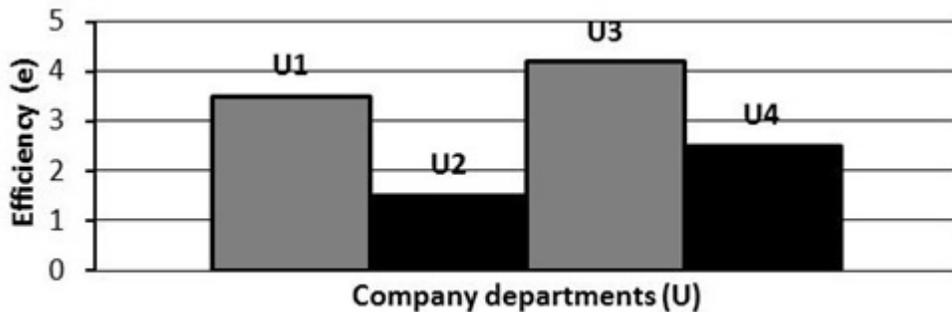
The continuous line in Figure 4 shows the function of the planned marketing strategy ($q_p(t)$) and the dotted line shows the function of the real strategy ($q_r(t)$). As soon as a difference is detected between the real fulfilment and the planned fulfilment (point t_a), the situation can be verified by audit according to Formula 3.

$$\exists t_a \forall t \geq t_a : q_r(t) \neq q_p(t) \quad (3)$$

The following risk, the risk of efficiency, is connected primarily to the monitoring of performance in fulfilling the company's marketing strategies. Verification of auditing possibilities for this issue was piloted on the given sample through monitoring of a business response of a group of customers that received communications during the marketing campaign. Through their response, these customers were supposed to fulfil the company's business plans by concluding contracts to use the selected product. The level of efficiency of fulfilment was set at 80% of the business plan over the course of two months. The audited results showed that throughout the whole experiment the plan was sufficiently fulfilled and therefore no auditing recommendation had to be given.

The results clearly show that the data concerning the realisation, or efficient fulfilment of individual tasks, should also be gathered in the online MIS/BI regime. Setting the optimal level of efficiency, which can differ for each level of performance, will enable the digital monitoring of the fulfilment of individual criteria in real time. The fulfilment of selected criteria indicates the level of risk and the possible time to start audit verification (see Figure 5). However, this does not exclude the possibility of performing audit investigation on a level when the efficiency was met before the limit, as this kind of positive fulfilment can indicate an incorrect setting at the beginning of the process.

Figure 5: Digital verification of risk of efficiency



where: U – company departments (U_1, U_2, U_3, U_4),
 e – efficiency,
 3 – minimal level of efficient fulfilment (e_{min}).

Source: own processing.

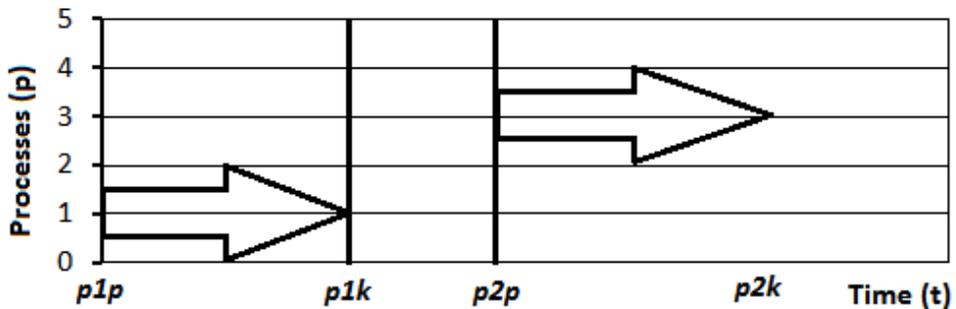
Figure 5 shows different company departments (U_1, U_2, U_3, U_4) which contribute to the fulfilment of the strategy. The limit for the efficient fulfilment of a marketing strategy is delimited by the efficiency level 3 (e_{min}). Departments (U_2, U_4) which do not meet the limit are included in the audited sample (AS) according to Formula 4.

$$\{U_x \in AS \mid e_{Ux} < e_{min}\} \quad (4)$$

Legislation risk is linked to all the previous areas. Experimental testing of auditing possibilities using digital approaches to this issue was linked to the selected sample group and to legislative requirements concerning providing information to customers about product changes in set time periods. The set date of a change in legislation or obligatory communication to customers in time (x), without fail, was monitored in the course of the whole communication process. Information concerning legislation was provided to 100% of customers in the sample group in time. At the same time, the start of the new legislative process with a firmly set expiration date was marked for each customer with respect to continuous monitoring.

Digital monitoring of the legislation risk is obviously one of the most difficult areas, primarily with respect to the fact that it concerns mainly qualitative information which is difficult to evaluate automatically. Monitoring of the legislation risk can be done from external sources by connecting the information systems (IS) of the audited companies to the IS of supervisory and regulatory bodies, which send out notifications about changes in regulations, guidelines and laws. Internally legislative regulations can be monitored in MIS/BI by marking legal force, change etc. so that possible differences in dates in internal and external information systems can be easily checked (see Figure 6).

Figure 6: Digital verification of legislation risk



where: t – time,
 p – legislative processes,
 p_{1p} – start of process no. 1,
 p_{1k} – end of process no. 1,
 p_{2p} – start of process no. 2,
 p_{2k} – end of process no. 2.

Source: own processing.

Figure 6 shows Legislative Process 1 and its start (p_{1p}) and end (p_{1k}) as well as Legislative Process 2 and its start (p_{2p}) and end (p_{2k}). If the two processes do not follow one another, see the difference between p_{1k} and p_{2p} , auditing investigation can be initiated.

The above-mentioned suggestions for auditing processes do not exhaust all of the possibilities regarding how to eliminate marketing process risks. The presented outcomes, however, take into account the current advancement of digital technologies. At the same time, these suggestions reflect a considerable level of development of all company and marketing information. The number of cases like these where internal audit is able to effectively analyse the so-called audit trail (Kupec & Petrů 2014) is growing. Another positive aspect of the presented propositions is that they eliminate the human factor risk. Provided all data is entered correctly, the monitoring and notifications to the internal audit are fully automated.

3.3 Proposed recommendations

Following the findings revealed by the auditing, it is also necessary to formulate recommendations which will eliminate company marketing weaknesses. The following section will therefore focus on how to eliminate deficiencies in company marketing linked to information, strategy, efficiency and legislation in the digital context of the article. Sawyer (2000) pointed out that in this phase of internal audit, it is necessary to discuss proposed recommendations with audited departments, primarily in order to clarify any possible technical discrepancies (Kupec 2012). The following section therefore concentrates on a list of individual auditing recommendations concerning the verified areas.

The findings concerning information risks must be approached carefully, taking into account the fact that this sphere provides data for subsequent company processes. If digital monitoring shows that the set limits have been exceeded (see Formula 2), the reasons why it happened must be discovered in order to eliminate possible impacts on other areas. Therefore, the auditing recommendation concerns the regular monitoring of selected information and their crosschecking using more sources with respect to the timeliness, precision and value of information. These measures can also be taken online in MIS/BI by electronic projection of information from several sources over one another. This will highlight possible deviations and make it easier for companies to manage risks.

Discrepancies between marketing strategies and real fulfilment are yet another finding which calls for rectification and monitoring. As soon as digital techniques announce any changes in the fulfilment of marketing values, or diversion from expected trends (see Formula 3), the situation must be amended in an appropriate manner. Here, auditing recommendations will concern the continuous and online assessment of the fulfilment of the strategy so that the defined strategies can be upheld with minimal deviations. This is where the high added value of digital techniques lies, thanks to which it is possible to follow the fulfilment of the plan in real time. Evaluation of marketing documents should be done on a regular basis, which, however, is often not the case.

The suggestions to eliminate risks of efficiency aim at overcoming problems with the fulfilment of individual marketing tasks. So while strategic risks are addressed as one area, under this concept, risks of efficiency concern individual issues. Auditing recommendations therefore focus on the elimination of the impact of any differences between the planned and actual fulfilment of marketing targets (see Formula 4). If targets are not met or the planned values are exceeded, this state must be analysed, criteria adjusted in real time and their changes also be incorporated in the overall marketing strategy. This approach will consequently help companies to efficiently fulfil their business plans.

Recommendations concerning legislation cannot be viewed as an independent aspect. Risks in this area can be dealt with through the cooperation of all company units. With respect to the suggested recommendations and the fact that legislation is present in the whole company structure, auditing recommendations should aim at establishing a unified digital hub for monitoring changes in legislation. Consequently, under such arrangements, all involved departments can enter information and cooperate in a responsible manner so that they are able to process all regulations, guidelines and laws coming from both external and internal information systems. The proposed method will consequently allow companies to apply crucial legislation policies.

The presented auditing recommendations are purposely only of a general nature, so that they can be further adjusted in accordance with each company's individual needs. The intention of the article was to present an overview of the possible ways to eliminate marketing risks with regard to digital technologies. Until now, auditing approaches have been confined primarily to physical verification of issues at-risk, which is demanding mainly with respect to the required capacity, time and financial costs. The automated monitoring of selected processes and subsequent activities undertaken by internal audit

can partly replace these methods, while at the same time achieving more efficient results in reducing certain risks.

4 Discussion

The presented results need to be confronted with other theories which will allow a balanced picture to be presented. In general, it can be said that digital methods of internal audit are important for managers, primarily with regard to marketing issues. This claim can be supported by theories by Kumar and Sharma (2005), who presented the following view on the subject matter: "The objective of the marketing audit is to identify marketing problem areas and to recommend a corrective plan with a view to improve the organization's overall marketing effectiveness" (Kumar & Sharma 2005, p. 36). Marketing effectiveness can be achieved by the application of digital techniques in internal audit.

The suggested methods for eliminating information risks are linked to the precise targeting of auditing techniques and the selection of a particular sample group for auditing verification. As Coderre (2009) claimed, it is on the basis of a study of a sample group that internal auditors arrive at their conclusions with regard to the whole process. A digital selection in accordance with the presented method will enable auditors to focus exclusively on preselected areas which either meet or do not meet the given criteria. Unlike in case of traditional selection by physical methods, the suggested digital method is clearly faster, more precise and efficient, according to Dvořáček (2003) and in this way it is in line with the changing trends in management.

The monitoring of strategies can be internally audited under the presented concept, primarily with regard to analysing trends and marketing information. Each strategy has to be planned beforehand, and if such a project is transferred to electronic systems with a link to MIS/BI systems, its realisation can be followed online and in this way, possible strategic differences can be monitored. Blatná (2004) confirmed that marketing analyses designed in this way can be statistically evaluated through trend analyses. The suggested method, which monitors only collected data on strategy fulfilment, is also in line with theories presented by Anderson et al. (2009), who pointed to the efficient use of selected information by management.

In regard to the risk of efficiency, the auditing possibilities depend on a strategic process. The main stages of the project are the importance of defining criteria, their continuous monitoring, real-time application and adequate auditing intervention. From the point of view of profession-specific auditing operations, the feasibility of application of this intention follows from theories concerning the Six Sigma auditing technique by Dvořáček (2005). Dvořáček (2005) claimed that as soon as we are able to measure potential deficiencies in a process, we are also able to offer methodical recommendations on how to eliminate these deficiencies. On the other hand, he also points out that evaluation of information can be quite demanding. And finally, the importance of analysing the presented information was suggested by Boone and Kurtz (2011), who saw the aforementioned techniques as a comparative advantage.

The suggested management of the legislation risk using digital methods and its subsequent monitoring using auditing techniques is one of the possible ways to approach these issues from the point of view of marketing. The importance of analysing the legislation sphere has been confirmed by Boone and Kurtz (2011), who included it among five basic attributes of the macroeconomic environment. The suggested auditing of qualitative information is a highly sophisticated activity which serves primarily as prevention (Dvořáček, 2003). A similar link between information databases is definitely not an exhaustive way to deal with this area; however, it is an accessible method which contributes to the successful management of risks in the legislation sphere.

Finally, we can say that internal audit can achieve better added value for the company management if digital methods are used, with respect to three basic attributes, the time of their implementation, accuracy of their results and cost efficiency, as important standards used for the evaluation of individual projects in firms (Hejduková & Kureková 2016). It is obvious that digital techniques can be used primarily in the preparatory phase of auditing, which consequently reduces the time needed for the verification itself. Sharma (2010) confirmed that meticulous preparation is essential and claimed that an audit without proper preparation rarely succeeds in providing the necessary recommendations. Consequently, the preparatory phase in the application of digital methods enables better orientation during the actual auditing.

Conclusions

This article has analysed the internal audit of company marketing in the digital environment. The aim of the study is to verify the efficiency of the digital potential of internal audit in the field of marketing, which forms an important part of company management. The presented results draw on the Delphi analysis of significant risks, which are ordered according to the probability of occurrence and size of impact as follows: information risk, strategic risk, risk of efficiency and legislation risk (see Figure 1). This analysis was followed by possible approaches to digital audit which can effectively detect the aforementioned threats (see Formulas 2, 3, 4). Finally, expert recommendations on how to eliminate the detected risks were presented. On the basis of the summarised results, we can conclude that the presented methods of digital audit in the marketing environment will allow the efficient management of company strategies. Modern audit can benefit from using digital techniques which can detect flaws in company processes.

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The Value of the Firm in Dependence on Technological Shocks – the Czech Republic Case

Hodnota firmy v závislosti na technologických šocích – zkušenosti z České republiky

PETR MAKOVSKÝ

Abstract

The article presents an innovative interpretation of the relationship between firm value and technological shocks. The motivation comes from the theory of technological shocks and their effects on the economy. We tried to confirm the hypothesis of neoclassical technology of the firm regarding the relationship between firm value and investment amount (interconnected with the interest rate). The relationship was empirically tested using a sample of data for the last 16 years (quarterly data). The Solow residuals represent the technological shocks and the PX index is an approximation of the firms' value. The model explaining the rate of growth of the PX index in dependence on the Solow residuals is confirmed, but the linear coefficient is negative. However, it is close to zero value, which means that there is no dependence between the observed variables. The falsification of the neoclassical firm approach is argued using the Czech economy as an open small economy with high interdependence on the financial sector. Due to the presented solution, we secondly tried to explain the evolution in the firms' value using autoregressive methods. We ran GARCH tests in order to gain a proper model of the PX index's rate of growth behaviour. The most appropriate model was the GARCH (2,1) model. Moreover, we made a forecast of the volatility of the PX index. The theoretical values of the forecast fit the empirical data we observed. Furthermore, we discuss the features of the model on two levels: the whole time horizon of observations (quarterly horizon 1999-2015, 85 observations) and the post-crisis horizon (quarterly 2010-2015, 25 observations).

Keywords

technological shocks, GARCH, firm value, volatility, time series analysis, variance

JEL Codes

E22, G17

Abstrakt

Článek přibližuje inovativní interpretaci vztahu mezi hodnotou firmy a technologickými šoky. Prvotní motivaci jsme získali na základě závěrů teorie technologických šoků a jejich dopadu na ekonomiku. Primární testovaná hypotéza je sestavena na závěrech neoklasické teorie firmy a vypovídá o vztahu mezi hodnotou firmy a investicí do fyzického kapitálu (i na základě vývoje úrokové míry). Samotný vztah byl v příspěvku testován na vzorku dat české ekonomiky za posledních 16 let (kvartální data). Jako aproximaci technologického šoku uvažujeme vývoj Solowových reziduí, aproximací hodnoty firem v ČR je vývoj indexu PX. Model, který vysvětluje tempo růstu indexu PX za pomoci vývoje Solowových reziduí je možno sestavit. Nicméně lineární koeficient regrese je negativní. Hodnota koeficientu

je velmi blízko nule, což značí spíše nezávislost hodnoty firem v ČR na technologickém pokroku. Falzifikace primární hypotézy je argumentována českou ekonomikou jako malou otevřenou ekonomikou s významnou mírou propojenosti vzhledem k zahraničnímu i vnitřnímu finančnímu sektoru. Na základě představených závěrů jsme nabídli alternativní hypotézu, která vysvětluje hodnotu firmy na vzorku dat české ekonomiky autoregresním přístupem GARCH. Provedli jsme několik testů typu GARCH, abychom získali uspokojivý model vývoje indexu PX (hodnoty firem). Nejvhodněji se jeví GARCH (2,1). Tento model uspokojivěji vysvětluje vývoj hodnoty firem v ČR než technologické šoky. Navíc jsme představeným modelem provedli předpověď volatility indexu PX a nyní můžeme konstatovat, že teoretické předpovědi modelu odpovídají empirickým pozorováním v současnosti. Dále jsme diskutovali vlastnosti modelu ve dvou rovinách. Zaprvé v kontextu celého vzorku dat (kvartálně od roku 1999 do roku 2015, 85 pozorování), zadruhé na vzorku dat po krizi v roce 2008 (kvartálně od 2010 do roku 2015, 25 pozorování).

Klíčová slova

technologické šoky, GARCH, hodnota firmy, volatilita, analýza časových řad, rozptyl

Introduction

Pastor and Veronesi (2005) have provided conclusions on the explanation of technological shocks. Technological shocks influence parts of the economy in different ways. There is a lag in the "old economy"'s absorption of technological shocks in comparison with that of the "new economy". This is why we observe technological bubbles. According to previous theory, the technological shock explanation is consistent with the goal to maximise firm value. We are interested in the dependence of firm value on technological shocks. More particularly, this means the technological progress. In this article we assume there to be little difference between technological shock and technological progress (or regression).

The main purpose of this article is to evaluate the verification of the neoclassical theory of investment using a data sample for the Czech Republic economy, and if this relationship is falsified, to find an alternative.

In the following analysis we assume the firms' value in the Czech Republic to be approximately the same as the value of the PX index (the index of the Prague stock exchange market). On the other side, the technological shocks are measured in the form of Solow residuals. The primary hypothesis is that an increase in technological progress causes an increase in firms' value in the economy. If this is falsified, we expect the alternative hypothesis to hold about the value of firms being dependent on the previous values of the firms.

Further connected literature has been interested in the interdependency between the financial sector and real economy processes (Wickens 2012) or in modelling of volatility of financial variables (Cipra 2008). The contemporary state of research of primary hypotheses and alternatives more or less consists of two methodological areas. The first is the meaning and explanation of pure economic theory, and the second is the time series analysis approach, which concentrates on variable modelling and forecasting (sometimes on the equilibrium state between confirmation of variables).

The presented relationships of both approaches have been empirically tested using data samples for various financial time series across various economies, for instance analysis of the Czech Republic case of the FOREX market (Pošta 2012a, 2012b). The theoretical solutions have been argued on the basis of the C-CAPM model (consumption-based) and these arguments were discussed in Cochrane (2009). It is important to state that for small open economies, according to these empirical results, the risk premium dependency is weakened. There is a space for other explanatory variables, for example technological progress.

1 Methodology – economic theory analysis

In this study we used the theoretical conclusions of pure macroeconomic theory and time series analysis. First we found a suitable approximation for firm value: the rate of growth of the PX index. Technological progress is most appropriately simulated with the evolution of the so-called Solow residuals. These are calculated from the production function of the economy, assuming standard features.

Here we prefer the real business cycle theory (Lucas 1975), which is why we assume the potential product growth is the same as the real GDP growth. So here we see the basis of our analysis. We need to calculate the real GDP and subtract the influence of the input factors (labour, physical capital). Then we achieve the residuals, which represent technological progress. This is standard usage of the growth accounting equation (Solow 1988). Although the approach is said to be obsolete, in many way it is much more useful than the variety of innovation indices, in which we observe subjective biases. Solow residuals are gained from nominal GDP rates, gross fixed capital formation, evolution of labour amount and the deal of valued physical to GDP. The Solow residuals are achieved from Equation 1.

$$y_t = \psi_t + w * l_t + (1 - w)k_t \quad (1)$$

where y_t is the rate of growth of real GDP, ψ_t is the Solow residuum in a particular year, w is the deal of labour force (financial value) to the nominal GDP, the growth rate of the labour force and, k_t is the growth rate of physical capital (gross fixed capital). Then $(1-w)$ is the deal of capital to nominal GDP. Although modern mainstream theory does not reject the growth accounting equation (Equation 1) alternatives have appeared for technology progress measurement, for instance Mihola and Wawrosz (2014).

The dependency between firm value (rate of growth of the PX index) and technological shocks (relative change in the Solow residuals) is theoretically based on the pure theory of the firm. The value of the firm is the sum of future discounted economic profits. The value of the firm (Pindyck 1986) is calculated according to Equation 2:

$$VoF_t = \sum_{j=0}^{\infty} E_t \beta^j \pi_{t+j} \quad (2)$$

where VoF is the value of the firm, E_t is the expectation in time, β_j is the discount factor in time from t , and π_{t+j} is the future economic profits. As there is an increase in physical investment, this is interconnected with lower interest rates. This low general interest rate forms the discount factor in an inverse way. This is why we expect that higher technological progress leads to lower interest rates and this also leads to higher value of the firm according to Equation 2.

2 Methodology – time series analysis

The second part of our analysis concerns time series analysis. The alternative method for modelling the value of the firm for our purposes is autoregressive conditional heteroscedasticity (ARCH). There are many ARCH-based approaches (Bollerslev, Engle & Nelson 1994). These methods provide both the regression equation for the mean value and the variance regression equation. The ARCH approach uses the lagged value of the “white noise” stochastic process to explain the value of contemporary variance. Thus the ARCH method belongs to the autoregressive time series analysis methods (Box-Jenkins methodology). The generalised ARCH (GARCH) further expands the analysis on the lagged value of conditional variance.

ARCH (q) is the stochastic process following Equation 3:

$$\sigma_t^2 = \omega + \sum_{i=1}^q \alpha_i \varepsilon_{t-i}^2 \quad (3)$$

where $\alpha_i > 0$, $\omega \geq 0$ for all $i > 0$.

The stationary condition is that all of the roots of the polynomial equation are inside the unit circle. Unconditional variance of the stochastic process ε_t does not differ through time, moreover it provides unconditional homoscedasticity. The prediction ARCH(q) in horizon h is calculated according to Equation 4.

$$\sigma_{t+h/t}^2 = \hat{\omega} + \sum_{i=1}^q \hat{\alpha}_i \varepsilon_{t+h-i/t}^2 \quad (4)$$

Here the $\varepsilon_{t+i/t}^2 = \sigma_{t+i/t}^2$ for all $i > 0$, but when $\varepsilon_{t+i/t}^2 = \varepsilon_{t+i}^2$ for all $i \leq 0$.

In contrast with the ARCH procedure, the GARCH approach is a modification of the previous model with delayed conditional variance (Nelson, 1990). It is useful to calculate GARCH when there are many parameters α in ARCH (for high q). The ARCH has its useful features using higher q . With knowledge of this we prefer the GARCH (1,1) approach to ARCH.

It is necessary to state that the presented time series methods provide a useful statistical confirmation, but the meaning is more technical than empirical. In other words, conclusions based on the explicit explanation of autoregressive-based methods are more difficult to draw, but this has been explained in the further literature (Makovský 2014). There is an advantage for the economic meaning of problem-solving.

3 Data

In order to provide the empirical analysis we used a data sample of the variables from 1997 to 2015 in the Czech Republic economy. We modified the data into quarterly data which are each the moving averages of 60 observations. This time series was transformed into differences of logarithm. For small changes, this is an appropriate approximation for the relative change of the variable – the rate of growth of the PX index or the percentage evolution of the Solow residuals. Moreover, the logarithmic transformation provides better features for the linear regression model which we wanted to use (mainly stationary). The data sample for the PX index was gained from the database of the Prague Stock Exchange. Other variables were gained from the Czech Statistical Office. Finally, for all the variables we removed the seasonality from the time series using the Hodrick–Prescott filter (Hodrick & Prescott, 1997). The dataset is structured according to Table 1. Readers may be surprised that for many quarters we see negative technological shocks (negative contribution). As far as we are aware, our calculation has no mistakes, but there might be differences from the official statistics, in which there are many adjustments. Moreover, we used the gross physical capital formation not the physical capital evolution. We used quarterly data and avoided seasonality in order to be able to find the relationship to the financial data of the PX index. Nevertheless the main purpose of this article is to verify whether there is any relationship between the rates of growth. This means that a small increase (connected with an official adjustments) in all the values in the data series does not matter. The complete dataset can be found in Annex 1.

Table 1: Data for analysis

	T (quarter)	nGDP (bn CZK)	wages + salaries (bn CZK)	L (amount of labor)	W	K (amount of capital)	rate of growth nGDP	rate of inflation (%)	rate of growth rGDP	rate of growth L	rate of growth K	Technologic progress (%)	PX index	rate of growth PX
1997	Q1	439.6	177.9	nGDP	0,40	136098	0,076	7,162	0,482	-2,463	-0,901	-2,360	579,3	-0,011
	Q2	484.6	204.6	2374345	0,42	149910	0,075	6,596	0,944	0,336	1,811	-3,141	569,5	-0,040
	Q3	502.3	196.8	2335886	0,39	154169	0,076	9,860	-2,291	0,045	-2,810	-3,652	510,9	-0,041
	Q4	526.8	218	2438651	0,41	185612	0,083	10,100	-1,849	0,382	7,018	-3,866	532,8	-0,023
1998	Q1	484	191.9	2265713	0,40	155940	0,101	13,299	-3,195	-2,249	14,579	-3,043	501,4	-0,034
	Q2	541.2	210.2	2428820	0,39	158020	0,117	12,690	-0,994	2,294	5,410	-0,916	479,0	-0,024
	Q3	554.5	204.9	2266195	0,37	161173	0,104	9,511	0,875	-2,983	4,543	0,096	467,5	-0,015
	Q4	562.8	230.2	2440186	0,41	177652	0,068	7,478	-0,643	0,063	-4,289	0,449	426,8	-0,009
2015	Q1	1 035.4	427.4	2298923	0,41	247738	0,053	0,126	5,172	-0,094	4,876	-0,473	966,9	0,001
	Q2	1 121.4	443.5	2383449	0,40	279688	0,052	0,654	4,512	2,438	10,114	-1,136	1002,8	0,003
	Q3	1 141.6	440.9	2198483	0,39	298686	0,045	0,391	4,139	1,769	8,828	-0,725	1018,6	-0,005
	Q4	1 173.9	475.1	2332938	0,40	327069	0,049	0,126	4,769	3,285	8,737	-0,353	1008,9	-0,009

Source: own calculations in MS EXCEL

Notice: All input data are gained from the CZSO database. We found the real GDP growth rate on the basis of the quarterly nominal value of GDP by the expenditure method and the quarterly average of the inflation rate (year-on-year moving average). The growth rate of capital was obtained on the basis of the evolution of gross fixed capital formation and the rate of change in the workforce, based on the number of recalculated employees by hours worked. The labor force share on the GDP in individual quarters was based on the nominal GDP structure based on the income method. The share of capital on the product is a complement to one of the labor force share on the product.

4 Economic analysis

Table 2 presents the descriptive statistics. There are two variables in the relative changes, rate of growth of the PX index (vPX) and relative change in the Solow residuum (vS). We see that the mean value is stable (non-zero). The PX index increases in a stable way, but the relative change in the Solow residuals decreases. Both movements are less than a 0.2% change. The standard deviation is greater in the vPX variable than in the vS.

Table 2: Descriptive statistics

	Mean	Median	Maximum	Minimum	Std. dev.	Skewness	Kurtosis	Jarque-Bera	P-value
vPX	0.015009	0.001120	0.129519	-0.069180	0.049490	0.741026	2.749616	7.812967	0.020111
vS	-0.139416	-0.308511	4.127763	-3.866459	1.889717	0.208883	2.683534	0.869815	0.647324

Source: own calculations in Eviews

When the best prediction of stochastic variable is its present value, then the stochastic process is called martingale. The random walk stochastic process is less restrictive than the martingale process. In the case of martingale, we assume independence of the iid (identically independent distribution) residuals from the AR process, but the conditional variance is not iid. We are able to predict the future conditional variance from the previous variance. This assumption is broken for the random walk stochastic process (Cuthbertson & Nitzsche 2005).

Here we observe a well-known fact from the financial markets. We are able to reject the null hypothesis of normality for the vS (represents the real sector). But the same hypothesis cannot be rejected normality for vPX (this does not mean that the vPX follows normal distribution).

An unsatisfactorily high level of autocorrelation appears in the relative changes of the analysed variables. Better input data features are gained through transformation into logarithms: then we can use the logarithmic differences. These are approximately the same as the relative changes. The primary transformation of the PX index is clear. The problem appeared in the case of the Solow residuals. These are sometimes negative. We had to sum to all values of variable its minimum. This drift is avoided through following differentiation. Table 3 shows more from the analysis of the process (PX is the PX index, firm value; S is the Solow residuum, technological process).

Table 3: Series statistics

	$\ln PX_t - \ln PX_{t-1}$ (vPX)	$\ln S_t - \ln S_{t-1}$ (vS)
Correlogram	No autocorrelation for first and second lagged values	No autocorrelation
Augmented Dickey-Fuller test	Does not have a unit root	Does not have a unit root
Jarque-Bera test	55.828 (p-value: 0.000)	334.2148 (p-value: 0.000)

Source: own calculations in Eviews

Both analysed time series are stationary. We were able to run the regression analysis in order to analyse the interdependence between the rate of growth of the PX index and the percentage change in the Solow residuals. Neither of these time series have a unit root and they are not auto correlated. We provide the regression analysis maximally to the second lagged values (two quarters).

Table 4: Regression analysis

	$vPX=c(1)+c(2)*vS$	$vPX=c(1)+c(2)*vS(-6)$	$vS=c(1)+c(2)*vPX$
C(1)	0.0722 (p-value:0.5744)	0.0093(p-value:0.468)	0.0149(p-value:0.73)
C(2)	-0.042 (p-value:0.2199)	-0.075 (p-value:0.0286)	-0.479(p-value:0.22)
DW statistics	1.483033	1.641415	1.226960
Prob. (F-statistics)	0.219892	0.028606	0.219892

Source: own calculation in Eviews

We do not present the solution for the first value lagged relationship. It provides more or less similar results to the second lagged relationship. Now we provide a few comments on the solutions presented in Table 4. Here we can see that the inverse relationship is not confirmed. According to the statistics, technological progress is not a function of firm value. We are further able to generalise the presented statement for the lagged values modification.

To sum up the analysis, we see that a non-delayed relationship between firm value and technological progress is, in the data sample for the Czech economy, falsified. We are not able to reject the null hypothesis for the constant to be zero. The same result appears for the linear regression coefficient. Firm value is not a function of the present technological progress.

But there are different solutions for the analysis of lagged variables. We are not able to reject the null hypothesis for the constant to be zero again. But we do reject the null hypothesis for the linear regression coefficient at a statistical significance of 5%. The value of this linear coefficient is -0.075 (the value for the first lagged situation is close at -0.07). Firm value is a function of the lagged technological progress (for a half year). The regression formula is described in Equation 5. The Durbin–Watson statistics achieve a suitable value. This speaks for the non-auto-correlated regression residuals. Furthermore, the F-statistics bring conclusions on the suitability of the regression model at all. The

interconnection between Equations 2 and 5 is that an increase in technological progress leads to an increase in investment in physical capital, which causes an increase in future economic profits and in the value of the firm. The data observation fits the following empirically tested Equation 5:

$$VoF(\%) = -0,07 * Tech.progress(\%) \quad (5)$$

Using the data sample for the Czech Republic, we have drawn a conclusion about the negative influence of technology shocks on firm value. According to our analysis, a percentage increase in technology leads to a 0.07% decrease in firms' value in the Czech Republic. Our primary hypothesis on the positive dependence of firm value on technology shocks is rejected. The primary hypothesis is built on the idea that a positive shock in technology leads to an increase in firms' investment in physical capital. These investments are essentially interconnected with the lowering of the general interest rate. Finally, this lower interest rate increases the present value of the total discounted sum of economic profits. We must repeat the conclusion that there is a negative dependence between the variables. More generally, according to the almost null value of the coefficient, there is no relationship between the analysed variables.

We need to further discuss the primary assumptions of the linear regression. These are the a) metric valued endogenous variable, b) metric valued exogenous variables, c) absence of multicollinearity, d) elimination of observed outliers in the data, e) linear relationship between the variables, f) normal distribution for all the variables, g) homogeneity in variance (homoscedasticity). In the presented analysis, some of these assumptions are confirmed (linearity through decadic logarithm linearisation), but some do not fit completely (for instance the normality assumption). These problems are connected with the inappropriate usage of linear regression in economic dynamics studies.

5 Time series analysis

In order to provide a more useful solution to our problems, we used autoregressive methods. As was presented in the theoretical section, we used the method of autoregressive conditional heteroscedasticity (ARCH) or generalised autoregressive conditional heteroscedasticity. In other words, we have tried to explain the evolution of the PX index (rate of growth in the PX index) using the (G) ARCH methodology. The starting point in this following analysis is the Box-Jenkins methodology, which assumes that the evolution of a time series is explained through the stochastic process with the random part.

For the volatility modelling we used the autoregressive conditional heteroscedasticity (ARCH), which is useful in the evolution of financial risk and uncertainty in a time series. A more simple explanation is the linear regression of conditional variance. The conditional variance is a function of the delayed squares of the residuals of the stationary autoregressive process. The delayed conditional variance is added in generalised ARCH (GARCH).

The persistence of variance is explained with the additional assumption of the autocorrelation function being hyperbolic (long memory process). The shock influences the variance in the long term. The conditional variance relies on the input conditions, no matter how far the prognosis is.

Non-linear models are able to foresee the asymmetric effect. This means that the impacts of positive and negative shocks on the variance are different. Let us explain this using implicit contracts. These assume firms to be risk neutral, while consumers are risk averse (Mankiw 2014). In this section we try to create a model of the volatility of the PX index. This is built in consequence to the discovery of the falsification of the previous hypothesis on firms' dependency on the technological progress.

First we calculated the autocorrelation function and PACF function of the logarithmic difference of the PX index (dIPX), which is approximately the rate of return of the PX index. This was done in order to gain the appropriate level of lag. The Eviews output gives information about autocorrelation through a graphical solution and the so-called Q-statistics (p-value 0.058). For the dIPX evolution, we are not able to falsify the hypothesis of no autocorrelation for the lags up to two.

The second-level lag in the autocorrelation results in the volatility model GARCH (1,1). Moreover, this specification does not contradict the practical experience. A smart money trader predicts volatility based on the information of volatility in the previous period and further on newly gained innovative information. If the yield is abnormal in both directions, the trader takes a new volatility estimation for the following period. GARCH (1,1) is also useful in explaining volatility clustering. This means that higher changes in volatility last for a longer time and the probabilistic distribution is leptokurtic (Cont 2007).

Here, we wish to make a few comments about the result of testing the GARCH (1,1) on the empirically observed data. The mean value is not confirmed at the value of 0.01544% at a 5% level of statistical significance as presented in Figure 1. The mean value is the null value as we have seen from the previous analysis.

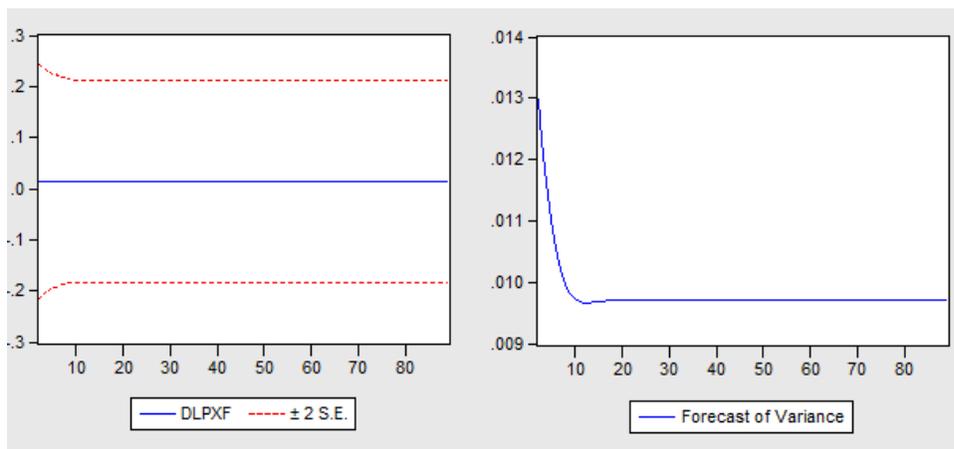
The variance equation falsifies the constant and GARCH term at a 5% statistical significance. Moreover, the ARCH term is verified. Now, according to our previous analysis from the autocorrelation analysis we ran the test up to the second lag. The results are presented in Table 2 (Annex 2).

The lagged analysis provides a better solution. Once again we falsified the non-zero mean value. But the ARCH terms are verified and the GARCH term up to the first lag is also verified at a suitable level of statistical significance. The second lag GARCH term is falsified.

In contrary with the conclusions from the previous "economic" analysis, we have been able to create a model explaining the evolution of the rate of growth in the PX index (firms' value in the Czech economy in the last 15 years). The previous statement is an alternative which is confirmed in the data sample for the Czech Republic's economy upon the rejection of the primary hypothesis.

Volatility is dependent on the volatility in the previous period (previous quarter) and on the random part of stochastic processes. The whole analysis is made in a range from 1999 to 2015 (quarterly data, 85 observations). Here in Figure 1 we tried to use the model for forecasting future evolutions in volatility. We made a prognosis for one year (4 observations). At the time of creating this contribution, we were able to gain the data for half of 2016 and compare. The forecast for the four periods of 2016 predicted stable volatility. For those who might argue with the wide spread between the four times' standard deviations, we need to highlight that there is a percentage analysis. The spread is then much smaller and appropriate.

Figure 1: Forecast of PX volatility based on the GARCH (2,2) model for 2016

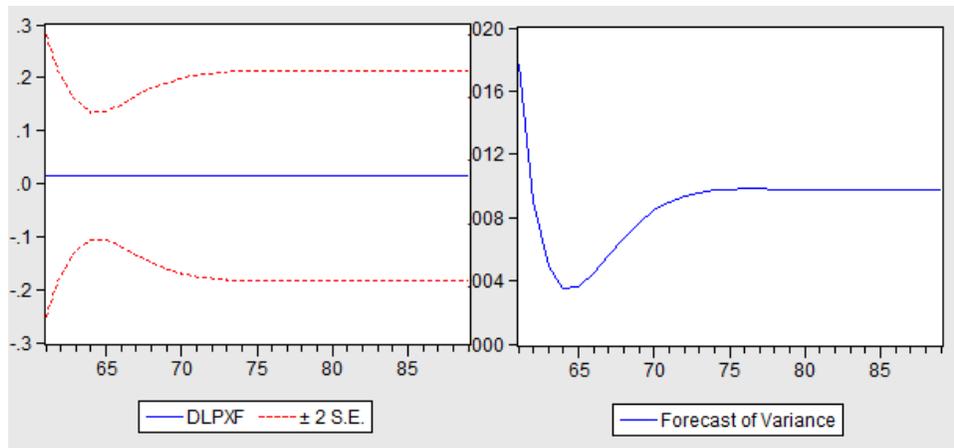


Source: own calculations in Eviews

In Figure 2 we present the forecast of PX volatility of the GARCH (2,2) model, which considers the just post-crisis period (2010 to 2015, 25 observations). The model is based on the whole period analysed. It is not confirmed in the post-crisis period data (insufficient amount of observation).

The output for the post-crisis data predicted a decrease in volatility in the first post-crisis year (2009) and an increase in the second post-crisis year (2011). For the rest of period the forecast predicts stable volatility at 0.8%.

Figure 2: Forecast of PX volatility based on the GARCH (2,2) model for 2016 – post-crisis period



Source: own calculations in Eviews

The alternative hypothesis is confirmed. We have found a useful explanation of firm value. Remember that the pure economic theory of capital was falsified in the data sample for the Czech Republic economy. In contrast with the previous falsification of the primary hypothesis, we verified the alternative explanation of firm value by its previous values and random factor (white noise). This GARCH methodology provided a useful solution and we made a prediction for the whole year 2016 (four quarters). The main purpose of this article has been achieved. According to the results of our research, we prefer the time series analysis, mainly GARCH (2,2), to the neoclassical theory of capital for the future prediction of the value of firms in the Czech Republic economy. This idea is based even on the evolution during the economic crisis in 2008.

Conclusions

The main purpose of this article was to evaluate the verification of the neoclassical theory of investment using a data sample for the Czech Republic economy, and if this relationship was falsified, to find an alternative. We were particularly interested in the effects of technological shocks on firm value. In order to achieve this goal, we tested the primary hypothesis that an increase in technological shock causes an increase in firms' value in the economy. According to pure economic theory, firm value is dependent on technological progress. We calculated the Solow residuals from the nominal GDP evolution and tried to explain the evolution in the rate of growth of the PX index (approximation for firm value). Based on this empirical data sample from 1999 to 2015, we were able to gain the regression model (no spurious regression). The problem is the negative value of the linear coefficient where we expected a positive value. The primary hypothesis of this article is thus rejected. It is necessary to mention that the coefficient is about small percentage values. We have falsified the original hypothesis on the dependence of firm value on technological progress. But we are able to make the statement that there is no relationship between

technological progress and firm value. This statement is arguably due to the Czech Republic being a small open economy in which there are other factors than just real factors.

The main goal of this article is achieved in the statement of the falsification of the relationship. A useful evaluation should contain alternatives. An alternative for the firms' value explanation is its dependence on the previous values of firms. This alternative hypothesis was tested using the GARCH methodology (models explaining the volatility of a time series). The presented conclusions are connected with the evolution of the international financial sector. In order to provide an alternative research method for the presented problem, we ran GARCH tests, meaning that we were interested in the time series analysis of the evolution of the PX index.

The autoregressive methodology GARCH provides a useful solution for the PX index (approximation for the firms' value). We confirmed the GARCH (2,1) model. The volatility of the rate of growth of the PX index is explainable with its previous volatility (the GARCH term) and with not up to three lagged values of the stochastic process "white noise".

Furthermore, we ran forecasts for 2016 (4 quarters observations) using the presented model on first the whole dataset and secondly on the dataset involving the post-crisis period (2010 to 2016). In the first half of 2016 we are able to confirm the theoretical values of the GARCH volatility forecast using the actual values of the volatility.

Finally, although we rejected the primary hypothesis, the alternative relationship was confirmed. The firms' value volatility (PX index rate of growth) is explained with the previous values of volatility and the stochastic process called white noise. The presented model built on the data sample of 1999q1 to 2015q4 predicts the stable volatility for 2016q1 to 2016q2, which fits the observed volatility. We observed martingale behaviour of the PX rate of growth.

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Appendix 1

T	T (quarter)	nGDP (mid CZK)	wages +salaries (mid. CZK)	L (amount of la	W (%)	K (amount of Capital)	rate of nGDP (%)	rate of inflation (%)	rate of rGDP (%)	rate of L (%)	rate of K (%)	Technologic progress (%)	PX index	Rate of growth PX (%)
2005	Q1	748169	301131	2244128	0,402	202255	0,077395079	1,631	6,109	3,087	5,286	-0,265	970,651	0,112
	Q2	816100	319755	2357820	0,392	232846	0,082296149	1,553	6,677	2,496	7,876	-0,919	1144,876	0,082
	Q3	823330	323815	2110089	0,393	230170	0,060457939	1,853	4,193	2,142	7,288	-1,373	1158,516	0,052
	Q4	870373	354496	2232445	0,407	256548	0,045116475	2,394	2,117	0,078	7,590	-1,316	1327,391	0,056
2006	Q1	797802	323376	2298728	0,405	219956	0,06633929	2,833	3,801	2,433	8,752	-1,100	1403,704	0,029
	Q2	870410	342995	2294343	0,394	236785	0,066548217	2,897	3,758	-2,692	1,692	-0,959	1532,591	0,019
	Q3	896437	345783	2110322	0,386	239984	0,088794287	2,895	5,984	0,011	4,264	-2,167	1401,840	-0,001
	Q4	942482	381880	2271696	0,405	286226	0,082848388	1,491	6,794	1,758	11,568	-3,128	1423,911	0,017
2007	Q1	882421	353927	2321185	0,401	264926	0,106065164	1,547	9,059	0,977	20,445	-3,477	1558,773	0,014
	Q2	949243	371302	2339194	0,391	272323	0,090569961	2,466	6,591	1,955	15,009	-3,236	1667,011	-0,008
	Q3	976901	374791	2126216	0,384	274900	0,089759793	2,491	6,485	0,753	14,549	-2,964	1826,965	-0,027
	Q4	1023254	413234	2301001	0,404	320243	0,085701371	4,762	3,808	1,290	11,885	-2,710	1782,596	-0,053
2008	Q1	926672	390484	2338911	0,421	287716	0,050147265	7,364	-2,349	0,764	8,602	-2,218	1831,455	-0,056
	Q2	1014549	401015	2411508	0,395	288023	0,068797979	6,767	0,113	3,091	5,765	-0,647	1529,384	-0,069
	Q3	1039324	397976	2235738	0,383	287439	0,063899003	6,665	-0,275	5,151	4,561	0,393	1608,038	-0,041
	Q4	1034801	427374	2327473	0,413	302154	0,011284588	4,564	-3,435	1,150	-5,649	1,407	1393,169	-0,056
2009	Q1	929368	383943	2317023	0,413	254033	0,002909336	2,163	-1,872	-0,936	-11,707	1,696	855,647	-0,032
	Q2	980926	387882	2367413	0,395	256036	-0,033140834	1,411	-4,725	-1,829	-11,106	0,722	723,556	0,052
	Q3	987262	379975	2151086	0,385	262793	-0,050092175	0,245	-5,254	-3,786	-8,574	0,181	901,689	0,093
	Q4	1024271	416761	2254060	0,407	290610	-0,01017587	0,433	-1,451	-3,154	-3,821	-0,191	1106,720	0,048
2010	Q1	914538	377961	2341325	0,413	234033	-0,015957081	0,665	-2,261	1,049	-7,873	-0,730	1136,475	0,002
	Q2	1000113	390410	2393712	0,390	254611	0,019560089	1,166	0,790	1,111	-0,557	-1,308	1169,467	-0,005
	Q3	1004700	394692	2127038	0,393	275386	0,017662991	1,933	-0,166	-1,118	4,792	-1,634	1191,555	-0,013
	Q4	1034300	425989	2239016	0,412	301975	0,009791354	2,095	-1,116	-0,667	3,911	-1,223	1161,760	-0,020
2011	Q1	933307	388179	2371954	0,416	239686	0,020522931	1,733	0,320	1,308	2,415	-0,652	1164,304	-0,018
	Q2	1012128	402675	2393930	0,398	258857	0,012013642	1,793	-0,591	0,009	1,668	-0,336	1238,631	-0,021
	Q3	1017894	402461	2093999	0,395	268779	0,013132278	1,733	-0,419	-1,553	-2,399	0,008	1239,275	-0,038
	Q4	1059182	432428	2246635	0,408	301670	0,02405685	2,399	0,007	0,340	-0,101	-0,337	1035,605	-0,043
2012	Q1	954584	401352	2357115	0,420	243732	0,022797429	3,665	-1,385	-0,626	1,688	-0,327	894,920	-0,011
	Q2	1016849	410327	2329392	0,404	258154	0,00466443	3,397	-2,931	-2,696	-0,272	0,164	986,102	0,019
	Q3	1016439	408397	2037982	0,402	262999	-0,001429422	3,264	-3,407	-2,675	-2,150	0,606	895,724	-0,002
	Q4	1053738	443392	2270927	0,421	287225	-0,005139815	2,803	-3,317	1,081	-4,788	0,927	932,275	0,019
2013	Q1	941608	401285	2260677	0,426	230138	-0,01359356	1,764	-3,124	-4,091	-5,577	1,294	989,709	0,012
	Q2	1015585	415031	2326379	0,409	242963	-0,001243056	1,523	-1,648	-0,129	-5,884	1,051	1008,580	0,000
	Q3	1034183	415610	2111926	0,402	260252	0,017457024	1,221	0,525	3,628	-1,044	0,745	950,239	-0,005
	Q4	1085733	442601	2258534	0,408	291438	0,030363335	1,115	1,921	-0,546	1,467	0,923	947,803	0,008
2014	Q1	983311	411234	2301089	0,418	236220	0,044289131	0,200	4,229	1,788	2,643	0,777	997,105	0,009
	Q2	1066281	424121	2326713	0,398	253998	0,049918028	0,200	4,792	0,014	4,542	0,319	1006,351	-0,002
	Q3	1092149	422891	2160266	0,387	274458	0,056050041	0,594	5,011	2,289	5,459	-0,177	1011,273	-0,004
	Q4	1119145	454084	2258734	0,406	300788	0,03077368	0,648	2,429	0,009	3,208	-0,323	975,612	-0,006
2015	Q1	1035402	427392	2298923	0,413	247738	0,052975101	0,126	5,172	-0,094	4,876	-0,473	966,939	0,001
	Q2	1121364	443450	2383449	0,395	279688	0,05165899	0,654	4,512	2,438	10,114	-1,136	1002,798	0,003
	Q3	1141631	440940	2198483	0,386	298686	0,045307005	0,391	4,139	1,769	8,828	-0,725	1018,619	-0,005
	Q4	1173927	475102	2332938	0,405	327069	0,048949868	0,126	4,769	3,285	8,737	-0,353	1008,945	-0,009

Appendix 2

Table 1: Output from GARCH (1,1) analysis in Eviews

Dependent Variable: DLPX
 Method: ML - ARCH (Marquardt) - Normal distribution
 Date: 06/20/16 Time: 12:18
 Sample (adjusted): 2 85
 Included observations: 84 after adjustments
 Convergence achieved after 16 iterations
 Presample variance: backcast (parameter = 0.7)
 GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.015444	0.011886	1.299386	0.1938

Variance Equation

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.003919	0.003032	1.292371	0.1962
RESID(-1)^2	0.369381	0.141168	2.616616	0.0089
GARCH(-1)	0.354039	0.336038	1.053568	0.2921

R-squared	-0.004407	Mean dependent var	0.008122
Adjusted R-squared	-0.042072	S.D. dependent var	0.110961
S.E. of regression	0.113272	Akaike info criterion	-1.569513
Sum squared resid	1.026435	Schwarz criterion	-1.453760
Log likelihood	69.91956	Hannan-Quinn criter.	-1.522982
Durbin-Watson stat	1.460381		

Source: own tests in the Eviews

Table 2: Output from GARCH (2,2) analysis in Eviews

Dependent Variable: DLPX
 Method: ML - ARCH (Marquardt) - Normal distribution
 Date: 06/20/16 Time: 12:35
 Sample (adjusted): 2 85
 Included observations: 84 after adjustments
 Convergence achieved after 7 iterations
 Presample variance: backcast (parameter = 0.7)
 GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*RESID(-2)^2 + C(5)*GARCH(-1) + C(6)*GARCH(-2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.014190	0.008135	1.744157	0.0811

Variance Equation

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.001295	0.000697	1.857444	0.0632
RESID(-1)^2	0.466113	0.104477	4.461406	0.0000
RESID(-2)^2	-0.375880	0.101240	-3.712773	0.0002
GARCH(-1)	0.898373	0.149538	6.007642	0.0000
GARCH(-2)	-0.121822	0.096043	-1.268406	0.2047

R-squared	-0.003026	Mean dependent var	0.008122
Adjusted R-squared	-0.067323	S.D. dependent var	0.110961
S.E. of regression	0.114636	Akaike info criterion	-1.537226
Sum squared resid	1.025024	Schwarz criterion	-1.363597
Log likelihood	70.56351	Hannan-Quinn criter.	-1.467429
Durbin-Watson stat	1.462391		

Source: own tests in the Eviews

Czech Public and Occupational Pension Schemes and Reforms

České veřejné a zaměstnanecké penze a jejich reformy

JAROSLAV VOSTATEK

Abstract

The Czechoslovak communist retirement protection scheme resembled the Bismarckian earnings-related pensions, with new benefits close to final salaries and with their insufficient indexation. The aim of this paper is to evaluate the reform processes in Czechia and the potential for a simple technical reform that would make the public retirement schemes understandable and efficient. In the process of the transition to capitalism under liberal Czech governments, the prevailing concept of the public retirement scheme changed to a Beveridge model of pensions not being related to previous wages. The insufficient valorisation of bend points was the main method of this transition. Modern international pension theory recommends the separation of a solidary pillar and an earnings-related pillar. After the Czech "small" pension reform, a basic technical reform may be simply realised, resulting in a higher flat-rate pension and an NDC pension insurance scheme, convenient to parties with programmes based on three basic welfare regimes. The introduction of occupational pension schemes is necessary to reflect the specifics of arduous occupations.

Keywords

retirement pension, welfare regimes, occupational pension schemes, pension pillars, Bismarck system, Beveridge system

JEL Codes

H55, J26, H 53, H24

Abstrakt

Československý komunistický systém důchodového zabezpečení připomínal bismarckovské penze závislé na výdělku, s nově přiznanými dávkami blízkými výdělkům v předdůchodovém věku a s jejich nedostatečnou indexací. Cílem příspěvku je zhodnocení reformních procesů v Česku a analýza potenciálu jednoduché technické reformy, která by učinila veřejný penzijní systém srozumitelným a efektivním. V procesu přechodu ke kapitalismu za českých liberálních vlád došlo ke změně převažujícího konceptu veřejných penzí na Beveridgeův systém penzí nezávislých na předchozích výdělcích. Hlavní metodou tohoto přechodu byla nedostatečná valorizace redukčních hranic. Moderní mezinárodní penzijní teorie a politika doporučuje oddělení solidárního penzijního pilíře a pilíře s penzemi závislými na výdělku. Po „malé“ důchodové reformě lze snadno provést základní technickou reformu veřejných penzí, spočívající v přechodu na poměrně významný rovný důchod a na sociální starobní pojištění typu NDC, která by vyhovovala stranám, majícím program založený na třech základních sociálních modelech. Zavedení zaměstnaneckých penzí je nezbytné k zohlednění specifík fyzicky náročných zaměstnání.

Klíčová slova

starobní důchod, sociální modely, zaměstnanecké penze, penzijní pilíře, Bismarckův systém, Beveridgeův systém

Introduction

The aim of this article is to compare the Czech system of public and occupational pension schemes with internationally recognised pension theory and policy and then formulate fundamental reform proposals that could be used by Czech political parties and future Czech governments. We base our assumptions on the summary of elementary pension policies across the world and apply them using Esping-Andersen's welfare regimes theory (1990) regarding the issue of pensions. We extend the scale of "his" pension regimes from three to four by using Bovenberg and Ewijk's (2012) typology, while retaining the terminology of Esping-Andersen, and adding the neoliberal welfare regime which has been developed since the 1990s. We assume that the selection of a welfare regime is a result of public choice in the sense of modern public policy. Ideally, each pension system should be based on one of the four welfare regimes. This is particularly significant for Czechia, where the pension system has undergone many transformations since 1990 without an attempt to introduce a comprehensive welfare regime, albeit in the basic pension pillar.

The first part of the article will deal with the development tendencies of pension theory and policy, in the context and respecting the four welfare regimes and main typologies of pensions systems and pillars. The second section then focuses on the evaluation of reforms of the Czech public pensions from the systemic point of view. The third section will deal with potential reform alternatives to the existing "pension insurance". In discussions and preparation of reforms, the NDC (notional/non-financial defined contribution) scheme had a very specific role and is analysed in the fourth section. The fifth and sixth sections deal with occupational pension schemes – the theory and Czech policies. In the last section, we show that the creation of a comprehensive and comprehensible system of public and occupational pension schemes is relatively very easy under the current circumstances, if modern and proved pension policies are applied.

1 Pension welfare regimes

From the general theory perspective, it would be ideal if every individual provided for themselves for old age. However, this does not work, and the theory only explains that this is the result of a certain "myopia" in the actions of people and, objectively, also the unpredictability of how long we will stay alive (longevity risk). The willingness to purchase an old-age pension for life under "standard market conditions" is very low, and the generally recognised "failure" of this market is an intrinsic part of it. In principle, old-age security within the family is non-existent in a modern society and neither is a "child pension" project under which full public pensions should only be provided to parents of three and more children and a proportional share to parents of one or two children (Sinn 2004) a viable solution.

The classic liberal welfare regime works only with general social assistance provided by municipalities, charities or the state. Everything else is an exception to the general rule. These exceptions may include annuities of military personnel or civil servants. General public pensions are as out of the question as any other motivation for taking out personal pensions. The brilliant advocates of an “absolute” liberal order have even strongly opposed occupational pension schemes (and other employee benefits, particularly the provision of medical care or health insurance to employees) – as by doing this we would depart from the economic optimum, and products that do not correspond to their individual preferences are forced upon employees as a result.

The modern liberal welfare regime is based on the cognition that “freedom and choice” do not work much in reality. It is practical to take care of the elderly (voters) much more and better than using the final social protection benefit – general social assistance. The provision of a means-tested pension – naturally a “non-contributory”, tax-financed benefit – is a minority alternative in modern liberal welfare regimes. An example of such a means-tested pension is the “Age Pension” in Australia providing – together with means-tested supplements and rent allowance – an income exceeding the poverty line used in the EU (60% of income median) even for the poorest senior citizens.

The majority, fully prevailing alternative of the modern liberal welfare regime is the provision of a universal, flat-rate old-age pension to all residents who have reached the fixed statutory retirement age. Under identical circumstances, the flat-rate pension is financially more demanding for the state, but it is much less demanding on administration and in a way, it is fairer, as it is a pension for everyone. Except for the retirement age, the only “tested” matter is the period of residence in the given country. The pension of immigrants is reduced: e.g. in the Netherlands, 40 years of residence is required for a full flat-rate pension of 30% of national average earnings (NAE).

The “Superannuation” in New Zealand may serve as an example of a flat-rate pension, financed from taxes and providing an income exceeding the poverty line according to the OECD (50% of the income median). The flat-rate pension for two seniors living together is usually determined using the “65 at 65” rule – at 65 years of age the couple is entitled to an after-tax pension of 65% of net NAE. Thus, as of 1 April 2017, a couple receives \$1,363.20 for two weeks, \$1,200.60 after tax. The pension of a single senior is by 32% higher than the pension of a couple divided by two. Therefore, the economies of scale for couples are reflected.

The British state pension is more complicated and significantly lower: following the recent increase (at the expense of the state second pension) it amounts to 26-27% of net NAE. From the model perspective, an important complication in the British system is the existence of national insurance contributions (NICs), which were originally introduced after World War Two in the form of a head tax paid by employees regardless of their amount of earnings. This concept was recommended by the Beveridge Commission; Beveridge, as a liberal, put an emphasis on insurance: ‘It is, first and foremost, a plan of insurance – of giving in return for contributions benefits up to subsistence level, as of right and without means test, so that individuals may build freely upon it’ (Beveridge 1942). With the later introduction of the state earnings-related pension scheme (with an

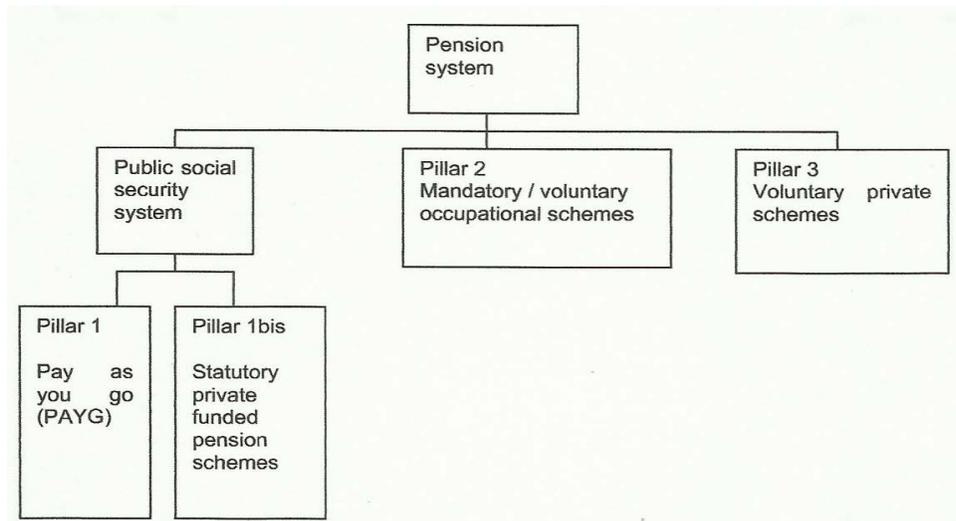
option of contracting-out to an occupational pension scheme) NICs were transformed to a percentage payroll tax that does not have an entirely logical construction. Currently, employees pay NICs of 12% from wages over £157 weekly and 2% from wages over £866 weekly. The employer pays NICs of 13.8% from wages over £157 weekly. The British tax commission headed by Mirrlees (2011) recommended to merge income tax and NICs. In relation to pensions, it is more than interesting that when the retirement age (65 years) is reached, NICs are no longer paid. NICs represent the second-largest British tax channel, yielding over 22% of tax revenue.

Public pensions that are not earnings- or income-related are often internationally recognised as belonging to the Beveridge model; the Bismarck model with fully earnings-related pensions is its exact opposite. The OECD progressivity index is designed to summarise in a single number the relationship between pension in retirement and earnings when working. The results show variation from 100 in pure basic schemes (such as Ireland and New Zealand) to zero in Hungary. The average index across OECD countries is 39. Regional differences are striking, with the index averaging 82 in the Anglophone countries: public pensions are strongly progressive. In Southern European countries, by contrast, it averages 23, indicating a very strong link between earnings and pension benefits (OECD, 2015).

Flat-rate pensions have existed in many countries. They are a basic alternative to current solidary pension pillars. Liberal countries have established other pension pillars that cannot be automatically considered part of the modern liberal model. A modern liberal model can also be characterised as a social-liberal model; social pension insurance or quasi-mandatory systems of occupational pension schemes should not be prevalent in the model.

The conservative (Christian-democratic) pension welfare regimes represent a mix of different concepts of pension protection – for different social groups, proportionally to their specific position (“performance”) and relevant needs. These include both the protection of civil servants by the “retirement salary”, generally at the level of the pre-retirement salary, and originally low workers and higher clerks' disability, survivor and old-age pensions from systems of social insurance in the private sector, as well as voluntary occupational pension schemes. Even though there has been a significant integration of the largest systems of social insurance which existed in parallel in the relevant countries, significant differences between social groups persist. Even today, some social groups (e.g. freelancers or the self-employed) do not have a mandatory social pension insurance. Different occupational pension schemes, representing the second pension pillar, are an intrinsic part of the conservative model. The third pillar is personal pensions, supported by the state e.g. by applying one of the tax theories, according to which contributions to pension savings should be deducted from the income tax base and payments under these savings schemes should be fully taxed. This is a system of a “deferred” income tax, in short EET (with the contributions being exempt from tax /E/, yields not taxed /E/, pay-outs fully taxed /T/).

Figure 1: Classification of pension systems



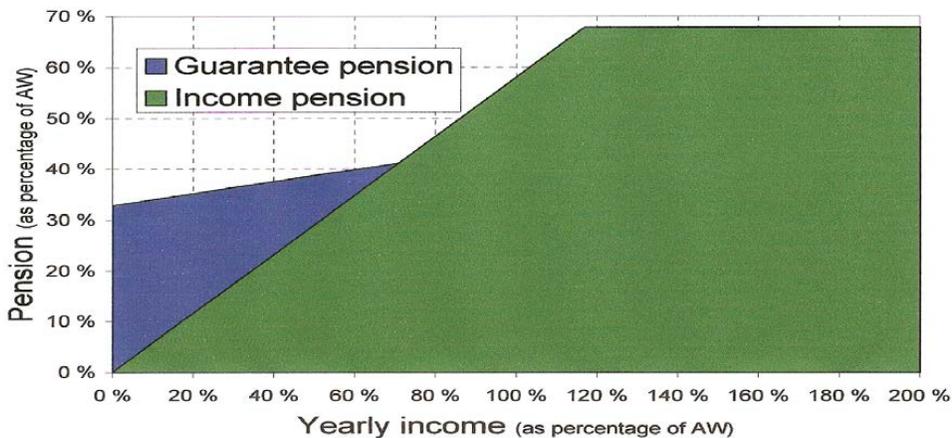
Source: Eichhorst et al. (2011)

It is typical of conservative (Christian-democratic) welfare regimes that they comprise no solidary pension pillar – flat-rate pensions or means-tested pensions. We can encounter tested pensions, for example, in Germany, however they are strictly classified as social assistance benefits, not benefits under the pension system. The Bismarck model is typical of a conservative pension system, even though Bismarck introduced in Germany old-age pensions as an additional benefit in workers' social disability insurance that were very low – and predominantly flat-rate, also owing to a flat state contribution. In this pension scheme, disability pensions prevailed in the Western Germany as late as the 1950s, when Adenauer started the concept of old-age pensions sufficiently replacing previous earnings (while reflecting the lower consumption of the elderly). The Adenauer concept of old-age pensions from the social insurance of employees (clerks and workers) thus created little room for occupational and personal pensions. Half a century later, the German policy has changed: today, it should achieve the same by using all three above mentioned pillars, currently with an emphasis on occupational schemes.

Regarding the three model pension pillars in the conservative (Christian-democratic) welfare regime, the EU uses a classification of pension systems (see Figure 1) that tries to merge what others (and we) consider non-mergeable – solidary pensions are added to the first pillar (flat-rate and means-tested pensions) and the whole is referred to as public pensions. They include both Bismarck- and Beveridge-type pensions. It is even more peculiar that renowned authors have added mandatory private pension schemes introduced partially in almost every postcommunist country to this pillar. (Just as well as referring to them as “Bs” of the first pillar: pillar 1 bis.) Such a classification may encompass all of the European systems of old-age pensions; however, it does not reflect the significant differences between them.

Social-democratic pension welfare regimes have developed from the original liberal systems (based on a flat-rate pension) by adding a universal social insurance pillar built on the equivalence between the paid premiums and assessed old-age pensions. With this concept (ideology) the solidary state pension pillar must be designed to protect adequately low-income senior citizens (not only employees), residing in the given country over an extended period (and not requiring long-term care). An appropriate benchmark would be the at-risk-of-poverty rate used in the EU. A social-democratic model is oriented towards providing earnings-related pensions for middle-income employees. The solidary pension pillar is closely related to this insurance pillar, e.g. in Sweden or Norway, the amount of the “guarantee pension” is determined while considering the amount of the NDC type insurance pension. Housing benefit for seniors is a significant supplement to solidary pensions – in fact, it is a second component of the solidary pension pillar, important for the elimination of poverty of the elderly. In countries with a policy of this type, quasi-mandatory systems of occupational pensions covering more than 90% of employees based on collective agreements, agreed either at national or sectorial level, play a key role. Similarly to the liberal regime, the social-democratic welfare regime refuses state support of the third pension pillar and other financial products. In the social-democratic model, the role of the personal pensions pillar is entirely marginal.

Figure 2: Norwegian Income pension (NDC) and Guarantee pension (43 years of insurance, percentages of NAE)



Source: Christensen et al. (2012)

In conservative (Christian-democratic) and social-democratic systems, social pension insurance dominates with occupational pensions mostly taking a significant role. The role of a solidary pillar represents the significant structural difference between these two social models (systems). The original version of the social-democratic model included a flat-rate pension (with social insurance being a superstructure); the modern version is centred around social insurance and the solidary pillar predominantly includes the income-tested old-age pension, a direct supplement to the insurance pillar. Figure 2 illustrates the coexistence of modern NDC social insurance, herein referred to as income pension, and the NDC pension-tested pension (guarantee pension) in Norway. In 2014, the minimum pension under this two-pillar-system amounted to approx. 31% of NAE (OECD, 2015) for

singles. Senior housing benefits are common follow-up allowances in these systems (all-income-tested once a year), granted for one year.

The public pensions in social-democratic welfare regimes knowingly combine the Bismarck and Beveridge models. In this regard, there is a clear effort to achieve high efficiency while maintaining relatively high equity.

Neoliberal pension models place an emphasis on mandatory private pension savings regulated by the state. The economics of these pension savings assumes high investment yields that would also cover the high margins of private providers of pension savings or insurance. If the yield for the client were on average e.g. 5% annually (inflation-adjusted), then the accumulation factor after 40 years of saving with this interest rate would be more than three. Thus, the client would receive three times what they had put into the system. The neoliberal concept seems a radical solution to the pension problem related to population ageing. To support the privatisation of social old-age insurance schemes, the so-called Aaron rule, which compares arithmetically the interest yield of private savings in the funded system with the growth of total wages in the pay-as-you-go financed state insurance pillar in the given country, was used. Even though Aaron (1997) did not recommend the privatisation of public pensions, under the given conditions in the given country – when Aaron's rule is applied – either a funded or pay-as-you-go system may seem more advantageous.

In times of intensive globalisation, the appreciation of pension savings has been rather high – and for this reason (not only private) pension funds were much advantaged. Thus, premiums of e.g. 17% from wages could “generate” pensions averaging around 70% of final wages, in the case of life-long employment. In contrast, in a pay-as-you-go financed insurance system, the same premiums may generate pensions at the level of 30-35% of wages. Chile was the pioneer in the privatisation of segmented systems of social pension insurance where the private pension companies promised pensions of 70% of wages for a contribution of 10% from wages; in practice, it may have been more important for switching to the new system that following the opt-out, employees had higher net wages by 11% on average – because of the lower premiums/contributions in the new system. The option to use a funded system must always be analysed in detail in the specific economic conditions of the given period. However, this is not accepted by neoliberal pension theory – as according to this theory the private sector has an absolute prevalence over social insurance and also autonomous (non-profit) occupational funds in the provision of old-age pensions.

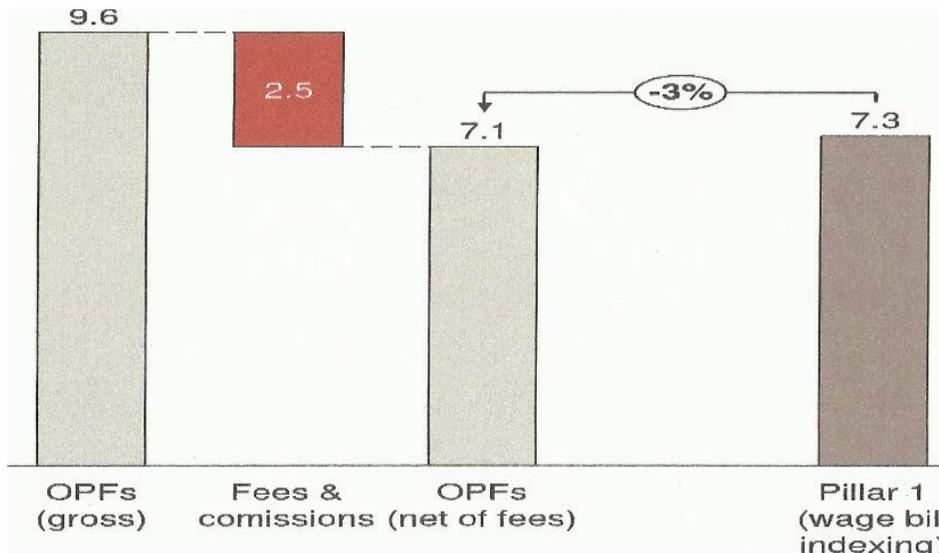
The emphasis on the strict separation of the solidary and insurance pillars is a certain contribution of the neoliberal pension theory of the World Bank (James et al. 1994). The state can be the only provider of the solidary pillar. At the same time, the private sector can find its use in the funded system only.

Mandatory private pension savings were designed by the World Bank as the “second” (first by relevance) pension pillar. The reason given by the World Bank was not primarily an ideological one, but a factual one – with reference to the high negative investment yields of public pension funds in the 1980s in Peru, Turkey, Zambia and so on, these funds

were used in fact by the state for other public purposes. Chile stood at the opposite end, with typical private pension companies that achieved gross investment yields of 12.3% on average, of which clients received 9.2% from the assets annually (James et al. 1994). This presented the entire professional argumentation – with the conclusion that private funds clearly beat public funds. However, serious professional analyses are performed differently. Certainly, investment yields are a significant argument, however they must be monitored over extended periods of time, and particularly in relevant countries and under relevant circumstances. Nevertheless, in the period of 25 years ending in 2007, real average investment yields for balanced portfolios in G7 countries and Sweden reached 7.3% from assets – for pension institutions, real net yield for clients amounted to 5% from their assets. The difference (2.3% from assets annually) represents the total margin of pension funds, including the margin of providers of life annuities (Whitehouse et al. 2009).

Overhead costs are a cardinal problem of private pension systems. The high margins of typical private pension institutions are given by their nature – these are competing systems requiring distribution networks and they must also respect various rules of solvency and caution, which is reflected in the amounts of the old-age pensions provided. Last but not least, the overhead costs of pension companies also include an investment yield for shareholders. The overhead costs of the “pay-out phase” alone (payment of pensions) represents 0.5-1% from assets during the entire period of savings and pay-out from the total of 2.3% annually. At the same time, the comparable costs of non-profit occupational pension funds in the Netherlands are at 0.15% from assets on average.

Figure 3: Internal rates of return on pillar 1 and pillar 2 (OPFs) accounts in Poland



Source: Bielecki (2011)

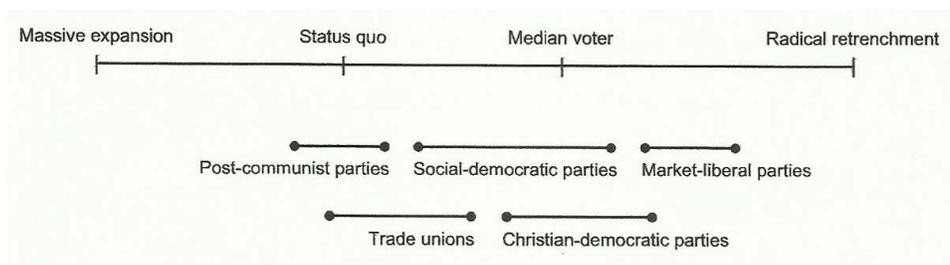
The problem of high margins can be illustrated by the second pension pillar in Poland in 1999-2010: the fees of the Polish private pension companies amounted to 2.5% from assets annually, in the “savings phase” only – see Figure 3. The yields for clients of pension

funds were even lower than the valorisation of client accounts in the first (NDC) pillar; thus, even Aaron's rule "does not work". Of course, one may object that this period covers only the first 12 years of existence of the second pillar, however, client recruitment was very successful, and the contribution to the second pillar stood at 7.3% from wages, in relation to other postcommunist countries, the Polish results were very positive and Poland was barely affected by the crisis. Kaczmarczyk (2014) claimed that the valorisation of client accounts stood at 6.8% in the NDC pillar and 6.6% in the second pillar in 2000-2012. Direct comparison of account valorisation in the private and public systems can only be done if both systems are of the DC (defined contribution) type and if the public NDC system (non-funded, pay-as-you-go financed DC) is sustainable in the long run.

If we wish to compare the overhead costs of private pension schemes and national public pay-as-you-go pension schemes, other than NDC, then we must apply different indicators – the overheads to total expenses ratio or overhead costs per participant. If we do not have this information, we can convert indicative overhead costs of pension funds, expressed as a percentage from assets, to a percentage from paid pensions and other expenses using a coefficient of 20:1. Roughly speaking, 1% from assets is equivalent to 20% from expenses. The overhead costs of state pension schemes are significantly lower than the overhead costs of private pension schemes, with the overhead costs of German social pension insurance provider Deutsche Rentenversicherung, at 1.2% from expenses in 2015, serving as a benchmark. The overhead costs of the Czech Social Security Administration which also operates other branches of social protection (which need relatively higher overhead costs than pensions) amounted to 1.26% from the total expenses in 2014. This implies that the benchmark for a private pension scheme that should fully or partially substitute public pensions is a margin of approximately 0.05% from assets annually. (The Swedish NDC system, which also manages extensive reserve funds, posted overhead costs of 1.11% from total expenses and the account management fee stood at 0.03% from assets annually in 2013.) This value can never be achieved by the private sector, despite potentially substantial state regulation. Thus, the neoliberal concept of the "second" pension pillar is not economically feasible, regardless of other incurred costs – specifically the costs of transition from the pay-as-you-go system to the funded system.

In recent years, it has become more and more evident that the high investment yields from the times of fast globalisation are over. The interest from government bonds has long been on steady decline and in a mid-term perspective, the real yield is negative. Investments in shares tend to return some 3% annually, inflation-adjusted. This approximately corresponds to conditions in the 1950s and 1960s, when funded social insurance systems were economically rationally transformed into pay-as-you-go systems.

Figure 4: Policy positions of typical political parties and trade unions towards pension reform in the context of demographic ageing and fiscal austerity



Source: Schludi (2003)

The selection of a retirement welfare regime continues to be an issue of public choice. The key role here is played by ideology, or general politics. The position of typical political parties and trade unions in some countries in Western Europe is outlined in Figure 4. It also shows the policies of post-communist parties, with trade unions finding themselves somewhere between the political orientation of social-democratic and post-communist parties. Christian-democratic parties are located to the right of social democrats; however, the politics of these parties may significantly overlap. The parties with neoliberal policies, exceptionally social-liberal policies, can be understood under “market-liberal parties”.

In recent decades, pension theory and policy has significantly influenced the development of pension systems in many countries. The urgent need for the clear proliferation of each of the pension pillars is one of the findings. Each pension system should include a solidary pillar – but the question is how it should be designed and what role it should have in the system. The modern liberal pension system is dominated by flat-rate pensions as a tool for removing poverty in old age, supplemented by housing benefit or another means-tested pension.

Neoliberal policy includes mandatory private savings which are, however, more expensive than comparable public pensions, and for this reason the relevant countries put more and more emphasis on fundamental state regulation. At the same time, there has been a drop in gross investment yields, and so neoliberal pension policy may present ideological arguments only, offering private sector provision as an alternative at significantly higher costs.

At present, the pension policies of (Western) social-democratic and Christian-democratic parties are oriented at the “median” voter, or political “centre” respectively. In many aspects, the pension policies of post-communist parties have taken over the role of the social-democratic left, and the policy of large trade unions corresponds to the average of both policies. With a view to the prevailing available analyses of today’s social political systems, Figure 5 may show a relative efficiency and equity of each of the pensions welfare regimes, with the criterion of efficiency being the employment rate; high equity is perceived as a low poverty risk and vice versa (Sapir 2005). However, in practice, this depends to great extent on specific parameters of individual systems, and in this regard, the figure shows

the potential of each welfare regime primarily. Any system can be ruined by the wrong parameters, management or regulation.

Figure 5: Typology of pension welfare regimes

	<i>High Efficiency</i>		
<i>Low equity</i>	Liberal regime	Social-democratic regime	<i>High equity</i>
	Neoliberal regime	Christian-democratic regime	
	<i>Low efficiency</i>		

Source: Author, inspiration from Sapir (2005)

2 Reforms of Czech public pensions

Since 1996, the Czech state pension system has been referred to as “pension insurance”, maybe because we had already had premiums for pension insurance for three years. During the tax reform (1993), premiums for pension insurance were introduced as part of social security premiums; the authors of the tax reform obviously expected the introduction of a comprehensive system of social insurance, with earnings-related benefits, separated from the state budget. The division of payments of social security premiums between employees and employers on a 25:75 ratio was the only departure from this social insurance model – which resulted from previous wage and tax relations, not from a conservative (Christian-democratic) welfare regime (where a 50:50 ratio is usually applied in insurance) or from a social-democratic welfare regime (which has a 0:100 ratio – all premiums are paid by the employer).

We have never introduced a comprehensive model of social pension insurance: since the 1950s, pensions have been and continue to be financed from the state budget and the “renewed” premiums for pension insurance are in principle a pension tax which is, from the systematic point of view, unnecessary. Moreover, there is no “pension account” in the state budget that would regulate expenditure of the state budget on pensions according to the development of the collected pension insurance premiums (MF 2012). The pensions provided under the Act on Pension Insurance are state pensions, being the (largest) public expenditure programme – with all of the potential pros and cons of this arrangement. The practical impact of this is that despite being mandatory state expenditure, the expenditure of the state budget on state pensions may be adjusted (newly announced) annually e. g. in the act on the state budget. If there were a risk of a high state budget deficit, there may be – depending on government policy – reductions in expenditure on pensions; and if this should happen, the annual pension indexation would “be the first to go”.

The social pension insurance systems, which have separate rules on their financing and that which are relatively independent of the government and its fiscal policy in any given year, are an alternative to the system of tax-financed state pensions. In many countries with social pension insurance of the conservative (Christian-democratic) type, these systems are partially subsidised from the state budget, and there may be similar situations in countries with state pensions. However, in some countries, the system of universal social old-age insurance is in principle clearly separated from the state budget, and in crisis situations it is strictly stipulated (by law) as to how the sudden shortage of the receipts from premiums will be reflected in the valorisation of pension entitlements and into the indexations of paid-out pensions. The Norwegian system of social old-age insurance of the social-democratic type is part of the state budget, and for this reason, it is sometimes referred to as a system similar to NDC. (We do not share this opinion, as the design of NDC is critical.)

In the first half of the 1990s, the real value of an average old-age pension dropped by 20-25% in our country. Following the reform in 1996, this value has showed a slow increase. The design of pensions went through many changes during that time, one of them being that since 1996 all pensions consist of two parts: a universal "basic amount" and a partially earnings-related "percentage amount" of the pension.

The basic amount of pensions emerged through their transformation from the previous state compensatory benefit introduced in 1990 as a partial compensation for the increase in consumer prices as a result of the cancellation of subsidies on retail prices ("negative turnover tax"). The percentage amount of the old-age pension adopted the previous technique of reducing higher earnings when calculating the personal assessment base, but applied it more intensively towards pension equalisation, in contrast to in 1989. While previously employee earnings were reduced from the threshold of 75% of NAE, since 1996, the first bend point of CZK 5,000 was applicable, being equal to 52% of NAE. In 1989, the second bend point was at 181% of NAE, and since 1996 at CZK 10,000, i.e. about 103% of NAE. It can be said that the reduction coefficients were almost identical – until the first bend point without reduction, then the earnings exceeding the first bend point were reduced to one third (1989), or 30% (since 1996) and above the second bend point, the reduction was to a mere 10% of the earnings of the insured in both years.

During the first half of the 1990s, the equivalence principle for newly awarded old-age pensions was significantly toned down. While in 1989, these pensions were highly related to final salaries (a full pension based on previous average earnings stood at 85-90% of the net NAE), following the 1996 reform, the same pension for men was earnings-related only in one third and consisted of a percentage amount of the pension, which per se was earnings-related in one half, and a basic amount of the pension which was independent of earnings. Moreover, nobody can now explain why we have had the same basic amount for survivor and disability pensions. Both pension amounts are in fact two types of pension, two benefits. What logic do their parameters follow?

The system of bend points and subsequent reduction coefficients, valid since 1996 for the computation of the percentage amount of the old-age pensions, shows significant similarity to the American public pension scheme. In the US, similar bend points and

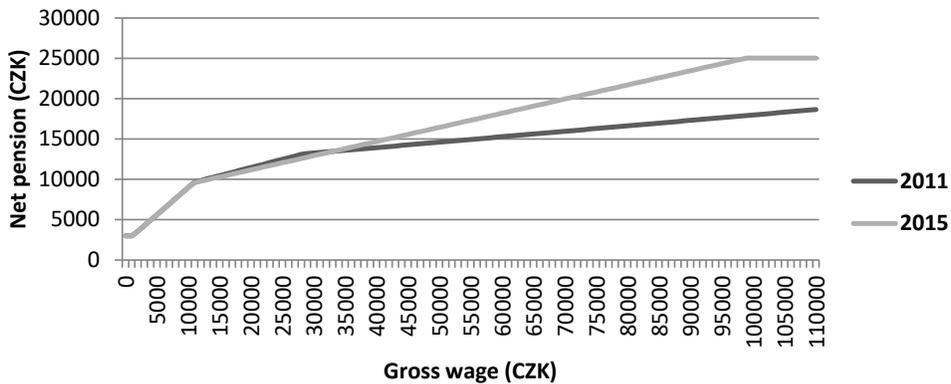
coefficients are used: the first bend point is set at the level of 22% of NAE, the second at 132% and the third at 256% of NAE. For the pension calculation, 90% of earnings are included up to the first bend point, above this bend point 32% and above the second bend point 15% of earnings. Therefore, the reduction coefficients have been very close in the US and Czechia since 1996. The first US bend point standing at the half of the Czech one is the biggest difference. The American system of public pensions is characterised as Beveridgean. The Czech “pension insurance” is of the same type.

In 2010, the Constitutional Court of the Czech Republic ruled as follows: “The complicated design of the pension system is so non-transparent that it is utterly incomprehensible for its addressees” (Constitutional Court 2010). The Court declared the valid bend points and reduction coefficients unconstitutional, as “in their effects, and in combination with other parameters and existing design of the pension system they do not sufficiently guarantee constitutionally granted right to adequate material protection and result in an unacceptable inequality among distinct groups of pension insureds”.

The ruling of the Czech Constitutional Court should be a major lesson learned for the Czech pension policy. The motivation was a complaint by one disabled pensioner about his low replacement rate, in particular 19% of his personal assessment base – which in his opinion was not adequate material protection, which is declared as a right in the Charter of Fundamental Rights and Freedoms. The claimant considered it an absolute inequality, in a situation when the average replacement rate for all old-age and disability pensions amounted to 44%. The Constitutional Court took his point, because since 1996 there had been a system of “public social insurance” in this area. The Court thus inferred the core of the system from the title of the act – on “pension insurance”. Basically, it had no other choice, as neither the law nor the Constitution include a definition of “pension insurance”. We might add that the title of the act should include one more adjective that would differentiate statutory “pension insurance” from private pension insurance. The term public pension insurance or social pension insurance is not legally defined in Czechia, not to mention the collocation “public social insurance”. However, the Court did not refuse the intra-generation redistribution connected with the existence of bend points and reduction coefficients, even though it might have done so with regard to the development of systems of social pension insurance in Europe after World War Two. In this regard, the Constitutional Court might even refuse the existence of the basic amount of the pension, or “allow” it, but then refuse the bend points and reduction coefficients at the percentage amount of the pension. However, the Court did not dare to start such a dramatic revolution in the Czech “pension insurance”. The Court “only” repealed Section 15 of the Act on Pension Insurance, containing the valid bend points used to determine the reduced personal assessment base for the purposes of calculating the percentage amount of the pension, and forced the government to act swiftly. The moral of this case is that the title and content of the act should always match. If we want to have social pension insurance, then the pensions should be in principle dependent on the paid premiums (or on the earnings from which the premiums were paid). From the perspective of modern pension theory and policy, or welfare regimes, a split of the Czech state old-age pensions into two pension pillars – a solidary pension and social pension insurance – would be an adequate solution.

The Nečas government did not opt for a major pension reform but for a change in several parameters of the existing “pension insurance”. Thus, the government implemented a “small” pension reform which reintroduced bend points and subsequent reduction coefficients, setting such parameters in a manner so as to reinforce the principle of equivalence between the amounts of pensions and earnings. The government did so reluctantly (“a coerced step”), as it preferred a different policy – a gradual transition to flat-rate pension, e.g. at CZK 6,500. However, it is fully legitimate to propose (and to enforce using mechanisms of public choice) a flat-rate state pension as a single public system of state pensions, or as one or the two public pension pillars from the perspective of pension theory and policy (standard welfare regimes).

Figure 6: Net pension dependence on gross wage in 2011 and 2015 (45 years of insurance)



Source: author

In principle, during the small pension reform, the second bend point was cancelled, or more precisely, this bend point grew more than threefold: from 109% NAE in 2010 to 400% NAE in 2015, and moreover, it was in fact merged with the earnings threshold of 400% NAE. The key parameter for dependency of the pension on earnings is already the first bend point that has also been newly parametrised, to 44% NAE – see Figure 6. When calculating the percentage amount, earnings above this bend point are included at 26%, below this point 100%. The first bend point with low parameters (44% NAE and inclusion of 26% over 44% NAE) continues to be a decisive factor characterising Czech “pension insurance” as a predominantly non-insurance system of the Beveridge type. After the small pension reform, the percentage amount is slightly more transparent and understandable – due to the factual removal of one bend point. However, in this regard, no major reform has taken place, as solidarity still prevails over the insurance principle in the system of “pension insurance”; the ruling of the Constitutional Court has not been duly respected.

3 Basic alternatives for pension reform

The Czech basic amount at 9% of NAE is a rarity around the world. CZK 2,550 monthly (in 2017) is a significant amount for pensioners, however it is not enough to cover sustenance, not to mention housing needs. From this point of view, the basic amount should either

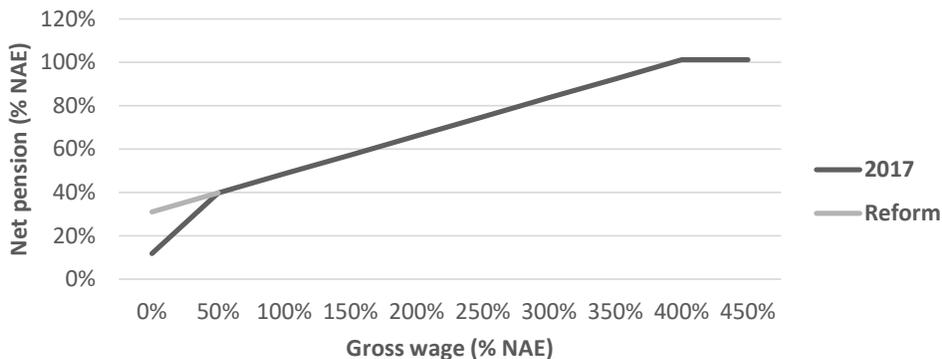
be significantly increased or cancelled – depending on the (public) choice of the pension welfare regime.

The Czech basic amount of pensions is not comparable with base pension amounts in former worker pension insurance systems. The major difference lies in the fact that the former base amount was added to the percentage amount (fully earnings-related, naturally with no reduction applied) in the total undivided amount of the benefit when assessing pensions; the benefit was (or was not) indexed as a single amount. Regardless of what comes next, we should leave the “independent existence” of the basic amount of the pensions. One way or another, the former state compensatory cost-of-living allowance should have been integrated into pensions since 1996 (it was assumed by the government bill on basic pension insurance in 1994), for example, it could have been reflected in bend points and reduction coefficients. As this integration has not been achieved until now, we could or should do this now. And it may be even a “mere” parametric reform of the existing defined benefit system. The minimal alternative would be a mere adding up of the basic and percentage amounts following their calculation for the pension award and subsequent “handling” of the pension as a whole. Pensions of all kinds that are currently paid may be added up (in their entirety) as well. If nothing else, this would make the current indexation of Czech state pensions significantly easier ... and it would become understandable. If discussion regarding the level of solidarity of our current state pensions was encouraged by this, it would only be beneficial.

A significant increase in the basic amount of the old-age pension to the level of a meaningful flat-rate pension, i.e. to at least 20% of NAE, is an alternative to the integration of the current basic amount of the old age pension into the (nonetheless) strongly Beveridgean “percentage amount”. Such parametric reform can be easily carried out in our country – after the small pension reform when the second bend point was in principle cancelled. We may proceed from the calculation of pensions for earnings exceeding the first bend point: we will multiply the percentage assessment rate of 1.5% per year of insurance by the reduction rate of 26% to arrive at: $1.5 * 0.26\% = 0.39\%$. If this 0.39% rate is applied to earnings up to the first bend point, we will arrive at the conclusion that the basic amount must be increased to some 31% of NAE (see Figure 7). The problem at hand (the meaningful adjustment of the calculation of the basic and percentage amounts of the old-age pension) is thus resolved by a simple parametric reform, which would significantly increase the basic amount and remove the bend points. This technical reform would be most beneficial to recipients of low pensions (or, better said, participants with a personal assessment base up to 44% of NAE). The advocates of “respectable” pensions would be happy. The conditions for the award of old-age pensions would remain the same. In addition to this parametric reform, the minimum amount of the percentage amount of pensions (CZK 770 monthly) could be cancelled and the design of the housing benefit for old-age pensioners could be adjusted accordingly. 31% of NAE under conditions of 2017 represents CZK 8,752 which is almost 80% of the at-risk-of-poverty threshold for individuals, and 105% of the same threshold for pensioner couples. After calculating the percentage amount of the pension, this alternative rationalising the calculation of newly awarded old-age pensions would include its “definitive” adding up to the basic amount of the newly awarded old-age pensions and we would further “work” with the total old-age pension only as in the previous alternative. Should anyone be interested

in the implementation of this rationalisation alternative, we would also prepare a new method of calculating other pensions.

Figure 7: Possible simple rationalisation of pension calculation



Source: author

With the abovementioned results of a potential rationalisation of the current basic and percentage amounts of old-age pensions, a radical systemic solution in line with international pension theory and policy comes to mind: remove the basic amount of old-age pensions from the Czech “pension insurance” into a separate solidary pension pillar: transform the basic amount of old-age pensions (only for insureds who will meet other conditions for entitlement to this pension) to a flat-rate pension for all residents of approximately 31% of NAE (conditioned by, for example, at least 40 years of residence for full pension entitlement). The “remaining” universal social pension insurance will then yield a pension of 0.39% for each year of insurance. This proposal is fully in line with current international pension theory and policy.

The said transformation of the basic amount into a flat-rate pension of approximately 31% of NAE for all old-age pensioners or for all residents (with adequate length of stay or tax history in Czechia) is conceived not to principally change the level of solidarity in the existing basic pension pillar, in its combination with the housing benefit and the social assistance benefit. Public choice could modify the said parameters in both possible directions, by either strengthening or reducing the scope of solidarity, or the insurance principle of equivalence.

Under given circumstances, the social-democratic party may choose – for the already paradigmatic pension reform – one of the two alternatives of the social-democratic regime:

- A flat-rate pension for all seniors at approximately 31% of NAE plus social old-age insurance of the NDC type, or in the form of current defined benefit (DB) product.
- A social old-age insurance of the NDC type (or in the DB form) plus an income-tested (“guarantee”) pension, directly connected to the insurance pension, following the Norwegian example above.

We take the liberty to expect support of a fundamental pension reform aimed at the transition to universal social pension insurance – if possible, without any compromises in the form of the existence of a solidary pension pillar, from a conservative (Christian-democratic) party. The social pension insurance may have a form of NDC or (N)DB, including the so-called point system (Germany, also seen in a deformed shape in Slovakia). From the model perspective, we may imagine a departure from existing universal pension insurance – as, even now we have different conditions e.g. for the self-employed; a separate system might have miners and other groups of employees, civil servants etc. At the same time, we may alternatively expect from a conservative (Christian-democratic) party that it would be interested in the development of occupational pension schemes, mainly on a voluntary basis.

Both social-democratic and conservative (Christian-democratic) parties may be recommended NDC as a system of modern social old-age insurance. In line with international experience, we recommend a one-step transition to the NDC system, while maintaining the existing old-age pension entitlements – not only in relation to the current old-age pension recipients, but also to make the greater pension reforms included in the alternative of a transition to the conservative (Christian-democratic) pension model easier. This transition cannot be achieved through gradual parametric reforms.

A modern liberal party can be recommended – as an initial paradigm reform – a transition to a flat-rate pension for all seniors at 31% of NAE plus social pension insurance of the NDC type. Such a programme would be sufficient for one electoral term; from the content perspective, it is a technical reform. In subsequent periods, the parameters could be adjusted to, for example, the development and needs of the economy.

In addition to the mentioned pension reform alternatives, it will be necessary or desirable to reform the housing benefit as well. The introduction of a flat-rate pension would significantly reduce the room for this social benefit. Even today, seniors use this benefit rarely – most of them are not sufficiently informed about it. Housing benefit needs a reform even now – it is neither rational or dignified to file a request for the allowance every quarter. The senior housing benefit should be a separate allowance, awarded and paid by the provider of old-age pensions for one year always, with an obligation to report significant changes during the year – in line with international experience and practice.

In relevant countries, flat-rate pensions are public expenditure programmes which are regularly evaluated with a view to the fulfilment of their role as the basic pension protection of the elderly in the given state. At the same time, the sustainability of this pillar is evaluated, in the broader context of the sustainability of public finances. This is also reflected in potential adjustments of the flat-rate pension parameters.

Across the world, systems of social pension insurance have undergone changes in recent decades that have strengthened links to life-long earnings, up to the NDC scheme with personal client accounts where valorisation of the paid premiums is performed, e.g. according to the development of the volume of nominal salaries in the economy, until the time when such pension entitlements are converted into old-age pensions using actuarial principles. When reconstructing a DB scheme to NDC, the system is significantly

“cleared” from the different, even only politically motivated “innovations” of DB systems, such as dual statutory retirement ages, connected with dual minimum insurance periods. “From a political economy point of view the NDC pension scheme is by far superior to the traditional pension schemes, just for its rule-oriented institutional characteristics. ... traditional parametric approach allows for discretionary measures, whereas the NDC rate of return is generated directly by economic and demographic factors and there is no administrative discretion involved other than what can be applied to fully funded schemes” (Chłoń-Domińczak & Mora 2006).

At the same time, it must be highlighted that NDC – as a system of universal social old-age insurance – is not isolated from public finances. Fiscal policy may thus significantly influence the accumulation phase of this system through specific parameters of the state budget contributions, particularly for non-contributory periods, but also through general subsidies of the social pension insurance system, as seen in Germany or Poland.

4 NDC: parameters and broader context

In June 2004, a team of experts from political parties was established, with Bezděk becoming the coordinator of the Executive Team for the preparation of documents. The main objective of the independent group of experts is to carry out calculations of the pension reform proposals put forward by the political parties. The Social Democrats propose a shift to a notional defined contribution (NDC) PAYG system. The Christian Democrats and Liberals suggest a parametric reform of the PAYG system and a possibility of partially opting out to a FF system. The Civic Democrats support the introduction of a flat-rate pension, while the Communists would like to continue with parametric reforms of the current PAYG system’ (Mora 2005).

Hájek and Samek, the experts from the Czech Social-democratic Party (ČSSD), proposed to introduce NDC gradually in combination with a minimum pension at 29.45% (from 2040 27%) of NAE. The assignment to the Executive Team counted on increasing the retirement age to 65 years of age by 2030 (men), or 2033 (women). In the projection, the team concluded that there would be a drop in the replacement rate to 27% in 2100. The drop is caused in particular by fixing the statutory retirement age in circumstances of continuously extending life expectancy. The team also explicitly noted that it may be possible that people would postpone retirement with the aim of increasing their replacement rate. Thus, there may be cases of people voluntarily extending their real retirement age, which is promoted by the system through its settings. The longer contributory period will thus fully be reflected in the amount of the assessed pension (Bezděk et al. 2005). The text of the following paragraph is as follows: ‘Approximately 60% of newly granted NDC pensions will be in the long run under the poverty line (approximately one quarter of the average salary in the economy)’. This sentence alone only reproduces the preceding text, but it fails to repeat the fundamental assumptions, that it concerns the end of the century and that the main reason for this is the capping of the retirement age. The artificially increased NDC overhead costs to 2.1% from the pension expenditure might be the secondary reason.

The NDC model or the model of any social old-age insurance as such has no relationship to any specified poverty line. However, an NDC pension is fully dependent on how high the premiums are and how long they will be paid for, under the given economic and demographic conditions.

In recent years, Bezděk has tried to disqualify NDC, referring to the analyses of the Executive Team: 'We considered the NDC system as early as in 2005. This system does not simply turn out well in Czech circumstances, because it would result in an enormous range of the pension amounts, and in addition, it would get the majority of people under the poverty line' (Táborský, 2010). However, nowhere in the world does NDC provide an 'enormous range of pension amounts', as in reality reasonable earnings caps are also used here; the World Bank recommends setting the earnings cap at 150-200% NAE. At the same time, NDC gets nobody under the poverty line, as this is not relevant to NDC; solidarity belongs to the solidary pillar. The NDC system cannot "turn out" badly, the NDC can only be fed with improper parameters and supplements, which precisely happened in projections in 2005. Clearly, increasing the retirement age only up to 65 years of age was an incorrect parameter.

Samek and Hájek argued similarly to Bezděk: 'The option to introduce NDC in the Czech Republic was analysed in detail based on the assignment by ČSSD already by the first Bezděk Commission in 2005 when it emerged that the taking of costly compensatory measures in the Czech Republic (e.g. introduction of the minimum pension) would result in the increased number of very low pensions (below the subsistence level) and thereby to the fall of many pensioners into poverty at the time of the pension award. The new Bezděk Commission took this into account and as a result, decided not to recommend the NDC reform to be deployed in the Czech Republic' (Samek & Hájek 2010).

The combination of a pension fully dependent on earnings or paid premiums with a relatively high minimum pension can be deemed problematic – in principle, the link between the pension and earnings disappears with most of the insured. For example, the means-tested pension benefit in the form of the guarantee pension in Norway or Sweden or similarly designed tested pensions e.g. in Finland or Chile, which obviously do not pose the practical problems argued by Bezděk, are something different. At the same time, 55% of pensioners in Sweden receive a guarantee pension, and in Australia the means-tested pension is received by 75% of the elderly. NDC and other products of social old-age insurance with fully earnings-related pensions may not pose problems in combination with the solidary pillar.

The assignment of the pension reform by ČSSD in 2005, evaluated by the Bezděk team, did not sufficiently correspond to the then state of the art and recommendations by the World Bank. For these reasons, the result arrived at by Bezděk team is irrelevant even today. NDC is a superior product. The second Bezděk Commission was dominated by lobbyists – and they clearly defied the transparent NDC with a relatively low premium rate: they preferred the current non-transparent Czech "pension insurance". The worse are public pensions, the more easily they explain that mandatory private pension savings, based on the principle of equivalence, must be introduced. The treatment of NDC system by the Bezděk team

proves that every model of public (and private) pensions may fail, if it is fed (knowingly or unknowingly) with inappropriate parameters.

The NDC products and schemes have been extensively verified in practice in many countries, among others Sweden, Poland and Italy (Holzmann et al. 2012). Its advantage is that it basically automatically reflects the ageing of population in the amounts of the newly awarded pensions – using actuarial methods, smooth adjustments of pension mortality tables – and thus also the conversion rates used to convert the assets in the personal account into life pensions as a result. The automatic stabilisation mechanism (in excess of actuarial methods) may well provide stability to the NDC system under changing economic conditions (e.g. in times of economic downturn); however, it is already inconsistent with the social-democratic welfare regime (Hippe 2007) – paid (nominal) pensions cannot be reduced under this regime. A strict stabilisation mechanism is applied in Sweden and is currently under review; however, this NDC alternative apparently corresponds with a social-liberal model. In Norway, the NDC system is part of the state budget and the problem is automatically ruled out. The effort to introduce an automatic stabilisation mechanism of the given type would clearly slow down the start of the Czech pension reform, aimed to remedy the “pension insurance”, either towards a “two-pillar” state system of the social-democratic type or towards a “single-pillar” social pension insurance of the abovementioned Christian-democratic type.

Any rationalisation or paradigm pension reform of the Czech public pensions must include the reform of premiums for (social) pension insurance; the new rate must correspond to the chosen welfare regime. We may imagine that the reform of premiums would be undertaken in advance, as part of the labour income tax reform. The taxation of the super-gross wage was also introduced in advance, and the decision regarding the neoliberal pension reform (at least about its basic parameters) had not been made, nor had the necessary one-step wage reform corresponding to the transfer of payment of all premiums to employees been prepared. However, the conditions for the introduction of social-democratic, Christian-democratic and modern liberal models of the financing of public pensions are much easier, as we have a low income tax rate for working activities, and low total premiums paid by employees – moreover, the premiums for health and social insurance may be “swapped” between employees and employers.

The tax reform needed for the rationalising pension reform, consisting of the transition to a flat-rate pension at 31% of NAE and a social old-age NDC scheme, is the easiest one. It follows from our calculations that this reform would only entail reducing the premiums for pension insurance by 11% from the wage, which by coincidence, is today's total rate of premiums for health and pension insurance paid by employees. Thus, there could be even more extensive rationalisation of premiums – “swapping” premiums for health insurance of 4.5% from the wages for premiums for pension insurance of 4.5% from the wage between the employee and the employer and subsequent compensation for the premiums of 11% from the wages paid by the employee, with wage income tax with an increased rate by 11% from the gross wages and simultaneous transition from the taxation of super-gross wages (15%) to the taxation of gross salary (equivalent rate of 20.1%) – so that the total rate of wage income tax would newly amount to 31.1% from the wages, which corresponds to a common level of personal income taxes in Western

countries. The result of this “manoeuvre” would be payments of premiums exclusively by the employer, at the current amount. This tax reform is fully compatible with the social-democratic model of financing social pension insurance, and will not “hurt” others.

It cannot be ruled out that the transition to the NDC system supplemented by a means-tested pension, e.g. following the Norwegian example, will be more “demanding” on premium rates for NDC pension insurance under the same circumstances. However, at present, it is not useful at this point to elaborate a specification, because the public pension system also includes disability and survivor pensions, the concepts of which have not been dealt with. This is crucial if political parties and movements show a principal interest in a rationalising or paradigm pension reform, not to mention that each reform is subject to, for example, coalition negotiations, in which other conditions and objectives of the reform can be set, also in a much broader context.

The implementation of the outlined Christian-democratic pension reform appears to be a more difficult one – it would be a gradual transition to a system of social pension insurance, without a stand-alone solidary pillar. However, we recommend changing the paradigm only into the future – actually, the NDC system can specifically achieve that, and existing pension entitlements would be transferred to the balance of a personal account and the newly accrued insurance contributions would have a corresponding rate. The existing premium rate (28%) should be sufficient here – and in the future, standard corrections will be made anyway. If we were to follow the German example, then the state could finance some solidary elements in social pension insurance, or may even set limits on the total amount of premiums, and replace the missing funds in the social pension insurance scheme by subsidies from the state budget as a result. Regarding the related pension reform, we can imagine that with the current mind-set in the relevant political party, the party would agree to the integration of all premiums paid by the employee into the income tax, and that it would not require a one-off increase of gross wages by half of the needed premiums for social and health insurance (as it would be suitable for a conservative welfare regime). This tax reform also allows an increase in family benefits, including tax credits for children – we consider this to be meaningful and rational, as opposed to the idea of introducing differentiation of premiums for pension insurance by the number of sustained children. As the Germans officially say, family policy is not the job of pension insurance. The reflection of the costs of bringing up children in the design of income tax is fully in line with the Christian-democratic model of this taxation.

5 Occupational pensions and welfare regimes

Occupational pensions are an independent pension pillar in both the social-democratic and conservative (Christian-democratic) pension welfare regimes. In Friedman's “pure” liberal model, occupational systems of all kinds are excluded as a non-effective waste of money – from the perspective of this economic school of thought, individual protection according to the needs and means of an individual is optimal. Employees should protect themselves for old age from their wages. However, in reality, the markets are not ideal in all aspects and it can be explained that liberal politicians in the West also “tolerate” the existence of occupational pensions. Neoliberals place occupational pensions among “private” pension

systems together with personal pensions: for them, it is crucial for there to be mandatory private pension savings, originally in the systemic form of a hard compulsion, then also as a soft compulsion. To push through their theories, neoliberals have altered facts, including that Swiss mandatory occupational pensions (with very strong state regulation and the substantial importance of autonomous pension funds) were declared an alternative to the system of mandatory personal pensions; at the same time, moreover, in the exemplary Chile, the opt-out – voluntarily leaving the public pension system, without an option to return, with a significant role of intermediaries – was the main method of compulsion. Our “pure” liberal, the first Czech Prime Minister Klaus, refused occupational pension insurance for primarily ideological reasons.

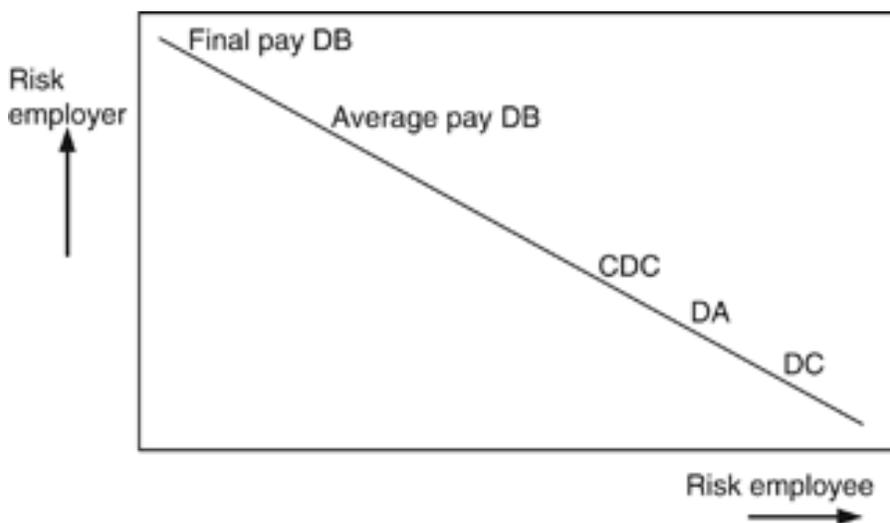
In classic occupational systems of the DB type, the employer or relevant autonomous pension fund is responsible for the fulfilment of pension liabilities. Frequently, these systems are underfunded – they do not have sufficient reserves to cover all future pension entitlements in the sense of actuarial science. In Germany, there is a wide range of occupational pension schemes, with a pension promise, backed by book reserves matched only by company assets, being the most significant system. In many countries, in the spirit of (the prevailing) neoliberalism, there has been a transition to occupational DC systems, in which the employer becomes a “mere” contributor into the system and the investment risk is fully transferred to the employees, in such a form that the employees “may” (or must, in reality) choose from several funds with different model levels of investment risk. Overall, the transition from DB to DC schemes is in line with globalisation tendencies and is relatively beneficial when moving from one employer to another, taking all pension savings that might be used for other purposes to some extent. In the US, the prevailing practice is even such that when leaving the company, the employee may transfer their savings to their individual retirement account. With these reforms, or gradual transformations, there has been a reduction of the overall extent of occupational pensions in these countries – the coverage has reduced from 60% to 50% of employees and rates of contributions of employers in DC systems are about half of those in DB systems on average. The trade unions and some liberal politicians (former British Pensions Minister Webb) do not like these tendencies, and the developments (negotiations) in relevant countries tend towards the application of combined DB/DC systems.

DB products automatically include life-long pensions. In contrast, DC-type systems strictly separate the savings phase (investments) and (a potential) payment of an annuity: the pension savings are accumulated in the personal client account, and upon reaching retirement age, the client may ask for annuitisation of the capital in their account. Historically, occupational pensions “involve” the payment of pension: the transition to a DC system creates conditions not to use annuities as part of the pension system, or pillar, respectively. Usually, this is the common practice, unless – in exceptional cases – stipulated otherwise by state regulation or the agreement of employer and trade union associations. The Netherlands is an exception of this kind, where DB occupational pensions continue to prevail (approximately 90% of participants in this pension pillar have them) and where participants in the DC-type systems must be paid life-long pensions. These old-age pensions are on average 70% of the previous wage of the employee. In addition, there is a flat-rate pension benefit for residents on reaching the age of 65 that

in principle guarantees 70% of the net minimum wage in the Netherlands (Schouten & Robinson 2012), which is approximately 30% of NAE.

The quasi-mandatory Dutch model of occupational pensions has aroused the interest of theoreticians and politicians in many countries. The reason is also that since the beginning of this century, there have been modifications of DB systems of these pensions, and these changes accelerated following the drop in investment yields across the entire world, resulting in the pressure to increase contribution rates for occupational pensions, which would be unbearable for the sphere of business. The main modification has been a limit on current contribution rates being put on the DB system (in 2012, the total average contribution rate was approximately 17.5% from the wages, 11.3% from the wage being paid by the employer) and subsequent partial transition of the investment risk (and risk of long life expectancy) to employees and pensioners. In 2013 the nominal paid-out pensions were even reduced. This – in the opinion of many authors – led to the creation of a combined DB + DC system, or the establishment of a stand-alone collective pension system (Bovenberg & Nijman 2009). There may be a variety of these combined products, or systems – depending on whether the products are closer to DB or DC, or are “somewhere in between”. The two alternatives of these combined products are shown in Figure 8: one product is designated as CDC (collective DC), and the second as DA (defined ambition). The DB product is presented in two alternatives: the historically first product is derived from the final earnings, the newer DB product calculates the pension from the average whole-life (valorised) earnings.

Figure 8: Risk profile of pension products



Source: Schouten and Robinson (2012)

A clear majority of Dutch occupational pensions are collective schemes – in one system, everyone is secured by a single product – no one may select the “fund” and everybody is in one pension fund. This is a classic model of occupational pensions. Limiting or “defining”

the contribution rates to occupational pensions has its systemic logic – these rates cannot be significantly, or “endlessly” increased, with a view to the competitiveness of the (Dutch) economy. A mere limit of the contribution (premium) rate represents a partial shift of the systemic risk to clients; however, as such, it does not mean a change in the insurance technique including the calculation of the pension amount. It is “only” a parametric reform of the DB system. In principle, such reforms may occur “automatically”, according to the degree of matching of retirement entitlements by pension fund assets; we may assume that basically there will always be negotiations between representatives of employees and employers.

6 Occupational pensions: Czech policy

The system of occupational pensions was refused in our country by the Klaus government, not only for ideological reasons, but also due to concerns regarding asset-stripping under the conditions of the insufficient infrastructure of the state regulation of financial institutions. Later rightwing governments continued to refuse occupational pensions, to the extent that there was conflict with the EU that pushed a single EU market in (fully funded) occupational pensions by the so-called Pension Directive (Directive 2003/41/EC on the activities and supervision of institutions for occupational retirement provision / IORPs/). In principle, the Czech government won this conflict, despite implementing the directive by law (amendment to act in 2011) on the activities of institutions of occupational pension insurance from the EU member states ... in the territory of the Czech Republic; with the reservations that these institutions may not be established in Czech territory and they are not entitled to a licence even if they meet all conditions. The state supervision (Czech National Bank) granted the registration, for example, to The VF Corporation UK Pension Plan; however, the activities of this institution are not clear.

The aim of the EU Pension Directive was to develop a single market in pension funds doing business under standard rules of comparable financial institutions – and thus to help to reduce overhead costs. (Therefore, the directive does not concern the main German system of occupational pensions with book reserves only.) Based on this directive, pan-European pension funds should be established, at the level of large international business groups. The resulting effects of the Pension Directive have been insignificant: in 2014 there were 75 active pan-European funds. A review of the directive has been prepared for some years. However, there may be a more significant problem than the EU officials might admit.

From previous times, we have had “retirement pay” and other benefits under special pension systems for professional military personnel, members of the security forces and firemen. In 2004, these occupational pensions were supplemented by an “annuity for the former President of the Republic”, originally designed as “Lex Havel” (as a former dissident, he would have had a low old-age pension, which was in stark contrast with his merits regarding the establishment of the new democratic Czechoslovakia). The annuity of an ex-President is CZK 50,000 monthly; it is not related to their “standard” old-age pension. The annuity resembles a life insurance *sui generis* that corporations purchase for their top managers according to the classic rules of occupational pensions.

The Czech retirement pay is intended for:

- former members of the Police of the Czech Republic, Fire Rescue System of the Czech Republic, Customs Office of the Czech Republic, Prison Services of the Czech Republic, General Inspection of Security Corps, Security Intelligence Service and Office for International Relationships and Information,
- former military personnel of the Army of the Czech Republic.

The basic concept and design of the retirement pay for these two groups of state employees is identical; however the parameters of the “basic amount” and “supplement” of the retirement pay are rather different (God knows why): the basic amount for the first group after 15 years of service amounts to 5%, while for soldiers it is 20% of the average gross salary (GS). The “supplement” is provided for each additional year of service: for the 16th-20th years of service by 6.2% GS for the first group and 3% GS for soldiers; from the 21st year by 2.5%, or 2% GS and from the 27th year of service for the first group and for soldiers already from the 25th year of service, there is a 1% GS supplement. The gross salary is calculated from the salary for the last calendar year, or for the last three calendar years, if this is more beneficial for the recipient of the retirement pay.

The retirement pay is undoubtedly an occupational pension intended for the abovementioned groups of state employees, with financing from standard budgetary expenditures of the relevant departments, as it is common in the civil servant type of conservative pension welfare regime. The retirement pay is designed as a retirement old-age pension, its amount is fully dependent on the final salary and no retirement age is set. The previous “service pay” was paid until reaching the retirement age (of men) of 60 years, and had a character of “a pre-retirement pension” similarly to the temporary supplementary pension of federal employees (FERS Supplement) in the US. Moreover, the current Czech retirement pay is tied to the old-age pension from the basic “pension insurance”: it is paid in a reduced or zero amount once the old-age pension is awarded; if higher, in the amount of the difference between the retirement pay and old-age pension.

The current effort of some of our politicians to reduce unilaterally the retirement age of miners and other professions distorts the existing universal pension system; higher pensions for miners are requested at the expenses of others. Of course, money comes first after all, and we may analyse, for example, the amount of miners' wages and conclude that the wages do not adequately reflect the increased occupational hazards; it would surely be interesting, but we would go back to the previous system where the communist elite (of the more and more problematic quality) tended to decide everything centrally. The system as a whole did not prove successful, and the wages and pensions of miners were no exception in this regard. Whether we like it or not, in large measure this must be left on the market, on the responsibility and agreement of social partners. All miners know and knew (or should have known) what they were going into – and after all, it is always about who paid and spent what, and alternatively whether there is or is not an extreme situation that the industry or company cannot handle alone. Additional increases of pension entitlements may only be part of a phase-out programme of the given industry or region, but not part of a universal pension insurance system. As part of this potential programme, money could be “poured into” a NDC or FDC social insurance (to the pension

accounts of miners), if we had such a system in place. (How many things can a good flexible basic pension system be good for!)

The proposals for the differentiation of the otherwise universal pension protection system, or for subsidising the pensions of miners or similar professions, should definitely be supplemented by analysis of the contributions of the employer for the supplementary pension insurance and private life insurance of miners and similar professions in the last two decades. Since 1995, for example, the Miner Pension Fund Ostrava has been active: in 2005 it had 19,000 clients – employees of the OKD Mining Co. for the most part. The shareholders of the Miner Pension Fund, OKD and Trade Union of Workers in Mining Industry, Geology and Oil Industry sold the fund to the ČSOB Group. It was declared that OKD would continue to provide contributions to supplementary pension insurance to its employees who were clients of the fund, in the same amount as previously (Tománek 2005). The clients of this fund had assets of approximately CZK 1 billion at that time. The Miner Pension Fund Ostrava merged with ČSOB Penzijní fond Progres plc at the end of 2006.

The most suitable solution for the pensions of miners and similar professions is the occupational pension. We may refer to the existing special pension systems for professional military personnel, members of security forces and firemen. The general reasoning for the existence of these special schemes is identical – dangerous and arduous professions are reflected in lower life expectancy. These pension schemes should be financed from contributions by the employers and employees (Zaidi & Whitehouse 2009). The extent to which occupational pension schemes are or should be used is a matter of the pension welfare regime, or the functioning of the labour market.

In developed Western countries, there has been a significant differentiation of systems of occupational pensions: in some countries, the original voluntary and differentiated system, related to segmented systems of basic pension protection, has been kept in principle (Germany, conservative system); in other countries, occupational pensions have become quasi-mandatory on a collective basis (the Netherlands, Sweden, Finland, social-democratic orientation) or have in a way become mandatory based on workplace pensions (Australia, the UK, strongly regulated neoliberalism, or social-liberal system); and last but not least, we have experienced a mix of occupational and personal pensions with robust tax support (the US, neoliberalism). Thus, the differentiation of occupational pensions is also in principle given by state social policy: the choice of pension welfare regime. The collective systems (products) incline towards a segmented social insurance and achieve significantly higher pensions under identical conditions. More or less, neoliberal policy is connected with the high margins of providers of private savings and annuities with an effort to regulate products and to use the entire system of occupational pensions to reduce the overhead costs, to a great extent in line with behavioural economics; this system also tends to include state pension companies as providers of low-cost pensions savings (NEST in the UK).

In our country, occupational pension schemes may, with a relative ease, provide additional protection for hazardous professions, such as mining or the armed forces where the universal pension insurance may be (albeit subjectively) deemed insufficient, for example

regarding a universal retirement age. From the perspective of universalism, we may say mockingly that all exceptions are unnecessary, as social insurance also comprises disability insurance – and it is questionable whether the special needs of miners or soldiers, for example, are (and how) covered by disability, accident or survivor or funeral insurance. It is like this, however: special pension systems also exist in our country, specifically in the form of the abovementioned special retirement pay for professional military and police personnel and firemen, and it is also common abroad. A typical and significant feature of these supplementary systems is the fact that they are financed (fully or to a great extent) by employers, and are fully reflected in the costs of relevant businesses and institutions – the financing is transparent and there is also pressure for economic rationality related to the fact that contributions to social security are part of labour costs and may thus influence, for example, the coal market in the given country or region. Such occupational systems may also serve as a defence against the potentially endless requirements of different, more “risky” professions for pension benefits in the (originally) universal basic pension system. In principle, occupational pensions must be negotiated by employees (or trade unions) with employers – preferably as part of collective bargaining. This policy should be fully supported by parties with social-democratic and Christian-democratic orientation, too.

The major amendment of the Act "on institutions of occupational pension insurance from the EU member states ... in the territory of the Czech Republic" in line with the spirit of the EU Pension Directive may pose a major political issue. These institutions should be allowed to have establishments in the Czech territory, and at the same time, the government should declare that it would be meaningful to establish such institutions directly in our country, mostly in the form of autonomous pension funds providing a single product of a collective type, with a clearly defined ambition in the broadest sense of the word. The subject-matter of the debate may be, for example, the tax regime of occupational pensions – in line with (potential) differences between the social-democratic and Christian-democratic models. Here, it would be useful to clarify beforehand the issue of taxation of (all) pensions which we neglect in this paper.

The “pre-retirement pension” (*předdůchod*) is a slang term for an option to receive a temporary pension from the supplementary pension savings, including the whole state support, up to five years earlier, before the client reaches the statutory retirement age for entitlement to the old-age pension. The minimum amount of a monthly pre-retirement pension is set at 30% of NAE (2017: CZK 8,100). For the term during which the pre-retirement pension is paid (2-5 years), the state pays premiums for health insurance for the client, if the client is no longer employed. When the “pre-retirement pension” is received, one may work, and before filing the request for the old-age pensions, the participant decides whether they want to include income from work from the period when they were receiving the pre-retirement pension.

The idea to introduce the “pre-retirement pension” originated in the trade union headquarters (ČMKOS), with the main purpose being to create an additional mandatory private system of pension protection for miners and those in other physically demanding professions, or for professions classified under the relevant hygienic regulations into the categories III. and IV. of hazard. This should concern approximately 350,000 to 400,000

employees. The contributions to pre-retirement pensions (with payment up to 5 years) ought to be paid by employers (with state support) into a special account with a private pension fund. Therefore, these should be mandatory occupational pensions for a selected group of professions, paid out before the proper old-age retirement, provision reserved for private pension companies. Such a system can be envisaged, and there are some alternatives abroad; generally speaking, an autonomous pension fund or the state could or should be the provider.

The concept of pre-retirement pension approved by the government and parliament has resulted from the tripartite agreement, but there was not much left of the ČMKOS proposal. The pre-retirement pension is not mandatory and applies to all participants in supplementary pension savings. Low volumes of savings in the accounts of pension companies pose major limitations; for a pre-retirement pension for 5 years, one must have at least CZK 486,000 (for 2 years at least CZK 194,400). Therefore, Prouza (2012) rightfully referred to pre-retirement pensions as another scam. Hájková wrote of a “sexy façade”: “At first glance, the setting of pre-retirement pension seems attractive. Just imagine, you can retire five years before reaching the retirement age. If you find yourself in a demanding situation after losing a job or due to worsened physical conditions, you sort things out with a relative ease by applying for a pre-retirement pension. ... Another sexy feature of pre-retirement pensions is the fact that from the health insurance perspective, you will be considered ‘state insured’ and you would not pay health insurance premiums for the term of the pre-retirement. The state will pay for you.” However, her final words are very illustrative: “Originally, the pre-retirement pension should have been intended for those who are not able to work until retirement age due to their physically demanding profession. Now, it will be available to everyone, only if they have enough money. However, this will probably not concern those who work hard (and often earn low wages), which significantly limits their opportunities to generate significant savings) in professions with high physical demands.” (Hájková 2012).

Because of pre-retirement pensions, the “retirement age” has also become more complicated in the third pension pillar: instead of a single and understandable retirement age of 60 years, the age was set using the following formula for individual years of birth: statutory retirement age for men participating in “pension insurance” in the given calendar year less 5 years (in 2017: 58 years + 2 months). This ought to follow the logic of pre-retirement pensions, but this logic would gradually dissipate, because the increasing statutory retirement age of men will reach 65 years and the lower retirement age for the pre-retirement pension would reach 60 years, the current valid early retirement age. Then the original arguments for pre-retirement pensions would become utterly pointless. Based on the proposal of the Association of Pension Companies, the link of the “retirement age” in the supplementary pension savings to the increasing statutory retirement age of men was cancelled – and we returned to 60 years. Nothing would happen if we only reduced this age to 58 years “because of miners” and then it would be clear to everyone that the existing concept of the Czech “pre-retirement pensions” is a bad joke. As of 30 September 2016, 1,585 pre-retirement pensions were paid out. Our recommendation is simple: Do not provide new pre-retirement pensions – it is an unnecessary complication. Occupational pensions cannot be replaced by anything in this regard.

Preferably, occupational pensions should be provided by single-product autonomous pension funds. Outsourcing is possible, of course. In our conditions, it is useful to prepare a sample pension plan and fund compliant with the Pension Directive.

Conclusions

Czechoslovak pensions were highly earnings-related. The reform of 1996 confirmed the liberal policy aiming to equalise pensions. The Executive Team for the reform preparation (2005) analysed each of the political parties' reform concepts. The NDC system proposed by the Social-democratic Party was not sufficiently compliant with the internationally recommended concept and lobbyists keep abusing it to this day, as the fundamental rationalisation of the current Czech system of public pensions prevents them from promoting the neoliberal concept of personal pensions. Discussions of the NDC system confirm that every pension system can be "killed" by improper parameters.

In principle, Czechia has a universal public pension "system" financed from the state budget, which is non-transparent and is in fact an incomprehensible mix of solidary and insurance pillars that may not fall under any standard welfare regime. A rationalisation (technical) reform of this pension pillar in pursuit of its transparency is relatively easy: a) introduce a flat-rate pension at approximately 31% of average national earnings, b) create a universal social pension insurance financed from premiums. Lobbyists and advocates of the "diversification" of the current system of "pension insurance" have strongly opposed any similar rationalisation. Refusal of a paradigm, albeit technical reform of public pensions is and continues to be part of neoliberal policy, or a token of clientelism, as if they were following the thesis "the worse the better": the worse the public pensions, the more mandatory private pension savings are needed, because they are related to equivalence (not solidarity).

There is already a "space" for occupational pensions with regard to the existence of arduous occupations. Autonomous pensions funds cannot be seated in our country, even though they are the easiest solution for specific sectors of the economy (e.g. the mining industry). Their introduction should primarily be strongly supported by the trade unions, as this is part of their "job description".

Generally, it is true that each political party should incline towards one of the pension welfare regimes – and a (potential) government coalition should seek to implement a major rationalising reform based on independent analyses of the current situation of the Czech pension system. A social-democratic party should support universal NDC social insurance, a solidary pension pillar, including annual housing benefit for seniors, and occupational pensions based on collective agreements. A modern liberal party should be oriented towards a flat-rate pension supplemented by a means-tested benefit for seniors (including housing benefit) and respect the existence of a supplementary pillar of social insurance or occupational pensions. The conservatives (Christian democrats) should support fully earnings-related social pension insurance, supplemented by occupational pensions and last but not least by a more effective social assistance benefit for seniors and annual housing benefit for the elderly. Other parties should in principle choose any of these concepts

(modern liberal, social-democratic or Christian-democratic). The neoliberal pension welfare regime should “satisfy” only a few (involved) private financial companies; it is ineffective from the point of view of the national economy.

The minimum programme, suitable for all parties and movements, is the rationalisation of the existing system, which is desirable for the sake of the comprehensibility of the system. This includes the removal of the two pension “amounts” that exist in parallel, and the merger of the wage income tax and premiums paid by employees which is facilitated by the current prevalent solidarity in the Czech pension “insurance” (which is *contradictio in adiecto*). If the parties and movements represented in Parliament find the courage to implement a paradigm reform of Czech public pensions then we may – in line with international recommendations – advise a transition to a modern system of NDC social insurance. Gradual, parametric reforms of defined benefit systems of social pension insurance usually bring nothing, because the energy required for the reform is “spent” in endless debates about the reform of individual parameters.

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On the European Sovereign Debt Crisis, or Why not Leave the Euro Area

O evropské dluhové krizi aneb proč neopouštět eurozónu

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Jean Pisani-Ferry: *The Euro Crisis and its Aftermath*. Oxford University Press, Oxford 2014. 206 pp.

The book will grab your attention with the title “The Euro Crisis” alone. What is the crisis all about? Is the euro going through a period of crisis? How is the crisis manifesting itself? Are investors showing distrust in the euro; are they getting rid of the euro? As the reader will learn in the very first pages, it is not a “euro crisis” in the sense of a “currency crisis”. By the “euro crisis”, the author means the “European sovereign debt crisis”.

The book consists of four parts. The first part primarily deals with the creation of the euro, with the first chapter dealing with the emergence of the debt crisis itself. The second part describes the first decade of existence of the European currency and the emergence of the imbalances leading to the crisis. The third part discusses the response of policy-makers to the crisis since 2010, and describes, among other matters, why the indebted countries should not leave the euro area. The fourth part offers options on how to reform the euro area and put an end to the crisis.

The title of the first part, “Bare-Bones Utopia”, signals the author's unbiased attitude towards a single European currency. The first chapter of this part describes the growing difference between the Northern and Southern regions of the euro area. While the Northern states have been increasing savings, the Southern states have been increasing debt. This resulted in the debt crisis, to which the euro area responded by introducing safety mechanisms. The following chapter starts with the following: ‘The euro was the last utopia of the 20th century... It was something that had never been created before: a currency that did not rely on a state or on a commodity’. The euro was implemented despite the warnings of academic economists that Europe is not an optimal currency area. Why? For three reasons. First, exchange rate volatility ceased to exist and competitive devaluations with it. Second, a single monetary policy with single interest rates resulted in reduced strong movements of capital between countries. The third reason was a political one, being the condition that German unification (and making Germany stronger as a result) could only happen if European integration was made closer by introducing a single currency.

The next chapter of this part explains the conditions under which the European Central Bank (ECB) was established. Germany agreed that it would only share the single currency on condition that this currency was subject to the German model of monetary policy. The first requirement was that the ECB, following the example of the Bundesbank, would be fully independent, as opposed to, for example, the Banque de France, which was merely a branch

of the Ministry of Finance. The second requirement was the determination of the monetary policy objective as price stability, and not for example exchange rate regulation on top of that, as proposed by France.

The remaining chapters of this part deal with the discussions held before the introduction of the euro. What should the political arrangement of the future euro area be? Should it be a federation of nation-states or a political union? The euro was eventually created without significant political foundations. It was logically bereft of any mechanism for solidarity between countries. Nor was the creation of the euro accompanied by improved economic cooperation. Therefore, the author calls the euro “the orphan currency”.

The second part of the book has the title “Crises Foretold, Unexpected Crises”. The opening chapter of the book describes the economic development of Germany in the first ten years following the introduction of the euro. In the beginning, Germany was a country with a sharp current account deficit in the balance of payments, while France posted a strong surplus. At the end of the period, it was the other way around, the reason being internal structural changes. Germany adopted a drastic reform of the labour market (Agenda 2010); consumption grew slowly and savings posted fast growth. The introduction of the euro and removal of the foreign exchange risk facilitated the circulation of these savings in the euro area (from the North to the South) and the emergence of external deficits and surpluses as a result. The German economy also influenced the anti-inflationary monetary policy of the European Central Bank. The low German inflation, which had a significant impact on average inflation in the euro area, led to the ECB’s low interest rates. With low interest rates, credit in the South (particularly Greece, Spain and Portugal) was not held in check.

The debt crisis sprang up in spring 2010 when the negotiations started between Greece and three major players (the “Troika”), the European Commission, International Monetary Fund (IMF) and ECB regarding the provision of debt relief to the Greek government. The crisis exposed other two dangers. First, it was not only about public debt. In the case of Ireland and Spain, the private sector, more specifically, the default of banks, was the main reason behind the debt. Second, a debt crisis can emerge quickly, as was the case with these two countries which had posted low public finance deficits for many years. In Spain (which is dealt with in a separate chapter), low interest rates resulted in an increased demand for mortgage loans and a bubble in the real estate market.

Rather surprisingly, the author claims that France is the country to “celebrate” most the introduction of the euro, for three reasons. First, the euro put France on par with Germany; second, the euro helped to weaken the international role of the US dollar, which had been systematically criticised by France; third, it was the success of a ten-year French diplomatic effort. However, neither France nor Italy could keep public debt down. The final chapter of this section deals with the financial markets. It has an apt title: “The Dogs that Did Not Bark”. Market judgement could still be expressed by interest rates on long-term government bonds. Interest rates should have continued to reflect risk. However, this was not the case, for three reasons. First, the euro’s first decade was dominated by the search for yield. Second, assessing a state’s long-term solvency is costly. Third, investors believed that in the unlikely event of crisis, the euro area’s member states would put together some type of rescue operation.

The third part of the book, entitled “Agonies of Choice”, deals with responses to debt crisis. First, it describes the debt relief provided to Greece by the IMF and via EU mechanisms (the European Financial Stability Facility and European Stability Mechanism). The author explains the reasons for this aid: ‘The leaders were aware that the stability of their own financial systems ... crucially depended on the fate of countries that, until then, had seemed economically insignificant’. Thus the aid continued. Ireland, Portugal, Cyprus and Spain followed. One can only agree with Pisani-Ferry’s explanation.

In the next phase of the debt crisis, when aid had been provided by both the IMF and the EU, the following issue arose at the turn of 2010/2011: should private creditors (banks) also be involved in the financial aid by writing-off a portion of government debts? The so-called debt restructuring (also referred to as “private-sector involvement”) was declined, mostly, under the influence of the ECB. The ECB’s arguments were threefold: government bonds must be considered more reliable than private bonds; fear of contagion – Ireland, Portugal and other countries would proceed in the same manner; debt restructuring is a developing-country syndrome – it must not be connected with a serious state. In the case of Greece, a compromise in the form of reducing interest rates from official loans, the provision of further loans and a call to private creditors to extend the maturity of loans was adopted. A partial write-off of receivables in the private sector (banks) occurred in 2013 with regard to the state debt of Cyprus.

The following chapter describes the spread of the debt crisis into other countries, particularly France and Italy. By “debt crisis” the author means the development of interest rates: spreads vis-à-vis interest rates on German bonds were on the rise. In addition, a massive capital outflow from banks in the South of Europe occurred; banks from the North preferred to deposit their surplus liquidity in the ECB. In the chapter “Redemption Through Austerity”, the author goes on to describe further steps aiming to resolve the debt crisis. More specifically, he means the “Fiscal Compact” of 2011 (with the UK and the Czech Republic being the only states not to join) and the long-term refinancing operations (LTRO) programme announced by the ECB.

The final chapter of this section reflects on so-called “internal devaluation”. Countries with high production costs (Greece, Ireland, Portugal, Spain, Italy and France to name a few) may not compete with Germany and other Northern European countries. If they had their own national currency, they could devalue it. However, this is not possible now. If they want to improve their competitiveness, there must be a drop in prices and wages in their economies. Both Latvia and Ireland employed this method successfully. But they are small open economies. However, Greece and Portugal are closed economies. In addition, large economies such as Spain, Italy and France have a low share of export to GDP.

This raises the issue as to whether it would not be better for some countries to leave the euro area. Pisani-Ferry explains four obstacles to leaving the euro area. First, there are *legal obstacles*.¹ The Treaty of Lisbon specifies conditions for leaving the European Union, not

¹ *Since the 19th century, 67 monetary unions have collapsed. In this connection, the author also mentions Slovakia, which was in union with the Czech Republic ‘until Czech prime minister Vaclav Klaus pushed them out.’*

the euro area. It is not clear whether a country that has left the euro area may continue to be a member of the EU. Second, there are *technical obstacles*, such as printing new bank notes, the reconfiguration of IT systems and so on. Third, the *economic obstacles* of leaving the euro area are the most critical ones. A country that introduced a new national currency would have an intention to perform controlled devaluation. However, the credibility of such a currency would be extremely low, and its significant devaluation may occur. This would result in price increases and the massive impoverishment of households and firms, and also a strong rise in interest rates. Fourth, there are *financial obstacles*. As of now, all existing assets and liabilities are denominated in euro. Newly, they would be redenominated in the new currency – or not. There are no established legal principles for converting financial assets into another currency. If debts are still payable in euro, and the devaluation of the new currency will take place, debts will grow unbearably. In my view, these four explanations for why not to leave the euro area are the greatest contribution of the reviewed book. The author also does not recommend splitting the euro area in two parts – “neuro” and “suro”. The collapse of the euro area would result in the greatest turmoil since the end of World War Two.

The fourth and last part of the book offers “The Repair Agenda”. The first chapter of this part deals with the unequal development of countries from the North and South (including France). The countries in the South are less competitive, more indebted (both with regard to public and private debt) and produce less added value. What should the monetary policy of the ECB be? An expansive policy would depreciate the euro exchange rate and support export from the countries in the South. However, at the same time, this would result in investors’ distrust towards European assets. Fiscal policy seeks a solution on how to deal with the requirements of low deficit and debt on one side and the support of the private sector on the other. Transfers through “Structural and Cohesion Funds” from the EU budget may be one potential solution. Funds from the European Investment Bank and European Bank for Reconstruction and Development that may help with for example privatisation programmes can also be used to support development in countries in the South.

A description of two models for reducing the unemployment and external deficit of Southern countries is also worth noting. The first model is the *agglomeration model*. This consists of the concentration of manufacturing and other economic activities in certain areas to which people would move for work. This would have to be accompanied by the unification of social rights (particularly pension protection), free movement of capital, and finalisation of a full banking union. This would naturally lead to big differences in GDP per capita. The *rebalancing model* is the second model. In this case, the work would move to the people. Structural Funds would be used to revitalise the South. There would be a convergence in GDP per capita, and at the same time a lower average GDP per capita across the entire euro area. The author concludes that regardless of the current financial problems, the euro area is confronted with deeper choices about its type of economy.

The next chapter deals with a description of how the banking union (which should reduce the risk of banking crises) was created. The author also deals with an option to issue “eurobonds”. These are government bonds that would be issued and guaranteed by a debt agency, the liabilities of which would be guaranteed collectively by the euro area countries. This is followed by an analysis of the EU budget, to which member states make

a contribution of 1% of GDP. This budget has no stabilisation function, as opposed to the US federal budget. The author notes that the attitude of European leaders is unclear in this regard. A short chapter deals with the international position of the euro. The last chapter ("Governance Reform") notes that Europe's governance is ineffective. It is not an executive, but an institutional problem, as the Maastricht Treaty was not drafted to deal with crises. The author also asks the question: should the euro area have a federative arrangement? Answer: In the long run this would certainly be the most fitting solution.

In the Conclusion, the author formulates questions addressed (implicitly) to European leaders. First: is the euro area willing to extend the integration of labour, product and capital markets? Second: is the euro area willing to fundamentally redesign its fiscal system and introduce risk sharing? Third: is it willing to allow redistribution through a transfer mechanism? Fourth: is the euro area willing to implement an institutional reform that would result in more effective decision-making? These questions were raised by the euro crisis. The future of the euro area is dependent on how they are resolved.

The former minister of finance of the USA, Larry Summers, evaluates the book using the following words: 'This is must-reading for anyone who cares about Europe's future'. We may fully agree with his opinion.

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