

The assessment of the pension base calculation

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Abstract

The objective of the paper is to present the possibility of the assessment reference earnings (calculation basis) which are taken into account by the calculation pension. In this paper is present the way of the assessment and treating with reference incomes in selected foreign earnings-related pension schemes. The author subsequently put forward various proposals for the adjustment of the Czech public pension scheme based on the information gathered.

The paper focuses principally on the method of assessment of the reference period, types of income credited for this purpose and the way they are ascertained by pension institutions and the handling of periods falling into the reference period including cases in which the lower statutory income limit has not been reached. The paper also provides information on the benefit formulae applied in foreign earnings-related pension schemes, the valorisation of income credited, contribution ceilings and pensionable earnings thresholds.

Key words: pension schemes, reference period, international comparison, pension benefit formula, pension insurance, valorisation, indexation, pensionable earnings thresholds

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1. Introduction

All developed countries face the process of demographic ageing. The pension schemes of these countries therefore generally face serious problems caused by adverse demographic trends, high unemployment, insufficient economic growth, the large range and cost of social programmes and, finally, increasing administrative costs (Musil, 1996). The total cost of pensions paid in the majority of Western European countries already exceeds 10% of GDP and makes up more than 25% of total public spending (Rutarová, Slavik, 2005). Social security systems are facing huge deficits due to a lack of funds to cover the increasing statutory requirements of pensioners and the other social groups concerned. In short, the cost of social security is rising. In order to guarantee the financial sustainability of their pension systems the majority of European countries have launched reforms in recent years. Such reforms have generally concentrated on strengthening the link between pension contributions and benefits. Certain countries have introduced DC schemes (either funded or notional account components) into their pension systems in which one of the characteristics is a close link between contributions paid and pension benefit received. Other countries have retained a defined contribution pension system, but even in these countries the above link has been strengthened in a large number of cases. This has been achieved through parametric reforms which have introduced the extension of the period of insurance required to qualify for a full pension, the tightening up of actuarial bonuses / reductions in case of deferred / early retirement as well as through the introduction of the calculation of pension benefits from lifetime income rather than income recorded during the years immediately preceding retirement. Thus, when assessing the level of pension benefit, the amount of contributions to the system during the insured's entire working life is accurately reflected.

As far as the Czech Republic is concerned, under current legislation pension entitlement¹ depends on the income of the insured since 1986. The reference period is automatically prolonged each year to up to 30 years; this will be achieved in 2016. Nevertheless, the target length of the reference period will not cover the significant part of a worker's productive life. This may adversely affect the pension rights of certain groups of workers who enjoyed relatively high income during the first part of their careers and relatively low income as they approached the end of their working lives. This may well cause problems with regard to the impact of a reduction in working time during the final years before reaching retirement and may have a disproportionate affect on future pension benefits especially for low-income groups (VÚPSV, 2007: Promoting the employment of older persons).

Adjustments to the length of the reference period or income counted within the reference period, including the valorisation of income credited, might be considered an additional tool for making parametric modifications to the pay-as-you-go system currently in operation in the Czech Republic. A definition of the income taken into account and ways of valorization of such income make up important tools for determining the expenditure side of the pension system as a result of their relationship to the calculation of benefit assessment calculation. The basic aim of this paper is to contribute towards the debate on the reform of the Czech pension system, in particular the possible parametric adjustment of the current system. The paper focuses on an

¹ The pension in the Czech Republic consists of two components, a basic amount (flat rate) which is the same for all types of pensions and a percentage-based assessment based on the insured period and earnings achieved. The calculation basis results from the reduced personal assessment base which is equal to the average annual monthly base for the reference period.

analysis of the reference period and the potential impact of its adjustment on the pension system, on individual pension entitlements as well as its overall long-term financial sustainability.

1.1 Objective

The primary objective of this monograph is to contribute towards the debate on the reform of the Czech pension system, particularly with regard to the possible parametric adjustment of the current system. Work focused on a detailed analysis of the vesting period from which the amount of the pension is determined as well as the potential impact of potential modifications and adjustments on the income of individuals and the pension system as a whole. The study provides a comprehensive international comparison of the assessment methods employed and the treatment of reference income in selected foreign earnings-related pension schemes, a subject which has not been fully addressed to date. The author further aims, by means of a micro-simulation model, to demonstrate the impact of changes in the method of determining the reference period and the impact of changes in the methods used to index pensionable incomes on an individual's retirement income.

2. Methodology

The monograph was divided into five logically inter-related parts. The first chapter consists of the introduction and the second of an outline of the methodology employed including a description of the data and calculation models used in the study. Then follows the analytical third part which, using the comparative analysis method, describes in detail the way in which the reference period is assessed and from which income is recorded for the calculation of pensions in selected foreign pension schemes. The selection of countries was limited by the type of pension scheme employed. The initial selection of the countries to be included in the study was made according to the method by which they determine pension benefits, i.e. only those systems employing the DB (defined benefit) method of determining pension benefits were considered. Therefore, the comparison included countries using the Bismarck basic pension system, those employing a combined basic pension system, i.e. Beveridge-type basic pension systems supplemented by earnings related schemes in the context of basic pillars, countries employing the Scandinavian pension system model and those with transitive pension systems. This comparative section is followed by the fourth chapter which consists of model data calculations and which deals with various options for determining the reference period and the method used for the indexation of income to be included in the reference period. This chapter is based primarily on data taken from the Information System on Average Earnings (ISAV), which was used as the basis for determining an individual's lifetime income. Chapter five summarizes the results obtained in the research and provides recommendations for the pension system of the Czech Republic.

2.1 Methods

Basic scientific methods – a combination of analysis, synthesis and comparison have been employed in the study. Statistical methods were used in the analytical part of the study in which they were applied to a unique data set compiled from the Information System on Average Earnings (ISAV).

Micro-economic, macro-economic and pension simulation models specially created for this study were used to formulate recommendations and suggestions for potential methods for both assessing and dealing with the income contained in the reference period. In addition, these simulation models were used for estimating the micro- and macro-economic impacts of different methods of assessing the reference period and the method used for the valorisation of pensionable income within the Czech pension system. Moreover, these models were also used in order to provide an analysis of the pension incomes of individuals and pension system cash flow as a whole.

As far as the international comparative analysis is concerned, the study focuses primarily on a descriptive analysis of the pension systems of selected developed countries, an analysis of reform strategies in order to determine the reference period in each country and their potential application in the Czech Republic. The basic analytical approach consisted of an evaluation of official documents, reform proposals and primary legislation in each country supplemented with the secondary analysis of existing research papers documenting the current status of the issue in each country. The effects of potential changes on the state, on the level of security of the elderly as well as on the stability of the pension system as a whole are examined. The

2. Methodology

compilation of current specific information from each country involved the use of targeted questionnaires addressed especially to experts at relevant international institutions and national MISSOC representatives.²

² MISSOC - Mutual information system on social protection was found by the European commission in 1990 to the continuously monitoring and the comparison of social Security schemes in EU members states.
Web pages: http://www.europa.eu/employment_social/social_protection/missoc_en.htm

3. Comparative analysis of the reference period in selected global pension systems

This chapter examines methods employed for the assessment of the pension calculation base in foreign earnings-related pension schemes. It also touches upon certain other parameters related to the link between pension benefits and previous income which is defined by a pension calculation formula for any defined benefit pension scheme. With regard to the diversity of such pension formulae in the pension schemes of EU member states and other developed countries, it is not easy to characterise the link between pensionable income and pension benefit. Ways in which pensionable income earned impacts upon final benefits can be defined thus:

- a) pension formula based on "pension points" for each year of insurance. Pension points represent the amount of income in a given year relative to the average wage. The valorisation of income earned in the past, which is one of the factors determining the level of benefits, is performed by changing the value the average wage, which defines the relevant pension points
- b) pension formula which use a percentage-based assessment applied to a calculation base derived from the average level of income achieved by the insured during the reference period, which is indexed according to various macroeconomic indicators.³

Abstracting from the formal differences in how these two pension calculation formula variants express the relationship between various factors determining the level of benefit, it can be concluded that calculation formula essentially consist of two components⁴:

- a) the accrual component that determines the way in which the period of insurance is taken into account. The accrual component of the pension calculation formula sets out how previous income will be replaced. For each year of contribution to the system a percentage-based assessment is linearly increased by a certain percentage rate of the calculation base, that being based on the average income achieved in the reference period. In the majority of countries studied, the percentage rate is fixed for each year of participation. However, in Finland and Slovenia the years immediately before retirement are evaluated using a different percentage rate.⁵
- b) the component which determines the reference income taken into account when assessing pension benefits.

The following comparative analysis is dedicated to the second calculation formula⁶ component and it aims to provide principally an overview of reference period assessment methods and ways in which income earned can be handled.

³ E.g. wage development, price level development, the development of newly granted pensions etc.

⁴ The pension systems of certain countries (e.g. Germany, Finland) recently added taking into account the so-called demographic factor in the calculation formula, which can be seen as a further component.

⁵ E.g. setting a higher percentage rate for the final years before retirement could be based on efforts to motivate individuals to stay longer in the labour market.

⁶ The accrual component was necessary for the following reasons taking into account the analysis of earnings thresholds.

3.1 Reference period assessment methodology

The length of the reference period and the way in which this period is assessed in the earnings related schemes of the countries monitored varies substantially. Certain countries have chosen to consider lifetime earnings when assessing pension benefits, other countries take into account only part of the insured's career. In the first case the reference period commences upon the engagement of the insured in the pension scheme and ends with his or her participation. In the latter case, pension benefit is based on records of the insured's income over a selected number of years:

- a) immediately before retirement
- b) when the insured person reaches maximum income
- c) a combination of both variants (e.g. the 5 best years of the last 20 years)

Table 1 The length of the reference period from which the income for pension calculation is taken into account: past, present and future planned legislative changes in the countries monitored

	historical development of determining the reference period from which pensionable income is collected for pension calculation	the length of reference period in 1998	the length of reference period in 2007	legislatively planned length of the reference period in 2007
Belgium	Reference period is defined as lifetime career. For the period before 1.1.1955, the reference income is a fixed amount for one year. For white-collar workers, this applies also for the years 1955 to 1957. For these years, there is a fixed reference income for each day the insured person spent at work for at least 4 hours. Income between 1955 and 1980 for manual workers is equal to gross income without any upper earnings threshold.	L42	LT	LT
Finland	Reference period in the 60s was defined at first the last 2, then 3 and 4 years before retirement. Since 1996, it has been the last 10 years before retirement. Since 2005 the reference period equals lifetime career.	L10	LT	LT
France	The reference income was defined as the average annual income for the best 15 years of career. Since 1993, however, it was gradually extended to 25 years to 2008.	B15	B25	B25
Italy	Before 1992 the reference period was defined as the best 5 years. In that year, the reference period was extended. In the private sector, the reference period for people participating in the scheme for at least 15 years till 31.12.1992 was set at the last 10 years before retirement, for those with a shorter period of insurance, according to the number of years of insurance, the length of the reference period was inversely extended to lifetime career. For people newly insured after	B10	B10	LT

3. Comparative analysis of the reference period in selected global pension systems

continued	historical development of determining the reference period from which pensionable income is collected for pension calculation	the length of reference period in 1998	the length of reference period in 2007	legislatively planned length of the reference period in 2007
Italy	1.1.1996 the new NDC scheme was introduced, where lifetime career is automatically taken into account. In the government sector, where in 1992 the reference period was determined as the last calendar month before retirement, it is also gradually being extended.			
Canada	Since the beginning of the scheme the reference period has been lifetime career with the exclusion of 15% of the years with lowest income.	LT	LT	LT
Germany	The reference period is lifetime career.	LT	LT	LT
Norway	The reference period has been extended from the best 10 of the last 20 years to the best 20 years of lifetime career.	B10 z L20	B20	B20
Portugal	Since 2002 the reference period has been continuously extended by 2 years for each subsequent calendar year so that in 2017 it will reach the best 40 years of lifetime career. It was originally defined as the best 10 of the last 15 years before retirement.	B10	B20	B40
Austria	The reference period was, until recent reforms, defined as the 15 best years of the last 40 years before retirement. From 2005 the reference period has been extended by one year for each additional previous calendar year.	B15 from L40	B18	B40
Slovakia	The reference period of the original best 5 of the last 10 years was extended in one jump to lifetime income from the year 1984. However, if the determined reference period without non-contributory periods completed before 1.1.2004 is less than 22 years, then income in the years before 1984 is also taken into account, to achieve a period of 22 years.	B5 from L10	LT	LT
Slovenia	The reference period in 2001 was extended from the best consecutive 10 years to the best 18 years from 1.1.1970.	B10	B18	B18
USA	The reference period has, from the 1950s been defined as the best 50 years of the lifetime career.	B35	B35	B35
Spain	The reference period is defined as the last 15 years before retirement.	L15	L15	L15
Switzerland	Since the beginning of the scheme the reference period has been lifetime career.	LT	LT	LT
Great Britain	The reference period is defined as lifetime career from the beginning of the appropriate scheme (SERPS and from 2002 State Second Pension).	LT	LT	LT
Average length of reference period		23	30	35

Note: LT - lifetime career, B-reference period defined as certain number of income-best years of the career, L - reference period defined as certain number of income years of the career before retirement.

Source: MISSOC 2007, MISSOC 2006, OECD 2007: Pensions at a Glance 2007.

3. Comparative analysis of the reference period in selected global pension systems

At the end of the 1990s, the average length of the reference period in the countries surveyed was 23 years.⁷ In six of those countries, the reference period was defined as the insured's lifelong career. In 9 countries, it was set at 15 or fewer years and the average length of the vesting period was a mere 11 years (see Table 1). In three of the countries surveyed, benefits were calculated on the basis of income earned during the years running up to retirement and in a further five countries on the basis of the period with the highest earnings; the remaining three used a combination of both methods to determine the reference period. By 2007, the average length of the reference period in these countries had increased from the original 11 to 22 years. The average length of the reference period in all 15 countries surveyed, as a consequence, had increased to 30 years.⁸ As a result of recently introduced reforms a further rapid extension of the reference period in certain countries can currently be observed; consequently, the average length of the reference period targeted by legislation in the countries surveyed is 35 years.

The original setting of the length of the reference period in earnings-related pension schemes to some extent reflects a classification of countries according to the type of pension insurance system they operate. Focused earnings-related schemes have been introduced in pension systems under various conditions and perform various tasks.

Those earnings-related schemes operated in states employing the Beveridge pension system model originated in an environment in which the benefits of the basic scheme, guaranteeing a flat-rate benefit covering the basic necessities of life, was found to be insufficient. The first reform proposals for the introduction of public earnings-related schemes to complement the basic scheme appeared in order to ensure a pension income that would enable the insured to maintain the living standards to which he/she was accustomed during their working careers.

In Bismarckian welfare states defined benefit earnings-related schemes form dominant elements of the pension system. This reflects the original philosophy of this type of pension system which was designed to replicate the social status of the insured. The earnings-related pension scheme was therefore seen as a major source of income in old age with relatively high contribution and previous income replacement rates. Such schemes provide the dominant element of the pension systems of the transition countries of Central Europe. In states employing the Scandinavian social insurance type these schemes were intended to provide a supplement to the basic scheme. Unlike countries with the Beveridgean welfare system, in these countries such schemes are provided in an effort to secure the highest possible standard of living; they have a relatively high replacement rate and are the main public source of income for pensioners.

In Beveridgean welfare states the reference period is defined as the working lifetime or very close to it.⁹ In all these countries the reference period is defined as commencing immediately upon the introduction of the scheme with no change over the following decades. This is in stark contrast to the situation prevalent in other types of welfare state where looking into the insured's history of even a decade previously is common.

⁷ If one assigns for this purpose 42 years throughout their lifetime careers.

⁸ If one assigns for this purpose 42 years throughout their lifetime careers.

⁹ In the United States since the establishment of Social Security the scheme defines the reference period as the best 35 years.

In countries with a Bismarckian pension system the reference period is defined as a certain number of years during which the insured attained the highest income of his/her working career or a certain number of years of the period leading up to retirement. The exceptions here are Germany and Belgium¹⁰ where the reference period is considered to be lifelong income. In those countries with a Bismarckian welfare insurance system in which the reference period was not defined in the past as the entire working life, it is presently being rapidly extended.

Even in countries with a Scandinavian type of insurance system, the reference period with regard to earnings-related schemes was set at a relatively very short time even as recently as in 1998. Benefits were related to the insured's highest levels of income during employment; in Norway the best 10 years of the last 20 years and in Finland the 10 best years. However, in both countries significant changes have taken place since 1997. In Norway, the reference period has been extended to the 20 best years and in Finland to lifelong career.

In the transition countries of Central Europe similar developments can be observed. One specific feature of these countries, in terms of defining the reference period, is that the period commences with a specific date. This can be attributed to efforts to limit the influence of historical earnings derived before the advent of the huge social changes which took place in these countries. In Slovenia the former definition, that set the reference period as the best 10 years of working life, has been extended to the best 18 years of the insured period since 1970. A similar rapid extension of the reference period can also be found in the case of Slovakia – from the best 5 years of the last 10 years of insurance to lifelong income with a lower limit set at 1984.

3.2 Considering actual income with regard to pension assessment

The length of the reference period is not the only parameter determining the amount of pension benefit accrued in the earnings-related pension schemes with which the author is concerned in this paper. The way in which the insured's average income is calculated has a significant impact on the benefits eventually paid out as well as on the overall balance of the scheme. With the extension of the reference period, the importance of the valorisation of reference income increases. The amount of benefit can be calculated on the basis of net or gross income. The amount of pensionable income may be constrained by upper and lower limits which correspond to a restriction of insurance contributions.¹¹ In addition, the extent to which reference income is considered in the amount of benefit is also affected by earnings thresholds.

¹⁰ In Germany, the pension benefit is provided under long term income levels throughout the insured's career. In Belgium, the reference period is defined in the same way, but income earned in the insured's fifties was flat-rate sum assessed for the purpose of calculating the pension. The reference period, the income from which is taken into account, was moving away from the limited time period to lifetime.

¹¹ This is true with the exception of Switzerland.

3. Comparative analysis of the reference period in selected global pension systems

3.2.1 Valorisation

Valorisation involves the multiplication of previous income by a certain growth index to adjust the records of previous income to changes in wage and/or price levels which occurred between the time contribution payments were made and that at which the pension benefit was assessed. If the reference period was defined as the last few years before retirement, valorisation would not have a significant impact. On the other hand, if the lifetime income average is taken into account, the effect of changes in price and wage levels over the insured's total career might well be considerable. The coefficient used for increasing the reference income is determined either by wage or price levels, their combination, or in one case, by changes in the level of newly granted pensions.

Table 2 The method of valorisation of income taken into account in the reference period in earnings-related pension schemes and the length of the reference period

	reference period (1998)	reference period (2007)	valorisation (1998)	valorisation (2007)
Belgium	42	LT	P	P
Canada	LT	LT	W	W
Germany	LT	LT	W	W
Great Britain	LT	LT	W	W
Switzerland	LT	LT	W	W
USA	B35	B35	W	W
Finland	L10	LT	50%W 50%P	20%W 80%P
France	B15	B25	P	P
Italy	B10	LT	P	P
Norway	B10 from L20	B20	W	W
Portugal	B10	B40	25%W 75%P	25%W 75%P
Austria	B15 from L40	B40	W	P
Slovakia	B5 from L10	LT	-	W
Slovenia	B10	B18	-	N
Spain	L15	L15	P	C

Note: LT - lifetime career, B-reference period defined as certain number of income-best years of career, L - reference period defined as certain number of income years of career before retirement. W - wage level development valorisation, P - price level development valorisation, N - newly granted pension level development valorisation

Source: MISSOC 2007, MISSOC 2006, OECD 2007: Pensions at a Glance 2007.

In 1998, the reference income for calculating the pension in 7 of the states surveyed was valorised according to the development of wages. In 4 states valorisation was conducted in line with price levels and in a further two states by combining both income and price development. With regard to the 6 states which took into account lifetime income when calculating benefits, valorisation in line with wage development clearly prevailed. Only Belgium implemented valorisation in line with inflation (see Table 2). In 2007, 8 states valorised reference earnings in line with wages with 4 states preferring price valorisation. Parametric reforms of the Austrian pension system

introduced valorisation according to price levels; reference income recorded after 2005 is valorised in line with prices while income recorded up to this year was valorised in line with wage levels. Finland has also implemented, albeit less radical, parametric reforms. Originally valorisation was based on a 1:1 ratio of income and price development. Currently however the balance stands at 20% wage and 80% price levels. Changes in valorisation in these countries were accompanied by a significant extension of the reference period (see table). The reason for these reforms was to ensure the long term sustainability of the pension scheme and the joint introduction of these two measures provides a significant synergistic effect. In Slovenia, the reference income is currently valorised in line with the development of newly granted nominal pensions. On average the growth of this index stands at only about 80% of wage growth.

In the majority of countries, reference earnings are valorised in line with price or wage levels to the level of the calendar year preceding the year in which the pension benefit is granted.

With regard to the assessment of the average reference income, which forms the calculation basis for pension assessment, all the states surveyed except one employ the gross monthly or annual income of the insured. Slovenia is the only state in which the calculation basis for the assessment of the pension benefit is based on net monthly income.

3.2.2 Pensionable earnings thresholds

One important parameter to be considered here is the existence of earnings thresholds. The principle of income solidarity evident in certain pension schemes is introduced via earnings thresholds. A further important parameter determining the relationship between lifelong income and pension benefit is the setting of upper and lower income limits to define the income from which contributions are paid and which is then taken into account in the assessment of pension benefit.

In terms of assessing pension benefit the author has chosen the consideration of reference income (individual calculation basis) in each income band as a tool for the analysis of the configuration of the lower and upper income limits in the scheme¹² in addition to earnings thresholds. Reference income is defined as average total annual income recorded during the reference period, valorised according to the rules applicable to the scheme.¹³ In certain earnings related schemes involving earnings thresholds, the reference income is not reduced directly before applying the accrual component of the pension formula as in the Czech Republic, but right through the accrual component, in which case a different percentage rate is applied to each income band. It is therefore necessary to assess the extent to which reference income should be considered after the application of the accrual component of the pension formula. Analysis is based on the assumption that the insured has acquired 40 years of insurance immediately, and without interruption, before reaching the statutory age of retirement.¹⁴ Furthermore, it is based on the assumption that the insured is male and retired immediately upon reaching the statutory age of retirement. Calculation of the

¹² The lower income earnings limits are taken into account in all reporting countries with an identical set of income limits for participation in the scheme. The highest threshold is termed the (insurance contribution) ceiling (except in Switzerland).

¹³ Analysis is abstracted from the influence of different methods of valorisation of previous income in each country.

¹⁴ Some schemes apply a moving (increasing) percentage rate increased in the period before reaching statutory retirement age.

3. Comparative analysis of the reference period in selected global pension systems

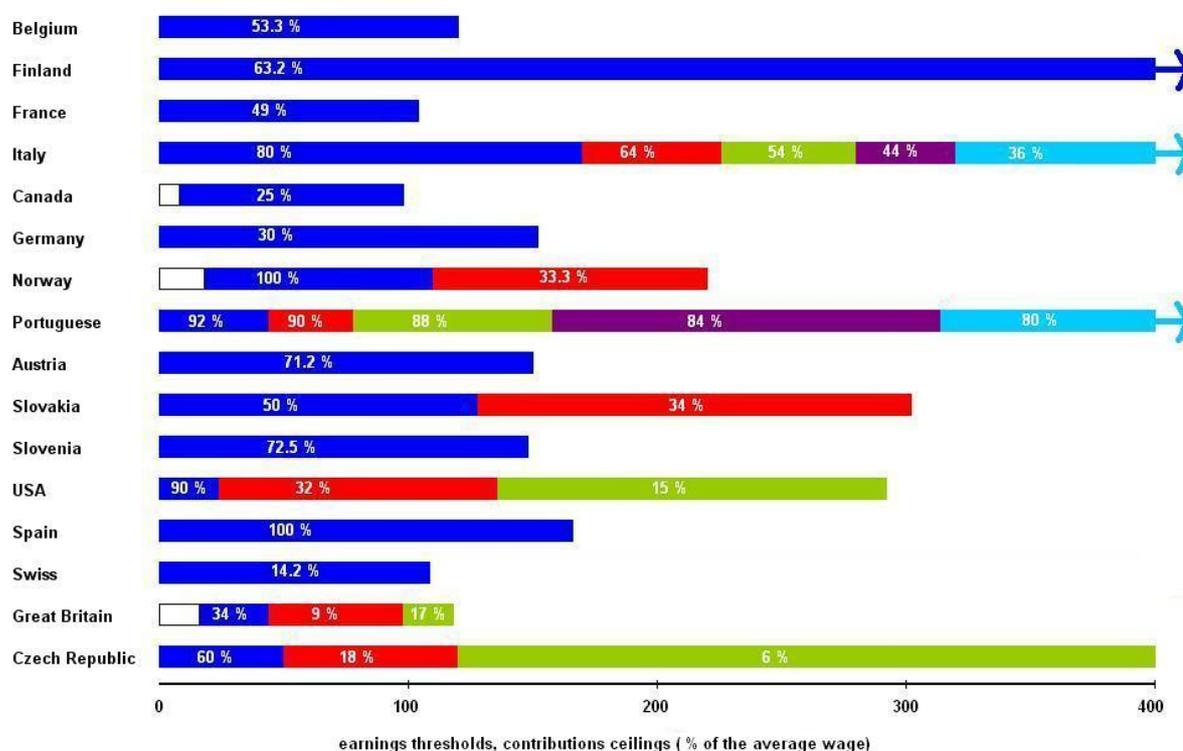
extent to which reference income is considered in the countries surveyed is based on data from 2006, only in the case of Slovakia was it based on 2007 data.

For the purpose of this analysis, earnings thresholds were defined as the limits separating the insured's various income bands in which reference income is considered to a greater or lesser extent. In Switzerland a similar institution can be found which does not fall within this definition and where the pension of the insured falling below a reference income corresponding to 54% of the average wage income is calculated differently than that of the insured enjoying a higher reference income.¹⁵ In Slovakia an insured person with a reference income below the average wage profits by receiving a higher percentage rate. An insured person with a higher income, however, has no right to the same percentage rate in this band up to the level of the average wage. These limits do not separate the bands of the insured's income in which the reference income is considered to a varying extent, but they distinguish between those insured as to what extent consideration of the reference income is applied concerning the whole of their reference income. Therefore subsequent comparative analysis does not deal with them further. Similarly, the lower income limit is defined as that income limit defining the income band which is not taken into account when calculating income. Participants attain higher income pay contributions from this income band and it is also taken into account when calculating the pension. Therefore the limits that define the amount of income from which insurance participation is compulsory do not fall under the definition of earnings thresholds. Figure 1 illustrates the extent to which reference income is considered in each income band when assessing the pension benefits of all the 15 countries surveyed and the Czech Republic. The following figures show clearly the situation in specific countries in which earnings thresholds exist.

¹⁵ Analysis in the Swiss case concerns an insured person with a reference income above 54% of the average wage in the economy. The pension benefit consists of a fixed amount and an amount reflecting the previous income. The fixed basic amount corresponds to 18.72% of the average wage in economy. Since it is a flat-rate amount is not subject to analysis and is not shown in the graph. It simply takes into account the reference income consideration of the insured which after 40 years of insurance amounts to 14.2% (16% after 45 years of insurance).

3. Comparative analysis of the reference period in selected global pension systems

Graph 1 Income bands with different measures of reference income



Source: MISSOC 2007, MISSOC 2006, OECD 2007: Pensions at a Glance 2007, OECD 2006: Taxing Wages 2005-2006, national legislation of each country, own calculations.

A ceiling to the consideration of the income of the insured (upper income limit) exists in 13 of the countries surveyed. In only one case does it not coincide with the contribution ceiling;¹⁶ on average it is set at 163% of the average wage. A lower income limit exists in 3 of the countries surveyed and is set at an average of 13.38% of the average wage.

Earnings thresholds as defined above exist in 6 of the 15 schemes surveyed. Figure 1 shows the correlation between, inter alia, setting a ceiling to take into consideration the income of the insured and the existence of earnings thresholds in the scheme. In those schemes where earnings thresholds exist, the income ceiling is set at 264% of the average wage in the economy on average; in two of these schemes no ceiling exists at all. The exception here is the earnings related scheme operated in Great Britain, where this ceiling is set at 115% of the average wage i.e. a level corresponding more to schemes in which earnings thresholds are not considered¹⁷ in which, in turn, the income ceiling for consideration of the income of the insured is set

¹⁶ In Switzerland it is the level of income taken into consideration limited only to a level of 108% of the average wage, because of the maximum amount of the pension. But premium income is not subject to contribution ceiling. It can be said that, according to set definitions, limit set on a level of 108% of the average wage is a kind of earnings threshold. (This threshold separates two bands of income of the insured person, in which the reference income is considered to different degrees).

¹⁷ This can be justified by the fact that until 2002 in this scheme no earnings threshold existed. The current scheme at the same time provides a progressive weakening of the pension and previous income and represents a gradual transference to a flat rate benefit.

3. Comparative analysis of the reference period in selected global pension systems

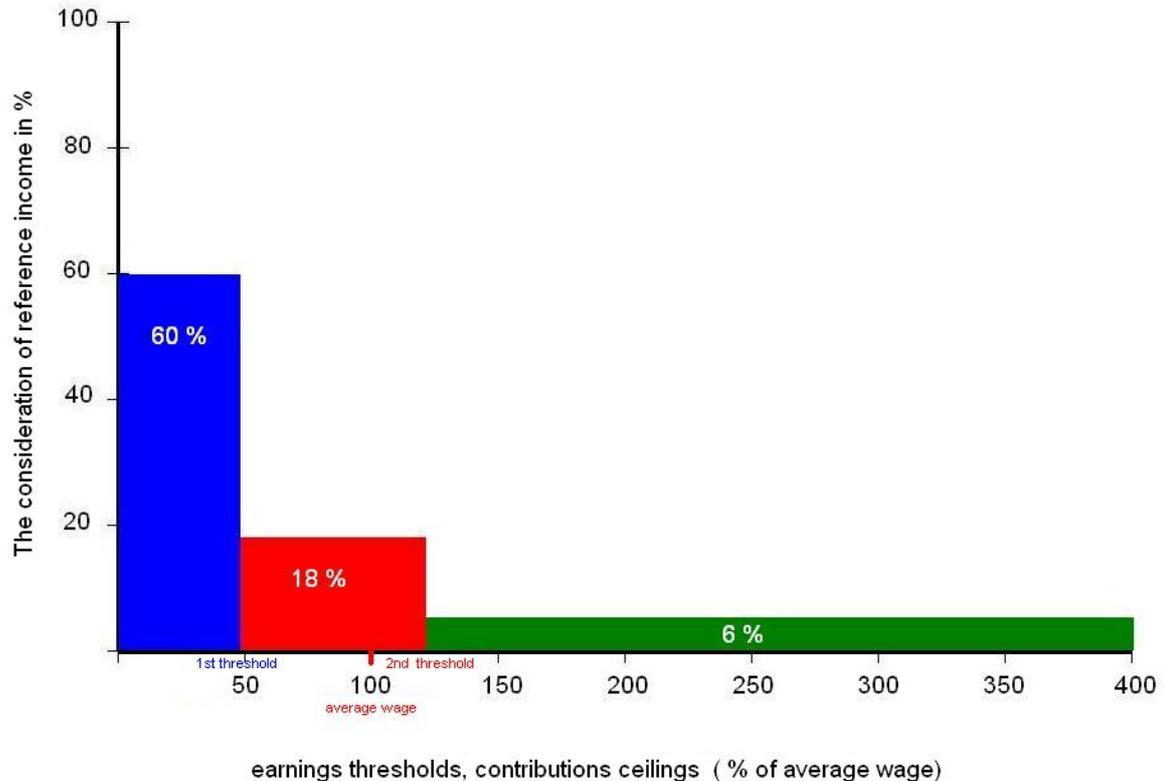
at an average of 128% of the average wage. Only in Finland does no ceiling exist. This correlation can be attributed to varying degrees of income solidarity in these two groups of schemes.

Techniques used for reducing reference income when calculating pensions in those schemes incorporating earnings thresholds varies. In the United States of America, when calculating the pension, the reference income is reduced directly before applying a uniform percentage of the accrual component. This is exactly the same procedure as that used in the Czech Republic. In all the other countries surveyed, a different accrual component percentage rate is applied in each of the specific income bands of the insured reference income. Therefore, reference income is considered to a different extent in each income band.

The situation of earnings-related schemes in the countries surveyed in which earnings thresholds exist can be illustrated by the following figures. The method for calculating the extent to which reference income is considered in each insured income band when calculating the pension, illustrated by the example of the Czech Republic, is as follows. The calculation considers the insured to be a man who has acquired 40 years of insurance and retired when reaching the statutory retirement age. The accrual value per one year of insurance is 1.5% in the Czech Republic which means that, if earnings thresholds did not exist, the reference income would be considered in 60% (40×1.5) after 40 years of insurance. Due to the existence of earnings thresholds the rate must be adjusted in each income band so as to arrive at the extent to which reference income is considered. In the first band, up to the first earnings threshold, income is taken into account at a level of 100% in the Czech Republic, so that the first column has a value of 60% (i.e. the extent to which reference income is considered in the first income band is 60%). Income falling into the band between the first and second earnings thresholds is taken into account at 30%. In this case the extent to which reference income is considered stands at only 18% (60% of the 30% of reference income taken into account). Income in excess of the second earnings threshold is taken into account at a rate of only 10% in the Czech Republic i.e. the extent to which reference income is considered is a mere 6% (60% of the 10% of the reference income taken into account). Since a contribution ceiling exists in the Czech Republic, income is taken into account only up to this ceiling.

3. Comparative analysis of the reference period in selected global pension systems

Graph 2 The consideration of reference income in particular income bands – Czech Republic

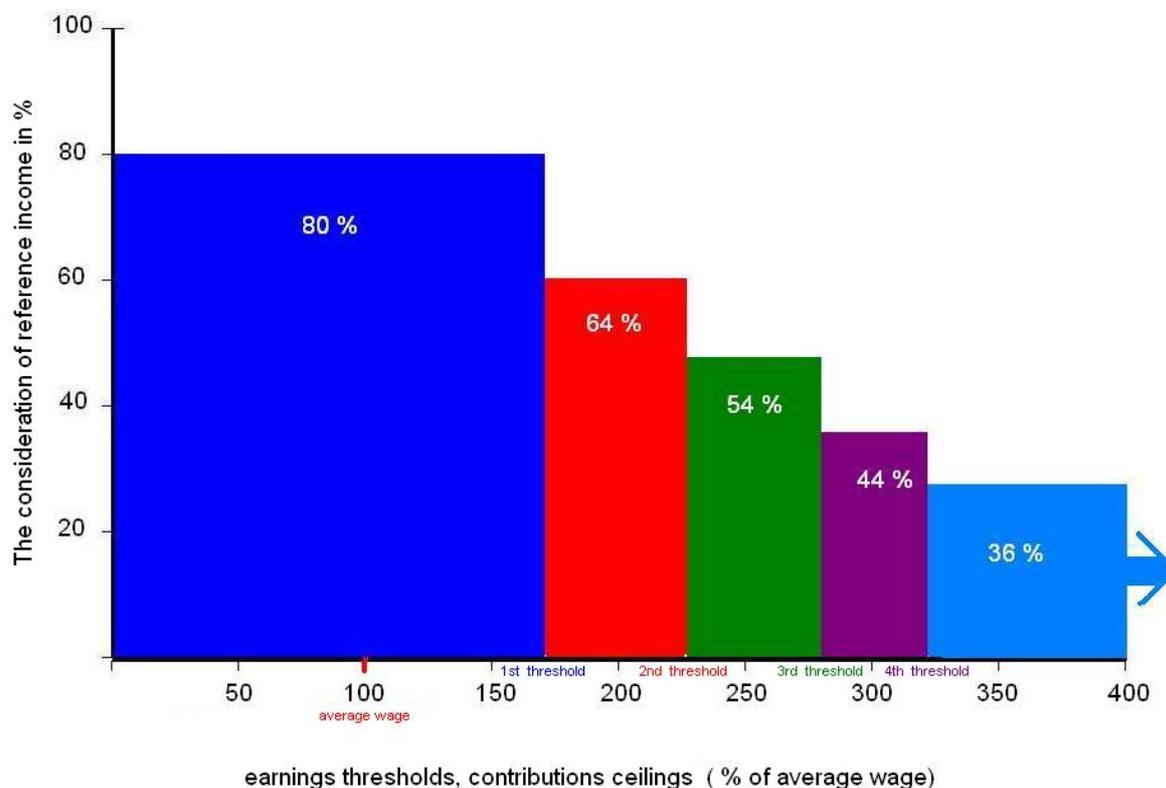


Source: MISSOC 2007, MISSOC 2006, OECD 2007: *Pensions at a Glance 2007*, OECD 2006: *Taxing Wages 2005-2006*, national legislation of each country, own calculations.

In the Czech pension scheme there is no lower income limit when calculating pension benefits. Earnings thresholds are set at 48% and 117% of the average wage. These thresholds separate three reference income bands in which the extent to which reference income is considered is set at 60%, 18% and 6%. The varying extent to which reference income is considered in these bands is achieved through a reduction in the calculation base (reference income) before the application of a uniform percentage rate of 1.5% per year. The contribution ceiling and thus the ceiling used to consider income is set at a level of 400% of the average wage.

3. Comparative analysis of the reference period in selected global pension systems

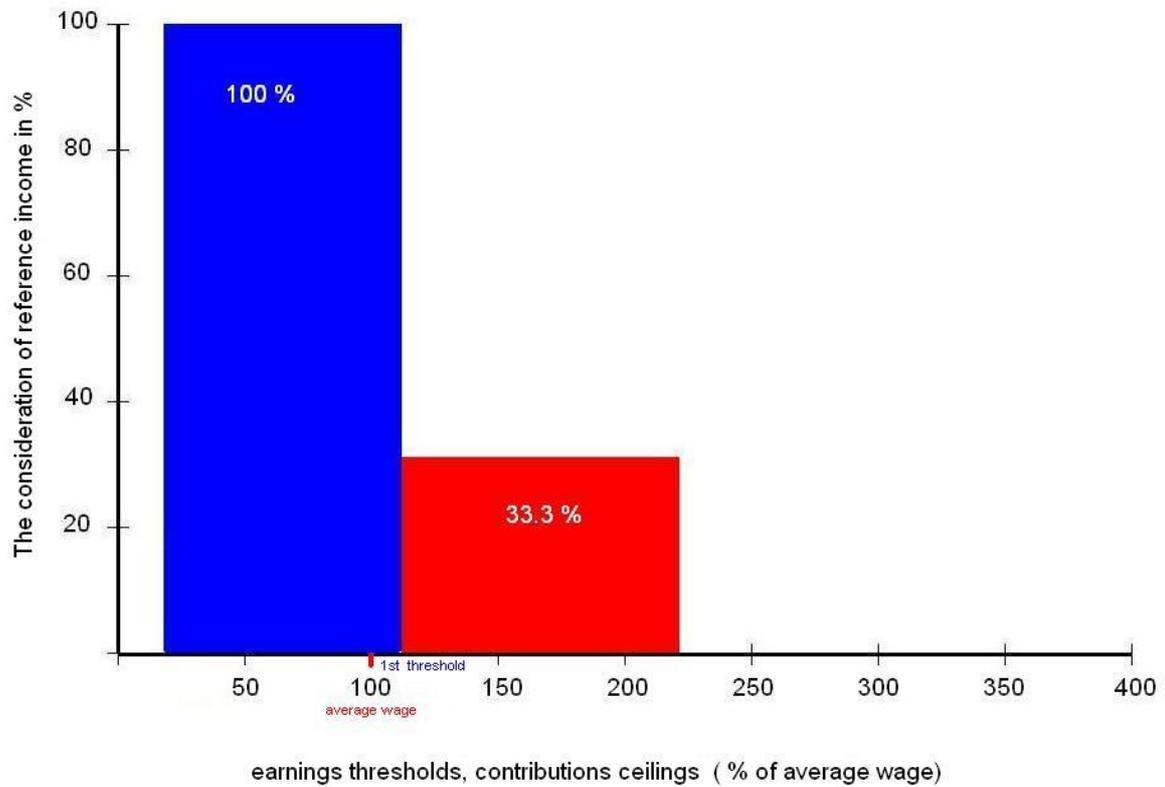
Graph 3 The consideration of reference income in particular income bands – Italy



Source: MISSOC 2007, MISSOC 2006, OECD 2007: Pensions at a Glance 2007, OECD 2006: Taxing Wages 2005-2006, national legislation of each country, own calculations.

In Italy's old defined benefit scheme the extent to which reference income is considered is 80% in the first band with an earnings threshold set at 1.5 times the average wage. Reference income in the following four income bands is reduced gradually reaching a reference income consideration level of 36% above the last earnings threshold set at a value of 300% of the average wage. Reduction is performed by the application of a different percentage rate for the accrual component of the pension formula for each specific income band. There is no contribution ceiling in Italy.

Graph 4 The consideration of reference income in particular income bands – Norway

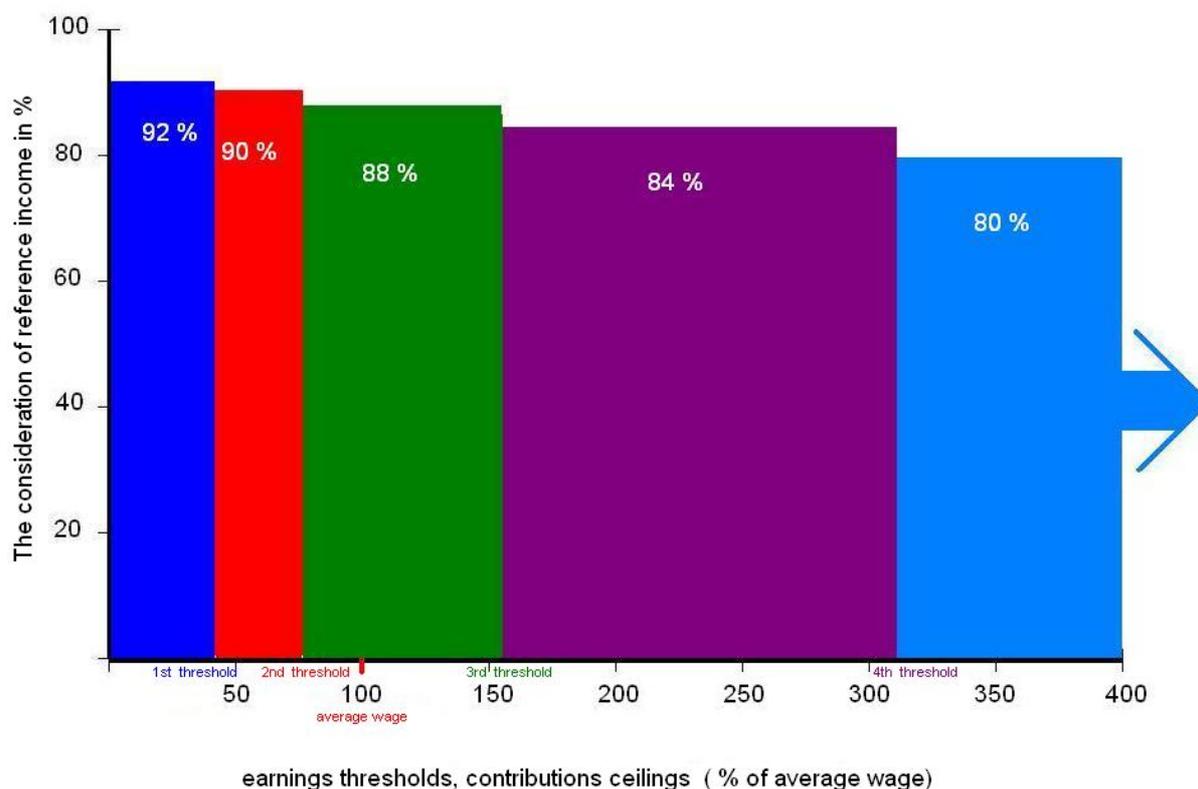


Source: MISSOC 2007, MISSOC 2006, OECD 2007: Pensions at a Glance 2007, OECD 2006: Taxing Wages 2005-2006, national legislation of each country, own calculations.

In Norway the reference income is limited by the lower and upper income limits set at 18% and 219% of the average wage in the economy respectively. The only earnings threshold is set at 109% of the average wage. Under this threshold the extent to which reference income is considered is 100% and in the band above 33.3%. The different extent to which reference income is considered in each band is achieved by applying varying accrual component percentage rates. In Norway the contribution ceiling is set at 219% of the average wage in the economy.

3. Comparative analysis of the reference period in selected global pension systems

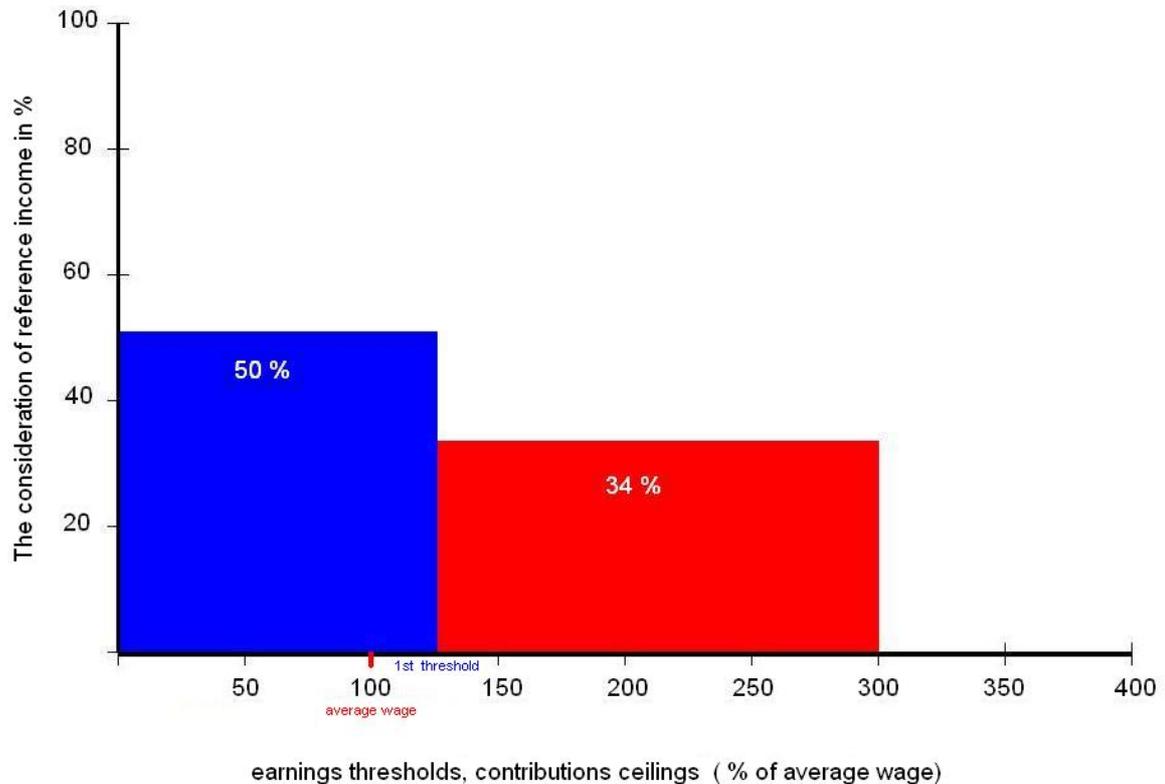
Graph 5 The consideration of reference income in particular income bands – Portuguese



Source: MISSOC 2007, MISSOC 2006, OECD 2007: Pensions at a Glance 2007, OECD 2006: Taxing Wages 2005-2006, national legislation of each country, own calculations.

In the Portuguese pension scheme there is no lower or upper limit to the reference income when assessing pension benefits. Earnings thresholds are set at levels of 43%, 78%, 156% and 312% of the average wage in the economy. A total of five income bands separated by these thresholds guarantee that reference income is considered to a relatively high degree i.e. 92%, 90%, 88%, 84% and 80%. The varying extent to which reference income is considered in each band is achieved by applying different percentage rates via the application of the accrual component of the pension formula.

Graph 6 The consideration of reference income in particular income bands - Slovakia

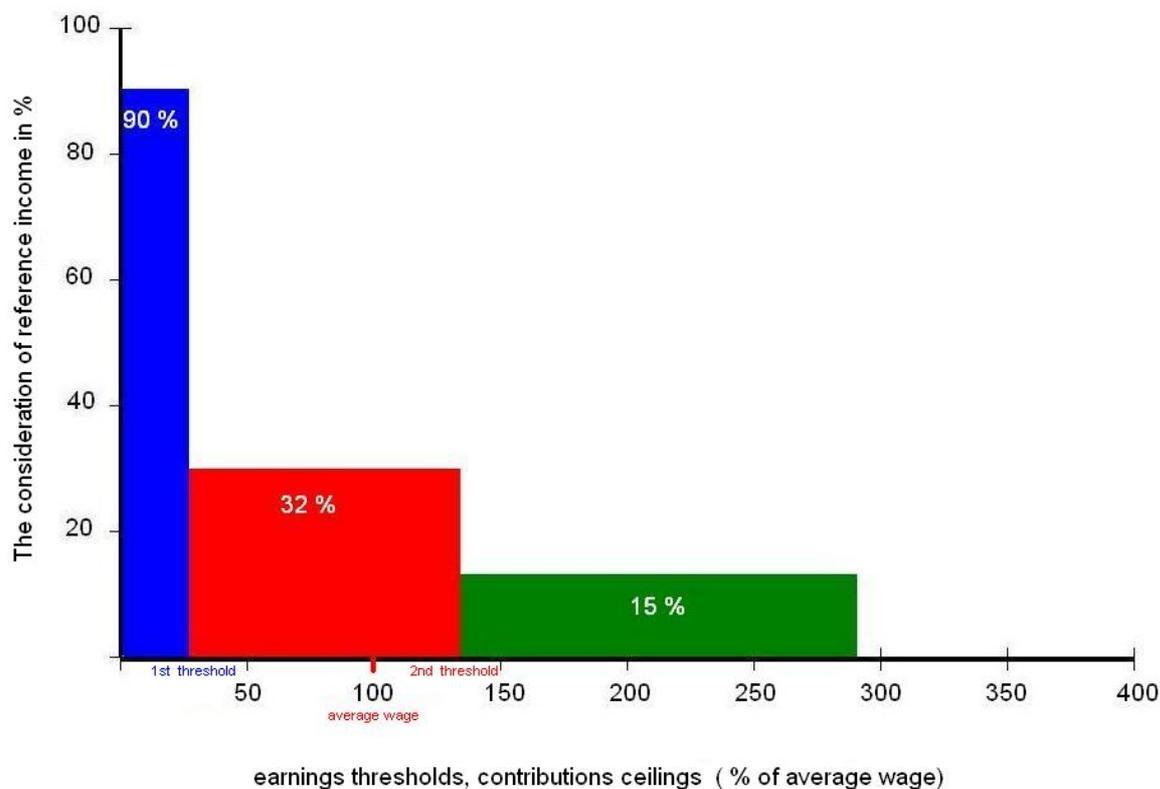


Source: MISSOC 2007, MISSOC 2006, OECD 2007: Pensions at a Glance 2007, OECD 2006: Taxing Wages 2005-2006, national legislation of each country, own calculations.

In the new Slovak defined benefit pension scheme the ceiling for consideration of income when assessing the pension is set at 300% of the average wage. Earnings threshold is set at 125% of the average wage in the economy. It separates two income bands with the reference income consideration levels of 50% and 34%. The different extend to which the reference income in each income band is considered is achieved by various treating the value of the average wage point when applying the accrual component. Those participants whose average income is lower than the average reference wage (average wage point of less than 1) benefit by receiving a higher level of reference income.

3. Comparative analysis of the reference period in selected global pension systems

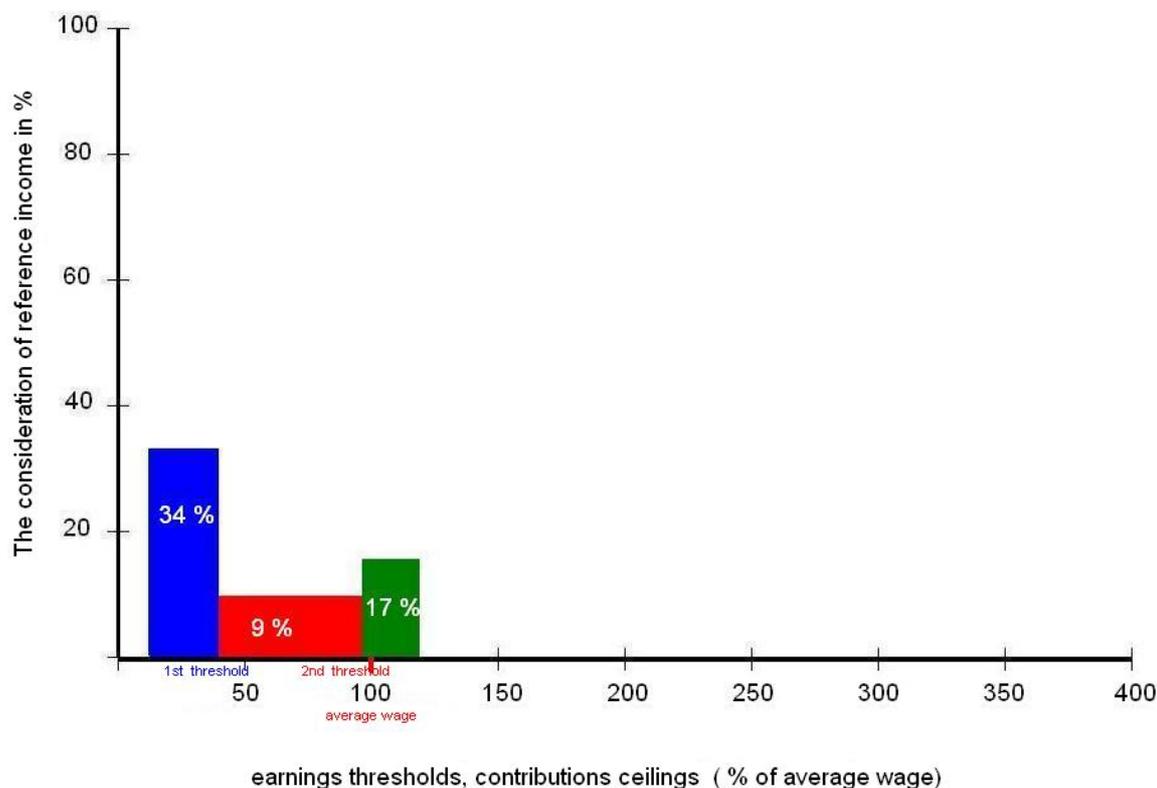
Graph 7 The consideration of reference income in particular income bands - USA



Source: MISSOC 2007, MISSOC 2006, OECD 2007: Pensions at a Glance 2007, OECD 2006: Taxing Wages 2005-2006, national legislation of each country, own calculations.

In the United States of America (Social Security scheme) the ceiling for considering income when assessing pension benefits is set at 290% of the average wage in the economy. Two earnings thresholds are set at 22% and 133% of the average wage. Three bands separated by these thresholds guarantee reference income consideration at levels of 90%, 32% and 15%. The varying extent to which reference income is considered is achieved via the direct reduction of the reference income, as in the Czech Republic.

Graph 8 The consideration of reference income in particular income bands - Great Britain



Source: MISSOC 2007, MISSOC 2006, OECD 2007: *Pensions at a Glance 2007*, OECD 2006: *Taxing Wages 2005-2006*, national legislation of each country, own calculations.

The State Second Pension scheme in the United Kingdom determines reference income as the lower and upper limits of pensionable income i.e. 15% and 115% of the average wage in the economy respectively. Earnings thresholds are set at 42% and 96% of the average wage. All income falling into the first band from the lower limit of pensionable income up to the first earnings threshold is evaluated as if it were equal to the first earnings threshold. This notional reference income is then considered at a rate of 34%. Therefore a flat-rate benefit is guaranteed for any income level in this band. The second and third income bands establish the extent to which reference income is considered at 9% and 17%. The current structure of the scheme is the result of recent developments and it is still in the transitional stage. In future the scheme will guarantee a flat-rate benefit.

3.2.3 Types of income considered with regard to pension insurance

In the earnings-related pension schemes of the countries surveyed, the reference income for the calculation of retirement benefits, in principle, covers wages and salaries, the income of self-employed persons and certain other income sources. A number of exceptions can be found in specific countries with regard to income from

3. Comparative analysis of the reference period in selected global pension systems

certain types of employment or the income of selected groups of persons. In the countries surveyed all wages and salaries are considered reference income. Any exceptions must be listed by law.

4. Possible changes in determining the reference period from which the pension is determined

In principle, two potential major adjustments can be made when determining the reference period - a change in the length of the reference period and a change to the method employed for the valorisation of income within the reference period or a combination of the two. A change in the length of the reference period might be based on existing models used to determine the reference period in various European countries. As a result of a comparison of the current, historical and potential (planned pension system reforms) variants discovered as a result of this analysis the author arrived at the following options for change. The first basic option is to determine the reference period by means of years of affiliation accompanied by an individual's maximum income years (his/her "best" years). These years can either be measured separately over the insured's entire working life or as a set of consecutive years. The second basic option for determining the reference period from which an individual's pension rights are then calculated is to take into account a number of years of contribution immediately leading up to retirement.

This chapter is divided into two main parts; the first is devoted to an analysis of various reference period set lengths in the Czech Republic and the second concerns the methods to be employed with regard to determining income valorisation subject to the reference period.

4.1 Adjustment of the length of the reference period - methods and data

In considering potential changes to the reference period in the Czech Republic the author considered for the purposes of this paper model cases of best earnings for 5-, 15-, 20-, 25-, 30- and 35-year periods. The selection of these periods was due to two main reasons - the data structure¹⁸ of an individual's lifetime income and the frequent use of these figures in existing pension schemes. The author's model considers one option, where the reference period is any 5 best years. In the pension schemes compared, however, the reference period is quite often a consecutive number of best years.¹⁹ It was decided not to include this method for determining the reference period principally because of the inadequacy of the relevant data. With regard to a reference period dependent upon the years running up to retirement, the author decided to include the last 5-, 22-, 30-, 35-, 40-, 42- and 44-year periods. A reference period of the final 22 years is intended to serve as a basic (zero) option reflecting, with respect to 2008, income earned since 1986. The final 30-year variant is included because it is enshrined in law; the limit in this case will be reached in 2016. With regard to the significance of reference periods of 35, 40, 42 and 44 years it is important to note that the final 40-year option coincides with the typical lifetime

¹⁸ Closer to the data file, see below.

¹⁹ This method of determining the reference period with a sufficiently high number of years taken into consideration approximates to the variant reflecting incomes in recent years as an equally long period.

4. Possible changes in determining the reference period from which the pension is determined

income for women.²⁰ The 42-year option covers the typical lifetime income of men and women combined the 44-year option typically covers the lifetime income of men.

A further option for determining the reference period is a combination of the two methods outlined above i.e. to take into account lifetime income excluding a certain number (usually determined as a percentage) of the revenue-weakest years. The author has included variants of lifetime income which exclude the revenue-worst four years for men and the five worst earnings years for women.

4.2 Lifetime income data file

An individual's lifetime earnings was required for the purposes of making model data calculations. However, since such data does not exist,²¹ the author decided to use data from the Information System on Average Earnings (ISPV) operated by the Ministry of Labour and Social Affairs.²² Data from this system provides an overview of the earnings of men and women in both the private and public sectors in a given year. While the author is aware of the difficulties involved with using such data, it seems the most appropriate for use in the model. Further, the author used a simplification in the design of the model i.e. by considering the distribution of income in a given year between various age groups to represent the distribution of the lifetime income of the average individual. Consequently, the author was able to examine the impact of changes in the length of the reference period of an individual pension.

The author constructed tables which simulated an individual's lifetime income using average income obtained from the ISPV survey data. Income was distributed separately for the private and public sectors and according to gender. Income was obtained according to the following age groups:

- up to 19 years,
- 20-24,
- 25-29,
- 30-39,
- 40-49,
- 50-54,
- 55-59,
- 60-64.

Since income was determined from one specific year thereby reflecting current value, valorisation was not necessary. Along with income details income summary charts were then compiled which were subsequently used to model different types of reference period. Based on such data the individual calculation basis was determined for each type of individual and the amount of pension calculated (according to the

²⁰ Lifetime income was determined based on the average period of insurance, which in 2004 in the CR was 44.4 for men, 39.8 years for women and 42.1 years on average.

²¹ Even if there were, it would be inappropriate for the calculation in the model due to social changes which have taken place since 1989.

²² Output sub-analysis of wage surveys, published by the CSO, based on ISPV sample surveys e.g. Structure of Earnings Survey 2004, CSO, Prague.

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rules for the granting of a pension in 2008). The average duration of insurance was set at 44 years for men, 40 years for women and 42 years for men and women combined. Non-contributory periods were taken into account to the extent identified in: "Analysis of non-contributory periods in the CR and recommendations for monitoring and registration" (Holub 2004). The range of each was adjusted to the length of each relevant reference period. Non-contributory periods were included of 3 246 days for men, 3 016 days for women and 3 144 days for both sexes combined. Earnings thresholds for 2008 (the first of 10 000 CZK and the second of 24 800 CZK) were used in determining the calculation basis.

4.3 Changes in the length of the reference period - results

Table 3 Distribution of income by economic sector, gender and age group (2004)

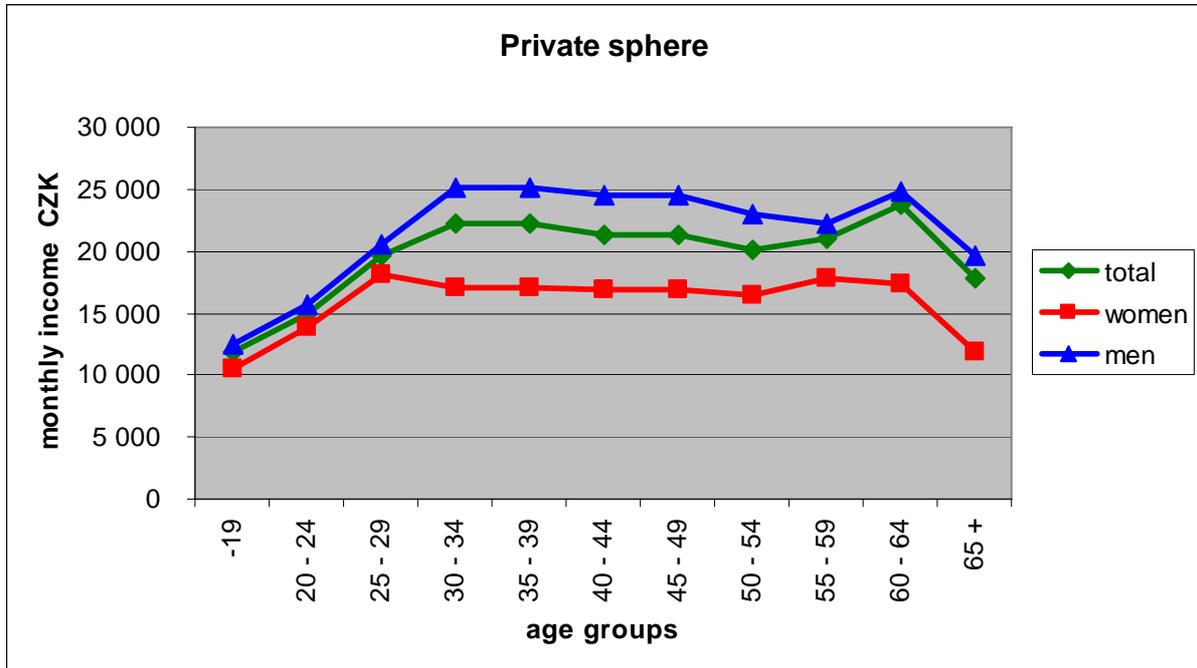
private sector											
age groups											
	- 19 years	20 - 24 years	25 - 29 years	30 - 34 years	35 - 39 years	40 - 44 years	45 - 49 years	50 - 54 years	55 - 59 years	60 - 64 years	65 + years
total	11 900	14 983	19 702	22 247	22 247	21 333	21 333	20 087	20 949	23 779	17 793
women	10 545	13 912	18 070	17 052	17 052	16 959	16 959	16 390	17 888	17 426	11 835
men	12 464	15 684	20 545	25 135	25 135	24 447	24 447	22 970	22 221	24 835	19 653
public sector											
age groups											
	- 19 years	20 - 24 years	25 - 29 years	30 - 34 years	35 - 39 years	40 - 44 years	45 - 49 years	50 - 54 years	55 - 59 years	60 - 64 years	65 + years
total	10 427	15 292	18 306	19 373	19 373	20 028	20 028	20 431	21 402	23 300	19 294
women	10 760	14 796	17 126	17 080	17 080	18 448	18 448	18 767	20 066	20 796	15 979
men	9 771	16 240	19 971	23 473	23 473	24 491	24 491	24 610	23 794	25 084	21 941
national economy											
age groups											
	- 19 years	20 - 24 years	25 - 29 years	30 - 34 years	35 - 39 years	40 - 44 years	45 - 49 years	50 - 54 years	55 - 59 years	60 - 64 years	65 + years
total	11 382	15 091	19 211	21 237	21 237	20 874	20 874	20 208	21 108	23 611	18 321
women	10 647	14 333	17 620	17 065	17 065	17 669	17 669	17 522	18 926	19 032	13 809
men	11 845	15 812	20 413	24 753	24 753	24 457	24 457	23 347	22 583	24 893	20 180

Source: Survey ISPV (2004), own calculations.

The above-mentioned tables compiled as part of the ISPV survey show the distribution of gross monthly income between the private and public sectors of the national economy by gender and age category in total. The most noticeable difference is that between the private and public sectors. Remuneration in the private sector is based on the labour productivity development of individuals whilst reward in the public sector is based on the principle of seniority (merit) - the more senior the position, the higher the salary. These two varying methods of remuneration, together with the relative representation of these two sectors within the national economy should be borne in mind when planning possible changes and in the interpretation of results. The following graphs illustrate the distribution of income in the national economy.

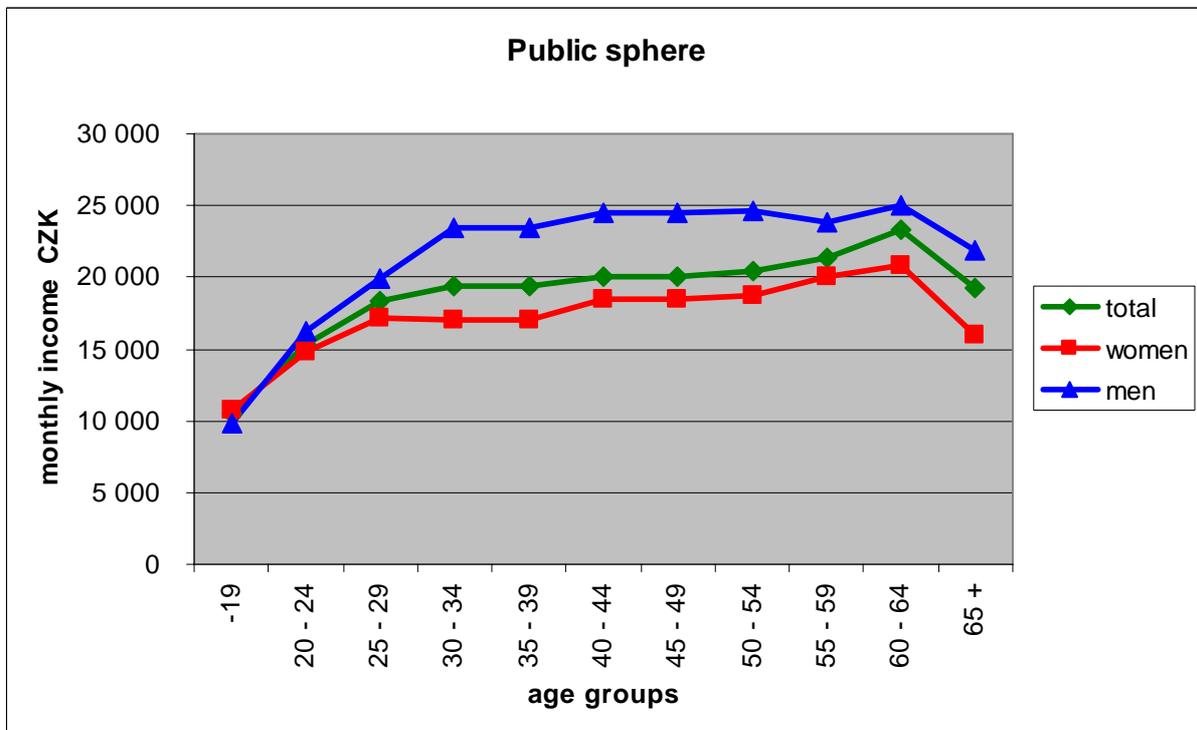
4. Possible changes in determining the reference period from which the pension is determined

Graph 9 Gross earnings and numbers of people (structure) by gender, age category and total



Source: Survey ISPV (2004), own calculations.

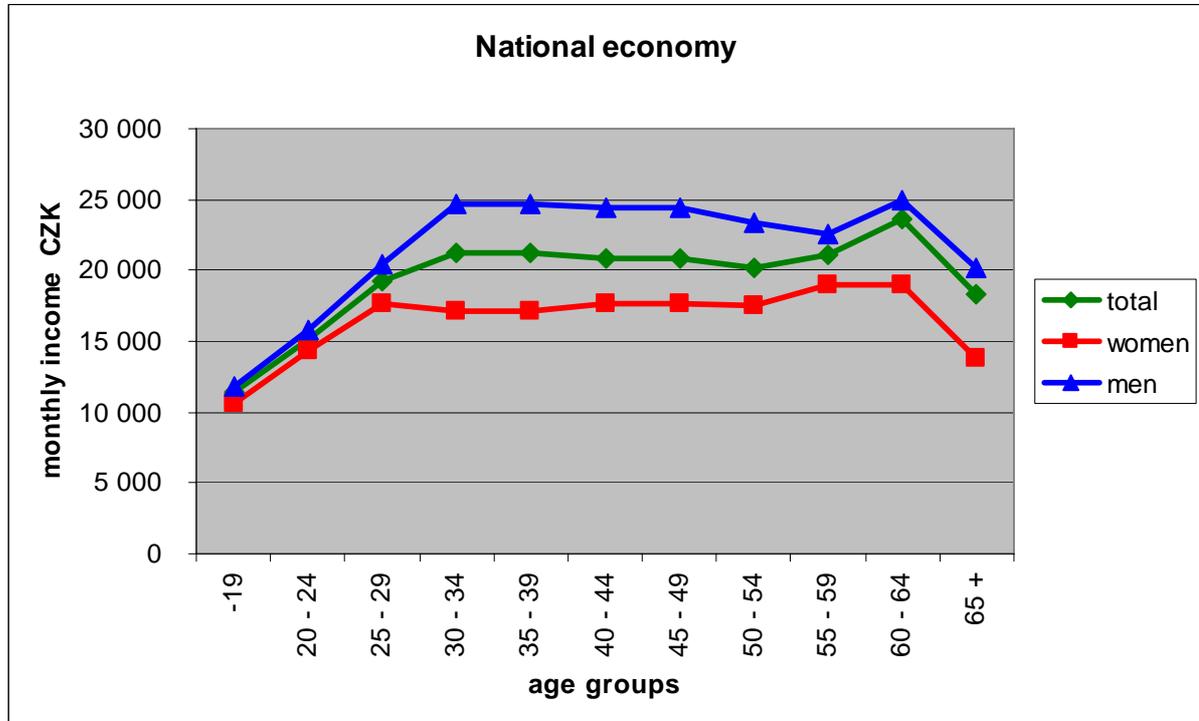
Graph 10 Gross earnings and numbers of people (structure) by gender, age category and total



Source: Survey ISPV (2004), own calculations.

4. Possible changes in determining the reference period from which the pension is determined

Graph 11 Gross earnings and numbers of people (structure) by gender, age category and total



Source: Survey ISPV (2004), own calculations.

The results of the proposed options for changing the length of the reference period compared with the zero option i.e. 22 years, presented in the table below, show that a change in the reference period i.e. has a marginal influence on an individual's pension. This is due mainly to the earnings thresholds which are used in the recalculation of income earned in the reference period. Earnings thresholds were set at 10 000 CZK for the first earnings threshold and 24 800 CZK for the second. The income from a given period is fully included up to the first earnings threshold, income exceeding the first earnings threshold but not reaching the second earnings threshold is included from 30% and income exceeding the second earnings threshold is included only from 10%. Consequently one cannot expect significant changes in an individual's pension due to extension of the reference period. The extension of the reference period to lifetime earnings will influence most notably the pensions of women in the public sector with average earnings whose pension would decrease by 274 CZK (2.5%). The same extension of the period would cause a drop in income for men in the public sector of 215 CZK (1.9%). As in the public sector, extending the reference period to lifetime income would cause a drop in the pension of individuals working in the private sector. The decrease, however, would not be as noticeable as in the public sector. A decrease in men's pensions of 143 CZK (1.2%) would be higher than that of women at 128 CZK (1.2%). On the other extreme, the reference period model which takes into account the best 5 years of earnings would see the average men's pension increase by 122 CZK (1.1%) and that of women with an average income working in the private sector by 284 CZK (2.7%). With a reference period consisting of the 5 best years, the increase in the pension for men in the public sector would not be as significant as for men in the private sector; those in the public sector would see a rise of only 29 CZK (0.3%).

4. Possible changes in determining the reference period from which the pension is determined

Women's pensions would increase by 232 CZK (2.13%). Women working in the public sector could expect to see the same increase in pension with a reference period consisting of the last 5 years of earnings; in this case the last 5 years corresponds with the best 5 years. The small increase in pension for men working in the public sector when considered with a reference period consisting of the best 5 years is closely tied to the development of income in this sector; income achieved from the age of 39 years (income is taken into account for the default/zero option from this age) proves to be almost constant i.e. without any significant development. If one considers the average earning individual, irrespective of gender and the national economic sector in which they operate, extending the reference period to include lifetime income would cause a fall in pension of 187 CZK (1.7%). Were the reference period to consist of the best 5 years, the pension would increase by 89 CZK (0.8%). Very interesting results would ensue should the reference period be extended to 30 years as contained in the Pension Insurance Act. Such an extension would, for individuals on an average income, irrespective of gender and the sector of the national economy, mean a pension increase of 3 CZK (0.03%). Such an increase would be due mainly to the private sector which would increase the pension for women by 34 CZK (0.3%) and men by 32 CZK (0.3%). Conversely, women in the public sector would receive a pension reduced by 84 CZK (0.8%) and men by 19 CZK (0.2%). All the variants described above can be seen in the following table. Selected options can be observed in the graph below.

Table 4 Pension amount variants (in CZK) according to method of determining the reference period

calculation basis - number of years	man - private sector	woman - private sector	man and woman - private sector	man - public sector	woman - public sector	man and woman - public sector	man and woman total
last 22	11 553	10 550	11 348	11 610	10 906	11 279	11 324
last 30	11 585	10 584	11 366	11 591	10 822	11 255	11 327
last 35	11 555	10 531	11 336	11 550	10 740	11 223	11 297
last 40	11 449	10 422	11 268	11 481	10 632	11 057	11 194
last 44 (42)*	11 410		11 235	11 395		10 955	11 199
last 5	11 477	10 564	11 321	11 586	11 138	11 357	11 334
best 15	11 659	10 692	11 418	11 629	11 009	11 300	11 377
best 20	11 649	10 661	11 405	11 616	10 939	11 287	11 364
best 25	11 623	10 640	11 389	11 601	10 870	11 270	11 348
best 30	11 593	10 612	11 366	11 591	10 823	11 255	11 327
best 35	11 555	10 531	11 336	11 550	10 740	11 223	11 297
best 5	11 675	10 834	11 443	11 639	11 138	11 357	11 413
lifetime career without worst**	11 449	10 531		11 481	10 740		

* last 44 equals lifetime earnings for men, 40 equals lifetime earnings for women, 42 together

** for men 4 worst-earnings years, for women 5 worst-earnings years

Source: own calculations based on ISPV survey (2004)

4. Possible changes in determining the reference period from which the pension is determined

Table 5 Difference in pensions (in CZK) according to method of determining the reference period

calculation basis - number of years	man - private sector	woman - private sector	man and woman - private sector	man - public sector	woman - public sector	man and woman - public sector	man and woman total
last 22	0	0	0	0	0	0	0
last 30	32	34	18	-19	-84	-24	3
last 35	2	-19	-12	-60	-166	-56	-27
last 40	-104	-128	-80	-129	-274	-222	-130
last 44 (42)*	-143		-113	-215		-324	-187
last 5	-76	14	-27	-24	232	78	10
best 15	106	142	70	19	103	21	53
best 20	96	111	57	6	33	8	40
best 25	70	90	41	-9	-36	-9	24
best 30	40	62	18	-19	-83	-24	3
best 35	2	-19	-12	-60	-166	-56	-27
best 5	122	284	95	29	232	78	89
lifetime career without worst**	-104	-19			-129	-166	

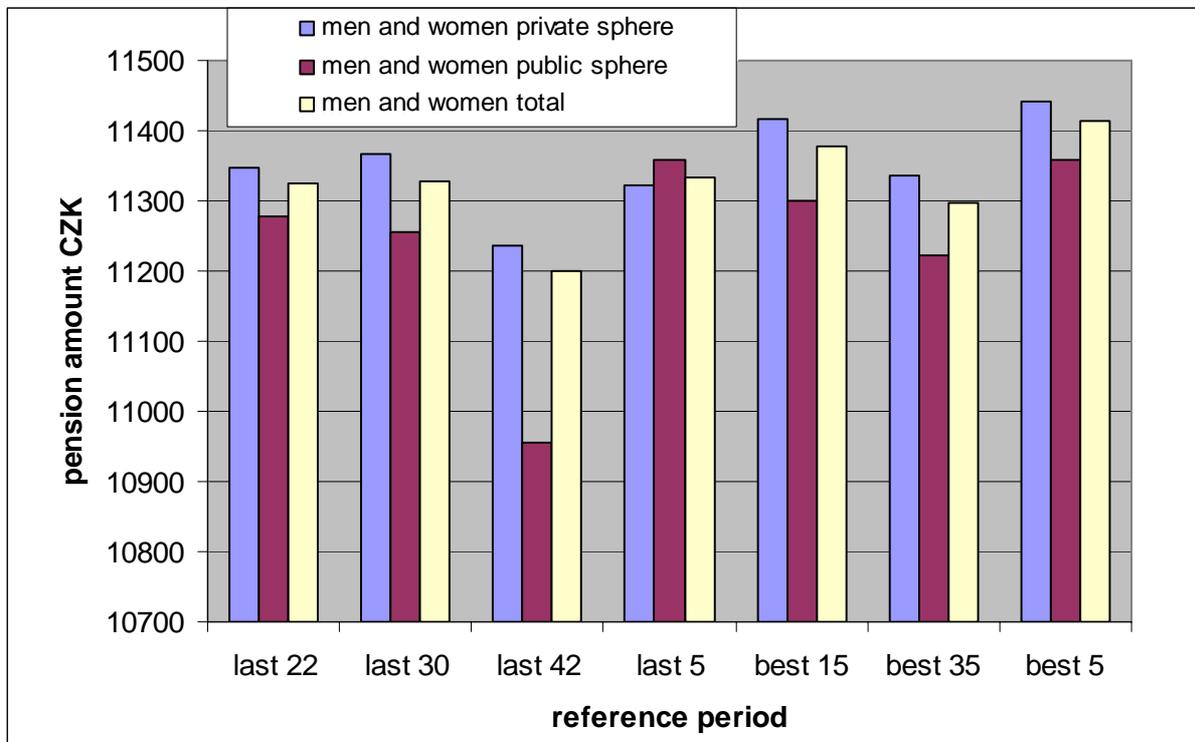
* last 44 equals lifetime earnings for men, 40 equals lifetime earnings for women, 42 together

** for men 4 worst-earnings years, for women 5 worst-earnings years

Source: own calculations based on ISPV survey (2004)

4. Possible changes in determining the reference period from which the pension is determined

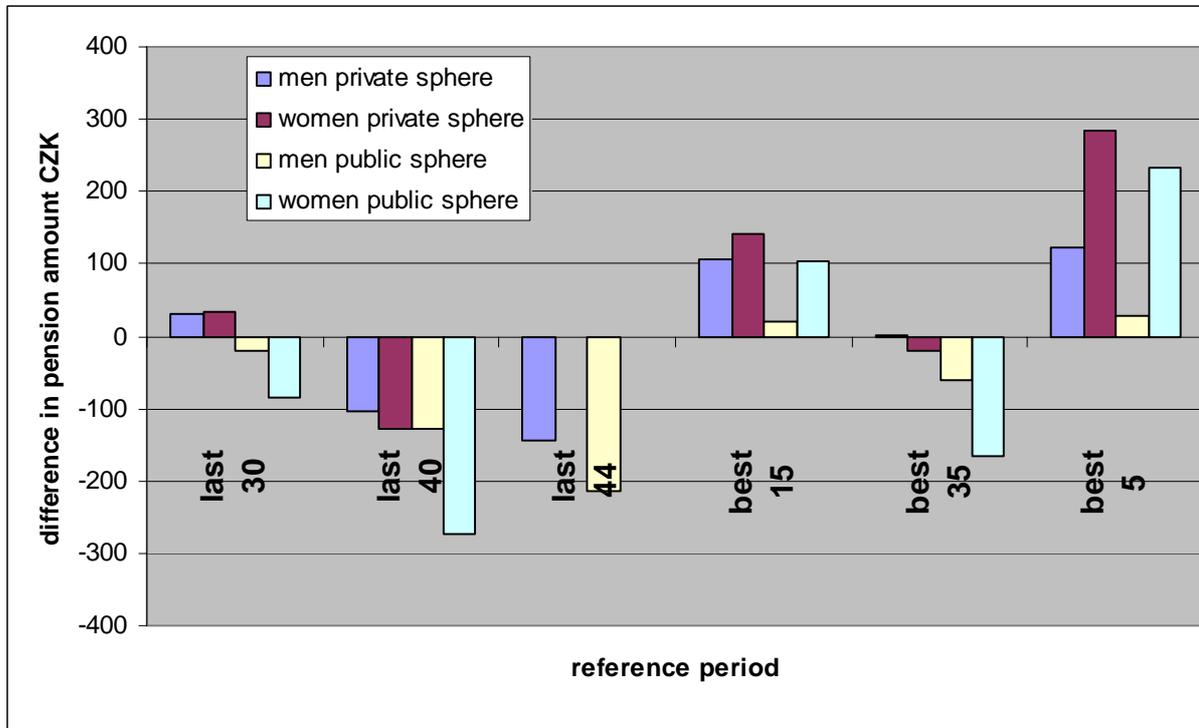
Graph 12 **Amount of pension (in CZK) according to method of determining the reference period**



Source: own calculations based on ISPV survey (2004)

4. Possible changes in determining the reference period from which the pension is determined

Graph 13 **Difference in pensions (in CZK) according to method of determining the reference period**



Source: own calculations based on ISPV survey (2004)

In order to exclude the effect of the earnings thresholds applied in calculating the pension on the variation in the amount of the pension caused by changes in the length of the reference period it was necessary to make a further comparison. The author therefore compared the impact of changes in the length of the reference period on the personal calculation base of individuals with average incomes. As a result of this model comparison the following results were obtained: by extending the reference period to lifetime income the personal calculation base of individuals with average earnings, irrespective of gender and sector of the national economy, would see a decrease of 1 860 CZK (7.1%). Modification of the reference period to the best 5 years would lead to an increase in the personal calculation base of 1345 CZK (5.1%).

The most obvious difference in the personal calculation base can be seen in the case of a man working in the public sector. The extension of the reference period to lifetime income would decrease his personal calculation base by 3 246 CZK (10.6%). The same extension would decrease the personal calculation base of a woman in the public sector by 1 383 CZK (5.6%). As far as the private sector is concerned, by extending the reference period to lifetime income most men would come off worse; their personal calculation base would decrease by 2 161 CZK (7.3%). Extending the reference period to lifetime income would lead to a reduction in the women's personal calculation base of 652 CZK (3.1%). The option of a reference period consisting of the 5 best years would again be favourable for all those receiving an average wage. The greatest gain could be expected by women working in the private sector; their personal calculation base would increase by CZK 1432 (6.7%), followed by men in the private sector, whose personal calculation base would increase by 1858 CZK (6.3%). By determining the reference period as the best 5 years women in the public sector could

4. Possible changes in determining the reference period from which the pension is determined

expect an increase in their personal calculation base of 1173 CZK (5.1%) and men in the public sector of 457 CZK (1.5%). An overview of changes in the personal calculation base caused by changes in the length of the reference period can be found in the following tables and graphs.

Table 6 Individual calculation base variants (in CZK) according to method of determining the reference period

calculation basis - number of years	man - private sector	woman - private sector	man and women - private sector	man - public sector	woman - public sector	man and women - public sector	man and woman total
last 22	29 672	21 363	26 573	30 533	23 157	25 529	26 206
last 30	30 168	21 531	26 850	30 243	22 733	25 170	26 260
last 35	29 704	21 262	26 388	29 627	22 320	24 759	25 816
last 40	28 108	20 711	25 351	28 587	21 774	23 918	24 847
last 44 (42)*	27 511		24 857	27 287		23 404	24 346
last 5	28 530	21 432	26 160	30 171	24 330	26 703	26 351
best 15	31 274	22 079	27 628	30 821	23 678	25 848	27 002
best 20	31 123	21 920	27 436	30 622	23 326	25 647	26 807
best 25	30 735	21 814	27 181	30 402	22 975	25 387	26 551
best 30	30 289	21 672	26 850	30 243	22 737	25 170	26 260
best 35	29 704	21 262	26 388	29 627	22 320	24 759	25 816
best 5	31 530	22 795	28 011	30 990	24 330	26 703	27 551
lifetime career without worst**	27 511	20 711		27 278	21 774		

* last 44 equals lifetime earnings for men, 40 equals lifetime earnings for women, 42 together

** for men 4 worst-earnings years, for women 5 worst-earnings years

Source: own calculations based on ISPV survey (2004)

Table 7 Individual calculation base differences (in CZK) according to method of determining the reference period

calculation basis - number of years	man - private sector	woman - private sector	man and woman - private sector	man - public sector	woman - public sector	man and woman - public sector	man and woman total
last 22	0	0	0	0	0	0	0
last 30	496	168	277	-290	-424	-359	53
last 35	32	-101	-185	-906	-837	-770	-391
last 40	-1 564	-652	-1 222	-1 946	-1 383	-1 611	-1 359
last 44 (42)*	-2 161		-1 716	-3246		-2 125	-1 860
last 5	-1 142	69	-413	-362	1 173	1 174	145
best 15	1 602	716	1 055	288	521	319	796
best 20	1 451	557	863	89	169	118	601
best 25	1 063	451	608	-131	-182	-142	344
best 30	617	309	277	-290	-420	-359	53
best 35	32	-101	-185	-906	-837	-770	-391
best 5	1 858	1 432	1 438	457	1 173	1 174	1 345
lifetime career without worst**	-1 564	-101			-1 383	-770	

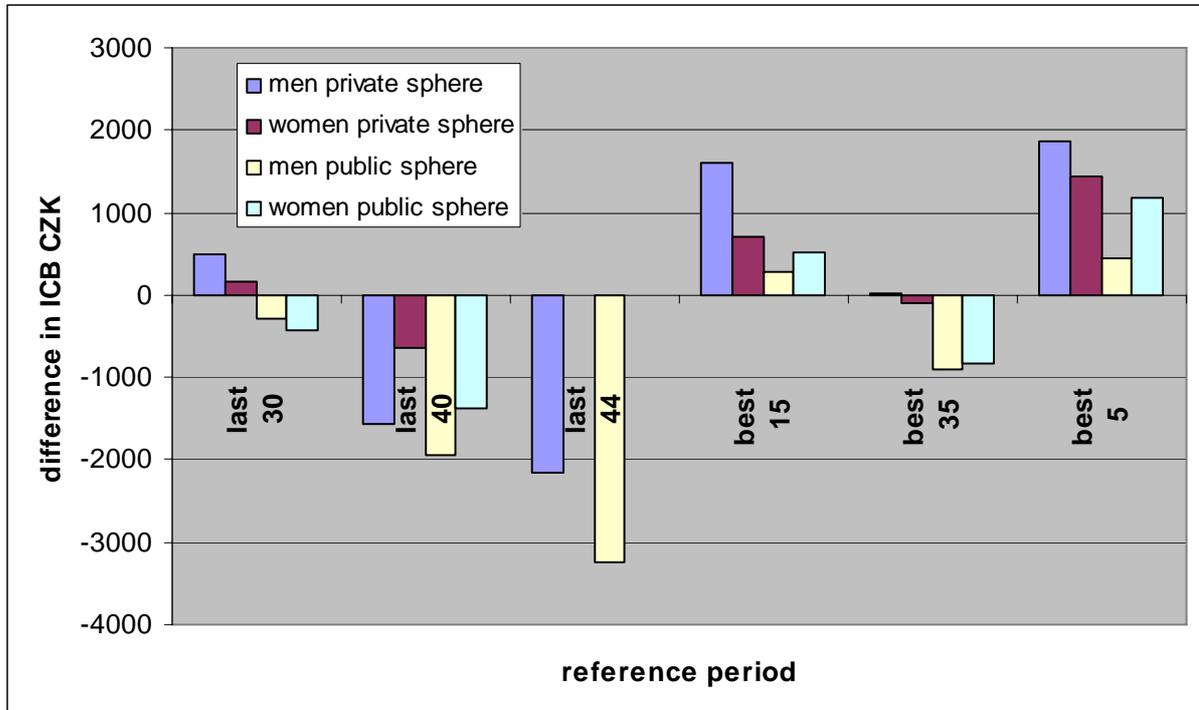
* last 44 equals lifetime earnings for men, 40 equals lifetime earnings for women, 42 together

** for men 4 worst-earnings years, for women 5 worst-earnings years

Source: own calculations based on ISPV survey (2004)

4. Possible changes in determining the reference period from which the pension is determined

Graph 14 Individual calculation base (in CZK) according to method of determining the reference period



Source: own calculations based on ISPV survey (2004)

The impact of changes in determining the reference period for the overall pension system, namely the macro-economic dimension is captured in the table below. The author calculated the impact of changes in the length of the reference period on the overall balance of the pension system. The calculation employs a simple expenditure model which is based on the following assumptions. The number of newly granted pensions each year is a constant 90 000. An abstraction was made from wage and price level development as well as from the extension of the reference period for each year. Paradoxically, in contrast with the expected results, that any extension of the reference period would reduce the cost of the pension system, by extending the reference period to 30 years pension costs would in fact increase. The reason for such a development is that extending the reference period increases the relationship between paid contributions and pension benefit. Paid contributions therefore depend on the development of the lifetime income of the model individual. Extending the reference period from the current 22 years to 30 whilst considering the average retirement age to be 59 years, includes the period of highest earnings for the model individual (for earnings between 29-59 years see Chart 11). Such relatively high levels of income will clearly increase the personal calculation base and so the pension. Therefore it is necessary to bear this in mind when planning further changes to the length of the reference period as part of the pension reform process. Any proposal for change must be prepared to reflect both the current situation and the distribution of the lifetime income of individuals. The greatest savings in terms of pension system total expenditure would be provided by extending the reference period to lifetime income. By introducing such an extension the resulting savings with regard to newly granted pensions would amount to 202 million CZK; after 5 years savings would

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amount to 1 billion CZK and after 20 years a significant 4 billion CZK. Conversely, a change in the reference period to the 5 best years would lead to an increase in expenditure within the pension system of nearly 2 billion CZK.

If the savings resulting from the extension of the reference period to lifetime earnings are expressed as a percentage of total expenditure on pensions, after 20 years of implementation a saving would accrue totalling 1.5% of total expenditure. Results are summarised in the following table.

Table 8 Cumulative pension savings by changing the length of the reference period

calculation basis – number of years	cumulative savings 1st year	cumulative savings 5th year	cumulative savings 15th year	cumulative savings 20th year
last 30	-3.24	-16.2	-48.6	-64.8
last 40	140.4	702	2 106	2 808
last 44 (42)	201.96	1 009.8	3 029.4	4 039.2
best 5	-96.12	-480.6	-1 441.8	-1 922.4
	savings as % of pension expenditure			
last 30	0.00	-0.01	-0.02	-0.02
last 40	0.05	0.26	0.79	1.05
last 44 (42)	0.08	0.38	1.14	1.52
best 5	-0.04	-0.18	-0.54	-0.72

Source: own calculations based on ISPV survey (2004).

4.4 Methods of income valorisation within the reference period - methods and data

A further tool available for influencing the pension is the way in which income subject to the reference period is valorised. A comparison of foreign systems shows that the most favoured methods are to either valorise income according to wage development (or according to the increase in the general calculation base from which contributions to the pension insurance system are paid) or to valorise according to general price level development. The least common method is a combination of the two options. Other valorisation methods are employed sporadically such as that related to the total cost of newly granted pensions. In the Czech Republic, reference incomes are indexed according to the development of the general calculation base. On the practical level valorisation is determined as a function of the so-called growth rate general calculation basis (GRGCB). The GRGCB is determined using general calculation bases which are set by the government for the period up to 30 September of the following calendar year. The general calculation basis responds to the average monthly wage for the calendar year, identified by the Czech Statistical Office (CSO), multiplied by the conversion rate set by government decree. The growth rate of the general calculation base is determined as a proportion of the general assessment base for the calendar year, two years prior to the payment of pensions, multiplied by the conversion rate, and the general assessment base for the calendar year for which the annual reference income is calculated. For the purposes of this study, the author calculated to what extent the amount of pension for individuals receiving an average wage would change depending on the method employed for the valorisation of reference incomes -

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according either to the growth of the general calculation basis or that of the general price level. The calculation procedure was as follows: data on the growth of the general price level was taken from the CSO and, in the same way as the growth rate of the general calculation base is calculated, an estimation was made of the growth rate of the general price level (GRGPL). Using this rate, the author then modified the average-income individual and, according to the conditions of 2008, calculated his/her pension benefit, assuming the valorisation of income within the reference period was performed using an increase in the general price level. Pensions were calculated for both men and women and for both sexes combined. Average wages since 1986 and the development of the general price level since that year were used as the calculation base. The reference period was set at 22 years and the average period of insurance for men at 44 years, for women 40 years and at 42 years for both sexes combined. Non-contributory periods were taken into account to the extent identified in the study "Analysis of non-contributory periods in the CR and recommendations for monitoring and registration" (Holub 2004). Their range was adjusted to the length of each relevant reference period. Non-contributory periods were considered to be 1 508 days for men, 1 785 days for women and 1 647 days for both sexes. The pension benefit thus calculated was then compared to the pension benefit computed according to existing rules, i.e. valorisation of income according to the growth of the general calculation base. Replacement ratios were calculated for both types of pensions (the pension from income valorised by an increase in the general calculation base and that from income valorised by the growth of general price levels). Finally the author computed the impact of macroeconomic changes on the pension system caused by the method of valorisation chosen.

4.5 Methods for the valorisation of income within the reference period - results

When one evaluates the development of key macroeconomic indicators and compares the development of the general price level and nominal wage growth it is evident that since 1996 in all but one year nominal wage growth has been greater than that of the general price level. The difference between inflation and the growth rates of nominal wages (i.e. real wage growth) together with other macroeconomic indicators can be found in this table.

Table 9 Main macroeconomic indicators (%)

indicator	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
growth of GDP	4.0	-0.7	-0.8	1.3	3.6	2.5	1.9	3.6	4.5	6.3	6.8	6.6
growth of nominal wages*	18.3	9.9	9.2	8.4	6.4	8.7	7.3	6.6	6.6	5.3	6.5	7.3
inflation	8.8	8.5	10.2	2.1	3.9	4.7	1.8	0.1	2.8	1.9	2.5	2.8
growth of real wages	9.5	1.4	-1.0	6.3	2.5	4.0	5.5	6.5	3.8	3.4	4.0	4.5

* Average gross nominal wages

Source: CSO, Main macroeconomic indicators 2008

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The development of these indicators shows that should valorisation be performed according to growth of the general price level or by a combination of wage growth and general price level development it would decrease the personal calculation base of individuals as well as their pensions, and thus the overall expenditure of the pension system (assuming other parameters to be unchanged). The difference between the growth rate of the general calculation base and that of general price levels is shown in the following table.

Table 10 Growth rate of the general calculation base and of the general price level

year	GRGCB	GRGPL	difference
1986	7.2739	4.5941	2.6798
1987	7.1248	4.5895	2.5353
1988	6.9660	4.5803	2.3857
1989	6.8012	4.5171	2.2841
1990	6.5611	4.1177	2.4434
1991	5.6856	2.6294	3.0562
1992	4.6425	2.3667	2.2758
1993	3.7063	1.9592	1.7471
1994	3.1264	1.7811	1.3453
1995	2.6382	1.6325	1.0057
1996	2.2282	1.5005	0.7277
1997	2.0157	1.3829	0.6328
1998	1.8438	1.2493	0.5945
1999	1.7037	1.2236	0.4801
2000	1.5982	1.1776	0.4206
2001	1.4727	1.1248	0.3479
2002	1.3723	1.1049	0.2674
2003	1.2857	1.1038	0.1819
2004	1.2057	1.0737	0.1320
2005	1.1462	1.0537	0.0925
2006	1.0753	1.0280	0.0473
2007	1.0000	1.0000	0.0000

Source: own calculations based on MLSA and CSO data.

Changing the method used for the valorisation of past earnings from wage valorisation to price valorisation leads to a decrease in the pensions of individuals and thus a decline in the profitability (from the individual's point of view) of the PAYG-financed pension system. The valorising of income according to wage growth (i.e. by the growth of the total payroll, thus the sum of population and wage growth) should provide a comparable rate of return for PAYG pension systems with funded pension schemes (provided that the interest rate is the same as the sum of population and wage growth).²³ Wage valorisation of reference incomes is better for the individual, but is in conflict with the financial sustainability of the pension system as a whole since it is, quite simply, more expensive than using price valorisation. The effects of changes

²³ Closer to this issue, see Aaron's rule.

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in the method of valorisation from wage valorisation to that according to price level development on the individual pension of individuals with different levels of income - set out as multiples of the average wage - and the impact on replacement rates is shown in the following table.

Table 11 **Effect of changes in indexation on individual income**

		GRGCB			GRGPL		
		man	woman	total	man	woman	total
multiple of average wage	average insurance period	44	40	42	44	40	42
	NP - days within 22 years	1 508	1 785	1 647	1 508	1 785	1 647
0,5	pension (CZK)	8 954	8 400	8 678	7 919	7 690	7 766
	replacement rate	78.2%	73.3%	75.8%	69.1%	67.1%	67.8%
	last salary (CZK)	11 456	11 456	11 456	11 456	11 456	11 456
1	pension (CZK)	11 350	10 543	10 948	10 051	9 443	9 749
	replacement rate	49.5%	46.0%	47.8%	43.9%	41.2%	42.5%
	last salary (CZK)	22 912	22 912	22 912	22 912	22 912	22 912
2	pension (CZK)	13 105	12 209	12 659	12 082	11 238	11 661
	replacement rate	28.6%	26.6%	27.6%	26.4%	24.5%	25.4%
	last salary (CZK)	45 824	45 824	45 824	45 824	45 824	45 824
3	pension (CZK)	14 860	13 876	14 371	13 325	12 419	12 874
	replacement rate	21.6%	20.2%	20.9%	19.4%	18.1%	18.7%
	last salary (CZK)	68 736	68 736	68 736	68 736	68 736	68 736
0,5	Difference in pension wage-price	1 035	710	912	11.6%	8.5%	10.5%
1	Difference in pension wage-price	1 299	1 100	1 199	11.4%	10.4%	11.0%
2	Difference in pension wage-price	1 023	971	998	7.8%	8.0%	7.9%
3	Difference in pension wage-price	1 535	1 457	1 497	10.3%	10.5%	10.4%

Note: NP - non-contributory periods

Source: own calculations based on MLSA and CSO data.

It is evident that a change in the method of valorisation of income within the reference period from wage growth valorisation to that reflecting changes in the price level would lead to a decline in the pension for the model individual i.e. with income equal to a multiple of the average wage. The decrease would be in the range 8% to 11% depending on the wage.

The macroeconomic expression of savings made from changes to the valorisation method used for reference earnings - from reflecting growth in the general calculation base (wage) to valorisation reflecting growth in price levels is shown in the table below. From this table it is apparent that accumulated savings from newly granted pensions (assuming a constant number of new pensions granted of 90 000 each year) would amount to 1.3 billion CZK in the year of introduction and close to 26 billion CZK after 20 years.

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Table 12 **Cumulative pension savings by changing from wage to price valorisation (in millions CZK)**

newly granted pensions	1st year	5th year	20th year	50th year
90 000	1 295	6 475	25 898	64 746

Source: own calculations based on MLSA and CSO data.

4.6 The synergic effect of extending the reference period and changing the reference income valorisation method

With regard to total pension system savings one might intuitively guess that the best option would be to change the extent of the reference period as well as the method used for the valorisation of income subject to the reference period. If one wishes to assess the impact of the synergic effects created by introducing changes to the methods of indexing and extending the length of the reference period, one would need data on lifetime income and valorisation method as well as on price level development for the entire period of insurance. Since such data is not available for the Czech Republic (due to the specific conditions pertaining before 1989), it is necessary to adopt certain simplifying conditions. For the purposes of lifetime income, data (2004) presenting the current distribution of income across the population, broken down by age group was used. The author assumes the simplification that the distribution of income is identical with the development of lifetime income for the average individual. The average period of insurance (42 years) was taken as the reference period. Inflation before 1986 was taken into account at a constant rate of 2% and growth in nominal wages at 4%. The GRGCB was then calculated from this input data from which lifetime incomes were "discounted". The resultant reconstructed lifetime incomes were then valorised according to the development of the general price level. The results are presented in the following table.

Table 13 **Amount of pension (in CZK) by extending the reference period to 42 years, changing from wage to price valorisation and combination of these changes**

	current state	extending of reference period	changing method of valorisation	extending period+ changing valorisation
Amount of pension	11 324	11 199	9 749	9 015

Source: own calculations based on MLSA and CSO data.

It can be seen that the extension of the reference period for lifetime income together with a change in the valorisation of income within the reference period would cause a significant reduction in income compared with individual changes only. The method used for the valorisation of reference income has the biggest effect on the amount of the pension resulting in a reduction of 1 575 CZK. The extension of the reference period to lifetime income alone would reduce the model pension by a mere CZK 125. If the two changes were to be made at the same time it would lead to a decrease in the pension of 2 309 CZK due to the attendant synergic effect.

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The macroeconomic expression of the synergy-effect savings i.e. the effects of a change in the valorisation method and a change in the reference period to include lifetime income can be seen in the table below. It is apparent that accumulated savings from newly granted pensions (assuming a constant number of new pensions granted of 90 000 each year) would amount to 2.5 billion CZK in the year of introduction and to almost 50 billion CZK after 20 years.

Table 14 **Cumulative pension savings by combination of extending reference period and simultaneously changing valorisation method from wage to price valorisation (in millions CZK)**

newly granted pensions	1st year	5th year	20th year	50th year
90 000	2 494	12 467	49 874	124 686

Source: own calculations based on MLSA and CSO data.

4.7 Gender dimensions of the method used for the valorisation of income

The extension of the reference period to lifetime earnings, however, also has gender dimensions due to the method used for the valorisation of income which is fully or partly dependent on the growth of average wages (growth of the general calculation base) in the majority of European and other developed countries including the Czech Republic. Individuals whose incomes are growing faster than the average lose out because of the link between valorisation and the growth of average wages. On the other hand, individuals whose incomes are rising more slowly than the average wage are better off thanks to the method used for wage valorisation. In the Czech Republic (as shown in Table 18), men's wages are rising faster than those of women. Comparing the average income of a combination of 60-64 year-olds and 25-29 year-olds, men's wages grow on average by 0.5% per year and those of women by only 0.2% per year. When the age groups 60-64 and 20-24 are considered the gender difference is even greater: men's wage growth is 0.5% higher than that of women with average wage growth reaching 1.31% per year for men and 0.82% for women. It is necessary to bear this fact in mind when considering any extension of the reference period.

Table 15 **Increase in lifetime income by gender**

share (%) of income of age group 60-64 of income of age group 25-29					
	men	women	difference	yearly growth in %	
income age group 25-29 in CZK	20 413	17 620			
income age group 60-64 in CZK	24 893	19 032		men	women
share (%) of income of 60-64 of income 25-29	122	108	14	0.50	0.20
share (%) of income of age group 60-64 of income of age group 20-24					
	men	women	difference	yearly growth in %	
income age group 20-24 in CZK	15 812	14 333			
income age group 60-64 in CZK	24 893	19 032		men	women
share (%) of income of 60-64 of income 25-29	157	133	25	1.31	0.82

Source: own calculations based on ISPV survey (2004).

5. Conclusions and policy recommendations

In most European countries, a long-term trend of extending the reference period from which the pension is calculated can be observed. Previously, in many countries, income for only the last few years before retirement was used as the reference period; usually corresponding with the highest earnings in an individual's entire career especially in the public sector. In this way the principle of equivalence was largely restrained since retirement benefits did not reflect adequately the relationship between the benefit and the pension insurance contributions paid. Recently, efforts have been made to extend the period from which pensions are calculated to total lifetime income in order to increase the level of equivalence and reduce the overall cost of the pension system.

The methods used for setting the length of the reference period in the countries researched vary substantially, an analysis of the historical development of which shows that the initial length of the reference period is largely connected with the different functions of the earnings related pension schemes in countries with different pension systems. While in countries which employ the Beveridge-type pension system the earnings related scheme primarily supplements the basic pension system, elsewhere the earnings related scheme forms the dominant component of the system. In schemes which were designed to complement the main system, the reference period was defined from the outset as lifelong career. In other schemes, the reference period was, shortly after the introduction of these schemes, defined as a proportion of the working career, in some cases consisting of a very short time period; the reference period in such cases was, however, subsequently prolonged. While in the past, the reference period was extended only in countries with an extremely short reference period (e.g. one year), the reference period has been extended in almost every country since the turn of the 21st century predominantly to include lifelong career or at least a significant part of an individual's career.

The income valorisation method used within the reference period varies from country to country, however a general shift from wage development valorisation to general price level development valorisation can be observed. Such changes are being implemented in an effort to ensure the long-term sustainability of pension insurance. Along with this aim efforts are being made to restrict an insured person's claims on the first pillar of the pension scheme. The first pillar is increasingly being regarded as providing only basic security to be complemented by the other pillars in the system. However, the extension of the reference period will result in significant savings in the pension system only if income from the reference period is valorised by means other than by wage development. Reforms introducing a transition from wage valorisation to price valorisation accompanied by an extension of the reference period might well yield significant savings due to the synergic effects of such measures.

Gross monthly or annual income serves as the basis for calculating pension benefits in all of the countries researched with the exception of Slovenia. With regard to the types of income counted for the purposes of calculating pension insurance, income from employment is covered by the pension schemes of all the countries studied. In some countries specific professional groups which have their own pension schemes as well as the self-employed are excluded from the basic pension scheme.

Further elements to be taken into account in an analysis of pensionable incomes include the existence and setting of minimum and maximum earnings limits (minimum and maximum ceilings insurance) and the existence of thresholds in the pension

calculation of earnings related pension schemes. In most of the countries surveyed, a ceiling exists for the payment of premiums thus the ceiling income of the insured is taken into account in the pension calculation. Switzerland is an exception here in that the amount of the maximum pension is limited whilst there is no ceiling for the payment of premiums thus characterising the Swiss pension system with a high level of solidarity.

A lower limit of individual income exists in three of the countries surveyed and is the same as the lower limit of the insurance payment. The existence of a lower boundary of income exempted from reference earnings fully correlates with the presence of a basic "flat rate" scheme in the pension systems of the countries surveyed.

No general pattern was detected in the setting of thresholds in the pension calculation of earnings related schemes. The only apparent correlation was found to be between the existence of thresholds and the setting of maximum earnings limits. In pension systems where thresholds exist the ceiling is set significantly higher than in pension systems with no thresholds.

Periods with low earnings or without any earnings at all are associated with specific life situations i.e. they are considered social events and beneficial to society as a whole. For this reason, such periods are taken into account in the pension calculation. The most common reasons for periods of low or no income are due to:

- child care,
- care of relatives,
- study,
- military service.

Such situations are considered non-contributory periods in earnings related pension schemes and are either excluded from the reference period for pension calculation (so as not to dilute pension revenues) or social insurance contributions are paid by government on behalf of the insured person. The trend in the countries surveyed according to the results of detailed analysis is to limit the extent of non-contributory periods and the introduction of funding, at least partially, by the insured. The minimum or average wage rather than a fixed sum is usually taken as the calculation basis.

When the length of the reference period is changed, the impact on different groups of insured persons should always be taken into consideration. The extension of the length of the reference period will generally have a more negative impact on individuals whose income gradually increases throughout their career while it will have hardly any effect on the retirement benefit of individuals whose incomes are almost constant over time.

The extension of the reference period to lifetime income would have only a small impact both on a hypothetical individual with average income and on total pension system expenditure in the current Czech pension system. This is due mainly to the structure of an individual's lifetime income which, in terms of the national economy, commences (age group to 19 years) at 11 382 CZK. Therefore, even if one takes into account potential lifetime income it will have no significant effect on the amount of pension because of the earnings thresholds used in the pension system. Because the first threshold is so low, any income above this threshold influences the final pension only minimally. In the Czech pension system earnings thresholds

5. Conclusions and policy recommendations

represent a strong element of (income) solidarity and any attempt to strengthen the principle of equivalence by extending the reference period encounters this barrier.²⁴

The analysis herein has focused on changes to the length of the reference period and shows that extending the reference period to lifetime income would most affect women on an average income working in the public sector - her pension income would decrease by 2.5% (274 CZK). From the perspective of the national economy extending the reference period to lifetime income would decrease the pension of a hypothetical individual on average income by 1.65% (187 CZK). If the reference period were set at the best 5 years of the working life, women on average income working in the private sector would benefit the most with a rise in their pension of 2.7% (284 CZK). The respective increase in pension for individuals in terms of the whole economy would be 0.8% (89 CZK). The distribution of income in the public sector indicates that for women a reference period consisting of the last 5 years before retirement would be the same as the 5 best years option. Interesting results are obtained if one compares the extension of the reference period from the current 22 years to 30 years (the target set by the Pension Insurance Act). If one applies a reference period of 30 years to the current distribution of lifetime income, the extension would result in an increase in the pension of the average individual of 0.03% (3 CZK); this increase is the result principally of the private sector in which the increase in the pension of women would be 0.3% (34 CZK) and for men also 0.3% (32 CZK). On the other hand, the pension of women in the public sector would fall by 0.8% (84 CZK) and of men by 0.2% (19 CZK).

In order to exclude the effect of earnings thresholds on the results of the reference period models, the author made a comparison of the effects of changes in the length of the reference period on an individual calculation basis. In this case an extension of the reference period to lifetime income would most affect men in the public sector whose individual calculation basis would fall by 10.6% (3 246 CZK); in the national economy as a whole the individual calculation basis for an average individual would decrease by 7.1% (1 860 CZK).

Moreover the extension of the length of the reference period to 30 years would paradoxically cause an increase in pension system expenditure instead of the expected reduction. This is the result both of the fact that an extension to the reference period increases the interrelationship between pension benefits and paid contributions derived from individual income and of the development of an individual's lifetime income. The extension of the reference period from the current 22 years to 30 years covers the period in which an individual earns his/her maximum income during his/her potential working lifetime i.e. 15-59 years (considering an average retirement age of 59 years; see Graph 11). Higher income would logically increase the individual calculation basis and thus the pension. This should be borne in mind when considering further changes to the length of the reference period. Each potential modification must reflect the initial situation and the distribution of an individual's lifetime income. The highest savings in terms of total pension system expenditure would be provided by an extension of the reference period to lifetime income; in the year of implementation such a modification would lead to savings in newly granted pensions of 202 million CZK, after 5 years savings would reach 1 billion CZK and after 20 years 4 billion CZK.

²⁴ In 2008 earnings thresholds were set at 10 000 CZK for the first earnings threshold and 24 800 CZK for the second. Income from a given period is fully included up to the first earnings threshold, any income exceeding the first earnings threshold but not reaching the second is included at 30% and income exceeding the second earnings threshold is included only at 10%. This system makes the effect of extending the reference period on the pension of a hypothetical individual with average income insignificant

Changing the method of income valorisation within the reference period from that based on the development of the general calculation base (wage increases) to that based on general price level development would lead to a decline in a model individual's pension of between 8% and 11% depending on income. Basing income valorisation on general calculation base development is more beneficial for the insured (less beneficial in terms of total expenditure) since it ensures higher pension benefits within the PAYG system for individuals. Conversely, income valorisation based on price level development would be more beneficial for the pension scheme (less beneficial for the insured) as the increase in the price level is slower than that of wages and would assist in maintaining the financial sustainability of the pension scheme as a whole. A change in the method of valorisation from wage valorisation to that according to price level growth would provide savings of 26 billion CZK in the 20th year of operation of the new method.

The highest savings in the pension system would amount to nearly 50 billion CZK after 20 years as a result of the synergic effect of a combination of the change from wage valorisation to price level valorisation and the extension of the reference period to lifetime income.

Differences in income growth between men and women (incomes rise faster for men than for women in the Czech Republic) mean that the income valorisation method is less beneficial for individuals whose income grows faster than the average (men in terms of the Czech Republic) but more beneficial for individuals whose income increases more slowly than the average. This should be taken into account should an extension of the reference period be implemented and the income valorisation method retained since in fact it represents a certain strengthening of the principle of solidarity and the suppression of the principle of equivalence within the pension system.

In order to strengthen the principle of equivalence in the Czech pension system the author would recommend extending the reference period from which the pension is calculated to include total work life income which would lead to a strengthening of the link between paid contributions and pension benefits. The reference period could be extended gradually up to and even after 2016; it would not be limited to a maximum of 30 years as is the case under existing legislation. The author would recommend maintaining the beginning of the reference period at 1986. However, the impact of such measures on equivalence within the pension system is severely limited and extending the reference period to lifetime income would have almost no effect on the overall level of the pension because of earnings thresholds and their current settings. Earning thresholds form a strong element of (income) solidarity within the Czech pension system and lead to a high degree of granted pension levelling. Given the reduction in reference income above the earning thresholds which in turn are relatively low it might be appropriate to consider the replacement of the existing scheme by a tax-financed basic minimum pension in the form of a flat rate benefit with supplementary income pension scheme with benefits based on insurance. With such supplementary benefits there would be greater opportunity to apply the principle of equivalence as well as to extend the reference period.

In any evaluation of adjustments relating to changes to the reference period it is necessary to distinguish between changes in the length of the reference period and changes in the method used in the valorisation of pensionable income. The results of the analysis carried out show that if the afore-mentioned changes are made with the intention of lowering total expenditure within the pension insurance system, it would seem to be more effective to change the method of indexation. From this perspective, however, the best solution would be to change the method of valorisation accompanied

5. Conclusions and policy recommendations

by an extension of the reference period, as only then can advantage be taken of the synergistic effect. The extension of the reference period would intensify the effect of changes in valorisation since savings would result from the single extension of the reference period and simultaneously further savings would be made from the change in the method of valorising the additional revenue entering the reference period.

Should one wish to pursue the aim of maintaining the return rate of the PAYG pension system for the insured in the Czech Republic, an appropriate solution would be to adopt a method of income valorisation within the reference period based on the development of wages. When one evaluates the current situation in the Czech Republic from the point of view of the long-term financial sustainability of the pension scheme (thus pursuing the objective of reducing expenditure on the pension system) a suitable solution would be to change the method used to valorise income within the reference period according to price level development. In this case, the author would suggest replacing the general calculation basis growth coefficient by the general price level growth coefficient - as was implemented in Austria in 2005; such a change would be effective since it would mean a change of indexation method. The effect of such a measure would be enhanced by further extension of the reference period. Given the synergic effect, the difference between price level and wage valorisation and thus the overall impact of such measures on the amount of pension paid out as well as on pension system balance would be significant. The financial effect of such measures would be manifested stepwise and would peak around the time of the highest predicted deficits within the system.²⁵

In order to strengthen the principle of equivalence the author would recommend reducing the contribution ceiling which, in the Czech Republic, is set at a very high level compared to the countries observed in the foregoing comparative analysis, especially in comparison with the amount of the earnings thresholds used in pension calculation. When setting the ceiling level it is necessary to consider the impact of changes on the income side of the pension system.

The author would further recommend reducing or even abolishing the non-contributory periods that form another feature of the high solidarity of the Czech pension system. He would also recommend introducing the payment of contributions even for those periods that are currently classified as non-contributory periods. The calculation base could take the form of, for example, the benefit received in this period and this revenue would then be taken into account when calculating the pension. Thereby the principle of equivalence would be strengthened in the Czech pension insurance system.

²⁵ E.g. forecast of an actuarial report on social insurance 2008.

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Appendix

Appendix Nr. 1 Questionnaire on national experts

Dear Sir/Madam,

For many years now the Research Institute of Labour and Social Affairs (Czech Republic) has conducted research into pension insurance in the Czech Republic, including international comparisons. We have recently been charged with a research project **Reference Earnings (Calculation Basis)** by pension calculation in European Union member states. The findings will be used as part of pension reform in the Czech Republic. Therefore, with the authorisation of the body commissioning the project – the Ministry of Labour and Social Affairs of the Czech Republic – and with recommendation from Jitka Konopaskova from CSSA (CSSZ) we are contacting you, as a national expert, to request your cooperation on this project.

We are especially interested in this information:

- description of legal regulation of this topic and the development during last 50 years
- description of present legal regulation
- the way (method) of reference period assessment
- kinds of incomes counted in (credited) for this purposes and the way they looked for
- the way earned income is taken into account in assessment of benefits (from net/gross, is there any reduction, etc)
- „handling“ of the period, which falls into the reference period, but in which certain level of income necessary wasn't attained
- comparison of legal regulations in the chosen states
- are there any planes or proposals for reforms regarding reference period (incl. time horizon)

If you can provide us any of above mentioned information, it will be really helpful for us. Or if exist already any study about this topic in your country could you please send us any electronic (or printed) version to us?

It would be very much appreciated if you could provide your answers as soon as possible to f the following address: Mr Martin Holub (martin.holub@vupsv.cz)

I would like to thank you in advance for your time and apologise for any inconvenience caused. I am looking forward to receiving your reply.

Best regards,

Martin Holub
Research Institute for Labour and Social Affairs

Appendix Nr. 2 Individual incomes (in CZK) according to method of determining the reference period

men private sphere												
year	av. wage											
reference period	last 22	last 30	last 35	last 40	last 44	best 15	best 20	best 25	best 30	best 35	best 5	last 5
retirement age	61	61	61	61	61	61	61	61	61	61	61	61
44					12464							
43					12464							
42					15648							
41					15648							
40					15648							
39				15648	15648							
38				15648	15648							
37				15648	20545							
36				20545	20545							
35			20545	20545	20545					20545		
34			20545	20545	20545					20545		
33			20545	20545	20545					20545		
32			20545	20545	25135					20545		
31			25135	25135	25135					22221		
30		25135	25135	25135	25135				22221	22221		
29		25135	25135	25135	25135				22221	22221		
28		25135	25135	25135	25135				22221	22221		
27		25135	25135	25135	25135				22221	22221		
26		25135	25135	25135	25135				22970	22970		
25		25135	25135	25135	25135			22970	22970	22970		
24		25135	25135	25135	25135			22970	22970	22970		
23		25135	25135	25135	25135			22970	22970	22970		
22	25135	25135	25135	25135	24447			22970	22970	22970		
21	24447	24447	24447	24447	24447			24447	24447	24447		
20	24447	24447	24447	24447	24447		24447	24447	24447	24447		
19	24447	24447	24447	24447	24447		24447	24447	24447	24447		
18	24447	24447	24447	24447	24447		24447	24447	24447	24447		
17	24447	24447	24447	24447	24447		24447	24447	24447	24447		
16	24447	24447	24447	24447	24447		24447	24447	24447	24447		
15	24447	24447	24447	24447	24447	24447	24447	24447	24447	24447		
14	24447	24447	24447	24447	24447	24447	24447	24447	24447	24447		
13	24447	24447	24447	24447	24447	24447	24447	24447	24447	24447		
12	24447	24447	24447	24447	22970	24447	24447	24447	24447	24447		
11	22970	22970	22970	22970	22970	24835	24835	24835	24835	24835		
10	22970	22970	22970	22970	22970	25135	25135	25135	25135	25135		
9	22970	22970	22970	22970	22970	25135	25135	25135	25135	25135		
8	22970	22970	22970	22970	22970	25135	25135	25135	25135	25135		
7	22970	22970	22970	22970	22221	25135	25135	25135	25135	25135		
6	22221	22221	22221	22221	22221	25135	25135	25135	25135	25135		
5	22221	22221	22221	22221	22221	25135	25135	25135	25135	25135	25135	22221
4	22221	22221	22221	22221	22221	25135	25135	25135	25135	25135	25135	22221
3	22221	22221	22221	22221	22221	25135	25135	25135	25135	25135	25135	22221
2	22221	22221	22221	22221	24835	25135	25135	25135	25135	25135	25135	22221
1	24835	24835	24835	24835	12464	25135	25135	25135	25135	25135	25135	24835

men public sphere												
year	av. wage											
reference period	last 22	last 30	last 35	last 40	last 44	best 15	best 20	best 25	best 30	best 35	best 5	last 5
retirement age	61	61	61	61	61	61	61	61	61	61	61	61
44					9771							
43					9771							
42					16240							
41					16240							
40				16240	16240							
39				16240	16240							
38				16240	16240							
37				16240	19971							
36				19971	19971							
35			19971	19971	19971					19971		
34			19971	19971	19971					19971		
33			19971	19971	19971					19971		
32			19971	19971	23473					19971		
31			23473	23473	23473					23473		
30		23473	23473	23473	23473				23473	23473		
29		23473	23473	23473	23473				23473	23473		
28		23473	23473	23473	23473				23473	23473		
27		23473	23473	23473	23473				23473	23473		
26		23473	23473	23473	23473				23473	23473		
25		23473	23473	23473	23473			23473	23473	23473		
24		23473	23473	23473	23473			23473	23473	23473		
23		23473	23473	23473	23473			23473	23473	23473		
22	23473	23473	23473	23473	24491			23473	23473	23473		
21	24491	24491	24491	24491	24491			23794	23794	23794		
20	24491	24491	24491	24491	24491		23794	23794	23794	23794		
19	24491	24491	24491	24491	24491		23794	23794	23794	23794		
18	24491	24491	24491	24491	24491		23794	23794	23794	23794		
17	24491	24491	24491	24491	24491		23794	23794	23794	23794		
16	24491	24491	24491	24491	24491		24491	24491	24491	24491		
15	24491	24491	24491	24491	24491	24491	24491	24491	24491	24491		
14	24491	24491	24491	24491	24491	24491	24491	24491	24491	24491		
13	24491	24491	24491	24491	24491	24491	24491	24491	24491	24491		
12	24491	24491	24491	24491	24610	24491	24491	24491	24491	24491		
11	24610	24610	24610	24610	24610	24491	24491	24491	24491	24491		
10	24610	24610	24610	24610	24610	24491	24491	24491	24491	24491		
9	24610	24610	24610	24610	24610	24491	24491	24491	24491	24491		
8	24610	24610	24610	24610	24610	24491	24491	24491	24491	24491		
7	24610	24610	24610	24610	23794	24491	24491	24491	24491	24491		
6	23794	23794	23794	23794	23794	24610	24610	24610	24610	24610		
5	23794	23794	23794	23794	23794	24610	24610	24610	24610	24610	24610	23794
4	23794	23794	23794	23794	23794	24610	24610	24610	24610	24610	24610	23794
3	23794	23794	23794	23794	23794	24610	24610	24610	24610	24610	24610	23794
2	23794	23794	23794	23794	25084	24610	24610	24610	24610	24610	24610	23794
1	25084	25084	25084	25084	9771	25084	25084	25084	25084	25084	25084	25084

women private sphere												
year	av. wage											
reference period	last 22	last 30	last 35	last 40	last 44	best 15	best 20	best 25	best 30	best 35	best 5	last 5
retirement age	57	57	57	57	57	57	57	57	57	57	57	57
44												
43												
42												
41												
40				10545								
39				10545								
38				13912								
37				13912								
36				13912								
35			13912	13912						13912		
34			13912	13912						13912		
33			13912	18070						13912		
32			18070	18070						16390		
31			18070	18070						16390		
30		18070	18070	18070					16390	16390		
29		18070	18070	18070					16390	16390		
28		18070	18070	17052					16390	16390		
27		17052	17052	17052					16959	16959		
26		17052	17052	17052					16959	16959		
25		17052	17052	17052				16959	16959	16959		
24		17052	17052	17052				16959	16959	16959		
23		17052	17052	17052				16959	16959	16959		
22	17052	17052	17052	17052				16959	16959	16959		
21	17052	17052	17052	17052				16959	16959	16959		
20	17052	17052	17052	17052			16959	16959	16959	16959		
19	17052	17052	17052	17052			16959	16959	16959	16959		
18	17052	17052	17052	16959			16959	16959	16959	16959		
17	16959	16959	16959	16959			17052	17052	17052	17052		
16	16959	16959	16959	16959			17052	17052	17052	17052		
15	16959	16959	16959	16959		17052	17052	17052	17052	17052		
14	16959	16959	16959	16959		17052	17052	17052	17052	17052		
13	16959	16959	16959	16959		17052	17052	17052	17052	17052		
12	16959	16959	16959	16959		17052	17052	17052	17052	17052		
11	16959	16959	16959	16959		17052	17052	17052	17052	17052		
10	16959	16959	16959	16959		17052	17052	17052	17052	17052		
9	16959	16959	16959	16959		17052	17052	17052	17052	17052		
8	16959	16959	16959	16390		17052	17052	17052	17052	17052		
7	16390	16390	16390	16390		17888	17888	17888	17888	17888		
6	16390	16390	16390	16390		17888	17888	17888	17888	17888		
5	16390	16390	16390	16390		18070	18070	18070	18070	18070	18070	16390
4	16390	16390	16390	16390		18070	18070	18070	18070	18070	18070	16390
3	16390	16390	16390	17888		18070	18070	18070	18070	18070	18070	16390
2	17888	17888	17888	17888		18070	18070	18070	18070	18070	18070	17888
1	17888	17888	17888	17888		18070	18070	18070	18070	18070	18070	17888

women public sphere												
year	av. wage											
reference period	last 22	last 30	last 35	last 40	last 44	best 15	best 20	best 25	best 30	best 35	best 5	last 5
retirement age	57	57	57	57	57	57	57	57	57	57	57	57
44												
43												
42												
41												
40				10760								
39				10760								
38				14796								
37				14796								
36				14796								
35			14796	14796						14796		
34			14796	14796						14796		
33			14796	17126						14796		
32			17126	17126						17080		
31			17126	17126						17080		
30		17126	17126	17126					17080	17080		
29		17126	17126	17126					17080	17080		
28		17126	17126	17080					17080	17080		
27		17080	17080	17080					17080	17080		
26		17080	17080	17080					17080	17080		
25		17080	17080	17080				17080	17080	17080		
24		17080	17080	17080				17080	17080	17080		
23		17080	17080	17080				17080	17080	17080		
22	17080	17080	17080	17080				17126	17126	17126		
21	17080	17080	17080	17080				17126	17126	17126		
20	17080	17080	17080	17080			17126	17126	17126	17126		
19	17080	17080	17080	17080			17126	17126	17126	17126		
18	17080	17080	17080	18448			17126	17126	17126	17126		
17	18448	18448	18448	18448			18448	18448	18448	18448		
16	18448	18448	18448	18448			18448	18448	18448	18448		
15	18448	18448	18448	18448		18448	18448	18448	18448	18448		
14	18448	18448	18448	18448		18448	18448	18448	18448	18448		
13	18448	18448	18448	18448		18448	18448	18448	18448	18448		
12	18448	18448	18448	18448		18448	18448	18448	18448	18448		
11	18448	18448	18448	18448		18448	18448	18448	18448	18448		
10	18448	18448	18448	18448		18448	18448	18448	18448	18448		
9	18448	18448	18448	18448		18448	18448	18448	18448	18448		
8	18448	18448	18448	18767		18448	18448	18448	18448	18448		
7	18767	18767	18767	18767		18767	18767	18767	18767	18767		
6	18767	18767	18767	18767		18767	18767	18767	18767	18767		
5	18767	18767	18767	18767		18767	18767	18767	18767	18767	18767	18767
4	18767	18767	18767	18767		18767	18767	18767	18767	18767	18767	18767
3	18767	18767	18767	20066		18767	18767	18767	18767	18767	18767	18767
2	20066	20066	20066	20066		20066	20066	20066	20066	20066	20066	20066
1	20066	20066	20066	20066		20066	20066	20066	20066	20066	20066	20066

women + men private sphere												
year	av. wage											
reference period	last 22	last 30	last 35	last 40	last 44	best 15	best 20	best 25	best 30	best 35	best 5	last 5
retirement age	59	59	59	59	59	59	59	59	59	59	59	59
44					11900							
43					11900							
42					14983							
41					14983							
40				11900	14983							
39				14983	14983							
38				14983	14983							
37				14983	19702							
36				14983	19702							
35			14983	14983	19702					14983		
34			19702	19702	19702					19702		
33			19702	19702	19702					19702		
32			19702	19702	22247					19702		
31			19702	19702	22247					19702		
30		19702	19702	19702	22247				19702	19702		
29		22247	22247	22247	22247				20087	20087		
28		22247	22247	22247	22247				20087	20087		
27		22247	22247	22247	22247				20087	20087		
26		22247	22247	22247	22247				20087	20087		
25		22247	22247	22247	22247			20087	20087	20087		
24		22247	22247	22247	22247			20949	20949	20949		
23		22247	22247	22247	22247			20949	20949	20949		
22	22247	22247	22247	22247	21333			20949	20949	20949		
21	22247	22247	22247	22247	21333			20949	20949	20949		
20	22247	22247	22247	22247	21333		21333	21333	21333	21333		
19	21333	21333	21333	21333	21333		21333	21333	21333	21333		
18	21333	21333	21333	21333	21333		21333	21333	21333	21333		
17	21333	21333	21333	21333	21333		21333	21333	21333	21333		
16	21333	21333	21333	21333	21333		21333	21333	21333	21333		
15	21333	21333	21333	21333	21333	21333	21333	21333	21333	21333		
14	21333	21333	21333	21333	21333	21333	21333	21333	21333	21333		
13	21333	21333	21333	21333	21333	21333	21333	21333	21333	21333		
12	21333	21333	21333	21333	20087	21333	21333	21333	21333	21333		
11	21333	21333	21333	21333	20087	21333	21333	21333	21333	21333		
10	21333	21333	21333	21333	20087	22247	22247	22247	22247	22247		
9	20087	20087	20087	20087	20087	22247	22247	22247	22247	22247		
8	20087	20087	20087	20087	20087	22247	22247	22247	22247	22247		
7	20087	20087	20087	20087	20949	22247	22247	22247	22247	22247		
6	20087	20087	20087	20087	20949	22247	22247	22247	22247	22247		
5	20087	20087	20087	20087	20949	22247	22247	22247	22247	22247	22247	20087
4	20949	20949	20949	20949	20949	22247	22247	22247	22247	22247	22247	20949
3	20949	20949	20949	20949	11900	22247	22247	22247	22247	22247	22247	20949
2	20949	20949	20949	20949		22247	22247	22247	22247	22247	22247	20949
1	20949	20949	20949	20949		22247	22247	22247	22247	22247	22247	20949

women + men public sphere												
year	av. wage											
reference period	last 22	last 30	last 35	last 40	last 44	best 15	best 20	best 25	best 30	best 35	best 5	last 5
retirement age	59	59	59	59	59	59	59	59	59	59	59	59
44					10427							
43					10427							
42					15292							
41					15292							
40				10427	15292							
39				15292	15292							
38				15292	15292							
37				15292	18306							
36				15292	18306							
35			15292	15292	18306					15292		
34			18306	18306	18306					18306		
33			18306	18306	18306					18306		
32			18306	18306	19337					18306		
31			18306	18306	19337					18306		
30		18306	18306	18306	19337				18306	18306		
29		19337	19337	19337	19337				19337	19337		
28		19337	19337	19337	19337				19337	19337		
27		19337	19337	19337	19337				19337	19337		
26		19337	19337	19337	19337				19337	19337		
25		19337	19337	19337	19337			19337	19337	19337		
24		19337	19337	19337	19337			19337	19337	19337		
23		19337	19337	19337	19337			19337	19337	19337		
22	19337	19337	19337	19337	20028			19337	19337	19337		
21	19337	19337	19337	19337	20028			19337	19337	19337		
20	19337	19337	19337	19337	20028		19337	19337	19337	19337		
19	20028	20028	20028	20028	20028		20028	20028	20028	20028		
18	20028	20028	20028	20028	20028		20028	20028	20028	20028		
17	20028	20028	20028	20028	20028		20028	20028	20028	20028		
16	20028	20028	20028	20028	20028		20028	20028	20028	20028		
15	20028	20028	20028	20028	20028	20028	20028	20028	20028	20028		
14	20028	20028	20028	20028	20028	20028	20028	20028	20028	20028		
13	20028	20028	20028	20028	20028	20028	20028	20028	20028	20028		
12	20028	20028	20028	20028	20431	20028	20028	20028	20028	20028		
11	20028	20028	20028	20028	20431	20028	20028	20028	20028	20028		
10	20028	20028	20028	20028	20431	20028	20028	20028	20028	20028		
9	20431	20431	20431	20431	20431	20431	20431	20431	20431	20431		
8	20431	20431	20431	20431	20431	20431	20431	20431	20431	20431		
7	20431	20431	20431	20431	21402	20431	20431	20431	20431	20431		
6	20431	20431	20431	20431	21402	20431	20431	20431	20431	20431		
5	20431	20431	20431	20431	21402	20431	20431	20431	20431	20431	20431	20431
4	21402	21402	21402	21402	21402	21402	21402	21402	21402	21402	21402	21402
3	21402	21402	21402	21402	10427	21402	21402	21402	21402	21402	21402	21402
2	21402	21402	21402	21402		21402	21402	21402	21402	21402	21402	21402
1	21402	21402	21402	21402		21402	21402	21402	21402	21402	21402	21402