PENSION REFORM IN CENTRAL AND EASTERN EUROPE: IMPLICATIONS AND SIMULATIONS FOR ROMANIA

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ABSTRACT

This thesis attempts to expand the boundaries of knowledge on pension reform. It contributes to the pension reform literature on Romania by reviewing and explaining its pension reform developments and by re-evaluating its strategies. It runs 'overlapping generations' simulations on the adoption of a Notional Defined Contribution (NDC) pillar in Romania. Based on state-preference theory, a model is constructed in order to estimate the size of the private pillar suitable for the Romanian pensions system. The analysis highlights the significance of high public pension system implicit debt in the architecture of multipillar reform strategies, the role of the access to international capital markets in debt-financing the transition costs, the potential superiority of NDC schemes over other public pillar parametric reforms, and the importance of devising tools for determining the size of the private fully-funded pillar. The thesis prompts the need for further study into these issues.

Keywords: pension system reform, transition, Central and Eastern Europe, Romania, World Bank, multipillar system, Notional Defined Contribution (NDC), pay-as-you-go (PAYG) pensions, fully-funded pensions, OLG model, portfolio diversification, state preference theory

JEL classification: D30; G11; G23; H55 ; J11; J14; J21; J26 ; P2

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CONTENTS:

INTRODUCTION

The phenomenon of demographic ageing is a problem facing governments of countries all over the world. Its manifestation is found in trends of diminished labour force and increased proportion of old generations in population. As a result, the traditional social insurance systems, based on intergenerational redistribution, have come under attack, their financial sustainability questioned. While many OECD countries have started adjusting parameters within their public pension systems by raising retirement ages and promoting active ageing, some developing countries, especially in Latin America, have opted for more radical changes involving a partial or a complete switch towards private pension provision. In 1994, an important warning signal was given by the World Bank who published a report that highlighted the crisis of the traditional pension systems and urged countries to adopt privatisation strategies. The World Bank has been the major advocate of pension system reform ever since, promoting its reform model as a vehicle for spurring economic growth by furthering macroeconomic stabilization, advancing comprehensive liberalization, public sector reform and helping institution building. In Central and Eastern European countries (CEECs), social security systems had been playing an important role by smoothing the process of economic transition and maintaining social and political stability. All CEE transitional economies required rapid and comprehensive restructuring of their pension systems for both macro and microeconomic reasons. Pension reform, economic restructuring and economic growth options were closely linked. Following the World Bank's recommendations, Central and Eastern Europe (CEE) was the next region to consider the privatisation of pensions, with Hungary and Poland being the first CEECs to implement mandatory private pension components in their pension systems. The developments and problems Romania had been facing in the area of social security were the same ones faced throughout CEE. However, despite the post-1989 on-going debate on pensions, there had been no comprehensive effort to draw up a pension reform plan until 1999. Nor had there been any effort to undertake a comprehensive review of the goals for the reform policies (mostly labour market reform policies) implemented that far. Things changed when a new law on public state pensions and initiatives regarding private pensions were brought in 2000.

However, the introduction of private pensions has proven difficult. Legislation and implementation of private pensions has been delayed time and again. This thesis proposes that a re-evaluation of the Romanian pension reform is in order.

Research Question:

There are two major questions underpinning this thesis. First, "Is privatisation the most suitable pension reform strategy for Romania to adopt?" and second, "If yes, to what extent?".

Objectives

In analysing these questions this thesis is organised to addresses six inter-linked objectives:

1. To identify the theory underpinning the debate about pension reform.
2. To analyse the World Bank model of pension reform.
3. To analyse the experience of the countries that have undergone reform, focusing on their implications for Central and Eastern European countries.
4. To evaluate the Romanian pension system and the potential rationale for its reform.
5. To identify an appropriate reform model for Romania.
6. To draw conclusions and to make recommendations for a pension reform strategy in Romania.

Research Methodology

An overview of the literature on pension reform reveals that a range of approaches has been adopted. Some writers have utilised an empirical approach, such as Feldstein (1974, 1996) and Leimer and Lesnoy (1982), which analyse economic time series data for individual countries through the prism of the lifecycle hypothesis model in order to estimate the effects of public pension provision on private saving. Studies such as Engen and Gale (1997) and Geanakoplos, Mitchell and Zeldes (1998) have used empirical approaches to analyse the effects of privatisation on national saving. More recently, Diamond and Geanakoplos (2003) explore the general equilibrium impact of social security diversification into private equities. It is important to note that most of the seminal empirical work on pension reform, particularly on privatisation issues, has been based on U.S. data since the 1970s.

Other studies, such as Barr (1994, 1998, 2002) and Diamond (2002) have adopted a more theoretical approach in evaluating the merits of setting up pension provision systems under two alternative arrangements: public unfunded and private fully-funded. Chand and Jaeger (1997) argue that traditional social insurance pension schemes can be successfully adjusted to become financially sustainable. Hemming (1998) outlines the arguments for and against funding of public pensions. Holzmann (1998, 1999) advocates the merits of the World Bank reform model in diversifying risk and promoting economic growth, while Kotlikoff (1999) and Orszag and Stiglitz (2001) criticize the model. More recently, Bodie and Merton (2002) suggest the viability of swap contracts as a strategy for pension funds in diversification and hedging.

Case studies have a particularly strong representation in the literature, as most recent contributions to the theory of pension reform are in fact lessons learned and implications drawn from the experiences of reforming countries. The Latin American pension reform cases have been studied extensively, literature being mainly concentrated in two categories: the Chilean experience (Arenas de Mesa and Bertranou, 1997; Coronado, 1997; Pinera, 2000; Rodriguez, 1999; Ruiz-Tagle and Castro, 1998; Valdés-Prieto, 1998) and the "second-generation reforms" (Aiyer, 1997; Mesa-Lago, 1997; Quiesser 1998; Tomassi, Bambaci and Saront, 1999; Vittas, 1997). Case studies on the Central and Eastern European pension reform are also in increasing supply (Fox, 1994; Andrews and Rashid, 1996; Chlon, Gora and Rutkowski, 1999; Lindeman, Rutkowsky, and Sluchynsky, 2000; Palacios and Whitehouse, 1998; Schmähl and Horstmann, 2002). Case studies are also extensively employed in the growing literature on the political economy of pension reform - James and Brooks (2001), Müller (1999, 2001) and Orenstein (2000) derive and test hypotheses about the influence of political-institutional structures and processes on pension reform.

As remarked by writers such as Chund and Jaeger (1999), there are many approaches to pension reform and a variety of different paths to choose from but economic theory still has not given any guide as to what type of reform is most likely to achieve the goals of reform policy. It is the author's opinion that no consistent theory exists due to the very country-specific nature of the pension reform experience in each case. Even if the literature brackets together countries, writing about the Latin-American pension reform, the Central and Eastern European reform, there is no single completely unifying experience, from which a theory can be drawn. There have been several attempts to define pension reform objectives, to derive principles of reform and to theorise appropriate policies, but they are all different, being mainly conclusions from different country-cluster studies.

Given the breadth and complexity of the issue, the inadequacy of theory and the need for individual and in-depth analysis, this study adopts a case study design trying to answer questions framed mostly in terms of "why" and "how" (Yin, 2003), such as "What pension reform strategies are available?", "How did other CEE countries reform their pension systems? What are the implications for Romania?", "Why privatise the system in Romania?", "How to decide on the degree of privatisation?". Romania was selected as unit of analysis for many reasons. There are very few studies on the Romanian pension system and its reform. Within the CEECs, Romania has been a special case – a pension reform laggard, following unapparent reform strategies, displaying little public debate on the issues and reluctance for privatisation. Further, as the author is Romanian, the subject presented an additional interest. This also meant that the author had benefited from enhanced access to data on pensions from the Romanian Government and various agencies and institutions, national statistics and Romanian journals.

This research exercise is not typical as in finding a data set, identifying a model, calibrating parameters and testing against theory. This thesis does not have a traditional working hypothesis. At its core, this thesis is a descriptive single-case study of the Romanian pension reform with empirical elements. Although centred on the Romanian pension reform, for comparative purposes, the thesis also draws on theory and the experience of other CEECs. Moreover, the thesis runs simulations to help identify and evaluate an appropriate reform model for Romania. The simulations contained evolve from actual data but it should be noted that this is not an empirical study in the truest sense. Instead, the aim of the thesis is to provide policy-makers with an insight into the parameters of pension reform by presenting a sensitivity analysis of results emerging from one particular type of pension reform strategy.

This thesis is significant because it addresses distinctive issues that have not been researched thoroughly. First, this thesis reviews the identified range of relevant theoretical aspects of pension reform through the prism of Central and Eastern

European pension reform experience. A cross-case analysis will be employed with the aim of providing a clearer understanding of the relevant experiences and best approaches. The practices emerging from the CEECs have important implications for the theory of pension reform with particular emphasis on the architecture of mixed systems – sizes of public and private components, administration, regulation and supervision issues, etc.

Second, it uses the implications, hypothesis and lessons learned to analyse the outcome of the pension reform process in Romania. There is very little literature pertaining to the Romanian pension system or, indeed, its reform. A paper by De Menil, Hamayon and Seitan (1999) analyses the pension system's legacies from the past, while snippets can also be found in some larger scale studies, such as Cangiano, Cottarelli and Cubeddu (1998) and GVG (2003) where the analysis is limited to snapshots of the pensions situation and describing the state of reform and its problems. This thesis will contribute to the literature on the Romanian pension reform through the use of multiple sources of evidence, such as documents and archival records, and by employing an explanation-building analytic technique.

Third, it runs simulations based on secondary raw data to investigate the choice for a mixed public-private reform strategy, the adoption of an alternative type of reform for the public pensions, and the shape of the private pension component in the case of Romania. The Romanian experience can generate effective tools for bridging research and policy. The simulations will seek to formulate practical recommendations that will interest policy-makers and develop ideas for further study.

The feasibility of implementing a mixed public-private reform strategy will be tested based on the existence of negatively correlated rates of return in the public and private pension components. Given the lack of historical data on investment efficiency of pension assets in Romania the thesis will construct a potential hypothetical rate of return for private pensions based on the investment regulations envisaged for the private pension funds, past investment experiences of mutual funds and returns of the main asset classes (detailed methodology on this in chapter 6). Factor analysis will then be used to give additional grounding for the rates of return generated.

An overlapping generations (OLG) model of intergenerational risk-sharing will be employed to compare the outcomes from reforming the Romanian public pension scheme in the two different ways. In order to illustrate the effects on pension rights and their evolution, seven scenarios within a stylised economy will be used, which will then be combined into one simulation. The OLG model will provide a rich description of the generational structure of the Romanian population, breaking down the population into different age groups. Based on the population data and a set of assumptions (fertility and survival rates, labour market participation, retirement, contribution rates etc.), pension projections will be performed following a five-year cohort methodology. The existing population is aged and gradually replaced by successive cohorts of contributors on a five-year basis according to the demographic and coverage assumptions.

The thesis addresses the question pertaining to the size of the private pensions component within a mixed public-private pension system by developing a model based on the Arrow-Debreu state preference theory. Lindeman, Rutkowski and Sluchynsky (2000) is perhaps unique in that it ventures an estimate for a suitably, cost-effective, size for the private pensions component, based on the level of transition costs involved. The model designed in this thesis will treat the public and private pension components as being two securities in which people invest, while the uncertainty about the future will be represented as a vector of two possible payoffs at a future date, each one associated with a mutually exclusive state of nature. The model will assume a 'typical' individual - thus ignoring group differences on gender and income - displaying rational, non-myopic behaviour, consistent with the life-cycle hypothesis. The underlying idea is that, by dividing the social insurance contributions in a particular way between the two components, the uncertainty about the future value of the pension benefit payoff could be reduced. The initial target of the model will be preserving the value of the social insurance contributions made in the system. This will later be changed by taking individual preferences into consideration - optimal portfolio allocation, assuming that the individual is in complete control of his wealth and preservation of contribution is not an issue.

Structure of chapters

In meeting the five objectives outlined above, this thesis is organised into nine chapters. The first two chapters provide the majority of the literature review on the theoretical issues and concepts important to pension reform and relevant to the research questions - different theoretical (albeit partial) perspectives on pensions such as agency, finance, political economy, state preference, and institutional perspectives. The purpose behind these chapters is not to provide a comprehensive survey of literature on pensions but rather to outline the insights and the shortcomings from the perspective of income security provision. The first chapter focuses on the theoretical background surrounding pension reform issues stating with pension economics basics (Objective 1), a review of issues that is carried forward in the second chapter, centred on analysing the prominent World Bank model of pension reform. (Objective 2)

Chapter three identifies the need to reform in the Central and Eastern Europe and presents the landmark pension reform experiences thereby addressing objective 3. The chapter details a number of reasons why the CEE public pension systems, which provided suitable universal coverage until late 1980s, seemed to be heading towards failure in meeting their objectives. Following the example of the Latin-American reforms and the reform path recommended by the World Bank, the proposals and reforms from CEECs involve a shift from publicly managed, unfunded schemes to privately managed, funded schemes.

Chapter four is also relevant to meeting objective 3. In this case the narrative analyses previous pension reform cases in Latin America and Central and Eastern Europe and focuses on the important lessons learned. Latin America has proven to be the most dynamic and innovative region in the area of pension reform, setting a precedent in pension reforms that spurred all subsequent pension reform policies and studies. The CEECs, envisioning pension reforms of their own, tried to draw for themselves and to apply the lessons learned in the reform process in the Latin American countries. Examination of the case study countries suggests a number of important implications for pension reform strategy.

By chapter five, the thesis contains sufficient background to focus explicitly on the case of Romania (Objective 4). The chapter introduces the Romanian case, presenting the pre-reform pension system and its problems. Due to the diversity and complexity of its pension system, it took years to build up a framework in which comprehensive pension reform involving private pensions could be effective. Even now, the reform is approached in an iterative way. The chapter then proceeds to present the features of the reform and comment on its various aspects. This introduction is complemented by the following chapters, which concentrate on the analysis of the Romanian pension reform (Objective 5).

First, in meeting objective 5, chapter six focuses on the introduction of mandatory private pensions. First, the Romanian financial sector is analysed from the perspective that a well performing financial infrastructure (banking system, stock markets, insurance sector) could be instrumental in facilitating pension system reform Second, the chapter contains empirical estimates on the returns associated with the yet-to-be-implemented private pension scheme and concludes with testing the applicability of the systemic reform (the World Bank model) in Romania.

Next, chapter seven contributes to the development of an appropriate reform model for Romania (Objective 5) by simulating the introduction of a Notional Defined Contributions scheme instead of the existing parametrically reformed public pension scheme. It concludes with a sensitivity analysis of the budgetary implications.

Last, the analysis of the Romanian pension reform is finalised in chapter eight, which completes objective 5 by dealing with the issue of finding the optimum degree of privatisation the Romanian pension reform should undertake. The chapter tries to devise a simple model that can help determine the way of splitting the mandatory pension contributions between the public and private schemes. The chapter concludes with a sensitivity analysis that proves the flexibility of the simple model.

Chapter 9 brings the thesis to a close with a discussion of the Romanian pension reform and its implications, along with the conclusions drawn from the simulations run in the thesis. (Objective 6)

CHAPTER 1.
LITERATURE REVIEW

1.1. Introduction

The present chapter is concerned with introducing the theoretical background of pension reform. The sections will explore the range of theoretical issues relating to pensions from the theoretical framework for analysing pensions to institutional perspectives and pension reform basics.

1.2. The Early Theories of Saving

Modern studies on saving, such as Owens (1993) and Smith (1990), argue that provision for retirement and bequests is the major reason saving occurs, listing alongside three other main motives: precautionary saving aimed at dealing with future uncertainties, saving for optimising the income stream and consumption smoothing over a life time and saving for the acquisition of expensive goods that require large down payments. Cipolla (1994), Kohn (1999) and Van Houtte (1997) strongly support the view that in the Medieval and early Modern ages the same concerns applied, albeit with significant variations. Securing old-age income and protecting against various risks was not based on directed saving but on re-arranging wealth assets – switching capital to different types of assets that were safer and more liquid. The main problem of the Middle Ages for individuals that had accumulated savings (such as retiring merchants, wealthy landowners, guardians of widows and orphans) was a lack of suitable assets. Largely, savings were placed in real assets – real estate, hoards of coin and bullion. (Kohn, 1999)

In the Middle Ages, the wealth of the mostly agrarian European economies was concentrated in the hand of a few landowners and had extremely low liquidity. Through most of that period, the Church, which had been accumulating wealth through gifts and donations for centuries, was the only organisation with substantial liquid assets and, thus, the potential to be a creditor. However, after the Reformation had drastically reduced the wealth of the Church, the merchants become the main source of debt finance, as, in spite of being less wealthy than the landowners, their assets had the highest liquidity. The rapid expansion of trade (domestic and international) had been generating considerably more profits than could be safely reinvested in the same business, so the surpluses led to the arrival of merchant banks. Wars and recessions frequently affected trade, pushing businesses to find alternative uses for their capital[1]. The merchants took the initiative in developing financial institutions, markets and instruments like deposit banks, credit, bills of exchange etc. Apart from financing activities in other sectors of the economy, capital markets played another vital role - governments with access to finance had extra support in their territorial conquests. The merchants become the main lenders to the governments/princes who had to borrow against their wealth in order to finance wars and their courts' consumption.[2]

Under the influence of the mercantilists, the private virtues of saving were considered to be antagonistic with the public virtues of consumption. The doctrine of "private vices/public virtues" was underpinned by the famous "The Fable of the Bees" written in 1724 by Mandeville (1670-1793). Mandeville chastised luxury and the rush for private vices while, at the same time, emphasizing their vital importance for public welfare. He highlighted the way luxurious consumption of the rich provided employment for poor people, while virtuous thrift did not. The tremendous popularity these arguments enjoyed in the 18th century ended with the Napoleonic wars. The wars brought a period of inflation and full employment, giving impetus to classical economists. The classical economists hailed the thrifty individuals as the creators of capital and scoffed at the spendthrift (the ones depleting capital). They defined savings as both the difference between income and consumption and the accumulation of capital stock. Mill (1848), a leading classical figure, assiduously argued that "all capital, and especially all addition to capital, are the result of saving" and that "the only way to accelerate the increase of capital is by increase of saving" (Mill, 1848: Book 1, Chapter 5, Section 4) and concluded that "saving, in short, enriches, and spending impoverishes, the community along with the individual" (Mill, 1848: Book 1, Chapter 5, Section 5). However, unlike the other classical economists, he pointed out that an increase in saving could be created by an increase in income as well as by a reduction in consumption. Along the same lines as Keynes, Mill recognised that an increase in income is divided between consumption and saving. Furthermore, Mill

[1] Houte (1997) gives the example of the textile merchants of Arras in the 13th century, who only became creditors to the prices when the French occupied Artois, thus cutting their supply of wool from England and leaving them with unallocated funds.

[2] If under the feudal system the princes had the services of their vassals in exchange for fiefs of land, in the increasingly monetary-based economy they have to pay in cash. Fighting a war required large outlays of cash and the rulers had to borrow with the hope that victory will cover the reimbursement.

identified a few of the traditional savings motives including precaution and saving according to the life cycle stages. Classical economists saw the no difference between the individuals who saved and those who invested, because in their period, as was in the Middle Ages, the only ones who could afford to save were the landowners and the rich merchants or manufacturers. Thus, prior to the industrial revolution, the large majority of individuals in society had no savings and 'business saving' was the main source of finance for investment and government consumption. It was only in the 19th century, when society became more institutionalised, that a growing number of individuals could afford to save.

Saving continued to be identified with the accumulation of the stock capital with little reference inter-temporal allocation until Fisher. In essence, Fisher's time preference approach asserted that individual consumption and saving depend not just on income but on the individual's entire income stream allocated during a lifetime (Fisher; 1907, 1930). Fisher created the basis for the analysis of wealth effects, precautionary savings, life cycle and intergenerational hypotheses – the main points in the modern approach of savings.

Two World Wars and the Great Depression brought a new influential period - they switched the economic focus from the micro level to the macro level and from the short-run to the long run. Saving and the time preference became among the main concerns of the business cycle theory. Keynes (1936) argued that under-consumption and over-saving have prolonged the Great Depression and emphasized the role of investment.[3] Among the cornerstones of his General Theory of Employment, Interest and Money was the consumption function – the relationship between national income and consumption underpinned by a "psychological law" according to which household consumption increased as their income did, but not by as much. He postulated that savings and investments are equal[4] and formalised the existence of eight savings motives: Precaution (unforeseen contingencies), Foresight (anticipated future needs – old age, dependents), Calculation (interest accrual), Improvement

[3] It was investments that posed the main problems - their level was too low during the Great Depression while, at the beginning of the Second World War, their level seemed too high. However, Keynes later reversed the focus back on savings when he advocated "compulsory saving" as a way of combating the "inflationary gap" created by resource constraints during the Second World War. Under his proposals (adopted in 1941), a proportion of each worker's income would be automatically invested in government bonds that were redeemable only after the war (when consumption would have been needed) (Keynes, 1940).

[4] Both statically defined as the difference between income and consumption, without reference to capital stock accumulation.

(future consumption increase), Independence, Enterprise (speculation), Pride (bequests) and Avarice. His General Theory introduced revolutionary concepts: the idea that governments could control business cycles, the existence of unemployment in a demand-determined equilibrium, "liquidity preference" as basis for the theory of money, the idea of "radical uncertainty" and expectations.

Keynes' theories were well received in the years following the publication of the General Theory. However, in the 1940s, evidence turned against some of his assumptions. His theory of saving argued that the share of savings in national income would rise in periods of economic growth. This was later invalidated empirically by Kuznets (1946) who showed that, in the U.S., for a long period of time (1869-1938), savings had been a relatively stable proportion of national income. Furthermore, towards the end of the Second World War, the Keynesian economists were expecting a resurgence of depression generated by the fall in consumption associated with the war effort. However, price controls, rations and general shortage during the war had generated forced savings which, in peace time, created the additional spending needed to offset the reduction in war-related government expenditure. Thus, the post-war boom invalidated their predictions and triggered revisions to the Keynesian theory.

While, for Keynes, consumption was based on real disposable income and interest rates, other economists like Pigou (1941) and Metzler (1951) started expanding on the issue of savings and wealth, pointing out that consumption decision is based not only on current income but on "real net wealth". The 'Pigou effect' is based on the idea that individuals keep part of their wealth in the form of money balances and bonds and so, whenever prices rise the real value of these holdings diminishes triggering a reduction in the individuals' consumption. Conversely, when prices fall, the feel-good factor makes them feel richer and more inclined to spend more from their current income.

1.3. The Modern Framework

Gradually, post-war reconstruction shifted economists' attention towards economic growth but, especially in the United States, the 1950s and 1960s saw macroeconomics research focus on applying neoclassical economic theory to the major concepts Keynes had introduced such as the consumption function. These years have contributed the most to the modern analysis of savings and pensions. The following section focuses on intertemporal consumption allocation in the aspect of the state preference theory and the life-cycle hypothesis, two areas providing crucial relevant background for the following chapters.

1.3.1. State-preference theory

Arrow (1953) and Debreu (1959) considered Keynes had not taken proper account of the influence the future has on present market conditions. They argued that Keynes' precepts could not be fully functional without incorporating future markets in the theory of value and equilibrium. As result they developed the "state-preference" approach to uncertainty under which individuals differentiate between commodities not only based on their physical characteristics and the time of their consumption but also on their location in a "state of nature"[5]. Thus, given a set of mutually–exclusive states of nature, consumer preferences are formed over bundles of state-contingent commodities. A state-contingent commodity was defined as a contract that delivered a commodity only at a particular time when only a particular state occurred (contract delivered nothing in any other state and/or time).

If n is the number of physically different commodities required by an individual and S the number of states of nature in every period, the state-contingent markets are as detailed in the Table 1.1.

Table 1.1. State-contingent markets

		Commodities						
		1	2	...	j	...	n	
States	1	x_{11}	x_{12}	...	x_{j1}	...	x_{n1}	$\mathbf{x_1}$
	2	x_{12}	x_{22}	...	x_{j2}	...	x_{n2}	$\mathbf{x_2}$
	...	...	...	...	...	...	...	**...**
	s	x_{1s}	x_{2s}	...	x_{js}	...	x_{ns}	$\mathbf{x_s}$
	...	...	...	...	...	...	...	**...**
	S	x_{1S}	x_{2S}	...	x_{jS}	...	x_{nS}	$\mathbf{x_S}$
		$\mathbf{x_1}$	$\mathbf{x_2}$	**...**	$\mathbf{x_j}$		$\mathbf{x_n}$	

If x_{js} is the quantity of commodity j delivered in state s, there will exist a corresponding similar table containing the prices p_{js} for the commodity j in state s. As each row in the table contains the bundle of commodities delivered in each corresponding state, the state-contingent bundles can be defined as $x_s = [x_{1s}, x_{2s}, \ldots, x_{ns}]$, and, similarly, the state-contingent prices as $p_s = [p_{1s}, p_{2s}, \ldots, p_{ns}]$. Thus, a bundle is a set of state-contingent vectors $x = [x_1, x_2, \ldots, x_s, \ldots, x_S]$.

[5] So that, for example, 'flu pills' when young and in summer are a different commodity from 'flu pills' when old and in winter. In this case, the set of mutually exclusive states of nature is S = {summer, winter}.

Individuals choose their optimal consumption of a commodity bundle x that maximises their expected utility:

$$U(x)=\sum_{s=1}^{S}\pi_s u(x_s)=\sum_{s=1}^{S}\pi_s u(x_{1s},x_{2s},...,x_{ns}) \qquad (1.1)$$

where utility is derived from the consumption of an array of state-contingent bundles $u(x_s)$, weighted by π_s, the probability of each state s occurring, with $\sum_{s=1}^{S}\pi_s=1$. The individual optimum is the solution of the following:

$$\max U(x)=\sum_{s=1}^{S}\pi_s u(x_s) \qquad (1.2)$$

subject to individual's budget constraint

$$\sum_{s=1}^{S}p_s x_s = e_0 \qquad (1.3)$$

where e_0 is the individual's endowment. The Lagrangian function appears as follows, with λ is the Lagrangian multiplier:

$$L=\sum_{s=1}^{S}\pi_s u(x_s)+\lambda[e-\sum_{s=1}^{S}p_s x_s] \qquad (1.4)$$

and, by differentiating with respect to every x_{js}, the first order conditions are in the form of

$$\frac{\partial L}{\partial x_{js}}=\pi_s u'(x_{js})-\lambda p_{js}=0\,. \qquad (1.5)$$

By substituting λ across the first order conditions, the individual optimum implies that, for any commodity j, the marginal utility per unit of account will be the same in every state s[6]:

$$\frac{\pi_1 u'(x_{j1})}{p_{j1}}=\frac{\pi_2 u'(x_{j2})}{p_{j2}}=...=\frac{\pi_s u'(x_{js})}{p_{js}}=...\frac{\pi_S u'(x_{jS})}{p_{jS}} \qquad (1.6)$$

Arrow and Debreu introduced an intertemporal economy with perfect foresight and a complete set of future state-contingent markets, which came to be known as the Arrow-Debreu economy. In essence, this assumed that individuals hold money for only one time period and that, in the initial period, forward markets exist for all commodities in every future period and for all contingencies imaginable. With perfect foresight in the initial time period, individuals could accurately plan their

[6]This condition is referred to as "the fundamental theorem of risk-bearing".

entire lifetime consumption by arranging a set of contracts for future state-contingent commodities. They demonstrated that, with a full set of state-contingent commodities, optimum allocation of risk would be attained in equilibrium.

Requiring a full set of state-contingent commodities was deemed unrealistic, as a full set would call for all possible forward markets to be open in the initial period. If n is the number of physically-different commodities required by an individual, S the number of states of nature in every period and there are T time periods, then a full set needs $n*S*T$ state-contingent markets.

However, Arrow (1953) showed that a full set of state-contingent commodity markets could be replaced by a small set of financial securities that took into account all possible states. Arrow argued that individuals did not need to contract state-contingent commodities on the forward market, but could, instead, invest in a security that would yield the unit of account needed to purchase the commodities on the spot market of the future. He proposed the "Arrow securities", 'pure securities' that paid a unit of account if a particular state occurred and nothing otherwise. The payoffs of a set of pure securities is presented in Table 1.2.

Table 1.2. State-contingent payoffs of Arrow securities

		Pure securities					
		1	2	...	j	...	n
States	1	1	0	...	0	...	0
	2	0	1	...	0	...	0
	...	...	...	...	...	...	...
	s	0	0	...	1	...	0
	...	...	...	...	...	...	...
	S	0	0	...	0	...	1

Provided that an Arrow pure security existed for each state or could be constructed as a portfolio of conventional market securities, capital markets were said to be complete. Thus, using the same notations as before, individuals would only need S number of securities for each time period - $S*T$ markets in total.

Thus, trading occurs in spot markets for commodities and assets. In the initial period, individuals use their endowments to purchase commodities for current consumption and also invest in securities whose returns will finance future consumption purchases. The individuals' future endowments stem from the returns of the securities purchased in the initial period – they have an endowment vector based on future state-contingent returns on their initial portfolio of securities. It is assumed that, in order to purchase commodity bundles, individuals have to sell their endowments. Consequently, the individual budget constraint in a particular state s becomes

$$p_s x_s + q_s a_s = p_s e_s + V_s a_o \qquad (1.7)$$

where p_s is the commodities spot price vector, x_s is vector of state-contingent commodity bundles, q_s is the set of security prices prevailing in state s, a_s is the portfolio of securities chosen to finance the next time period, e_s is the individuals' endowment vector if state s occurs, $V_s a_O$ is the return of the securities portfolio a_O chosen in the initial time period if state s occurs.

Derivation of pure securities

If there are n conventional market securities and S states of nature, the payoffs of each security in each state of nature can be displayed as the following matrix

$$M = \begin{bmatrix} m_{11} & \cdots & m_{1n} & \cdots & m_{1N} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ m_{s1} & \cdots & m_{sn} & \cdots & m_{sN} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ m_{S1} & \cdots & m_{Sn} & \cdots & m_{SN} \end{bmatrix} \qquad (1.8)$$

Each column represents the vector of state-contingent payoffs $m_n=[m_{1n},\ldots, m_{sn},\ldots, m_{Sn}]$. Note that if the market securities are already pure securities, the M matrix becomes the identity matrix (I) presented in table 1.2.

Further, while the market securities are not pure, it is assumed that portfolios of conventional market securities exist that can replicate the payoffs of the pure securities for every state s. Thus, a matrix A is needed to be found that represents the sets of portfolios of the market securities for each state so that

$$M * A = I \qquad (1.9)$$

In matrix A each column represents the vector of shares of each market security that should be held in a portfolio replicating pure security payoffs:

$$A = \begin{bmatrix} a_{11} & \cdots & a_{1s} & \cdots & a_{1S} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ a_{n1} & \cdots & a_{ns} & \cdots & a_{nS} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ a_{N1} & \cdots & a_{Ns} & \cdots & a_{NS} \end{bmatrix} \qquad (1.10)$$

From (1.9) it can been seen that:

$$A = M^{-1} \qquad (1.11)$$

Note that, as a result of the inversion, some portfolios appear as negative (some $a_i < 0$ in matrix A), which means that those particular portfolios are 'short-sold'. Short-selling involves selling a security that is not currently owned and which has to be borrowed from the future. Individuals borrow the securities a_i and sell them on the spot market, receiving the price q_i, while undertaking to return the securities in the future when they will have to buy them at the future state-contingent prices.

Consequently, finding a portfolio of securities that would match the payoffs of pure securities is possible provided that the number of market securities is the same as the number of possible states of nature (S=N) and that their state-contingent payoffs are linearly independent. In these conditions, the markets are considered complete.

Individual optimum

In a simple form, based on (1.2), 1.3) and (1.7), individuals want to maximise their state-contingent utilities by optimum allocation of their wealth in a portfolio of pure securities (a).

$$\max U(a) = \sum_{s=1}^{S} \pi_s u(a_s) \qquad (1.12)$$

subject to

$$\sum_{s=1}^{S} q_s a_s = W_0 \qquad (1.13)$$

where q_s is the price of the pure security s, a_s is number of pure securities, and W_0 is the individual's initial wealth and π_s, is the probability of each state s occurring.

The solution is found with the Lagrangian

$$L = \sum_{s=1}^{S} \pi_s u(a_s) + \lambda[W_0 - \sum_{s=1}^{S} q_s a_s] \qquad (1.14)$$

There is a difference between the Arrow-Debreu economy scenario and the Arrow's pure securities approach, namely in the way capital markets operate. In the Arrow-Debreu economy, since individuals had perfect foresight and decided on their entire lifetime consumption from the outset, there was no reason for markets to remain open in the future once the intertemporal allocation contracts have been made in the initial time period. With pure securities, capital markets have to remain open in every time period.

1.3.2. The Life-Cycle theories

Keynes had looked at national saving but, apart from listing the saving motives, he had paid little attention to what drove people to save. This was first undertaken by Harrod (1948), who followed on from Fisher's ideas on inter-temporal consumption and time preference, and maintained that individuals saved over the course of their life in order to accumulate funds for retirement. He advanced the concept of 'hump saving' – the accumulation of savings was highest in the middle age of an individual. Inter-temporal consumption was thus linked to optimising the income stream in a lifetime. Later, Modigliani and Brumberg (1954) and Friedman (1957) proposed, separately, to improve on Keynes' theory of saving by developing on the 'foresight' motive, and put forward hypotheses that have since been fused together under the term of 'life cycle theories'.

Friedman (1957) developed the "Permanent Income Hypothesis" (PIH), which, in its simplest form, states that individuals make consumption and saving decisions based not on their current real disposable income but on their anticipated lifetime income. Friedman took into account that incomes change over time but distinguished between permanent changes (anticipated) and transitory ones (unexpected). Consumption depends on what individuals expect to earn in the long-term and, thus, remains fairly constant and uninfluenced by temporary changes in income:

$$C = cYP \tag{1.15}$$

where c is the marginal propensity to consume, considered constant, YP is the permanent income.

Individuals smooth out temporary fluctuations in income so as to keep their standards of living. Their consumption level changes only when changes in income are perceived as permanent and, so, are included in individuals' future expectations. If an increase in income is deemed to be transitory, the individuals will be inclined to save a higher proportion of the increase in income. For these reasons, Friedman argued that the average propensity to consume was constant (for Keynes, it was decreasing) and that individuals react differently to long-term or short-term changes in income. Also, low-income earners have higher average propensity to consume, while high earners have a higher propensity to save, as transitory incomes play a larger role. Thus, Friedman introduced a time lag in Keynes' consumption function – an increase in income will not translate immediately into an increase in consumption.

He provided an explanation for the so-called 'Kuznets paradox' by proving Keynes' assertions incorrect because they had not been based on permanent income.

Modigliani and Brumberg (1954) advanced the "Life-Cycle Hypothesis" (LCH) that examines not only the implications of random shocks to incomes but also the systematic variations in savings and wealth. They also demonstrated that individuals (households) make consumption and saving decisions based on their aggregate lifetime income but, expressly, took into account the fact that income and consumption have systematic fluctuations caused by life-cycle stages – childhood, work participation years and retirement. The hypothesis highlighted that consumption and saving behaviour were different across households depending on their income, wealth, age and other conditions related to their stage in the life cycle.

If the PIH introduced lags in the consumption function, the LCH added wealth assets and capital markets. "Consumption smoothing" - shifting income between different time periods, can only be achieved thorough the use of capital markets. LCH argued that individuals smooth consumption over their lifetime - set their consumption at a level that can be maintained in throughout the early years, the active work period and during the retirement. The LCH establishes the accumulation of wealth destined for retirement consumption as the main motive of saving. In the early years, individuals live off endowments or borrow. During the working years, individuals' wealth accrues as they save part of their income (they lend in capital markets) and reaches a maximum just before retirement. Wealth is hump-shaped as, after retirement, households start dissaving in order to maintain consumption. Individuals are faced with an optimisation problem summed by the following: they choose the levels of consumption (C_1, …, C_T) which maximise their utility according to their time preference

$$\max U = \sum_{t=0}^{T} \beta^t U_t(C_t) \tag{1.16}$$

subject to the intertemporal budget constraint that the present value of lifetime consumption is less than or equal to the present value of lifetime income

$$\sum_{t=0}^{T} \frac{C_t}{(1+r)^t} \leq A_0 + \sum_{t=0}^{T} \frac{Y_t}{(1+r)^t} \tag{1.17}$$

where t denotes time periods from $t = 0$ to $t = T$, the end of life, U_t is the utility derived from consumption, C_t is consumption in period t, β^t is a subjective time discount factor ($0<\beta^t<1$), r is the rate of interest, A_0 is the wealth at birth and Y_t is the income in period t.

The Modigliani and Brumberg use a consumption function identical to the one presented in the PIH:

$$C = cPV_t \tag{1.18}$$

where PV_t is the aggregate lifetime income equivalent to Friedman's "permanent income". Ando and Modigliani (1963) calculated PV_t as the sum of income in period t, the present value of expected future earnings and the net worth in period t.

$$PV_t = Y_t + \sum_{t=0}^{T} \frac{Y_t}{(1+r)^t} + A_t \tag{1.19}$$

Ando and Modigliani described wealth as the present value of the expected income stream derived from ownership of assets and, in estimating wealth, they highlighted the importance of efficient capital markets able to provide prices reflecting market expectations on ownership of assets. They further simplified (1.19), arguing that the expected income in the current period (Y_t^e) is the average of the present value of expected future incomes.

$$Y_t^e = \frac{1}{(T-1)} \sum_{t=1}^{T} \frac{Y_t}{(1+r)^t} \tag{1.20}$$

Ando and Modigliani propose the following consumption function:

$$C_t = cY_t + c(T-1)Y_t^e + cA_t \tag{1.21}$$

Thus, according to the LCH, an individual's combination of saving and consumption in a lifetime depends on the rate of interest, his preference for future or present consumption, his future earnings profile and accumulated wealth. High interest rates diminish the present value of expected lifetime earnings, and prompt a reduction in consumption and an increase in savings – changing the size and structure of wealth.

The LCH is a microeconomic application that reiterates the implications of PIH. Only changes in the expected income stream (permanent income) will have a significant effect on consumption while temporary increases in income will boost savings instead. Also, as the individual wealth curve is hump-shaped, the ratio between consumption and income decreases as income rises. Low-income earners have a high average propensity to consume, as they are likely to be young or old, while high-income earners have high average propensity to save, as they are likely to be middle aged.

However, the LCH also has applications at the macroeconomic level. It shows the impact of monetary policy on consumption and highlights government expenditure as a burden borne either by the current generations (if financed through taxes) or by the future generations (if financed by deficit). Moreover, the LCH has powerful implications. First, that national saving depends on the rate of growth of national income and not on the level of income. Second, that the level of wealth is influenced by socio-demographic variables like demographic structure, population growth, life expectancy, retirement behaviour and family size.

Wealth can accumulate in an economy even in the absence of a bequest motive. In an economy with a growing population more people are accumulating wealth than are dissaving, so wealth increases with each generation. Productivity growth provides increasing income for the working cohorts, generating higher levels of savings that offset the dissaving of the retired generations. According to the LCH, in a 'steady-state' economy wealth is just passed around from the old generation to the young.

The LCH argued that individuals belonging to different generations were separated by different life expectations, mortality rates, preferences and productivity[7] and assumed that generations of individuals succeeded each other. In this respect, an important contribution to the life-cycle analysis was Samuleson's (1958) model based on overlapping generations (OLG) – in which individuals in different stages of the life cycle and coexisted in the economy. A simple model of overlapping generations is the "2-period-life" model in which a generation lives for two periods (youth and old age) and, at any time period, one young generation coexists with an old one. In the next time period, the old generation dies, the former young generation becomes old and a new young generation is born. A generation born at period t (which lives for periods t and $t+1$) would have the following intertemporal utility function:

$$U(C_t, C_{t+1}) = U(C_t) + \beta U(C_{t+1}) \qquad (1.22)$$

where β is the personal time discount factor ($0<\beta<1$).

The main difference between PIH and LCH resides in the time span considered. Friedman considered that individuals had an infinite lifespan and that they

[7] It followed that economic growth redistributes income in favour of the younger generation.

saved not only for themselves but also for their descendants. Modigliani and Brumberg assumed that individuals had finite lives and saved only for themselves. The distinction is important especially when considering the implications for the relation between fiscal policy and national saving. Modigliani argued that private saving was governed by life cycle considerations and was independent from the government budget so that private wealth was independent from national debt. He followed that, with a finite planning horizon, national debt would crowd out private saving.

In contrast, Barro (1974) was the first to develop a LCH model with altruistic bequest motives in which finite lived individuals maximised not only their lifetime utility but the utility of their descendants as well (a 'dynastic utility function'), so that households were assumed to live infinitely. Each individual lives two periods: youth (superscript y) and old-age (superscript o). Assuming that the utility function and consumption allocation are always the same in a dynasty and since the utility of the individuals also depends on the utility of their descendants, the utility function for an individual is

$$U = U(c_0^y, c_0^o, U(c_1^y, c_1^o, U(c_2^y, c_2^o ...))) \qquad (1.23) \text{ or}$$

$$U = \sum_{t=0}^{\infty} \gamma^t U(c_t^y) + \beta \sum_{t=0}^{\infty} \gamma^t U(c_t^o) \qquad (1.24)$$

where c_t^y is youth consumption at period t, c_t^o is old-age consumption at period t, β is the personal time discount factor ($0<\beta<1$) and γ^t is the discount factor that simulates the selfishness or myopia of the current individuals in considering the utility of their offspring ($0<\gamma^t<1$, their descendants' utility is not as important as their own).

In this influential study, Barro (1974) established 'Ricardian equivalence' – the hypothesis that government budget balances have no effect on national saving, as infinitely lived households anticipate government's fiscal policies and adjust their consumption to compensate their effects, maintaining the national saving level. In the presence of a government deficit individuals save more in order to offset the effect of the future tax increases on their descendants. With an infinite planning horizon, national debt, taxes and government transfers would have no effect on national saving.

A more recent extension of the LCH theories, in this context, was the intergenerational accounting framework introduced by Auerbach, Gokhale and

Kotlikoff (1991), which tries to evaluate the intergenerational effects of fiscal policy based on the intertemporal and intergenerational constraints of the government budget. Comparing the present value of net tax payments across generations can help highlight unfair, inequitable or unsustainable policies.

Application of the standard LCH model in later empirical research has revealed some problems – elderly not dissaving at the rate predicted by the model, persistence of saving in retirement – and has given way to criticisms. Banks, Blundell and Tanner (1998) observed that saving for retirement seemed to start only in middle age and that the wealth accumulated was insufficient to keep retirement consumption at pre-retirement levels. Kotlikoff and Summers (1981) argued that the LCH generally applied to a large portion of the population but there were segments proving to be the exception to the LCH rules.

The newer LCH models blend together around integrating in the original framework the conditions of imperfect capital markets and uncertainty. The existence of bequests was acknowledged even in the early versions of the LCH but was only dealt with after studies like Kotlikoff and Summers (1981) had stressed the importance of bequests to the formation of national wealth. Davies (1981) had shown that, in the absence of an annuity market, the elderly completely run down their savings only when there was a zero per cent chance of living longer. Modigliani (1988) recognised the importance played by the uncertainty while leaving the underlying model unchanged. He argued that uncertainty led to precautionary saving so that wealth accumulated was for rainy days as well as for retirement. However, uncertainty about the date of death and health hazards diminished the optimum dissaving rate during retirement and generated accidental bequests.

Carroll (1997) added to the debate by introducing precautionary saving and imperfect capital markets, particularly in the first stages of the life cycle. First, he showed that, when faced with a great deal of uncertainty in predicting future incomes, prudent individuals would not borrow, maintaining their consumption within the levels of their current income – closer to Keynes' assertions. Second, under imperfect capital markets, individuals would find it hard to borrow, again being restrained to tailor their consumption to current income. Under these conditions, Carroll argued that household consumption is, mostly, tracking expected household income and that consumption smoothing could not happen over the life cycle, but only on shorter periods and later in life.

Arguably, the most recent criticisms - aimed at the LCH assumptions on individuals' rational, utility maximising, behaviour - are the most important. Thaler (1994) eschews the LCH assumptions and focuses instead on the psychological determinants of consumption and saving behaviour, highlighting problems of self-control and myopia. Thaler's psychological approach suggests that individuals are not the LCH rational economic agents concerned with life-cycle optimisation, who make long-term consumption and retirement saving plans. On the contrary, he argues that individuals are myopic decision makers (focused on short time horizons) that find saving for retirement to be difficult due to their lack of motivation and their inability to anticipate future needs. Under myopia, individuals start realising the need to save only as they get nearer to the retirement age. In terms of the LCH model, the implication of myopia is that, again, individuals maximise consumption over short time horizons and later in their life cycle. Thaler, along with others like Bernheim (1994) and Hubbard and Skinner (1996), argue that individuals react positively to government schemes designed to encourage self-control in putting assets aside for future consumption. It has to be noted that justifying governmental intervention in old-age income provision based on individuals' myopic behaviour was first mentioned by Pigou as early as 1920 (Pigou, 1920).

Authors such as Laibson (1997) and Laibson and Harris (2001) introduce the concept of "hyperbolic discounting" which modifies the standard assumption that the rankings of future consumption (the discount rates) are constant over time. Under the standard LCH, individuals using a constant set of discount rates can anticipate the fall in income associated with retirement and smooth consumption. Under "hyperbolic discounting", psychological evidence (individuals' bias for the present) is taken into account - individuals' rankings of future consumption change depending on their current circumstances and position in their life cycle. Specifically, individuals' preferences for future consumption feature high discount rates over short time horizons and relatively low discount rates over long horizons. From today's perspective, consumption in two far-off periods t and $t+1$ will be evaluated at the low long-term discount rate. However, from the period t perspective, consumption in period $t+1$ will be evaluated at the high short-term discount rate (Laibson, 1997). Thus, individuals' decisions on consumption and savings are not time-consistent. Individuals might wish to start a vigorous retirement savings plan provided that they only start saving tomorrow; however, when tomorrow comes, their preference will be to postpone making consumption sacrifices until the following day. Procrastination ensues with the same end result as in the case of myopic behaviour or in Carroll (1997) - individuals only start saving for retirement late in their life cycles. Laibson's implication is that saving will take place only if the individuals are subjected to "external commitment devices" to help them achieve self-control. This idea is developed in studies such as Thaler and Benartzi (2004) who proposed a prescriptive savings programme entitled "Save More Tomorrow ™" (the SMarT programme) under which individuals commit (well) in advance to allocating a portion of their future wage increases towards retirement saving. In order to combat procrastination, with each wage raise, the contribution rate is scheduled to increase gradually until it reaches a target level.

Such studies that deal with behavioural influences like inertia, myopia and irrational behaviour have transformed the way economists look at the LCH. These studies, belonging to developing field of behavioural economics, have pointed that the LCH remains the model of how individuals should behave if they were capable of planning. However, uncertainty and human psychology make actual behaviour different from the life cycle behaviour.

The LCH is the benchmark theory that has helped economists start addressing concerning issues like the provision of social security, the economic effects of demographic ageing and the relationship between capital markets, wealth and economic growth. In particular, the LCH provided the framework for analysing the institutional arrangements and their effect on private saving and retirement behaviour.

As a conclusion, studies like Kohl and O'Brien (1998) summarise the theories of saving into three main categories, based on individuals' time horizon and utility function: the life-cycle model (focused on consumption smoothing without bequests), the multigenerational model (with bequests) and the precautionary motives.

1.4. The Institutional Arrangements

Institutional arrangements for retirement income are part of the larger system of social security programmes that society offers its members facing economic and social adversities. Social security[8] is a form of the social solidarity mechanism which

[8] This paper uses the term "social security", similar to the European Union's term of "social protection" but including voluntary schemes. Note that term has a more restricted meaning in countries like the UK, where it refers only to the financial statutory benefits, or the US, where it refers only to the public

individuals use as protection against the social risks[9] prevalent in the social and economic life. Social security is the product of institutionalised solidarity, enthroned by civil rights as the responsibility of society as whole towards its less fortunate members. Thus, social security manifests itself as a state of well being perceived by the society following public measures taken to insure the economic security and the social welfare of the individual.

In the past, securing old-age income and protecting against risks was largely an individual or family matter, sometimes with help from municipality or the church. However, collective support for the poor has manifested as early as the 16th century in many European countries. In Germany, the urban poor had been supported by community taxes since 1520. In England, the 1601 'Elizabethan Poor Law' asked for a compulsory poor tax to be levied on every parish intended to help the poor sick, unemployed or old with relief.

Today, social security has become synonymous with the term of social insurance. Social insurance literature distinguishes between two types of social security programmes: insurance schemes - with benefits based on contributions made from earnings and aimed at insuring against risks like longevity, accidents, unemployment etc., and minimum schemes - with benefits that are means-tested or universally provided at a preset level, aimed at providing a welfare safety net.

As in the case of private insurance, social insurance schemes offer benefits only to those that have contributed. Stipulating by law a minimum number of contribution years also affects different categories of individuals (such as those who cannot enter the labour market due to family obligations, individuals with poor health) and generate lower benefits for women (shorter contributions periods due to child birth and rearing, higher risk of unemployment etc.). Where benefits are correlated with contributions, individuals with low-income receive small benefits. Many schemes have thus introduced supplementary benefits for low-income earners. Political support for the extension of mandatory social insurance has meant increased acceptance for the extension of government intervention, which, in turn has led to tax increases needed for the financial support of the insurance schemes.

segment of old-age income insurance. In countries like the UK and Denmark, the historical objective of the social security has been poverty reduction while welfare policies have been aimed at income support, whereas the opposite has been true in France.

[9] According to the International Labour Organisation Convention no. 102 concerning Minimum Standards of Social Security (1952) social risks are considered to be sickness, unemployment, old age, employment injury, provision for family, maternity, invalidity, and death.

The first mandatory scheme of social insurance on a national scale was initiated in Germany by the Chancellor at the time, Otto von Bismarck, who introduced successively sickness insurance (1883), accident insurance (1884) and old-age and invalidity pensions (1889). The scheme was focused on employees, was financed by mandatory contributions and the pension benefits were linked to individual contribution and earnings history. It was publicly managed but allowed for involvement from trade unions and employers' associations (tripartite). Germany was soon followed by Austria and Hungary and - before long - the model became the main pension provision scheme throughout Europe.

By the 1920, most European countries had adopted mandatory systems of social insurance. Between 1920 and 1930, comprehensive social insurance schemes had also been adopted in Latin American countries – Argentina (1921), Uruguay (1922), Chile (1925) etc. The United States lagged behind Europe and Latin America until 1935 when the Social Security Act introduced federal social insurance schemes that provided benefits covering retirement, survivors, healthcare and invalidity.

In contrast to these examples, the United Kingdom adopted a minimum scheme. As the focus of the welfare policies had always been on poverty relief, a system with means-tested, flat-rate benefits provided quicker support for poor pensioners, the unemployed and the sick than a contributory social insurance scheme of the Bismarck type. Britain adopted means-tested pensions for over-70-year-olds in 1908 and expanded them 65-year-olds in 1925. A major influence was exerted by Lord Beveridge who, in his famous study (Beveridge, 1942), argued for a universal mandatory social insurance system based on flat-rate contributions financing flat-rate benefits that provided a "minimum income needed for subsistence". The post-war years fostered solidarity and the desire for social inclusion while the government became committed the Keynesian policy goal of full employment. As a result, Britain abandoned means testing in 1948.

After World War II, social insurance schemes experienced rapid increases in population coverage and features development, particularly in pensions. Levels of benefits were gradually raised and were subsequently followed by the introduction of earnings-related schemes designed to support the extra costs involved. Years of economic growth and inflation prompted the development of mechanisms of indexation, while more flexibility was introduced by social changes like entry of women in the workforce, early retirement, single parent families etc.

The fact that social security schemes based on mandatory insurance were only established in the last decades of the 19th century gives rise to questions regarding their determining factors. A study by Cutler and Johnson (2001) that looks into the theories advanced for the birth and growth of social security systems summarises them into several main groups. The first set of theories argue that social security is a modern response to the process of industrialisation, which has separated large numbers of individuals from the support of their extended families and made them dependent on employed work as they migrated from the rural areas into cities. The second group of theories is focused on the issue of political legitimacy, arguing that the intent behind the introduction of social security systems was to undermine political opposition and to instil various social groups with vested interests in the continuity of the State[10]. A third view on the origin of the social insurance schemes views social security as a luxury good whose provision depends on a country's level of economic development and its administrative capacity. Another important set of view on the origins of social insurance emphasises the role of heterogeneity in population and incomes. Countries with large income inequality will tend to adopt redistributive transfer programmes. Also, in a democracy, adoption of a government pension program will depend on the share of the elderly in the population.[11] The last group of theories argue that social insurance schemes are created by the governments' desire for expansion, at the pace set by the availability of sources of finance. Thus, government expenditures programmes, including social insurance schemes are launched following wars, when revenues are available and tax collection and administration is efficient.

Mulligan and Sala-i-Martin (1999b) make a case for the introduction of social insurance programmes as incentives for the elderly workers to leave the labour market. First, they suggest that, given that human capital depreciated with age, older workers would have a negative impact on the productivity of the young, and, thus, it was "Pareto-improving for the young to trade money for the jobs of the old", raising

[10] Flora and Alber (1981) describe the need to legitimise the new German state and order created in 1870. Bismarck introduced the social insurance schemes after having taken radical measures against the socialist movement.

[11] Olson (1982) argued that democracies are more likely to introduce social insurance systems based on redistribution than non-democracies, as the poor individuals desire for redistribution can take political form. However, in a recent study by Mulligan and Sala-i-Martin (1999a), when they reviewed previous studies on the growth of social security based on the level of economic development and the type of regime (democratic/non-democratic), they summarised that, controlling for GDP per capita, there were no differences.

aggregate GDP in the process. Second, they point out that governments find that having high levels of unemployment is less acceptable from the political point of view than having large numbers of retirees. Third, they argue that these policy efforts would have the backing of the unions because moving some of the unemployed into 'retirement status' would relieve some of the downward pressure on wages exercised by the unemployed.

A study by Barr (1992) argued that the emergence of large-scale social insurance is largely justified by asymmetric information problems (to be discussed later), which explain why the schemes are aimed not only at redistribution and provision of a safety-net but also at contingencies that private markets cannot cover. Barr also argued that the compulsory feature of social insurance was mainly justified from the market failure perspective, by the view of social insurance as a merit good provided as a response to a "national efficiency" externality or mistaken preferences (individuals' myopia). Diamond (1977) is one of the first studies to suggest that governments should act paternalistically given the individuals' myopic behaviour and free-rider problems. He suggested several reasons that make government provision desirable[12], among which that individuals do not have the information necessary to recognise and give sufficient weight to their retirement consumption needs, they are unable make effective long-term plans due to their unwillingness to face the fact of growing old. Another reason for the expansion of government-run social insurance is the economies of scale in administration costs that governments can reap. Diamond (1977, 1993) argued that the flexibility costs of the "one-size-fits-all" social insurance (statutory retirement age, set number of contribution years etc.) are outweighed by the reduced administration and transaction costs.

Another explanation for the development of the social insurance systems rests on the idea of widespread dynamic inefficiency. In a seminal paper, Samuelson (1958) showed that in an economy without money, where the rate of interest is equal to the rate of population growth, the introduction of social insurance (i.e. PAYG - pay-as-you-go pension system[13]) could improve the welfare of all individuals as the rate of return on individuals' contributions would surpass the interest rate. Samuelson argued that, with real incomes rising, it became possible for every generation of

[12] However, Diamond (1977) also argued that the schemes need not necessarily be administered by the governments.
[13] Where the young generation makes collective contributions that finance the benefits of the old generation, detailed in the following section.

workers to receive more pension benefits than the sum of contributions paid in the PAYG. In another key article, Aaron (1966), proved that the implicit rate of return of a mature PAYG pension system is the rate of wage bill growth[14], which, in the long run, should be about the same as the rate of economic growth. Aaron further argued that sufficiently high productivity growth could make the rate of return of the PAYG match and exceed the rate of interest for private capital, even when added to negative population growth – a situation he defined as the "social insurance paradox". Using an OLG model, Diamond (1965) showed that a competitive equilibrium could be reached that was dynamically inefficient as it involved excessive capital accumulation, which dragged the real interest rate below the rate of economic growth. Dynamic efficiency holds that, in an economy, the rate of return on capital should be higher that the rate of economic growth – i.e., according to the Aaron-Samuelson criteria, the interest on private savings should be higher than the PAYG rate of return. On the contrary, if the population growth rate is higher than the marginal product of capital, or if investments are consistently higher than the earned profits, the economy is considered dynamically inefficient (Abel et al., 1989). Abel et al. (1989: 1) argued that in a dynamically inefficient economy, a Pareto improvement could be achieved by "allowing the current generation to devour a portion of capital stock and then holding constant the consumption of all future generations". Thus, in situations of dynamic inefficiency, introducing social insurance systems would be beneficial, as they would improve welfare and deliver rates of return superior to the private pension systems.

Regardless of the rationale for their development and expansion, since the 1970s, social security systems have been financially pressured by various new forces such as globalisation and recessions, which changed the nature and structure of employment and created the need for new forms of social protection not easily provided by the traditional social insurance schemes. The latest demographic changes, accentuated in the last two decades, have turned the pressures into a crisis.

1.4.1. Basic system design

Pensions schemes are a subset of general social insurance programmes. According to Barr (2002), the list objectives of all pension systems should include the following:

[14] Equal to the sum of the growth rates of labour force and productivity - as discussed in the following section (see equation 1.29).

- to provide security against destitution in old age;
- to smooth the distribution of consumption spending over a life span;
- to provide life's requirements for those with exceptional longevity.

When analysing a pensions program several criteria must be considered. First, whether the scheme is aimed at smoothing income and consumption over the life cycle - outlining individual responsibility in old-age income provision, or it is aimed to reflect the social contract based on collective intergenerational old-age support - incorporating more redistribution. Second, the method of financing the scheme benefits is important – the extent to which benefits are explicitly set in relation to individuals' earnings and contributions. Third, the method of administrating the scheme also has implications for pensions – whether the government is in charge of managing the contributions and benefits or whether private companies and individuals are. Generally speaking, the above dichotomies are summed up by the following classification: pensions systems organised as pay–as-you-go schemes (PAYG) or pensions systems based on individual fully funded accounts (FF).

PAYG

PAYG has been the traditional framework for organising public pensions systems. PAYG systems embody the principle of collective solidarity mentioned previously (the intergenerational social contract – Samuelson, 1958), aiming to provide old-age income security on the basis of inter- an intra-generational redistribution. PAYG systems are public systems administered by government – who has the prerogative to preset the value of the pension benefits and to manage the financing of benefits either by collecting targeted contributions or through direct taxation.

In a PAYG system, the typical pension benefit formula is:

$$P_i = bY_i n \tag{1.25}$$

where P_i is the pension value, b is a policy-determined constant, Y_i is an average of earnings for a period of time close to retirement, n is the number of years in the workforce (n usually between 30 and 35).

Under PAYG, the current workers' contributions or taxes are paying for the current pensioners' benefits as described by the following equation:

$$c\overline{w}_t W_t = \overline{p}_t P_t \tag{1.26}$$

where c is the contribution rate to the PAYG system, $\overline{w}_t$ is the average wage, $\overline{p}_t$ is the average PAYG pension, P_t is the number of pensioners and W_t is the number of contributors (wage earners), all in period t.

Table 1.3 presents the outlook of a PAYG system in an OLG framework – Y and O are used to signify the *young* and *old* attributes of the generations of workers.

Table 1.3 The PAYG system – OLG outlook

1st generation	2nd generation	3rd generation	...	Nth generation
O – benefits	Y – contributes to support the 1st gen			
	O – benefits	Y – contributes to support the 2nd gen		
		O – benefits		
				Y – contributes to support the N-1th gen
				O – no benefits supported by another generation

Under a PAYG system, given that benefits are predetermined in relation to prior average earnings, the main issue becomes finding the appropriate contribution rate – the definition of the equilibrium contribution rate can be found out by rearranging equation 1.26:

$$c = \frac{\overline{p}_t P_t}{\overline{w}_t W_t} \qquad (1.27)$$

In the defined benefit PAYG scheme, the contribution rate to the system becomes a function of benefits, set at the level required to cover the benefits. The crucial features affecting the financial sustainability of a PAYG scheme are the dependency ratio - defined by $\frac{P_t}{W_t}$, the ratio between the current number of pensioners and the current number of active workers, and the replacement ratio – defined by $\frac{\overline{p}_t}{\overline{w}_t}$, the ratio between the current level of average pension benefits and the current level of average wages. Analysing the dependency ratio can reveal the status of the PAYG system. Literature distinguishes between the 'system dependency ratio' – calculated as in equation 1.27, the ratio between the number of pensioners and the number of contributors, and the 'old-age dependency ratio' – calculated as the ratio between the population over the statutory retirement age and the population between 20 years old and the statutory retirement age. Differences in the results for the two expressions are telling. If the old age dependency ratio is larger than the system dependency ratio, then it can be assumed that the pension scheme is immature. If the reverse happens, then the system features early retirees. Replacement rates indicate how generous is the PAYG system.

The rate of return in a PAYG system can be defined as the ratio between the sum of pension benefits received in retirement and the sum of contributions made in the active years. In an OLG framework, based on equation 1.27 and assuming a constant rate of contributions c, the rate of return appears as

$$R_{PAYG} = \frac{\overline{p}_t P_t}{c\overline{w}_{t-1} W_{t-1}} \qquad (1.28)$$

where $\overline{p}_t$, P_t are the average pension and the number of pensioners in period t and $\overline{w}_{t-1}$, W_{t-1} are the average wage and the number of contributors in period $t-1$.

Substituting $\overline{p}_t P_t$ from equation 1.27, equation 1.28 can be rewritten as

$$R_{PAYG} = \frac{\overline{w}_t W_t}{\overline{w}_{t-1} W_{t-1}} \qquad (1.29)$$

Thus, it is clear that the rate of return in a PAYG system depends on the growth of the wage bill ($\overline{w}_t W_t$), the sum of the growth of the average wage ($\frac{\overline{w}_t}{\overline{w}_{t-1}}$) and the growth of the labour force ($\frac{W_t}{W_{t-1}}$). It can be easily observed that, under PAYG, high levels of benefits or low contributions are sustained only in the presence of increased rates of productivity and wage growth and/or increased rates of population growth. The last few decades of decreasing birth rates and increased longevity have negatively affected the PAYG structures.

As noted earlier, the PAYG system is focused on redistribution and, thus, has the potential to let down certain population groups by favouring others – i.e. awarding the others higher benefits than the value of their corresponding contributions. Even with identical wages, contribution periods and contribution rates, intra-generational redistribution is present because of differences in life expectancy. Redistribution can take place across generations (from young to old) or intra-generation (from rich to poor or from men to women).

Fully Funded (FF)

If the PAYG system has the outlook of a giant pyramid scheme, the FF system looks like a 'relay race' based on the life-cycle hypothesis. As generations of individuals grow older, they accumulate savings in various forms of assets that, upon retirement, they sell to the younger generations in order to finance their old-age years. This exchange is mitigated by pension funds, as buffers between generations made up of individual fully funded accounts.

Under a FF system, the provision of future benefits is explicitly dependent on the accrual of contributions made by fund members during their working years until retirement. Contributions are invested in financial assets that yield returns, which are accrued in members' accounts. An individual's account balance at retirement will amount to

$$Ras_i = \sum_{t=0}^{R} cw_{i,t}(1+r)^{R-t} \tag{1.30}$$

where Ras_i is the individual's retirement accumulated savings, c is the contribution rate, $w_{i,t}$ is the individuals wage at time t, R is the retirement age and r is the market rate of return.

At retirement, individuals' accounts balances are usually paid out as lump sums that are consequently converted into annuities. The purpose of annuities is to protect individuals against the risk of outliving their retirement savings. Considering that an individual's retirement accumulated savings have to be the present value of the future pension stream for the rest of his life

$$Ras_i = P_i + \frac{P_i}{1+r^e} + \frac{P_i}{(1+r^e)^2} + \ldots + \frac{P_i}{(1+r^e)^{n-1}} \quad (1.31) \text{ or}$$

$$Ras_i = P_i \frac{(1+r^e)^n - 1}{r^e(1+r^e)^{n-1}} \tag{1.32}$$

where Ras_i is the individual's retirement accumulated savings, P_i is the individual pension value, n denotes the life expectancy of the individual and r^e is the expected market interest rate.

From (1.32) it can be seen that the value of an individual's pension depends on the amount accumulated in his account and the annuity factor (a_i) base on the life expectancy of the individual and the expected market interest rates.

$$a_i = \frac{(1+r^e)^n - 1}{r^e(1+r^e)^{n-1}} \qquad (1.33)$$

Insurance companies will pay out lower annuities the longer the period they expect to pay them. Therefore annuities will be lower for young retirees, women – who, on average, outlive men, individuals without health problems and married individuals – when the annuity is payable to the surviving spouse. However, as Barr (1998) points out, companies would usually pool across different categories of individuals for equity reasons.

Thus, in a FF system, the pension benefit formula is reflected in the following expression

$$P_i = a_i \sum_{t=0}^{R} cw_{i,t}(1+r)^{R-t} \qquad (1.34)$$

where P_i is the individual pension value, a_i is the annuity factor, c is the contribution rate, $w_{i,t}$ is the individuals wage at time t, R is the retirement age and r is the market rate of return.

A FF system has a defined contribution rate preset at a desired level and the value of the pensions depends on the length of the contribution period and on the real rate of return on assets. The first major implication is that the accumulated total assets are sufficient at any time to cover the entire value of future pension liabilities. High benefits or low contributions are provided by higher investment returns and a lower ratio between the number of years spent in retirement and the number of years spent working and contributing. The second implication is that individuals' consumption at retirement is constrained by their past savings. No generation of individuals could live 'beyond its means'.

Under a FF system, there is a strong, transparent link between individual contributions, investment returns, and pension benefits, which means that there is no room for redistribution towards favoured groups. Thus, the FF system will potentially fail to reduce poverty among certain population groups that lack the resources needed for saving. Support for groups like low-wage earners and workers with short careers must come from outside the individual pension savings accounts system.

1.4.2. Public PAYG vs. private FF

It has to be recognized that social expenditure can only be financed from the current national income. As argued in Nitsch and Schwarzer (1996), no income can really be shifted from the past to the present or to the future, so the problem of sharing national income between active workers and pensioners always remains. As a result, some economists, like Barr (1998, 2002), are critical about the PAYG-versus-FF debate arguing that, in essence, both FF and PAYG schemes represent claims on future production output – the first builds up account balances for individual future purchases, the second represents a promise from the younger generation, employers, or the government to provide retirement income. If future output falls short, both type of claims are worthless. Similarly, Diamond (2002), while not taking sides in the FF vs. PAYG debate, argues that support should be given to the type of funding that increases national savings, as greater growth of national capital will ultimately increase resources available in the future. However, some economists would interpret this as support for the fully-funded approach.

Today's pension systems are the result of a long reform process began in the years of the post-war period, with the critical touches being the reforms in the 1960s and 1970s. In those years it had been relatively easy to obtain consensus for the basic pay-as-you-go (PAYG) structure of financing. The idea that active workers should collectively subsidise the relatively short period of leisure before death for the older workers was readily embraced by most. With strong inter-generational solidarity, the PAYG structure proved even more popular as it promised generous benefits at a relatively low cost – relatively easy set-up and revenues immediately available for the first old generation, at a time when it would have been too late to coerce them to save on their own. As mentioned previously, certain economic conditions can make the PAYG structure very economically attractive – see the Aaron-Samuelson criteria discussion. Thus, in the 1960s, from the financial point of view, the PAYG structure made sense because real wages were rising, fertility was high and working age population was growing. The high promised benefits were based on the optimistic idea that future economic growth will provide funding for the generous benefits. From the political point of view, the PAYG structure was viable, given the fact that 'winners' would predominate for many years to come. As shown in Table 1.3, the introduction of a PAYG will be strongly supported by the first generation of pensioners as they stand to receive a positive net transfer – pension benefits without having contributed previously.

The present wave of reforms, began in the 1980s and 1990s, was triggered by the reversal in the demographic and economic trends that put financial pressure on the systems. Countries face low fertility rates and the prospect of the baby boom generation retirement. Increased life expectancy has only served to boost the numbers of retirees – individuals enjoyed longer retirement, not longer labour force participation. Furthermore, labour productivity and real wages growth has slowed, severely limiting the expansion of the tax base. Applying the Aaron-Samuelson criteria, with a diminishing labour force and a slowdown in labour productivity growth, the PAYG does not look promising. Under the new economic conditions, the mature systems have had gradually to adjust their pension commitment. If the dependency rate increases, maintaining the level of the replacement rate will require increasing the contribution rate – effectively a tax that is not really a contribution since the pension benefits remain the same.

Recently, private FF schemes have become more attractive, especially since the matured PAYG systems seem to have lower rates of return than the capital markets[15], negative effects on private saving and negative consequences on the incentives to work. In order to eliminate the perceived disadvantages of the PAYG systems, reforms have been suggested that privatise them partially or fully.

1.4.2.1. Saving and economic growth issues

The analysis of the institutional arrangements and their effect on private saving and retirement behaviour has mostly been done within the framework provided by the LCH presented earlier. Feldstein (1974) was among the first studies to analyse the effects of a government pension system on private saving in accord with the LCH arguments. Feldstein extended the standard LCH model by arguing that the age at which individuals retire is determined endogenously.

Feldstein (1974) argued that one of the effects of introducing a governmental pension system would be the reduction of private saving[16], a result based on the

[15] A study by Palacios and Whitehouse (1998) mentions the higher rates of return of the private schemes as an important reason for reform.
[16] His empirical findings suggested that the PAYG-based U.S. Social Security reduced personal savings by approximately 50 per cent, leading to 38 per cent less capital stock than would have existed without the scheme.

existence of two effects. First, he argued that the transition to an unfunded pensions system would crowd out private saving - the substitution effect (or welfare replacement effect). As individuals target savings towards a level of wealth aimed at supporting their retirement (see the LCH assertions in the previous section), a government-provided pension would offset the need for private retirement savings. Second, the provision of a government pension induced earlier and longer retirement, which would, in turn, raise the target level of savings - the induced retirement effect. One implication of the fact that PAYG pensions are mainly financed by payroll taxes while fully-funded pensions rely on individual savings account accumulation is that the total funds accumulated from individual savings under a FF system greatly exceed the contributions reserve needed under a PAYG system. Thus, Feldstein pointed out that there are potential welfare gains arising from replacing PAYG systems with partially of fully funded ones. Because economies are, in general, dynamically efficient[17], the return on capital is greater than the return of the PAYG and, thus, switching to a FF scheme would bring back the welfare lost under the PAYG from diminished private savings and labour market distortions (Feldstein, 1997).

However, other studies like Munnell (1974) and Kotlikoff (1979) found little evidence to support Feldstein's findings. Feldstein's analysis was criticized by studies like Aaron (1982) mainly because it had been done within the standard LCH model, where government provision of benefits must displace private saving given that net benefits (net present value of benefits minus the contributions) will change net expected wealth. Aaron argued that this displacement effect would be lower than Feldstein's estimate, because of offsetting factors such as labour supply changes. Early retirement tendencies would justify the predominance of the income effect. However, earlier and longer retirement should prompt individuals to increase their savings during their working life in anticipation of a longer retirement. Moreover, given that, within a PAYG, the change in benefits is dependent on rights build-up over a determined number of contribution years, the substitution effect should dominate. Further, Aaron pointed out that had Feldstein done the analysis within a multigenerational bequest model, the introduction of a PAYG system or a change in benefit levels would have led to increased savings in the form of bequests. Another important study was done by Leimer and Lesnoy (1982) who found an error in

[17] Studies such as Abel et al. (1989) provide some empirical evidence.

Feldstein's study which, when corrected drastically reduced the savings displacement effect to almost insignificance. Nevertheless, Feldstein (1996) revisited the study and reconfirmed the original findings[18]. Moreover, a study by Gale (1998) argued that previous empirical research had understated the savings offset because of econometric biases.

Variants of Feldstein's original analysis have been subsequently done in Europe with mixed results. Studies like Jappelli (1995) and Rossi and Visco (1995) found that expansion of the Italian PAYG public pensions system had significantly offset private wealth accumulation.[19] Studies on the UK and Sweden also showed displacement effects, while no savings offsets were found in Germany, Norway and the Netherlands (Kohl and O'Brien, 1998).

A study by Chand and Jaeger (1996) argues that, in the absence of compensating gains such as increased national savings and superior equity implications, it may be preferable to 'fix' the PAYG system instead of shifting to a FF system, due to the considerable fiscal costs imposed by the transition (transition costs and parametric reform will be discussed in the following section). However, Thompson (1998) argues that, although there is not enough evidence to prove that the PAYG systems are responsible for the decrease in personal saving[20], there is proof that funded approaches cause personal savings to rise. A study by Coronado (1997) on the Chilean pension reform found that the switch to a FF system provided a significant stimulus for saving[21]. For the U.S., a study by Engen and Gale (1997) suggests there is a substantial agreement that a move towards funding the PAYG Social Security will lead to an increase in national saving, although the magnitude of the increase is uncertain, depending on the level of government spending, taxes and household behaviour. The World Bank (1994) argues that, while the introduction of a mandatory FF system will displace some of the voluntary savings based on foresight and precaution, it will boost saving for bequests and from shortsighted or low-income individuals, resulting in a net rise. Further, given the lack of self-control and myopic behaviour of individuals, mandatory individual savings might actually be welcomed,

[18] Feldstein (1996) finds that the U.S. Social Security reduces overall private saving by 60%.
[19] Jappelli (1995) estimates a displacement of of 20% of private savings, while Rossi and Visco (1995) estimate around 32%.
[20] References on this topic can be found in a study by Mackenzie, Gerson and Cuevas (1997).
[21] Coronado (1997) found that the switch of the Chilean pension system to a FF system increased the households' saving rates by more than 7 percentage points, which translated into an increase in national saving of more than 2 percent of GDP.

as opposed to payroll tax increases. Authors such as Burtless (2000) argue that individuals would react better to an increase in pension contributions if the increase required were, in fact, deposited in individual savings accounts. Thus, for some economists, even partial privatisation is seen as desirable.

Following the issue of privatisation it is worth mentioning that FF approaches have already been developed and implemented in many countries in response to the fall in saving rates registered in the last decades. Considerable efforts have been made especially in the U.S. in schemes containing 'saving incentives' – special voluntary savings accounts featuring preferential tax treatment of contributions and investment returns, limits to total annual contributions and penalties to early withdrawals. The idea behind is that the governments are financing schemes that try to turn households away from their current preferred level of consumption and towards favouring retirement consumption. Hubbard and Skinner (1996) point that this action has multiple aims. First, they argue that there are positive externalities associated with higher capital accumulation - also maintained by Romer (1986), King and Rebelo (1990) – and so, the government may place a higher social value on capital accrual. Second, encouraging individuals into higher saving will enable the government to eschew certain expenditures by lowering the chances that, once retired, individuals need or qualify for extra income support. However, a study by Engen, Gale and Scholz (1996) concluded that little if any of the overall contributions to existing saving incentives have raised private or national saving.

The issue at stake here is whether the increase in national saving would actually generate income growth, which, in turn, would make a larger pensioner population more affordable. Many authors like Barr (1994, 1998), Hemming (1998); Nitsch and Schwarzer (1996) point to the inconclusive evidence for the effect of funding on savings and growth and doubt whether the three links[22] necessary for an increase in savings to lead to an increase in output will hold. Cesaratto (2003) points out that this is precisely a point of divergence between Keynesian and neoclassical economists, as only in a neoclassical setting an increase in the marginal propensity to save corresponds to an increase in the full-employment saving rate.[23]

[22] Fully-funded systems generating higher savings; higher savings translated into higher investment; higher investment generating increase in output. (Barr, 1998)
[23] For Keynesians, the saving paradox suggests that higher savings can lead to a fall in both income and employment.

1.4.2.2. Risk issues

Risk pooling and asymmetric information

Asymmetric information plays an important role in justifying government intervention in pensions. As shown by Feldstein (1974), PAYG systems are dangerously predisposed to principal-agent and moral hazard problems. Under PAYG systems with generously defined benefits there is always the temptation of early retirement and contribution evasion. The decision on individuals' eligibity for early retirement or disability usually rests with agents (for ex. employers) who are not ultimately responsible in paying the pension benefits. Further, given that benefits are pre-set, individuals have incentives to decrease their contributions and abstain from efforts that would support the system overall but are undesirable on a personal level (such as having an increasing number of children).

While FF systems do not suffer from this type of problems, they are still prone to moral hazard in the presence of government safety nets and insolvency insurance. Also, principal-agent problems lurk in the context of complex specialised information – pension fund administrators may pursue strategies that optimise their gain and not the individual's. These are serious market failures and government intervention is required, such as requesting disclosure of information.

However, the FF systems suffer most seriously from adverse selection (Bodie, 1990a; Poterba, 2001). Adverse selection is a key characteristic of annuity markets, having its say when it comes to differences in life expectancy and the incidence of old age and poverty. Private companies aim to improve the quality of their pool of policyholders and, so, try to avoid insuring those individuals whose benefits exceed their premiums. On assessing longevity risk, higher premiums are charged for individuals with higher incomes, higher educations, women etc. At the same time, individuals who perceive their longevity risk as small (expect to die soon) are inclined to not insure (buy annuities). Asymmetric information is present in the fact that individuals know more about their risk profile than insurance companies. Thus, by extension, individuals who buy annuities tend to live longer than those who do not and private companies end up insuring mostly high-risk individuals. The result is that companies cannot price their annuities based on an average individual risk profile and must raise the price of annuities in order to account for the pool of largely high-risk individuals insured. This, in turn, makes annuities even less appealing to the low risk individuals. The adverse selection problem disappears when making the insurance schemes universal - imposing mandatory membership and mandatory annuity purchases. This is one of the reasons why the mandatory feature is present in almost all the pension reform cases that will be portrayed later on. However, under FF systems, mandatory annuity purchases during a period of downturn in the market may seem unfair and there are considerations of optimal retirement income allocation as well (to be discussed in the next chapter).

In many respects, government intervention in old-age pensions provision is justified. Running a single universal programme is, potentially, less costly than deploying several competing schemes and high transaction costs in the private provision affect benefit levels (Diamond, 1993; Stiglitz, 1994). Diamond (1993) argued that privatising the PAYG systems would involve forgoing the administrative economies of scale and lower transaction costs enjoyed by the governments.

Barr (1992) draws attention to the fact that a key issue of social insurance systems is the compulsory membership feature, which deals with the free-rider problem and makes risk-pooling possible by locking-in the low risk individuals. He argues that mandatory membership in social insurance schemes creates the possibility of breaking the link between premium and individual risk[24] and offers additional risk protection. Although the risks of old-age and longevity are insurable in the private market, a government-run social insurance scheme can protect individuals against the whims of the market and insure society as a whole against risks like inflation, war or economic downturn, spreading them across generations (Barr, 1998). Even if private pensions could insure against such risks, they would lead to significant inequality between different generations of pensioners. Individuals who retire during periods of economic boom benefit from the accumulation of high returns, while individuals who retire in periods of economic downturn take out small pensions. Thus, under FF systems, individuals face financial risks: the real return on their retirement savings might fall below expectations, converting them into annuities will bear a variable price according to market interest rates, life expectancy and level of adverse selection in the market. After that, there is always the risk of inflation.

While recognising the benefits that a switch to a FF system would bring, Geanakoplos, Mitchell and Zeldes (1998) also stress the importance of transition costs

[24] It is possible but not essential, as a newer variant of a reformed PAYG system (the NDC scheme) will show in the next chapter.

and warn against the loss of social risk pooling. Assuming that FF pension systems feature no redistribution between individuals (because of the exclusive link between contributions and pension benefits), the benefits of switching could be offset by the loss of risk sharing.

Investment risk

Under a private FF system, individuals are able to place their retirement savings in investment portfolios that match their disposition towards risk. One of the empirical findings of a study by Bodie and Crane (1997) is that, in the U.S., individuals place their retirement savings in a well-diversified portfolio consisting primarily of equities and long-term fixed income assets, with the share of equities in total assets rising with individual wealth but declining as individuals age.[25] However, faced with a bewildering choice of investment instruments, individuals find saving for retirement very difficult given the complexity of the decision making process due to the specialised knowledge required. As mentioned earlier in the chapter, individuals have problems with self-control, unstable preferences and display myopic behaviour. Thus, individuals are unable to make rational long-term saving and annuitization decisions, so that choice and preferences in retirement matters might not mean much. Further, as Geanakoplos, Mitchell and Zeldes (1998) point out, depending on knowledge and luck, individuals might make good or bad investment choices, with social as well as personal consequences.

Under a public PAYG system, the individuals do not have any choice in the matter of investment portfolio but they face no investment risk either. However, focusing on the lack of investment risk in PAYG schemes is misleading because this ignores the fact that FF schemes also offer investment options with minimum risk (Bodie, 1990a). Bodie stresses that investment risk should be associated with the inability of the FF schemes to guarantee that the combination of contribution plans and asset portfolio allocations will provide the desired level of benefits at retirement.

Inflation risk

FF systems can deal with inflation during the accumulation phase by portfolio diversification (international and domestic) and investment in inflation-protected assets such as government gilt, while at retirement the annuitisation process would incorporate an element of anticipated inflation. However, during retirement,

[25] Bodie and Crane take on board this finding and advocate is as a principle.

unanticipated bouts of inflation would negatively and irrevocably affect the value of the pensions in payment – there would be no way for the pensioners to recuperate the losses or increase their pensions. In contrast, under most PAYG systems, benefits are indexed to wages before retirement and to prices during retirement. The distinction in indexation methods is important because while indexation of benefits to prices is straightforward, as the benefits have to reflect the real value of the contributions made, the indexation to real wages is based on social justice arguments - that pensioners are entitled to enjoy the productivity gains in the economy as well as the inflation protection (Gillion, 2000).

Political risk

PAYG systems are always exposed to political risk. PAYG systems are publicly managed, which means that the governments often have privileged access to the funds, being able to spend, borrow and finance their deficits from these funds at a low cost, interest paid usually being lower than inflation. FF systems are based on privately managed funds who will see these funds invested on financial markets, which means that the governments can still access them, but at the prevailing market interest rate. Also, in PAYG systems, the future levels of contribution rates and pension benefits are determined by future voters, fact which has serious implications in difficult situations such as finding ways to finance increased future PAYG pension deficits. Raising future contribution rates would prove to be unpopular with future working-age voters, while lowering future pension benefits would be opposed by the future pensioner voters. Future working-age voters might decide to reform radically the structure of the existing PAYG system or turn their back on the system's past promises. Valdés-Prieto (1998) argued that the main reason for pension system privatisation in Latin America was to insulate pensions against the political interference that had negatively affected the previous PAYG systems.

Nevertheless, in spite of the public misconception, political risk is present under a private FF system as well. Whitehouse (1999) points out that governments may not be able to tamper with the private personal retirement savings accumulation contract, but they may still affect the value of the pension rights by changing the tax treatment of contributions (employer's and employee's), capital gains (income accrual inside pension funds) and pension themselves (retirees' income).

The risks pertaining to the two alternative pension systems have been debated at length in pension reform literature (Burtless, 2000; Hemming, 1998; Holzmann, 1998). The risks run by the two types of pension systems are shown in the Table 1.4. Both FF and PAYG approaches offer individuals varying levels of protection against risks, but neither can insure against common shocks. Therefore, it cannot be concluded that FF systems are superior to PAYG arrangements.

Table 1.4. Responsiveness of PAYG and Fully Funded schemes to main risks

Risks	PAY-AS-YOU-GO	FULLY FUNDED
Ageing (higher dependency ratio)	**Exposed** (deteriorating finances)	**Less exposed** (no direct effects)
Unemployment or low wage growth	**Exposed** (lower revenue but effects on individuals can be mitigated)	**Less exposed** (no effect on financing but affected individuals receive lower benefits)
Political bargaining	**Exposed** (high responsiveness to fiscal situation and easy contract change)	**Less exposed** (low responsiveness to fiscal situation and difficult contract change)
Financial crisis (depression, war, hyperinflation)	**Less exposed** (lower revenue but effects on individuals can be mitigated)	**Exposed** (accumulated stock reduced or even eliminated)

Source: Barr (1998); Chlon, Gora and Rutkowski (1999); Holzmann (1999)

As mentioned previously, some authors, like Barr (1998, 2002), consider the debate of PAYG versus FF to be of secondary importance, subordinated to the government's ability to manage the economy effectively and promote adequate growth, thus providing the stable foundation for either pension system. According to Barr (2002), the most important issue that pension system reform must solve is the demographic pressure. Barr argues that, along with deterring early retirement, encouraging productivity growth is the only way to meet future income requirements. Governments have to either manage public systems efficiently or provide the private systems with the regulatory and institutional framework that facilitate high standards and transparency. While maintaining that having an effective government offers a considerable range of choice, Barr considers parametric reform (discussed later) to be more suitable for more types of countries, a conclusion also found in a study by Chand and Jaeger (1999).

1.5. Pension Reform Paths

Literature distinguishes two types of reform: parametric (moderate) and systemic (complex, radical, comprehensive). Parametric reforms are the most commonly used and least complex way of reforming PAYG systems, directed at diminishing the system dependency ratio (to a level at which the PAYG pension liabilities are sustainable in the long run – i.e. affordable to the current generation of workers) and at closing the extremely visible gap between the pension system dependency ratio and the demographic dependency ratio (as shown Table 3.3, Chapter 3). On one hand, this means reducing the number of beneficiaries (by increasing the retirement age limit, restricting early retirement and disability options) and raising the number of contributors, on the other.

Table 1.5. The two conventional types of PAYG reform

PARAMETRIC, MODERATE	SYSTEMIC, RADICAL
Adjusting the existing defined benefit (DB) key parameters:	Switching to new systems based on defined contribution (DC) components that are:
• Contribution rate • Replacement rate ➢ Pension formula ➢ Accrual factors ➢ Contribution period ➢ Indexation ➢ Demographic factors ➢ Early/late retirement • Coverage ratio ➢ Statutory retirement age	➢ Mandatory ➢ Privately managed ➢ Fully-funded • Substitutive • Parallel • Mixed

As Chand and Jaeger (1999) show, parametric reforms are comprised of adjustments in contribution rate, replacement rate (mainly by changing the benefit formula, by reductions in accrual factors, lengthening of assessment periods, changes in indexation, introducing demographic factors and actuarially fair adjustments to early/late retirement) and pension coverage ratio (probably the most frequently considered, increasing the statutory age for retirement). A gradual phasing-in is needed, especially in the case of the last type of adjustment, in order to limit the unfair treatment between different generations of workers. Raising the retirement age will affect most severely the working-age individuals who are close to retirement. However, the increase in labour force will translate into higher domestic output, which should lower consumer prices, benefiting all population cohorts.

A study by Mulligan and Sala-i-Martin (1999a) in a cross-section of countries found that the share of GDP devoted to public pensions was positively correlated with the incentives to retire implicit in benefit formulas and with per capita income growth. As a result they argued that pension reforms should remove the retirement incentives previously imbedded in the PAYG systems. Usual PAYG systems required benefit recipients to be of a certain age (the statutory retirement age) and to have accumulated a number of years in employment (and, consequently, in contribution payment years). Usual pension rules also required individuals to permanently leave their jobs and, in case of continued employment, specified a mandatory retirement age.

Under reformed PAYG, workers should be able to choose between retiring and claiming their pension or remaining employed and delaying the receipt of higher future pension annuities (given that more pension rights are accumulated with additional years of work over the same expected lifetime). The choice depends on whether the increase in future pension annuities is enough to compensate for the years of pension benefits foregone. The higher the opportunity cost of continuing employment, the more likely individuals will retire. The pension scheme would be considered actuarially fair if the present discounted values of the pension annuities equate, as it would not matter whether the benefits are first claimed at the statutory retirement age or later on.

In order to break the vicious circle of increasing tax and contribution rates and rising evasion, expenditure savings will have to be sought by lowering the rates in concert with lengthening minimum contribution periods and reducing benefit levels, especially because the demographic dependency rate is predicted to worsen in the future. Such changes in pension formula would also help strengthen the relationship between contribution and benefits and thus, help reduce the practice of evasion.

Under most PAYG systems the burden of contributions is split between workers and their employers. The effects of increasing employers' social insurance contributions are multiple. In the short-run, higher employer contributions will be transferred to consumers through higher prices. In the long run, employers will try to lower wages or, if the contribution increase is perceived as too high, they might start laying-off staff. Thus, Palmer (1999) considers that employers' contributions to the pension system come at the expense of higher wages for workers and higher prices, meaning that the workers pay the tax anyway.

However, altering the way the contribution is shared between employees and employers would further help the contribution-benefit link. Shifting a larger share of the contribution to the employees, matched by an increase in their gross wages, would have no effect on the total labour cost or the net wages, but it would indicate more clearly who bears the responsibility of the benefits and would diminish differential treatment among workers (self-employed vs. regular employee). Chand and Jaeger (1999) also point to another parametric adjustment, increasing the budget transfer rate, which they deem as desired for a temporary period of time in case there are serious political costs associate to the adjustment of the other system parameters.

Systemic reform involves radically changing the system, switching to new systems having a mandatory fully funded private pension scheme, which is either substituting (the PAYG is phased out – the substitutive model), competing with (individuals have to choose – the parallel model) or complementing the public PAYG scheme (the two coexist – the mixed model) (Mesa-Lago, 1997). In the recent years, following the efforts of the World Bank and the IMF, it is the last type of reform, which combines public PAYG and private FF components into a 'multipillar' system that has gained the most followers.[26]

1.6. Conclusions

Securing old age income is an age-old problem with a never-changing solution - the process of saving. The theory of saving starts with the classical economists' long-lasting view (as both the difference between income and consumption and the accumulation of capital stock), is jump-started by Keynes' postulates (the consumption function, the psychological law and the savings motives), and is calibrated by Pigou and Metzler (replacing Keynes' disposable income with real net wealth instead). The modern (post WWII) additions to the theory have resurrected the forgotten contributions of Fisher (time preference and lifetime income) and have focused on inter-temporal consumption and saving allocation. Arrow and Debreu have shown that, in an inter-temporal economy with perfect foresight and a complete set of markets, it is possible for individuals to accurately plan their lifetime

[26] The study uses the concept of 'pillar' to denote different pension provision components within the systems. Other authors use the term 'tier' to mark the same differences between pension components constructed around the already mentioned design dichotomies - public - private, mandatory - voluntary, PAYG - fully-funded.

consumption. The life-cycle theories focus on modelling lifetime saving decisions around the life-cycle stages (childhood, work participation years and retirement) based on lifetime income and time preference under the assumptions of rational behaviour and expected utility maximisation. The latest batch of studies continues tweaking the life-cycle model in order to improve its predictions by taking into account actual human behaviour.

If over time, the views on the role and determinants of savings have kept changing so has the choice of savings vehicles. Until the industrial revolution, securing old age income meant, for the few well off, saving in real assets or in a business; for the majority, who couldn't save, it meant relying on the family or on charity. Beginning with the 18^{th} century, pensions and savings start becoming available to an increasing number of people, culminating with the late 19^{th} and early 20^{th} centuries when mandatory state run social insurance schemes spread throughout the world. The development and expansion of the social security systems backs the theories that justify government intervention in old age income provision.

Nevertheless, the pressures felt by social insurance systems in the last decades have ignited a debate over the design of pension systems – on the one hand, the public unfunded PAYG social insurance scheme, and, on the other, the private fully funded individual accounts scheme. There are different benefits and risks associated to the two schemes and it cannot be said which system is superior to the other. This debate brings up the issue of reforming the incumbent public PAYG systems. Two strategies are available: parametric reform, aimed at reducing the system dependency ratio, and systemic reform, involving new private fully-funded schemes that can replace or coexist with the PAYG schemes. Given the inconclusive outcome of the debate on fully-funded versus PAYG pension schemes and the widespread misgivings about the PAYG systems, systemic reform involving a public-private mix has become the strategy of choice, not least because international institutions such as the World Bank and the IMF have championed it. The discussion of the following chapter focuses on analysing the World Bank's 'multipillar' pension reform strategy.

CHAPTER 2.

THE WORLD BANK INITIATIVES AND THEIR THEORETICAL UNDERPINNING

2.1. Introduction

This chapter focuses on the presentation and critical analysis of the dominant pension reform model: The World Bank's multipillar system. Given the inability of the standalone PAYG and FF pension schemes to protect against all risks, the World Bank makes a case for a pension system that combines a public PAYG pension component with a private FF component. The criticisms are mostly directed at the World Bank's recommendations for the private component. The chapter then presents the Notional Defined Contributions scheme - a recent innovation in the reform of the public pension schemes, which tries to improve the tradeoffs between the public PAYG and private FF pension schemes. Lastly, the chapter discusses certain aspects of the political economy of pension reform relevant for the subsequent chapters.

2.2. The World Bank Model

In 1981, under the military dictatorship of General Pinochet, Chile was the first country in the world to switch from a public PAYG pension system to a multi-pillar scheme in which the lion's share of old age security falls to private, fully funded pension funds. Since 1981, several Latin American countries have privatised their pension systems to varying degrees. Chile's experience, however, remains the most successful example of social security privatisation.[1] Supporters of the Chilean reform, for example Coronado (1997), claim that switching to a fully funded, private system is expected to increase long-term national saving and help deepen the capital markets, thus spurring long-term growth and decrease the role of government and of public spending. The significance of the Chilean case resides not only in developing a substantially new concept for reform but also in putting a long-existing liberal reform into practice and establishing a precedent. The Chilean experience soon became a model that influenced reforms throughout Latin America and beyond (Holzmann, 1994; World Bank, 1994).

[1] The cases of Chile and Argentina are detailed in Chapter 3, which also includes a synthesised comparison of the Latin American pension reforms (see Table 3.1).

The Chilean model gained international prominence when the World Bank published "Averting the Old Age Crisis" (1994), a report that tried to establish the guiding criteria for the World Bank policy on pensions. The report intended to address the global problem of old-age protection with a universal strategy modelled based not only on social policy considerations but also on macroeconomic goals. Beside stirring international public debate on the subject of pensions, the report also helped in laying the foundations for the "New Pension Orthodoxy".[2]

The New Pension Orthodoxy integrates old-age security reform in a larger neo-liberal reform package, dismissing the populist welfare state and supporting the private provision of social security. The change to a more liberal paradigm seems integrated in the larger international trend in economics (Schmähl and Horstmann, 2002). A new "Regulatory-State model", based on liberal ideology and directed towards the affluent, in line with the 'subsidiarity' principle of the Catholic social doctrine, is strongly promoted against the traditional "Welfare-State model". In this new vision, the Regulatory-State is supplemented with a reduced Welfare-State component targeted towards the poor (Nitsch and Schwarzer, 1996).

The World Bank Report (1994) focused on the impending old-age crisis, deplored the traditional social insurance systems as unsustainable and made a case for pursuing structural reforms that emphasise individual choice and responsibility. The World Bank criticized the traditional Bismarckian[3] PAYG pension scheme for several weaknesses embedded in its unfunded single public pillar feature: weak link between contributions and benefits, labour market distortions, and susceptibility to political manipulation. One criticism was that the substitution of political action for private action in old-age income provision has distorted the relationship between individual efforts and benefits (in the sense of workers trying to minimize their active-lifetime contributions knowing that pension benefits are guaranteed and financed by a future generation of workers), this proving to be one of the major destabilizing sources in the system. A further criticism regarded the payroll tax route of financing the PAYG systems. Under PAYG, contributions are, in effect, payroll taxes that artificially increase the cost of labour and thus affect negatively the employment and alter the allocation of resources in the economy (increasing the informal sector). Retirement

[2] Term used by authors like Müller (1997) and Orenstein (2000) to label the dominant faction within the international pension reform debate, which endorses the privatization of pension systems.
[3] See previous chapter.

benefits are a function of the size of the tax base, which, in turn, depends on the size of the labour force and real wages. As PAYG benefits are paid regardless of labour force participation, there are negative labour effects (early retirement) - a reduction in labour force participation does not translate into lower pension benefits. A related critique was the negative effects of PAYG on fertility as securing old age income reduces the incentive of developing a family (traditionally needed for old-age support). Also, a point was made of the fact that the PAYG schemes are, basically, intergenerational transfers of wealth highly dependent on the political process. The World Bank further argued that national saving and growth are negatively affected by the PAYG, accumulated reserves (if any) are publicly managed poorly and that the rise in pension expenditure was responsible for increasing fiscal deficits, inflation and cuts in social spending (e.g. in health and education).

In consequence, the World Bank drew heavily on the Chilean precedent and, originally, recommended a model purged of traditional social insurance features as a universal plan:

- the first pillar - a non-contributory anti-poverty pillar guaranteeing a basic pension;
- the second pillar - a mandatory private savings pillar;
- the third pillar - a voluntary private savings pillar.

However, in the following years, the World Bank revised its original model and now recommends, “as a benchmark, not as a blueprint” (Holzmann and Hinz, 2005) a multi-pillar system involving a combination of pay-as-you-go and funded pension schemes, including the following components (Holzmann, 1999; Holzmann and Hinz, 2005):

- the “zero pillar” – a non-contributory tax-financed component aimed at poverty alleviation which provides a minimal level of protection in the form of an universal flat benefit, social pension or means tested pension benefits;
- the first pillar - a mandatory pay-as-you-go (PAYG) public pension scheme designed to provide an income floor for all elderly persons, with inter- and intra-generational redistribution, funded and earnings-linked to various degrees (in most countries, these pillars are defined-benefit with the level of benefits set by the government);

- the second pillar - a mandatory fully funded, defined-contribution and privately managed pension scheme - whose current reserves are equal to or greater than the present value of all future pension payment liabilities, based on personal accounts (the Latin American approach) or occupational plans (the OECD approach), where benefits depend on the individual's account at retirement provided as lump sums or annuities;
- the third pillar - a voluntary system (funded and privately managed), already present in many countries, incorporating 'saving incentives' (see previous chapter) which provide for additional savings and insurance;
- the fourth pillar – informal intra-family or inter-generational support for old age income, health care and housing.

The pillars differ from one another in objectives, contributions and benefits link, private or public ownership and individual choice in participation. According to the World Bank, there are many advantages related to this system centred on risk diversification.[4]

The 'zero' pillar is focused on alleviating poverty among the low-income earners. Providing a flat rate pension benefit would potentially have low administrative costs and rapid deployment. Employing means testing also has the potential to reduce pension costs by excluding the high-income earners and to diminish income disparities; however, it would be more costly to administer and could potentially exacerbate the moral hazard problem present in this public pillar, by deterring individuals to save on their own.

The first pillar usually represents a mandatory PAYG public pension. Given the ability of government to tax, to make transfers and to insure against inflation (as discussed in the previous chapter), there is almost a general consensus regarding the existence of a mandatory public pension insurance system aimed in particular at low-income earners (Hemming, 1998). The unfunded first pillar offers an income floor, which should make the goal of adequate retirement income more attainable. According to the "goal gradient hypothesis" (Katona, 1965 – the closer a person gets to achieving a goal, the harder he tries to reach it), this could encourage individuals to save more for retirement than they had been (i.e. engage more fully in the second and third pillars). Redistribution is still present in the 'zero' and the first pillars, so the

[4] The individual pillars are meant to handle different specific risks such as longevity, disability, and early death with survivors, while co-insuring against uncertainty. (James, 1997a)

government still has scope for political decisions, but, at the same time, by separating and privatising pensions, old age income security is taken out of the political process (Disney, 1999).

Holzmann (1998: 25) stressed that diverting contributions to the second pillar would lead to a "deeper, more liquid and more competitive" financial sector. Thus, the role of market in old-age income provision would be strengthened, the public-private mix would offer ways to diversify against different types of risks, and there would be a strong and transparent link between contributions and benefits. The strong link between contributions and benefits specific to fully-funded defined contribution schemes, is intended "to reduce labour market distortions, such as evasion by escape to the informal sector, since people are less likely to regard their contribution as a tax." (James, 1997b: 10) The second pillar is intended to help individuals in consumption-smoothing over their life cycle, to enhance risk coverage, to diminish asymmetric information and to eliminate free-rider problems (Davis, 1998). Asymmetric information and improved protection against risks and uncertainties advocate making membership in this pillar mandatory as well (Barr, 2002; Davis, 1998). Also, the compulsory membership would eliminate problems associated with irrational economic behaviour (lack of stable, ordered preferences, hyperbolic discounting, lack of self-control).

The World Bank underlined the positive role of private fully funded pension provision and emphasised that a multipillar approach would bring economic gains from lesser labour distortions, improved financial markets and potential higher savings. The World Bank promoted the model as a vehicle for spurring economic growth by furthering macroeconomic stabilization, advancing comprehensive liberalization, public sector reform and helping institution building (Holzmann, 1999).

Thus, the World Bank model's theoretical underpinnings are neo-classical: advocating the fully-funded pillars based on the belief in the savings-investment-growth transformation link and for actuarial fairness reasons centred on the life-cycle hypothesis, stressing individual responsibility and freedom in allocating resources during lifetime based on the life-cycle hypothesis, highlighting the contribution-benefit link as a labour market incentive and converting contributions from taxes into savings in order to minimise labour market distortions, aiming to limit pension-related government expenditure and redistribution in order to minimise harmful government intervention.

2.3. A Critique of the World Bank Model

The ILO has been one of the most resilient opponents of the World Bank model, a staunch defender of the social insurance systems. The ILO emphasised the role of the principle of solidarity in justifying the existence of social security pension schemes in addition to individual protection measures and argued that the responsibility for minimum old age income security lied with the state (Gillion, 2000). Where the World Bank argued the need for structural reform, the ILO stressed the parametric reform. Instead of highlighting the role of the private markets and individual responsibility and choice, the ILO promoted tripartite structures of governance (workers, employers and government). If the World Bank advocated pension reform as a stimulus for economic growth, the ILO emphasised concentrating on the main objective of old age income provision (Beattie and McGillivray, 1995). While the World Bank put the accent of the reform on defined contributions, a fundamental principle for the ILO has been that the retirement income should be predictable and guaranteed (Gillion, 2000), already embodied in one of its landmark recommendations – the 1952 ILO Social Security (Minimum Standards) Convention (no. 102) set a replacement rate of 40 percent of either the average wage of a male worker or the individual's own previous earnings.

Many of these arguments are supported by other economists. Kotlikoff (1999) underlined the fact that guaranteeing adequate retirement income is the most important goal of pension reform. Orszag and Stiglitz (2001), in their review of the World Bank model, reminded economists that the objective of public policy is to maximise social welfare (and not, for example, to maximise the labour supply or to develop the capital markets). In light of the financial crises of the 1990s, economists have started to recognise that, as a result of volatility, the replacement rate of fully-funded defined contribution accounts may cause substantial inequity between individuals retiring at different times (Holzmann and Stiglitz, 2001) – as discussed in the previous chapter.

However, a consensus seems to be emerging: just as the World Bank has revised its position on PAYG components, the ILO has conceded the need for fully-funded pillars and has proposed a multipillar model of its own (ILO, 2000) on the same bases of political and market risks diversification The ILO model features:

- a first tier - a non-contributory component offering a means-tested minimal social pension financed from general revenues aimed at poverty relief;
- a second tier - a mandatory, publicly managed and defined benefit PAYG component providing fully indexed benefits of 40 or 50 percent of lifetime average earnings;
- a third tier - a mandatory (subject to a ceiling) fully-funded defined contribution component, possibly managed by private pension agencies, providing benefits in the form of annuities;
- a fourth tier - a voluntary, privately managed, fully-funded defined contribution component.

Nevertheless, ILO (2000) states clearly that it still views contributory social security schemes the main source of retirement income. Gillion (2000) shows that the ILO also supports the newly emerged notional defined contributions scheme (NDC – to be discussed later in this chapter) as an alternative to the multipillar system.

More generally, the critics of the World Bank pension reform mainly point to the inconclusive evidence for the effect of funding on savings and growth[5], the fact that mandatory saving crowds out personal saving (see previous chapter discussion) and the high costs associated with the transition to a multipillar system and the administration and regulation of the second pillar. There are also issues with the overemphasis of the individual account approach (private management and defined contributions) and the marginalisation of participatory governance of the pensions.

<u>Overemphasis on individual savings accounts</u>

One of the main critiques in set out in a paper by Orszag and Stiglitz (2001) and concerns the fact that the World Bank multipillar model has been mostly interpreted as requiring a second pillar based on individual saving accounts. They maintain that opting for a second pillar of individual saving accounts restricts choice in pension strategy by bundling together four different aspects of pension reform, which they identify as:

[5] Mesa-Lago (1997) estimated that, in the first 10 years of the new system in Chile, the reform-related pension deficit (4.0 percent of GNP p.a.) exceeded the extra personal saving generated by the fully-funded pension scheme (2.4 percent p.a.). He forecasted the deficit only disappearing in 2020 - 40 years after the pension reform in Chile. Similarly, in Mexico, in 1997, the fiscal costs of the pension system transition were estimated at around 1.5 percent of GDP. This suggests that in the short and medium term, there are no reductions in public spending or increases in national savings and, thus, no extra growth stimulated.

- privatisation – switching from a publicly managed system to a private one;
- prefunding – accumulating assets towards the future benefit payments;
- diversification – allowing investment in various types of assets other than government securities;
- defined benefit versus defined contributions – choosing between assigning risk accrual to the sponsor or to the individual, respectively.

Orszag and Stiglitz argue the need for a broader view of the second pillar, including funded, publicly managed and defined benefit plans, allowing policymakers more choice in pension reform design (deciding on each of the four aspects separately).[6]

The importance of defined benefit occupational plans has long been argued by other economists such as Bodie (1990a). Defined benefit plans are usually provided by large employers and offer benefits linked to final salary or to life-time average pay. The pensions provided under defined benefit plans are best seen as participating annuities[7] that provide a guaranteed minimum pension level and are supplemented at various times depending on the financial situation of the employer, the inflation indexation commitments and the performance of the fund's assets. (Bodie, 1990a)

Bodie argued that given the complexity of the retirement plans decisions and the costs associated with gaining the specialised knowledge involved, the employers are in good position to offer retirement schemes that could suit the needs of many of their employees. He states that employers are able to save more efficiently than individual employees, as they have better information regarding the long-term financial outlook of their employees and can forecast future income streams for groups of employees. Further, large employers will also benefit from economies of scale in handling information and administering the schemes.

Financial intermediaries have access to capital markets unavailable to individuals and, by pooling risk, should be able to offer affordable insurance. However, as mentioned earlier, adverse selection and moral hazard may prevent individuals from getting the level of insurance desired at an adequate price. Insuring as a group, through an employer, should mitigate this problem. (Bodie, 1990a)

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[6] In his comment on the paper by Orszag and Stiglitz, Valdes-Prieto (2001) argues that the standard interpretation of the second pillar - as privately managed, defined contribution scheme – still applies for the developing countries.

[7] A non-participating annuity provides benefits that are fully guaranteed by the insurer – annuities are discussed later in this section.

Additionally, in the case of occupational plans, agency problems are diminished. Employers have an added incentive to provide retirement plans as they can market themselves as organisations that care about the needs of their employees. The level of trust employees have in their employers could increase and, with it, motivation and engagement. Employees' trust could be further enhanced by the knowledge that the company's management is also covered by the same pension schemes. Other pension providers (insurance agents, stockbrokers) may be less trustworthy as they may have ulterior motives in promoting particular investment products. Mis-selling retirement pension plans could mean individuals save too much or invest in inappropriate products. (Bodie, 1990a)

Financial markets and regulation

As mentioned previously, the World Bank model has been criticised for highjacking the pension reform from its main welfare objectives and manipulating it towards financial development and economic growth. The World Bank's intention is understandable - there is a lot of literature attesting to the fact that financial development accounts for a large share of economic growth (Beck, Demirguc-Kunt and Levine, 2001; Beck, Levine and Loayza, 2000; Demirguc-Kunt and Levine, 2001). The consensus among these is that more efficient financial systems should help provide cheaper capital for businesses and attract more savings from more trusting consumers. The clear implication for pensions is that a well performing financial infrastructure (banking system, stock markets, insurance sector) is one of the key social, economic and legal institutions that could facilitate pension system reform (Mitchell, 1998).[8] However, Kotlikoff (1999) argues, in the case of the developing countries, that, while the goal of financial sector development has merit, coercing these countries to pursue a privatisation strategy for pensions would mean pushing them into 'exploiting' their comparative disadvantages.

Davis (1998) argued that radical pension reform required streamlining the regulatory framework, including tax treatment regulation and concerning not only the pension fund administrators but also covering the other financial services providers (i.e. services like insurance, banking, securities markets trading, and legal, accounting

[8] Mitchell (1998) indicates that having a developed stock market can help pension reform, but argues that having it should not be considered a necessary precondition of reform - in developing countries, government securities would make up the bulk of the financial instruments in which the majority of pension funds would invest in the early stages of fund development.

and auditing). He stressed several preconditions to implementing funded systems, highlighting among them the availability of personnel skilled in asset management.[9] Holzmann (1999) mentioned that the creation of an efficient second pillar depended on a country's institutional capacity and political will, and raised concerns regarding the abuse of pension reform in order to support inefficient firms or concentrate control of capital in the hands of a select few. Similar worries had been issued by James (1997a) who highlighted two caveats regarding the introduction of a fully funded pension pillar – first, that "countries must have at least rudimentary capital markets", and second, that "considerable government regulation and regulatory capacity are need in order to prevent fraud and excessive risk" (James, 1997a: 7). She argued that developing countries should implement second pillars at a slower pace and recognises that these countries might be prone to abusing their PAYG pillar.

Orszag and Stiglitz (2001) point out that it is unlikely for the governments prone to abusing public systems to be efficient and honest in regulating a private system. They further argue that the complexity involved in regulating the private pillar would increase the risk of corruption, as interest groups try to persuade the government to adopt non-transparent schemes. Less developed financial markets and inadequate individual financial education compound the problem of regulation design. Orszag and Stiglitz indicate that even in developed countries, with relatively efficient governments and well-developed financial sectors, poor investor education is causing problems (they cite the UK personal pension mis-selling controversy) and the need for investor protection still challenges the regulatory frameworks.

Transition costs

In the case of systemic reforms, the biggest problem is financing the transition cost (already mentioned in the previous chapter in the FF vs. PAYG debate section). Transition costs are inextricably related to the degree of privatisation undertaken; however, they are not an exact measure of it. Reforming to a multipillar system decreases income in the PAYG pillar by diverting a share of total contributions to the FF private pillar. The ageing process decreases PAYG contribution totals even further. The transition costs are reflected in the increased burden on the working age population – active workers have to start contributing to their own private pension

[9] Along with support staff - actuaries, accountants, auditors, financial management experts, attorneys and computer specialists.

accounts while still providing the funds necessary for meeting existing pension liabilities. The reform requires staggered changes until the new system matures while the old system's promises to the older generations have to be honoured – thus, there is a choice in systemic reform strategy between running two parallel pension systems or devising instruments for acknowledging the older generations' pension rights. Holzmann (1999) listed the options available for covering the PAYG deficit representing the obligations towards the current retirees and individuals with acquired PAYG rights:

- partial default on promises to existing workers, particularly younger ones;
- using the proceeds from privatisation of collectively-held assets;
- using debt financing in order to spread the costs of transition into the future when the economic growth rate will have been enhanced by other aspects of the reform – better labour market incentives, less tax evasion, and more efficient use of existing capital;
- using fiscal measures outside the pension system, by raising other taxes or by cutting other government spending.

Generally, transition costs would have to be matched either by raising taxes, increasing budget transfers or by acquiring debt.

Tax financing (raising taxes or contribution rates) would bear political risk, being seen as unfair for the current working generation. Covering the transition cost with transfers from the central government budget would be equally unfair. Finding other sources, like revenues from privatisation and government expenditure cuts, is more desirable. Parametric reforms in the first pillar, such as reductions in future PAYG pension benefit payments, would also partially compensate the transition costs even though this would be unfair to the pensioners.

Debt financing, while less risky from the political point of view, implies simply shifting the burden on future generations. Valdés-Prieto (1998) argued that the introduction of government bonds in the financing of the transition deficit would be beneficial as it would serve to 'politically insulate' the pension system from the political process, as the bonds would guarantee the pension rights. However, those pension rights would still depend on the economic ability of the government to keep its future promises - the case of Argentina's government debt default is a warning in this respect.

The pension fund administrators' limitations on investments are also important. The transition costs also depend on the debt to equity ratio in the asset composition of the private pension funds. Issuing new bonds satisfies the demand for investment instruments coming from the new pension funds and allows the current generations to maintain their consumption (World Bank, 1994). If pension funds are required to invest only in government bonds, then the demand for government bonds will equate the PAYG deficit. The transition cost in this case will be covered. However, to the extent that all the pension contributions switched to the FF pillar are invested in public debt and not in private capital assets, the reform will only achieve a privatised version of the unfunded PAYG.[10] (Holzmann, 1998; Kotlikoff, 1999)

Debt financing transforms implicit pension debt[11] into explicit debt and, while this action might not have any macroeconomic effects[12] (Orszag and Stiglitz, 2001), it might change individuals view on the government budget (Holzmann, 1998; World Bank, 1994). In addition, there is the cost of interest – higher annual debt service, which will have to be financed either by raising taxes or by decreasing government spending. This way, it can be argued that the real aim of pension reform is to influence public opinion towards further reductions in government spending (Palley 1998).

Administration costs

If one of the reasons for pursuing a privatisation strategy in pensions was the higher rates of return associated with the privates schemes and dynamic efficiency considerations (see previous chapter), Orszag and Stiglitz (2001) argue that administrative costs are likely to consume a significant share of the individual savings accounts balances, to the extent that the rate of return of a decentralised private system could even be lower than the implicit rate of return under the old public systems.

[10] Orsag and Stiglitz (2001) define this as "a narrow prefunded scheme".
[11] Defined as the present value of the promises to individuals with pension rights accrued under the old pension system. The older the population (pensioners and workers nearing retirement) and the more generous the PAYG benefits, the higher will be the implicit debt.
[12] Mulligan and Sala-i-Martin (1999a) point out that there is evidence that individuals find it hard to borrow against future PAYG benefits, due to either government regulation or the individuals' reluctance to use pensions as collateral. This might be of importance in the case of debt-financing of the transition deficit, as government bonds are habitually used as collateral around the world and so the individuals' liquidity constraint would be lessened.

The introduction of a second private pillar will carry several fixed costs for the setting up and administrating private individual accounts. The larger the proportion of contributions being shifted to the private pillar, the lower the relative administration costs. Conversely, if the initial share of contributions being shifted is small, the administration costs will seem large when calculated as a percentage of these shifted contributions. In this case, consequently, the net rates of return could be adversely affected, especially if the individuals are close to retirement age and are only able to contribute to the second pillar for a short period.

In their study, Orszag and Stiglitz (2001) doubt whether competition among the pension funds will be enough ensure low administration costs and stress the importance of the second pillar's structure of individual accounts. According to a study by James, Smalhout and Vittas (2001), there are two alternative methods for organising mandatory individual accounts systems:

- the retail market approach, in which workers choose their own pension funds;
- the institutional market approach, in which choice is constrained and investment conditions are negotiated for larger groups or the entire labour force.

The government implements regulations in the first case and organises the competitive bidding in the second case. The aim of the pension administrators is to attain economies of scale by pooling contributions from many individuals, however, in achieving this, they incur high marketing expenses. Covering these large marketing costs accounts for a big chunk of the annual fees levied on assets, and the size of the fees has an immense importance – according to James, Smalhout and Vittas (2001), a 1 percent annual fee reduces retirement accumulation by 20 percent for a lifetime contributor, so administrative costs in the retail market reduce pensions by 15 to 30 percent. As a result, high administration costs constitute the main critique of the decentralised individual accounts based on the retail market approach.

James et al. argue that the institutional approach with constrained choice (under which the government auctions the asset management rights to its private pensions pillar contributions to investment companies, selects a small number of winners, negotiates investment strategies and restricts investment portfolio choice) can achieve substantial cost cuts, raising accumulations and pensions by 10 to 20 percent; however, the approach also runs risks of political manipulation, corruption, collusion, regulatory capture and decreased performance incentives. Orszag and Stiglitz (2001) argue the same conclusion - centralised approaches reap economies of scale and have lower costs than decentralised approaches (as in Chile).

Orszag and Stiglitz (2001) break the administration costs into three components:

- the accumulation ratio – fund management and administrative fees on balances and/or contributions made to a single pension fund (throughout an individual's active lifetime);
- the alteration ratio – additional costs relating to penalties for switching to another pension provider, stopping contributions or failing to make a scheduled contribution payment;
- the annuitisation ratio – costs in converting an account balance into an annuity.

As analysed by Whitehouse (2001), the type of fees charged is important – fees charged on contributions generate more up-front revenues than fees on assets, allowing for a more rapid recovery of pension fund administrators' start-up costs, while fees on assets ensure a constant stream of revenue (even from individual accounts where contributions have stopped). Also, while fixed charges on assets redistribute from individuals with larger assets (older, male contributors) to individuals with fewer assets (younger, female contributors), fees on contributions redistribute from high-income earners to low-income earners.

Portfolio regulation implications

Kotlikoff (1999) condemns the World Bank for not recommending the developing countries to adopt transparent policies and to fully open to international capital. A previous section has pointed out that the portfolio restrictions have a strong implication regarding the degree to which the system is privatised. In particular, especially in the earlier stages of reform implementation, pension funds are recommended to invest mainly in government bonds. It was argued that requesting a large proportion of pension fund assets to be invested in government debt instruments will diminish transition cost levels but will also reduce the level of prefunding in the resulting system. Further, contrary to the recommendation that the pension funds invest in public bonds, generating the advocated higher rates of return in the FF pillar will imply the pension funds' need to diversify their assets in domestic and international private securities. Orszag and Stiglitz (2001) recognize that diversification of pension funds investments could help achieving higher rates of return; however, they point out that, in efficient markets, higher rates of return are associated with riskier assets and reiterate the idea that diversification through a public defined benefit system is less risky for any individual than diversification carried out through the private defined contribution system. Moreover, Cesaratto (2003) argues that the portfolio reshuffling implied by diversification (from government debt to equities) would turn the pension funds away from their traditional institutional investor portfolio position, while Engen and Gale (1997), Diamond and Geanakoplos (2003) and Holzmann (1998) point out that diversification will lead to a rise in interest rates - due to the fall in bond prices, which would require higher taxes or government spending cuts.

As already mentioned, the World Bank has been criticised for pressurising developing countries to privatise and to invest resources into sectors in which they have comparative disadvantages. Kotlikoff (1999) argues that it is the developed countries that have the ability to offer financial products involving international diversification (lower volatility in returns), international financial expertise and exploitation of economies of scale at low transaction costs (also in Mitchell, 1998; Davis, 2001). Kotlikoff maintains that the World Bank's decision to endorse national governments in channelling a majority share of their pension assets towards domestic investment creates many problems – costs related to creating and regulating the system of pension funds and insurance companies, their supervision and investment policy etc., costs associated with the securities markets, and, crucially, problems stemming from giving pension funds no choice but to invest in risky, inefficient domestic companies or government bonds. The latter worry is also echoed by Orszag and Stiglitz (2001) who discuss it in the context of voucher privatisations.[13] However, while for Orszag and Stiglitz the uncertainty thus present in the second pillar justifies the government guarantee of certain benefit levels, Kotlikoff sees the guarantees as an excuse for extremely risky domestic investment in the private pillar and for the perpetuation of payroll tax financing of benefits. Walliser (2001) also highlights that

[13] They point out that voucher privatisation has created many voucher investment funds whose assets are mostly made up of illiquid shares and whose current market price may not be indicative of their true value.

the presence of government income guarantees fosters moral hazard in the form of individuals running down their savings and relying on the government welfare benefits.

Nevertheless, this strategy of restricting international diversification may be justifiable from a political economy perspective - policy-makers are interested in "creating a 'loyal' source of savings that is committed for the long term, is not subject to capital flight, would permit longer maturities on public debt and reduce dependence on foreign capital" (James and Brooks 2001:142). More recently, a study by Bodie and Merton (2002) suggested the viability of swap contracts as a strategy for pension funds in broad diversification and hedging while avoiding the capital flight. Swap contracts are contracts based on the bilateral exchange of a series of payments at specified intervals over a period of time. As the payments are reciprocated, the size of a swap payment is the difference between the actual value of the contract's object and the value specified in the contract. Bodie and Merton argue that the swaps achieve international risk diversification while leaving the domestic flow of capital untouched, precluding institutional change and enabling financial integration.

Individual saving account decumulation matters

The provision of retirement benefits from the second pillar is centred on the insurance sector and, since most pension-reforming developing countries feature underdeveloped insurance sectors, the efficiency of the second pillar will depend on the successful development of the insurance industry (James and Vittas, 2000). Additionally, retirement under the second pillar is subject to financial markets fluctuations and risks. Holzmann (1999) argued the responsibility of the government for imposing strict regulatory frameworks, specifying portfolio diversification rules (prompting a shift towards low-risk components as workers near retirement) and for providing inflation-protection instruments (indexed bonds).

Provision of retirement benefits can take three basic forms: lump-sum payments, scheduled (phased or programmed) withdrawals and life annuities (James and Vittas, 2000). Lump sum payments are the easiest to administer, however, unrestricted access to account balances may expose some individuals to longevity risk (outliving their savings due to mismanagement of the lump sum), coupled with the issue of moral hazard in the cases where social pensions are offered on a means-testing basis. Programmed withdrawals were first introduced in Chile as an alternative to annuities and, while cheaper, they still run a longevity risk.

As already mentioned in the previous chapter, annuities are long-term contracts sold by insurance companies providing a guaranteed stream of income until death. Annuities cover individuals against longevity risk but expose the individuals to inflation risk and investment risk (as rates of return fluctuate, inequity can arise between individuals retiring at different times). Inflation protection is possible but requires access to inflation-indexed instruments that have only been introduced relatively recently and only in a handful of countries (Bodie, 2001). Since alternative ways of decumulation may involve left-over wealth at death, annuities - if fairly priced - allow maximisation of income over an individual's retirement period (Davis, 2002).

Financial markets have developed a set of annuities, which can be differentiated based on five characteristics (Walliser, 2001): the method of payment (single premium versus a series of payments), the number of covered individuals (individual annuities or joint life, joint and survivor annuities), the waiting period for benefits (immediate annuities with payments starting directly or deferred annuities with payments starting when a certain age has been reached), the nature of payouts (life annuities that provide payments until death, fixed-payments-certain life annuities that also guarantee a number of payments in the event of early death or refund annuities that return a portion of the premium in the event of early death), the variability of payouts (fixed annuities that guarantee a minimum payment, participating fixed annuities that provide a guaranteed minimum and additional non-guaranteed payouts that can vary each year based upon the performance of the company's investment portfolio or variable annuities that only provide non-guaranteed payments in line with investment performance). Variable annuities expose individuals to additional risks – mortality risk and investment risk – but allow taking advantage of higher returns achievable in the future. However, James and Vittas (2000) and Walliser (2001) argue that allowing variable annuities could lead to higher administrative fees being charged, given that companies' risk intermediation function and profits would be reduced. They also advocate the need for portfolio restrictions on variable annuities in order to limit their investment risk. In this context, Bodie (1990a) noted that, in the U.S. financial markets, pension fund performance has been lower on average than the returns generated by mutual funds and he argued that the difference in performance is explained by that fact that pension funds are pursuing investment strategies that hedge against downside risk. Bodie also speculates that new annuity types may develop having the ability to take advantage of higher returns but also being partially protected from downside risk.

A seminal paper by Yaari (1965), using a LCH model with no bequest motive, uncertain lifetimes and complete markets, showed that mandatory complete annuitisation (100 percent of resources) is optimal. However, there is little evidence of voluntary retirement annuities. James and Vittas (2000) observe that annuity markets are not well developed even in advanced countries and proceed with identifying several reasons for this (many of them also found in studies such as Brown and Warshawsky, 2001; Gokhale, Kotlikoff and Sabelhaus, 1996; Mitchell et al., 1999; Poterba and Wise, 1996):

- adverse selection;[14]
- retirement savings made on the basis of bequest and precautionary motives;
- ignorance of longevity risk and myopic behaviour;
- mistrust of insurance companies to provide the annuities in the long term or, in the case of variable annuities, to yield high returns;
- aggressive marketing efforts - necessary to overcome the ignorance and mistrust of the public but which raise the total cost of annuities;
- uncertainty about future inflation, real investment returns and overall improvements in mortality risk - which force insurance companies to raise reserves and annuity prices;
- the likelihood that annuities are a luxury good with a very high income elasticity of demand - appealing mainly to upper income groups who have left-over wealth to annuitise after meeting their bequest and precautionary motives;
- tax policies that may favour the use of lump sum payments;
- public policies such social insurance and occupational scheme pensions that tend to crowd out individual annuities.

As discussed in the previous chapter, the problem of adverse selection in the second pillar can be resolved by making annuities mandatory. However, compulsory annuitisation may force individuals (particularly the low-income) into distributions of

[14] See previous chapter.

wealth that are not optimal (Brown and Warshawsky, 2001). Walliser (2001) also argues that the optimal allocation of retirement income depends on a large number of factors, including benefits from pension schemes, bequest motives and family arrangements, health and long-term care issues, housing, investment portfolio choices, and inflation protection. As a result of this and taking into consideration paternalistic concerns, James and Vittas (2000) recommend mandatory annuitisation only up to a level designed to keep individuals out of old age poverty alongside partial lump-sum withdrawals. Walliser (2001) suggests that the size of the mandate should take into consideration the proportion of retirement income accounted for by the second pillar. He also recommends that individuals be offered a choice between the types of annuities listed above, provided that the remaining income payments exceed the guaranteed pension. Most authors agree that inflation protection should be mandatory and that the government should be responsible for enabling access to inflation-indexed securities either by issuing them or by inducing the financial markets to create them.

Further, there is the issue of the annuities' "money's worth ratio"[15] - defined as "the expected present discounted value of lifetime payouts divided by the initial cost of the annuity" (James and Vittas, 2000: 17). The complexity involved in even simple calculations (choice of discount, interest and mortality rates, life expectancy estimations, sensitivity analysis etc.) makes them non-transparent and raises the issue of whether accurate individual annuity tailoring can be achieved. This highlights again the need for strong regulation - especially in terms of annuity pricing[16] - and investor education.

2.4. The Advent of NDC

After the publication of the 1994 World Bank report, many of the discussions issued referred to improving the trade-offs between the PAYG and fully-funded pillars, stressed by the Chilean experience. Recently, a new form of first pillar has emerged –

[15] More in-depth information on this can be found in studies such as Brown and Warshawsky (2001) and Mitchell et al. (1999).

[16] This involves controversial issues such as pricing distinctions based on sex and income. Using unisex data may be non-discriminatory but is actuarially unfair - as women tend to outlive men, there will be redistribution from men to women. Similarly, as high-income earners tend to outlive low-income earners, there will be redistribution from the latter to the former. James and Vittas (2000) point out that unisex tables also will provide adverse selection-related incentives for insurance companies to improve their risk pool by selling to men rather than women.

the Notional Defined Contributions (NDC) scheme (already implemented in Latvia, Poland and Sweden), which tries to emulate the advantages of the second pillar without the required change in funding (Fox and Palmer, 2000). Within the first pillar, NDC is a major change and has gained popularity in Western Europe and transition economies[17], because it provides a middle road between traditional PAYG defined-benefit and the fully funded defined-contribution systems.

The NDC system functions exactly as a fully funded defined contribution scheme - the participants contribute based on a fixed rate and the value is accredited to their notional accounts (the defined-contribution feature of the system). The account balance earns a notional rate of return determined by real wage growth per capita in a way set by law and not by the market. Also, the administrative costs for running the NDC are deducted from the account balance. Individual account records are kept and life expectancy is one of the parameters monitored (involved in individual decisions about when to exit the labour force). At retirement, the notional account balance is converted into an annuity but in a manner different from real insurance market annuities: the benefits are calculated by dividing the value of the account at the time of retirement to a number based on life expectancy and, in addition, a real rate of return is calculated to the annuity. Afterwards, individuals can combine a full or partial pension benefit with work, continuing to contribute and acquire new rights, and, subsequently, receiving a recalculated benefit.

Nevertheless, the NDC system remains a PAYG scheme - current contributions are used to pay current pension benefits, being in fact a fully funded scheme based on government debt rolling. For some economists, the NDC system is nothing but a thoroughly reformed PAYG defined benefit scheme (Scherman, 1999).

The value of a pension annuity under the NDC formula can be written as:

$$p = AD\sum_{t=0}^{R} cw_t (1 + NRR_t)^{R-t} \qquad (2.1)$$

where p is the pension value, AD is the annuity divisor of the account balance, c is the contribution rate, w_t is the wage at time t, R is the retirement age and NRR is the notional rate of return, with NRR_0=1.

For example, in the Swedish system, the account balance is divided by a unisex annuity divisor, which is determined by the average life expectancy at

[17] Moldova has expressed the intention of moving towards a NDC system in the future and Russia has been considering it (Lindeman, Rutkowsky and Sluchynskyy, 2000).

retirement and an assigned rate of return of 1.6 percent. The present value of future pension benefits calculated using an interest rate of 1.6 percent has to equal the balance in the notional account. After this, each year, the pension benefits are indexed with the rate of growth of the *nominal* average wage minus the 1.6 percent already imputed (Sunden, 1998).[18]

The NDC system is similar to the FF system (see Equations 1.30 and 2.1) in the sense that it makes the pension dependent exclusively on the sum of contributions. However, it should be noted that the key parameters in the notional account formula – the contribution rate, the annual notional rate of return, the annuity conversion divisor and the indexation of pension benefits after the retirement - are entirely under the control of the government, and so, subject to political manipulation. Nevertheless, a NDC scheme, just like regular defined contribution systems, is more rigid in many respects. The system is designed to keep the contribution rate unchanged indefinitely (Scherman, 1999). For instance, in the case of a pensions deficit, increasing the contribution rate would not be a viable response, as this automatically increases the future benefit promises.

In a NDC system, manipulating the contribution rates would not change the level of pensions in the short-term[19] (Settergren, 2001) and modifying the annuity conversion divisor or the rate of return would be fully exposed to public criticism – a simple comparison with private market conditions would be immediately revealing. Again, the main difference is transparency and fairness, even though some authors are sceptical on this subject. Disney (1999) pointed out that the annuity divisor is sensitive to assumptions on expected mortality and rates of return, offering scope for governments to cheat on particular generations. He also contests the idea of transparency, arguing that a pensions formula based on changes in productivity and life expectancy (involved in both contribution accrual and benefit indexation) is far from easily accessible.

Under the NDC, the contributions earn a wage-related notional rate of return while pension benefits are indexed based on wage growth, so benefits and contributions develop similarly. However, this may not necessarily be the case. Assuming that the *NRR* and the real wage growth rate (denominated as g) do not

[18] This implies that the actual pension benefits depend on inflation as well as real wage growth. Pension benefits will loose value if the real wage growth is less than 1.6%.

[19] However, it will affect the level of pensions in the long-term.

change for the duration of the full service period, two individuals starting work and retiring one year apart, will retire with different amounts.

Table 2.2 NDC account balance progression

	Individual A	**Individual B**
0	cw_0	Not working
1	$cw_0(1+NRR) + cw_1$ $= cw_0(1+NRR) + cw_0(1+g)$ $= cw_0[(1+NRR) + (1+g)]$	$cw_1 = cw_0(1+g)$
2	$[cw_0(1+NRR) + cw_0(1+g)](1+NRR) + cw_2$ $= cw_0(1+NRR)^2 + cw_0(1+g)(1+NRR) + cw_0(1+g)^2$ $= cw_0[(1+NRR) + (1+g)]^2$	$cw_0(1+g)(1+NRR) + cw_2$ $= cw_0(1+g)(1+NRR) + cw_0(1+g)^2$ $= cw_0[(1+NRR) + (1+g)]^2 - cw_0(1+NRR)^2$
...	...	...
N	$\mathbf{cw_0[(1+NRR) + (1+g)]^N}$	$cw[(1+NRR) + (1+g)]^N - cw(1+NRR)^N$
N+1	Retired	$\mathbf{cw_0[(1+NRR) + (1+g)]^{N+1} - cw_0(1+NRR)^{N+1}}$

If $a = cw_0(1+NRR)$ and $b = cw_0(1+g)$, the two individuals' account balances are $\boldsymbol{cw_0(a + b)^N}$ and $\boldsymbol{cw_0[(a + b)^{N+1} - a^{N+1}]}$. If the *NRR* is less than the average wage growth rate ($a < b$), then it is clear that individual B has a bigger account balance. Even if the indexation of contributions matches perfectly the evolution of wages ($NRR = g$, $a = b$), the balances becoming $\boldsymbol{cw_0(N+1)a^N}$ and $\boldsymbol{cw_0(N+1)a^{N+1}}$, individual B still has a larger balance ($1+g$ times higher). However, in this last case because, in the NDC systems, the benefits are also indexed to wages, the two individuals would receive the same pensions (countering the $1+g$ factor from above). If the benefits were indexed to prices, the pensions of the two individuals would differ.

One disadvantage of using a rate of return based on average wage per capita is that when the work force decreases, benefits and pension rights will grow faster than the contribution base from which benefits are paid. In order to prevent this situation from happening, some economists suggest introducing a brake mechanism in the NDC system, such as equilibrium ratios between the implicit pension debt and the contribution base (Sunden, 1998).

One of the problems NDC systems have is that short-run fiscal stability is hard to achieve. A continuously balanced NDC account is impossible, unless there are constant demographics or 'automatic stabilisers' are put in place (such as a reserve fund and the above mentioned brake mechanism) (Scherman, 1999). As Disney (1999) argues, the NDC scheme constitutes neither a funded equilibrium (in which accumulated assets are equal to pension liabilities at all times), nor a PAYG equilibrium (in which total contribution revenues must equal total liabilities at each point in time). However, as Valdes-Prieto (2000) argued, financial stability is achievable in the long run, by choosing particular indexing rules (i.e. tweaks in the accrual and the annuity conversion divisor) and allowing assets and debts evolve over time and after the adverse shocks had run their course.

One advantage of the NDC is that it allows for the expression of individual preferences regarding work and leisure, allowing early retirement. Under the traditional PAYG, full contribution history requirements and a retirement age limit prevent early retirement. The NDC promotes a more flexible and gradual exit from the labour force (Palmer, 1999). Workers can retire but also continue work, the new contributions going towards increased recalculated benefits. However, 'locking-in' is possible under NDC as well, even in the absence of a retirement age limit, because the government would have control over the annuity conversion divisor, the notional rate of return and the post-retirement indexation of benefits.

The NDC system aims to promote intra- and inter-generational 'actuarial fairness' by explicitly linking pension benefits to the accrual of contributions and life expectancy. As remarked by Disney (1999), the NDC arrangement attempts to reduce the variation in pension returns within the same generation as well as across generations. It also assumes that welfare gains can be achieved by cutting the deadweight loss associated with the microeconomic distortions of taxes (Feldstein, 1996; Disney, Palacios and Whitehouse, 1999).

The advantages of NDC PAYG in offering flexibility can be summarised as follows (Palmer, 1999):

- the only condition for claiming benefits is reaching the minimum retirement age set by law;
- individuals do not have to effectively retire in order to claim benefits, being able to combine partial benefit with continued full-time or part-time work;
- any portion of a whole annuity can be claimed;
- additional work generates extra contributions which always yield a higher annuity;
- no need to offer special tax treatment to pensioners, income from work and income from pension can be treated equally.

Some authors consider the NDC scheme to be a paradigm shift (Palmer, 2000), creating a direct link between contributions and benefits and sizing the benefit annuities based on life expectancy at retirement. Lindeman, Rutkowsky and Sluchynsky (2000) also argued that the promotion of a 'fundamental' shift in the PAYG pillar under the NDC scheme has proven effective in driving through parametric reforms previously resisted under traditional PAYG. But there are some important notes on the NDC systems (Disney, 1999; Fox and Palmer, 1999):

- they do not ensure completely against demographic risks, lacking the advanced funding;
- consistent relationship between contributions, reserves, indexation and benefits must be maintained;
- they are exposed to political risks, just as defined-benefit PAYG.

2.5. Political Economy Considerations for Pension Reform

Retirement pension schemes are (probably) the most complex and multi-dimensional social arrangements to be found in modern societies influencing public finance, national saving, labour and capital markets. The political economy of pensions is of utmost interest given the multitude of actors involved such as pensioners, governments, pension institutions (both public and private), trade unions and employers associations, all of which make the reform of old age security a "highly sensitive and politically difficult issue" (Müller, 1999). There is a growing literature on the political economy of reform and on the appropriate timing, speed and tactical sequencing of fundamental reforms (Tommasi and Velasco, 1995; Bönker, 2002) but still there is little literature focused on the political economy of pension reform. James and Brooks (2001), Müller (1999, 2001), Orenstein (2000) and Pierson (1999) bring important contributions on this subject.

Unlike structural adjustment reforms, designed by politically insulated technicians and implemented by governmental action, social sector reforms directly and visibly affect the interests of individuals and businesses and so depend on their public acceptance (James and Brooks, 2001). As a result, pension systems have long been difficult to reform, even if nowadays old-age security is considered a top priority in most countries of the world. The tremendous resilience shown towards pension reform, and in general towards welfare reform, reside mainly in two features:

electoral incentives associated with pension programs and *institutional stickiness* (multiple veto points and "path-dependent" processes that lead the reform agenda towards incremental or moderate adjustments to the existing arrangements), which limits the reform policies (Pierson, 1999). In democracies, voters are crucial players. Huge segments of electorates rely on the state for their income and pensioners are probably the largest single-issue constituency, a highly concentrated interest group whose power increases as the population aging process progresses. Besides, many other age groups sympathise with the elderly, who have certain expectations regarding their own benefits or feel that reform may indirectly negatively affect them. It is also an established fact that voters present a "negativity bias", reacting stronger against potential losses than supporting potential gains. Thus, the political risks associated with pension reform are enormous, as the voters sanction unpopular initiatives. Old-age pension systems are a strong case of institutional stickiness in that they have always displayed strong path-dependency effects, especially in relation to PAYG schemes. PAYG systems build long-term expectations and once in place for a long time, extensive and matured are highly resistant to radical reform. Mature PAYG systems with high implicit debts involve large populations of pensioners and older workers with generous rights acquired that would resist reform if they feared that their pension promises would not be kept under the new system. Further, mature PAYG systems with large implicit debts also imply path dependencies regarding entrenched governmental bureaucracy – which manage the old system, have accumulated power and employ large number of workers, and unions – which participate in the running of the old system and would see their role diminished after the reform (James and Brooks, 2001). Even when undergoing moderate reforms (incremental cutbacks and adjustments), pensions are framed by past commitments and specific institutional arrangements (Müller, 1999; Pierson, 1999). Thus, in many developed and developing countries a radical and quick change towards fully funded systems is not considered a serious option because of transition costs and the political prospect of many 'losers' for many years to come.

A study by James and Brooks (2001) argues that successful reform means prevailing over opposition by using a variety of methods that tilt the winners-losers balance towards the winners and change individuals perceptions on which category they would fall in, and concludes with the following findings (James and Brooks, 2001:164):

- a large implicit pension debt helps in bringing the pension reform at the top of the political agenda and in adopting structural reform; however, at the same time, it constrains the degree of funding and privatisation achieved as the large transition costs implied are strongly resisted by bureaucrats and pensioners (path dependency);
- pre-existing private financial organisations, such as voluntary private pension plans, signalling institutional interest, facilitate the adoption of a fully funded mandatory pillar, provided that their role is maintained and extended;
- factors such as cultural, linguistic and geographic proximity play a key role in reform ideas diffusion.

Similarly, in the light of his analysis of the pension reform process in Central and Eastern Europe, Orenstein (2000) develops the following six hypotheses:

1) policy legacies influence present reform choices. In particular,
    - countries with higher implicit pension debt will choose a smaller private pillar and retain a larger PAYG public pillar, in other words, less radical reform;
    - other pension reform design elements will build upon the legacies of pre-existing pension institutions;
2) the fewer the number of veto and proposal actors and the lesser the distance between them, the greater the opportunity for change in the scope and size of the PAYG pension system;
3) the impact of interest groups depends on their relations to and distance from important veto and proposal actors, their ability to mobilize constituencies to exert pressure at critical veto points, and their ability to act as veto or proposal actors themselves;
4) the World Bank influences pension reform through direct interventions and through contributions to global social policy discourse. Greater exposure to World Bank ideas and greater World Bank intervention in policy planning should therefore lead to more fundamental pension reform;
5) there are tradeoffs across deliberative fora. In particular,
    - choice of deliberative fora systematically influences reform outcomes because certain fora empower certain types of actors;

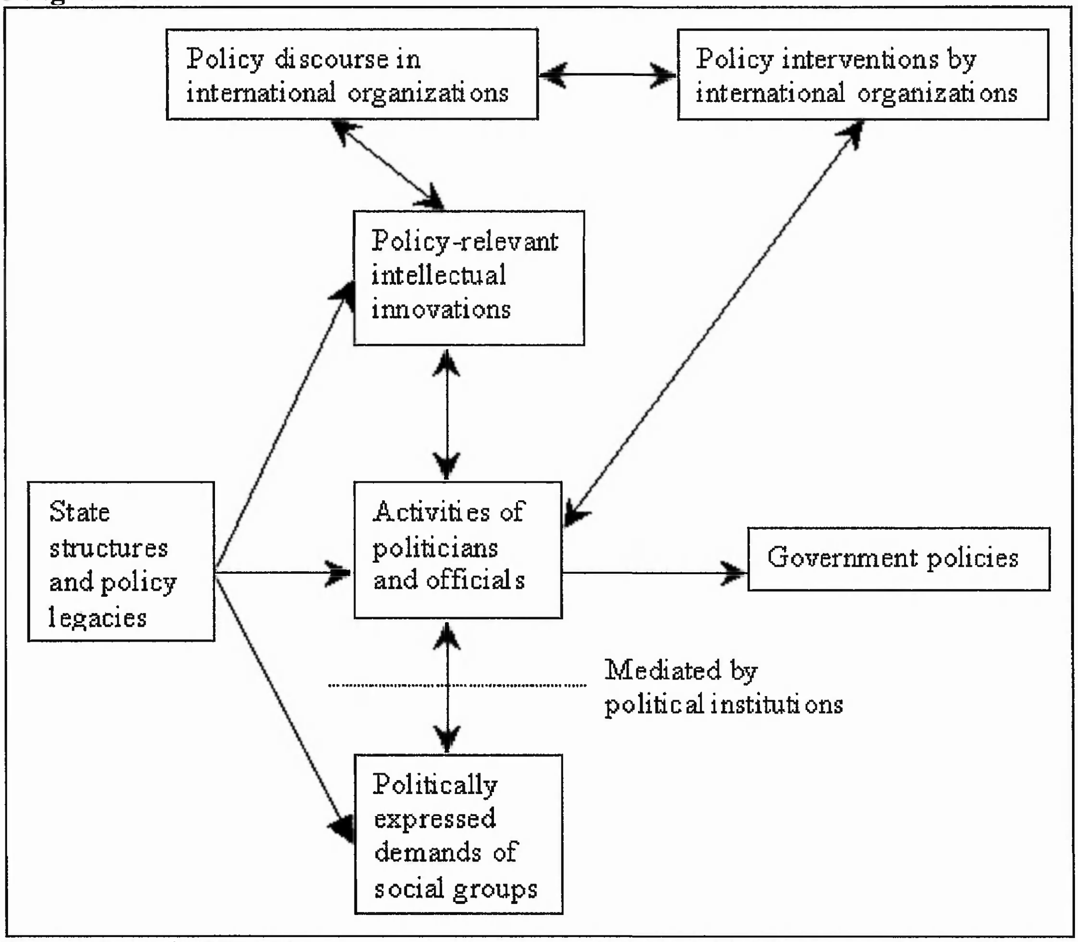
- exclusion of actors from one deliberative forum will often cause them to be more active in another;

6) there are tradeoffs across phases of reform. In particular,
   - the smaller the number of veto and proposal actors involved in the design of reform at the commitment-building phase, the faster and more radical the reform;
   - however, excluding veto and proposal actors at the commitment-building phase may pose threats and require greater compromises in later phases;
   - inclusive negotiation of basic design issues at the commitment-building phase will reduce the potential threats to reform at later stages, at the expense of time and less radical reform.

He also underlines the path-dependent character of pension reform, arguing that, in the context of Central and Eastern European countries, institutional legacies of the communist welfare state regime are the most important factors influencing social policy during the post-1989 transition, along with the policies of the early transition period. Decisions and non-decisions taken regarding high social spending during this time constrain the choices of policymakers considering fundamental reform. He also notices the path-dependent character of the social policy process as politicians, usually situated in positions determined by the institutional configuration of the old system, respond to and interpret ideas through the mechanisms of the old system, and respond to social groups whose interests and expectations are also influenced by the old system.

Orenstein (2000) develops a model of social policy process (Diagram 2.1) and argues that policy legacy, institutional structures and the particularities of the political process in each country influence the design of fundamental pension reforms.

Diagram 2.1



Source: Orenstein (2000: 11)

Following the example of Tsebelis (1995), Orenstein analyses the effects of political institutions on policy by looking at different 'actors'. There are two types of actors that appear in the framework of political institutions: 'veto actors' and 'proposal actors'. Veto actors include players who have a constitutional right to veto over legislation, players who by virtue of party majority or governing coalition have power to veto legislation or interest groups that have enough power to veto. Sometimes the veto actors are not the initiators of reform proposal, and more often than not they don't reveal preferences until late in the process. Proposal actors appear in cases such as social security reform, when veto actors lack the necessary expertise to develop comprehensive policy changes. They play a critical role by introducing intellectual innovations, setting agendas, and defining the range of feasible policy outcomes. Political institutions have a crucial role because they determine which actors are most influential in a given policy area. Different institutions structure the policy process and mediate relations among policy actors in different ways. They render policy-makers more or less insulated from some interest groups and parties, and more or less responsive to some others.

Orenstein (2000) argues that interest groups may access the policy process both as veto actors and/or proposal actors, but often they are concerned with different aspects of the reform proposed and not with the overall shape of reform. James and Brooks (2001) argue that the inclusion of a broad range of interests in the reform process leads to less radical pension reforms due to unstable government coalitions, credibility problems and unreliable 'veto partners'. When trying to build support for the reform the government is in the position to exempt groups from the incidence of reform, to offer guarantees, benefits and tax incentives, to make political appointments, bundle multiple reforms and agree tradeoffs (James and Brooks, 2001: 159).

2.6. Conclusions

In 1994, the World Bank published a report entitled "Averting the Old Age Crisis" that tried to establish the guiding criteria for pension reform policy. With the aim of addressing the short-comings of traditional PAYG pension systems by expanding on the Chilean pension experience of a complete switch to a fully funded private pension system, the World Bank constructed the model that soon became almost synonymous with pension reform – the 'multipillar' system.

The multipillar system, which combines fully funded and PAYG components, contributory and non-contributory elements, saving incentives and informal extended support, is centred on the idea of risk diversification and has an essentially neo-classical theoretical grounding. While many of its original critics have, in time, warmed up to the idea of a multipillar system, one enduring criticism has been that the World Banks strategy has enlisted pension reform under the objective of economic growth instead of the traditional welfare objectives. Other criticisms include the narrow definition of the second pillar (private, fully funded, based on individual pension accounts), the fact that pension system privatisation strategies involving restricted international diversification might be a dangerous undertaking in economies with poorly developed financial markets, and the controversial issues of financing the transition costs, managing private pillar administration costs and balancing benefit provision in the decumulation phase.

Recently, the pension reform headlines have been caught by the emergence of the Notional Defined Contributions (NDC) scheme, a hybrid of traditional defined-benefit PAYG and private defined-contribution fully funded schemes, which tries to emulate the advantages of a private fully funded pillar without the required change in funding. The scheme functions as a fully-funded defined contribution scheme, promoting actuarial fairness; however, it remains an unfunded PAYG, being exposed to the same risks as the traditional PAYG.

Pension schemes are among the most complex and multi-dimensional social arrangements. The political economy of pensions has insights into the monumental task of reforming them. Furthermore, it can offer hints and hypotheses on how successful reform can happen, based on receptiveness to reform ideas, pre-existing policies and institutions, transition costs and political actors. The relevance of these insights for the CEE pension reform will be discussed in Chapter 4, which will review the theoretical issues considered so far through the prism of the CEE pension reform cases. The cases will be introduced in the next chapter.

CHAPTER 3.

CASE STUDY MATERIAL ON PENSION REFORM IN CENTRAL AND EASTERN EUROPEAN COUNTRIES

3.1. Introduction

This chapter introduces the pension reform experiences in Chile and Argentina - the two pension reforms that have proved the most influential in the international pension reform debate. The chapter then argues the need for pension system reform in Central and Eastern Europe and presents the pension reform efforts in a selection of Central and Eastern European countries (Bulgaria, Czech Republic, Hungary, Poland, Slovakia and Slovenia).[1]

3.2. The Latin American Cases

3.2.1. The Chilean case[2]

Chile has been the first of the Latin American countries that attempted to defuse the fiscal time bomb represented by the government-run PAYG pension systems. Since 1st of May 1981, Chile flaunts a new retirement system based on clearly defined worker property rights in their pension contributions, said to be offering work and investment incentives, enhancing personal freedom and spurring economic growth. More than 95 percent of Chilean workers have their own pension saving accounts at administered by different pension funds, whose total assets have grown to over $34 billion (42 percent of GDP), at an average annual rate of return of approximately 11.3 percent per year.

Chile's experience remains the most successful example of social security privatisation and enough time has passed since the implementation of the reforms so that their effects can be fully appraised. The declared aim of reform was to create a social security system opened for all citizens, based equally on freedom and solidarity, promoting fairness as well as efficiency (Pinera, 2000).

[1] A selection from the thirteen countries that have applied for EU membership: Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia and Turkey.

[2] The presentation of the Chilean case is mainly based on Rodriguez (1999).

The system became a fully funded, defined-contribution scheme, administered by specialized private funds called Adminstradoras de Fondos de Pensiones (AFPs). The system is mandatory for all dependent workers[3] who entered the labour force after 1983. The workers already in the labour force before 1983 had the option to choose whether to stay in the government-run system and receive a guaranteed pension or to switch. Those who switched received government recognition bonds that acknowledged the contributions made to the old system. Recognition bonds are indexed to inflation, earn 4 percent annual interest and become due when their bearers retire. The old public pension system in Chile will only disappear when all its beneficiaries have died. For now, the old system is left with only 16 percent of insured, but 96 percent of pensioners (Mesa-Lago, 1997).

Within the new system, workers have individual pension savings accounts, into which they make tax-deductible monthly contributions of 10 percent of their wages, with the possibility of contributing an additional 10 percent of wages, also income tax deductible (an option that helps early retirement). In addition, since 1987, workers can maintain their Voluntary Savings Accounts also administered by the AFPs (this benefits mostly the low-income workers, offering them access to investment tools at little or no cost) but kept separate from their pension savings accounts, where they can deposit additional tax-deductible savings.[4] The workers have the freedom to select the AFP and to transfer from one AFP to another up to two times a year (there is also a minimum stay period of six months).

The AFPs and the funds administered by them are from the legal point of view separate entities. There is freedom of entry and of exit into the industry, even for foreign companies, once a minimum limit on capital has been reached. If in the beginning, the AFPs were only allowed to manage only one pension fund, a new law implemented in 2002 requires that the AFPs offer five different types of funds with varying degrees of risk, and allows individuals to freely split their contributions between two different funds within one AFP. The five types of funds have different investment limits. (SAFP, 2004, see Appendix A, Table A14)

The AFPs charge two types of monthly commissions for the services they provide – a *fixed commission*, ranging from $0 to $2.11, and a *variable commission*, a

[3] The system is optional for self-employed workers.
[4] The workers are able to withdraw money from these accounts up to four times per year, but these withdrawals are taxed (except in the case of transferring the money withdrawn to a pension account).

percentage of the worker's taxable income, ranging from 2.49 to 2.95 percent of that income, which includes premiums for life and disability insurance.

The new system offers three different types of pensions:

- *old-age pensions* – for workers reaching an age limit (65 for men and 60 for women) if they choose to retire (there is no penalty for continuation);
- *early-retirement pensions* – for workers younger than 60/65 and who have accumulated enough capital in their accounts to enable them to purchase an annuity that is both equal to at least 50 percent of the average wage from their last 10 years of active life and at least 110 percent of the state guaranteed minimum pension;
- *disability and survivor's pensions* – for workers who have lost some of their working abilities (two-thirds for full disability and between half and two-thirds for partial disability) and for the dependents of the departed workers.

Upon retirement, the workers themselves decide the exact form their pensions will take:

- *life-time annuity* – workers can buy them from insurance companies;
- *programmed withdrawals* – keeping the money in the account and making withdrawals at certain specified times;
- *temporary programmed withdrawals with a deferred life-time annuity* – a combination of the above two options, buying from an insurance company an annuity scheduled to start at a future date, in the meantime the workers being able to make programmed withdrawals from the amount of money remaining in the account.

The workers are able to withdraw any funds accumulated over the amount necessary to obtain a pension equal to at least 120 percent of the minimum state guaranteed pension and to 70 percent of their average wage over the last 10 years of active life. It is also important to notice the fact that, since workers have property rights over their contributions, any amount of money that remains uncollected after the death of workers belongs to their dependants.

In the new system, the government plays two important roles – as a regulator of the system and as the last-resort guarantor. First, the government has established a new independent supervising agency – the Superintendencia de Administradoras de Fondos de Pensiones (Superintendence of Pension Fund Administrators, relating to the government through the Ministry of Labour) in order to initiate and coordinate the pension reform. In the new system the SAFP oversees the entire private pensions, mainly by regulating the AFPs. Second, the government provides pensions for workers having either less than 20 years of contributions or at least 20 years of contributions but not enough capital accumulated to meet the minimum pension. In the first case the government will provide a pension from the budget and in the second instance the government will supply the extra money needed to provide the minimum pension. So, in a way, an unfunded public pension scheme still exists – the government finances guarantees a minimum pension funded from taxes.

The AFPs are required to meet a most serious demand: they have to guarantee that their return is not lower than the lesser of:

- the average real return of all AFPs in the last 12 months minus 2 percentage points;
- 50 percent of the average real return of all AFPs in the last 12 months.

If the returns are 2 percentage points higher than the greater of the above limits, these supplementary returns have to be deposited in a 'profitability fluctuation reserve', from which funds can be extracted in the event the above-mentioned limits are not met (minimum required return is not met). The AFPs are further asked to keep a cash reserve, equivalent to 1 percent of total assets, from which additional funds can be drawn if the fluctuation reserve is not enough to cover. In case not even this cash reserve is enough to make up the difference, then the government steps in, covers the difference and liquidates the AFP. According to Kritzer (2000), the average gross real rate of return for all AFPs from July 1981 to December 1999 was 11.21 percent, which, after discounting the administration fees, translates into net rates of return ranging from 7.44 to 7.79 percent, depending on the level of income.

Regarding the transition cost, the government's intention was to use the budget surplus it had previously worked hard to muster, which, in 1980, amounted to 5.5percent of GDP. However, between 1982 and 1983 a deep economic crisis saw the GDP falling by 15 percent, while unemployment reached 30 percent, putting pressure on the budget and forcing the government to switch to debt financing. (Ruiz-Tagle and Castro, 1998)

3.2.2. The Argentinean case[5]

The old system operated as a PAYG covering more than 80 percent of the economically active population (Kritzer, 2000) and provided generous benefits after only 15 years of contributions, while minimum retirement age was 55 for women and 60 for men. The demographic indicators were very similar to those from European countries, but compared to the other Latin American countries, Argentinean population appears old. The demographic dependency rate was 37 percent compared to 13 percent in Peru and Columbia. The system dependency had fallen dramatically from 40 percent in 1980 to 64 percent in 1990. Additional to high unemployment, approximately 46 percent of the economically active population evaded paying pension contributions (Queisser, 1998). As a result, the PAYG system lost financial control over pensions, real benefits falling by 28 percent between 1981 and 1988, followed by another 30 percent between 1988 and 1991 (Kritzer, 2000). Pensioners took the government to court, the court decided in their favour. However, the government had no funds available, having already declared financial state of emergency, so it changed the benefit formula. While some pensioners accepted the new formula, stopped legal action against the government and received their benefits, others refused and continued their action in court until 1991 when a settlement was reached.

Argentina launched its new system in July 1994, consisting of a public PAYG pillar complemented by a mandatory second pillar. For the second pillar, workers can choose between a system of privately managed individual accounts or a publicly managed defined-benefit scheme. Affiliates are allowed to transfer from the public scheme of the second pillar to the private scheme but not the other way around.

The public PAYG system provides several types of benefits (Rofman, 2000):

- *the Basic Universal Pension (PBU)* – approximately 27.5 percent of the average wage of all the contributors, available to workers who have contributed at least 30 years, every year of contribution over the required 30 years bringing an extra 1 percent to the basic pension; retirement ages are 65 (men) and 60 (women);
- *the Compensatory Pension (PC)* – payable to retirees who acquired rights under the old system, for every year of contribution pensioners receive 1.5

[5] The presentation of the Argentinean case is mainly based on Queisser (1998).

percent of their average salary of the last ten years before retirement, with a ceiling of 52.5 percent (a maximum recognition of 35 years);

- *Additional Pension for Permanence (PAP)* – to workers who meet the PBU criteria and choose the public option of the second pillar, calculated at 0.85 percent of the pre-retirement income per year of contribution to the new PAYG pillar[6];
- *disability and survivors' pensions* - paying the whole pensions for workers who remain in the public system and paying jointly with the second pillar for workers affiliated to the private system but with rights acquired under the old system;
- *the Advanced Age Pension (PEA)* – to people older than 70 years and who have not contributed enough to qualify for the basic pension; PEA is 70 percent of the PBU, around 19 percent of the average wage.
- *pensions in payment* – the existing pensions from the old system are also paid by the public system;

The new public system also provides an Ordinary Retirement (RO), a benefit payable to all the affiliates of the private pillar in addition to any other accrued rights (like PBU, PC). The government adjusts the amount of the RO yearly.

The public system is managed by the public social security agency ANSeS, and is financed through contributions of 27 percent that are split between employers of all covered workers (16 percent, all of it going towards the PAYG) and employees belonging to the public scheme (11 percent). The self-employed pay only 16 percent.

The second pillar consists of a system of private pensions funds administrators (*Adminstradoras de Fondos de Jubilaciones y Pensiones – AFJPs*) regulated by a governing agency (*Superintendencia de AFJPs*), similar to the Chilean case. Banks, insurance companies, trade unions and other financial institutions are allowed to own AFJPs. The minimum capital requirements for the funds are much higher than in Chile in order to prevent fragmentation of the pension sector. The largest AFJPs are joint ventures between foreign banks or insurance companies and locals. Concentration has been increased through mergers.

Workers in the private scheme must contribute their 11 percent of wages to the fund of their choice, which include the disability and survivors' insurance and the

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[6] A worker with 35 years of contributions will receive a PAP of 29.75 percent of his pre-retirement income (Rofman, 2000).

administration costs (which make almost 3.5 percent of wages). As in the case of Chile, upon retirement pensioners can chose on how they obtain their money – programmed withdrawals or purchasing a life annuity from an insurance company.

The AFJPs are allowed to charge fixed and variable commissions, with no restrictions on the level. The average commission is around 3.44 percent of wages. Unlike in Chile, pension fund administrators are allowed to offer discounts on commissions for affiliates who stay with one AFJP for a determined period. They also employ aggressive marketing techniques and a large number of selling agents, facts that increase the transfers between funds. The switch between funds is costly for all AFJPs and mostly not motivated by rates of return or quality of services.

Like in Chile, the AFJPs are required to maintain a fluctuation reserve, with the same specifications as for the Chilean AFPs, and have a minimum return requirement - the lesser of:

- 70 percent of the average 12 month real rate of return of the system, or
- 2 percentage points under the real rate of return.

In December 1997, the annual rate of return was 14.8 percent and since the beginning of the system the average rate of return has been 16.7 percent, this excellent performance is based largely on the high interest rates in Argentina, fact that reflects the difficult economic condition of the country (Vittas, 1997).

Following the Tequila crisis, the indexation mechanism that linked pensions to wage increases was replaced by an ad-hoc indexation to prices according to the situation of the fiscal budged. Also, there is no link between the level of PBU and the average covered wage; instead there is a ‘pension module’, an accounting unit determined annually by the government according to budget capacity. Thus, as in the case of Chile, the first pillar benefit becomes a minimum pension provider, paying out a flat-rate pension benefit, the level of which is at the government’s discretion, financed by payroll taxes, to everyone who has contributed for at least 30.

The transition cost, as annual deficit of the pension system, is estimated to decline from about 2.5 percent of GDP to 0.86 percent in 2005 and disappear around 2020 (Queisser, 1998).

Table 3.1. Synthesised comparison of Latin American pension reforms

	Mandatory Public Pillar	The Private Pillar: Type of funding	The Private Pillar: Mandatory or optional	The Private Pillar: Individual Contribution Rate [a]	The Private Pillar: Date	Reform Type
Chile	Phased out	Individually fully funded	Mandatory for new entrants to labour market. Optional for the others.	10%	1981	Substitutive
Peru	Traditional PAYG; alternative to private pillar	Individually fully funded	Mandatory participation in either pillar.	9%	1993	Parallel
Argentina	Traditional PAYG; complementary to private pillar	Individually fully funded	Workers may redirect their contributions to the private pillar.	8.5%	1994	Mixed
Colombia	Traditional PAYG; alternative to private pillar	Individually fully funded	Mandatory participation in either pillar.	10%	1994	Parallel
Uruguay	Traditional PAYG; complementary to private pillar	Individually fully funded	Mandatory for workers earning over US $800, optional for lower earning groups and workers above age 39 to redirect part of their contribution to the private pillar.	7.5%[b]	1996	Mixed
Bolivia	Closed down	Individually fully funded	Mandatory for all workers.	10%	1997	Substitutive
Mexico	Closed down	Individually fully funded	Mandatory for all workers.	6.5% + state subsidy	1997	Substitutive
El Salvador	Phased out	Individually fully funded	Mandatory for new entrants and affiliates up to age 35. Optional for older workers (up to age 50 for women and age 55 for men).	Gradually increased to 9.5% (only 3.25% from employees)	1998	Substitutive
Costa Rica	Traditional PAYG; complementary to private pillar	Individually fully funded	Mandatory for all workers.	1% + employers' contribution rate 3.25%	2001	Mixed

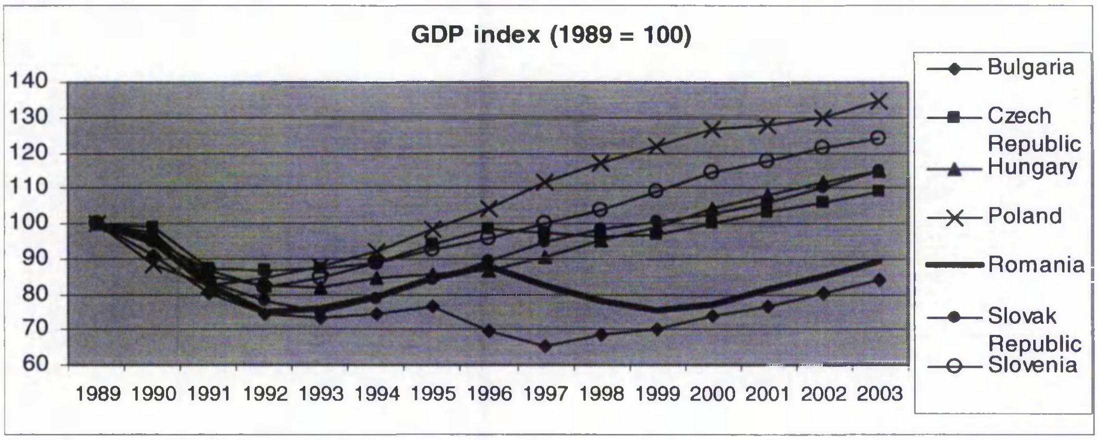
Source: Kritzer (2000), Müller (2001).

Notes: a) Individual contribution rates exclude commissions and disability and survivors' insurance; b) The official figure is 15 percent, however, workers earning less than US $800 (who make up around 87 percent of labour force) can choose to contribute 7.5 percent of earnings in each pillar (Kritzer, 2000).

3.3. General considerations on the need to reform in CEECs

In Central and Eastern European countries (CEECs), social security systems have been playing an important role by smoothing the process of economic transition and maintaining social and political stability. Following periods of decline, income throughout the region has fallen low and poverty and deprivation have become more widespread as unemployment has risen.

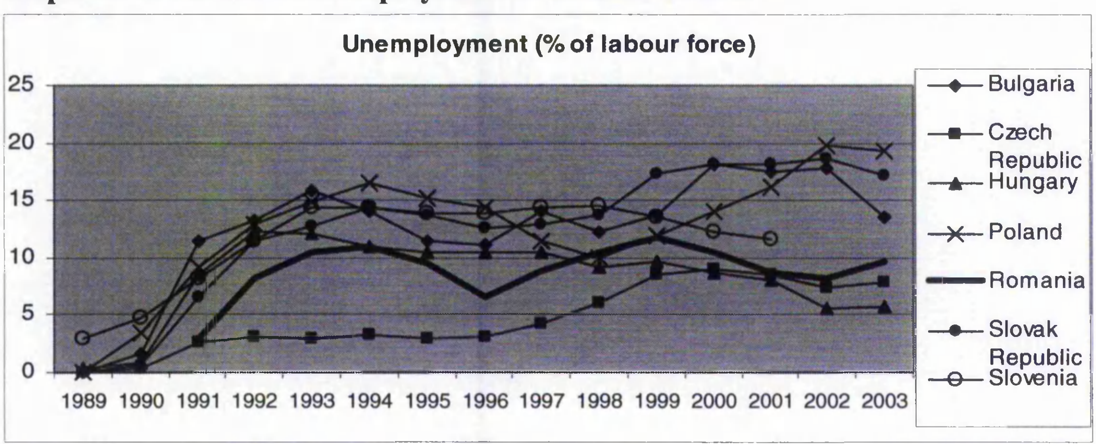
Graph 3.1 Evolution of GDP in selected CEECs



Source: UNICEF (2003), European Communities (2003a) and Eurostat

The dominant economic characteristic of the years after 1989 has been the plummet of output and employment. As shown in Graph 3.1, all CEECs experienced a dramatic fall of almost 20 percent in GDP during 1990-92, followed by a period of recovery in 1994-95, after which the growth rates began to slow down.

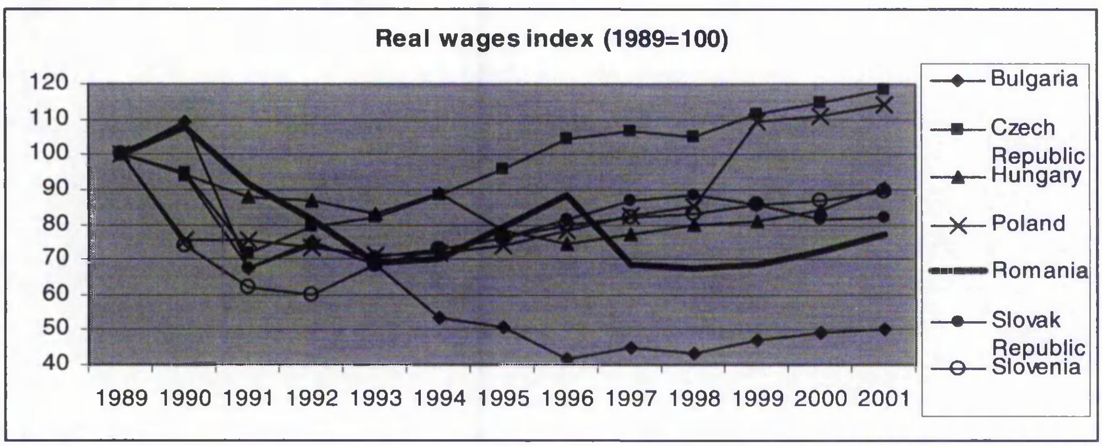
Graph 3.2 Evolution of unemployment in selected CEECs



Source: UNICEF (2003), European Communities (2003a) and Eurostat

Many factors have contributed to the decline in growth: decision delays in the investment process, arbitrary distribution of income, constant budget deficits; however, the irregular price fluctuation stands foremost. In the beginning of 1990s, all governments in CEE had lost control of inflation, with rates ranging from 60 to 600 percent per year. Rapid inflation deepened the macroeconomic instability and undermined the economic reform efforts. In order to help them back on the path of economic recovery, the CEECs have sought the help of international financial institutions, many of them applying the IMF stabilisation strategy, which involved price liberalisation. The decision to liberalise prices simultaneously and indiscriminately was proven to be a misjudgement. Many CEECs had to deal with restructuring their economy, which led to a scarcity of goods. Under the previous regime, the price controls imposed had generated forced savings, which actually represented excess demand. The continued lack of goods, combined with liberalised prices, has led to the upsurge of prices along with the annihilation of the accumulated forced savings. Also, price liberalisation was conducted under reduced market competition. The state owned companies (partially privatised or not) had continued to enjoy the monopoly power that had been instituted under the old regime. The market domination position coupled with newly gained freedoms meant the exploitation of the current inflationary tendencies. Finally, inflation has been fuelled by the constant, out-of-proportion, central budget deficits. Most governments have chosen – under union pressure - to cover the losses incurred by the large state owned industries from the state budget. The added pressure on income and public spending had unfortunate consequences.

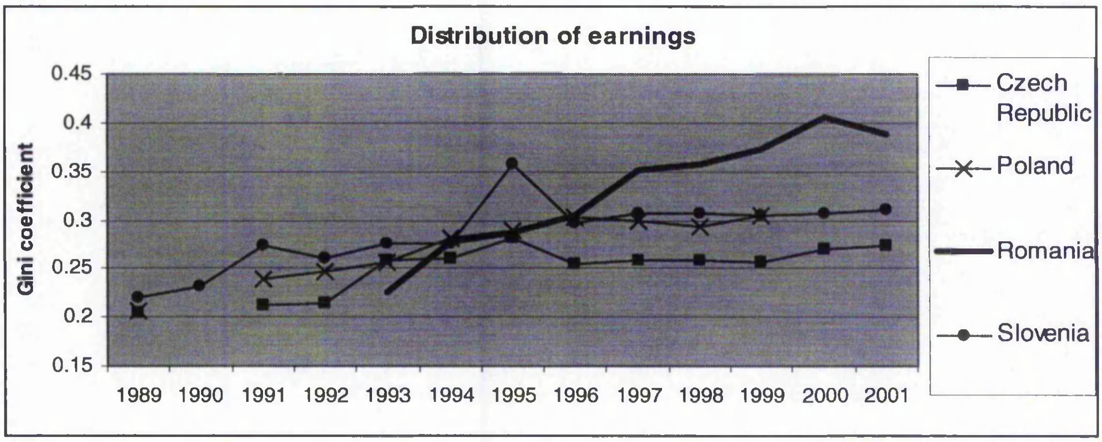
Graph 3.3 Evolution of wages in selected CEECs



Source: UNICEF (2003)

The IMF advice has been to control inflation through cuts in government spending and income policies intended to induce workers in accepting lower real wages (the neoclassical approach to unemployment caused by the restructuring programmes). Before 1990, wages represented the sole source of income and, despite all subsequent opportunities introduced, they continue to take the lion's share of individuals' incomes (e.g. in Romania, in 2002, over 60 percent of incomes were wages – N.I.S., 2004). As the previous graphs show, the drop in GDP immediately after 1990 was directly reflected in the tremendous fall in employment and real wages. The subsequent growth registered, however, was not entirely associated with an improvement in employment and wages indicators – while wages have generally picked up, unemployment has continued on an upward trend. Another clearly defined transition trend has been the continued increase in earnings' inequality (Graph 3.4). However, Lindeman, Rutkowsky and Sluchynsky (2000) argue that although poverty has increased throughout the region, there is evidence indicating that pensioners have been better protected than wage earners in Czech Republic, Hungary, Poland, Romania and Slovak Republic.

Graph 3.4



Source: UNICEF (2003)

CEE transition has meant unfaltering change at social, economic and political levels, bringing turmoil and uncertainty in all aspects of life. However, policy objectives such as macroeconomic stability and medium-term sustainability are ultimately meant to improve the social welfare. Social security reform, economic restructuring and economic growth options are closely linked.

Before the beginning of transition, the CEECs had a well-developed social sector, covering all the typical social and economic risks, as well as devoting large amounts of effort to health and education. The state controlled all aspects of the social and economic life and social security was no exception. Social security was completely incorporated in the state budget while private provision of old-age income was inexistent. The command economy promised 'cradle-to-grave' income security, including universal coverage and pensions replacing wages up to 80 percent. The general view was that these benefits had to compensate for the modest wages earned during working years and, by western standards, they were quite generous. Contribution rates were set at high levels but were borne mostly by the state companies (the employers) and the benefits, in the majority of cases, took the form of flat-rate pensions. There were, occasionally, some earnings-linked components in the pensions but their importance was relatively low (Schmähl and Horstmann, 2002).

Retirement ages were set very low: in every country except Poland, the statutory retirement age was 55 for women and 60 for men. There were also generous special provisions for disabilities and selected occupations, which reduced the average effective retirement age to about 57 for men and 53 for women (Fox, 1994). The pension systems were characterised by a multitude of pensions schemes each with their own set of rules up depending on being in specific professions (i.e. artists and music composers, teachers etc.), performing certain jobs in hazardous or hard working conditions or belonging to special segments of population (i.e. war veterans) (Schmähl and Horstmann, 2002).

However, in the years after 1989, the combination of declining GDP and market-determined wages and prices made the system unsustainable as the transition progressed. Large state budget deficits, high pension expenditure levels and an increasing number of pensioners have all combined into low benefit levels that provided income support only around the poverty level. Younger families pooled resources with pensioners in order to survive, with each contributing resources to the common household budget. The burden imposed on the shoulders of working generation had become smothering.

The problem was that their institutional arrangements had been designed for a centrally planned economic system and, thus, were incompatible with the problems brought by the transition to the market economy.[7] As a result, and the past experience shows this, the social sector as a whole has suffered significantly from this process, being the most vulnerable to market ailments such as unemployment and inflation.

First, privatisation and economic restructuring in the first part of the 1990s led to open unemployment. The increase in unemployment was at a slow but steady pace in the first years after 1989 (Graph 3.2). This was due mainly to political reasons, whereby the governments in the region were trying to smooth the implications of market reforms. Also, time was needed to develop legislation and create a satisfactory

[7] For example, the absence of an indexation mechanism for benefits, which has led to considerable inequity across different generations of pensioners.

social safety net, in order to match the bankrupt state of many enterprises. Nevertheless, since 1996-97, unemployment has stabilised. The phenomenon was relatively unknown to the CEE countries and questionable policies were pursued. One reaction was to ease early retirement conditions through explicit programs designed to absorb redundant labour force via pension system or through an informal policy of loosening eligibility requirements, in most cases through the disability pension program.[8] The result was the increased burden on the pension system due to the growing number of pensioners (Andrews and Rashid, 1996; Chlon, Gora and Rutkowski, 1999; Ghimpu, Ticlea and Tufan 1999). The largest increases happened in Romania (the massive early retirement program 1990-1991) and in the former Yugoslavia. In Romania, the number of pensioners increased by 40 percent between 1989 and 1992 and, generally, the reaction of the employers has been to reduce the number of vacancies and not to employ more of the younger workers. Early retirement has proven to be a difficult to manage and costly (pension benefits are larger and last longer than unemployment benefits) way of reducing unemployment. It reduced the labour force, diminished potential output and eroded the efficiency of policies oriented at unemployment reduction.

Second, early retirement also affected the dependency ratio by reducing the number of workers contributing to the pension fund. Furthermore, the unemployment itself reduced the contribution revenues. Finally, the number of contributors and the amount of contributions fell because of tax evasion and the underground economy. This all happened due to the privatisation and restructuring, which turned large state-owned enterprises into many small private companies and self-employed individuals. The structure of employment became hard to monitor and tax collection suffered because of the inertia in adjusting the tax collection mechanisms. There has been a dramatic decline in coverage and even if tax collection improves, the prospects for coverage rates remain poor.

Keane and Prasad (2000) have shown that in Poland, lax social transfer mechanisms may have played a critical role in maintaining social stability and in

[8] Following the dramatic increase in unemployment in the 1970s and 1980s, many European countries also encouraged early retirement, using their pension systems as an exit from the labour market as shown in Quadagno and Quinn (1996) – Netherlands used its disability programs for inducing early retirement, Germany employed disability schemes and facilitated the long-term unemployed go into retirement and, France reduced the statutory retirement age to 60 while the UK implemented the Job Release Scheme (older workers could retire early provided that the vacancy created was filled by someone who was unemployed).

reducing political resistance to radical economic reform, thus facilitating the subsequent strong growth. Early retirement and generous pension policies (as opposed to targeted transfer policies), though costly, may have helped removing the obstacles in enterprise restructuring. Mitigating the fall in income for the middle class (the group having the significantly higher propensity to vote than lower income groups) helped in gaining support for reforms. However, the experience of Poland may be singular, the authors pointing out that Poland has managed to generate high growth rates and even to limit the rise in inequality usually associated with transition. The authors also indicate that policies that buy political support in the short-run may generate future conflicts at a point when fiscal consolidation becomes necessary.

Thus, for a variety of inter-related reasons, the CEE countries, despite having much lower incomes and tax collection capabilities, had promised higher benefits than some of the richest countries in the world, many of which are now finding their own welfare systems unaffordable. Many Western countries - with the same share of their population over 60 and longer life expectancies - spend less on pensions as a share of GDP than do the CEE countries, due largely to the higher age of eligibility for pension – aspect to be developed later. The size of the prematurely retired group makes the situation of the latter countries unique in the world, and complicates any solution. Moreover, health indicators are expected to rebound over the next decade, exacerbating the problem further.

The pension crisis has economic, political and social influences. From the *economic* point of view, high pension expenditures have frustrated stabilization efforts and crowded out other needed government expenditures, such as new social and economic infrastructure. The payroll tax financing of these expenditures provides incentives for informalisation of the labour force and lowers labour demand. *Politically*, the demands of the pensioners (and the soon-to-be pensioners) for the government to keep its entitlement promises have proven to be very difficult to resist, despite the economic cost. The consequence is that only parties and leaders with populist promises get elected, despite the evident need for clear-cut economic reform. *Socially*, the insecurity associated with declining pension payments for those who have already withdrawn from the labour force has been a major hardship, especially for the small minority of pensioners who have no other source of income or assets.

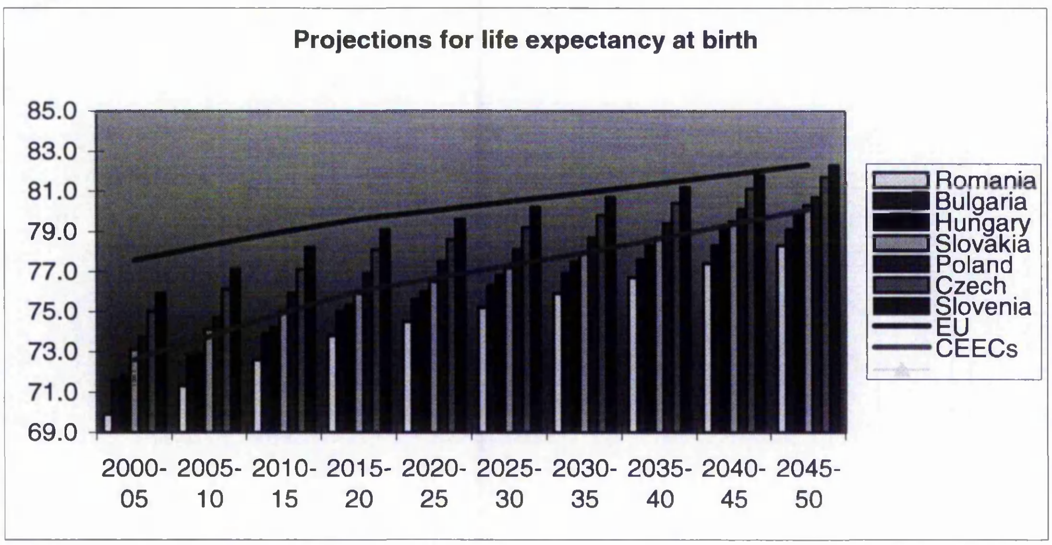
The following sections give a more in-depth review of the demographic and systemic features of the pension systems in CEE.

3.4. Pension economics in Central and Eastern European Countries

3.4.1. Short demographics analysis

Historically, Western Europe has always been in the lead of the demographic transition, while the Eastern Europe has lagged behind. Further more, in Western Europe, the problems associated with the demographic ageing process come on top of the already present and persistent issues of declining economic competitiveness, rigid labour markets, high taxation levels and high unemployment. Additionally, political initiatives that limit immigration and temporary work do no favours for the diminishing European labour force. However, statistics show that the Eastern Europe has been catching-up rapidly. The general patterns of demographic evolution (the post-war baby-boom generation and its echo, rising life expectancy rate, falls in mortality and fertility rates) are clearly visible in CEECs. In Romania, within less than a century, total life expectancy at birth (for both sexes) has risen from 42 to 70 years. Still, at the moment, life expectancy at birth is with two to eight years lower than the in the EU and death rate is suspiciously high, even if they are markedly younger. But the catching-up process will continue, as the Graph 3.5 shows.

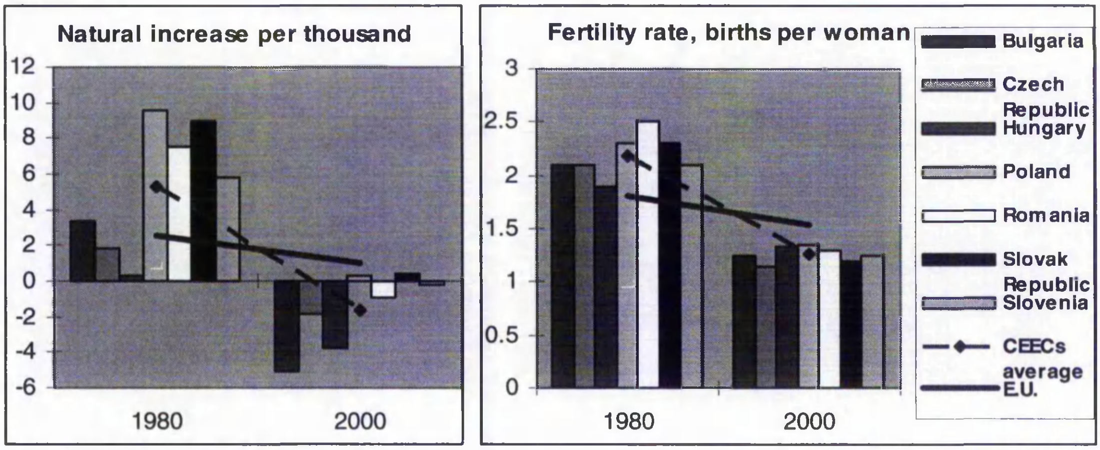
Graph 3.5



Source: see Appendices, Table A.

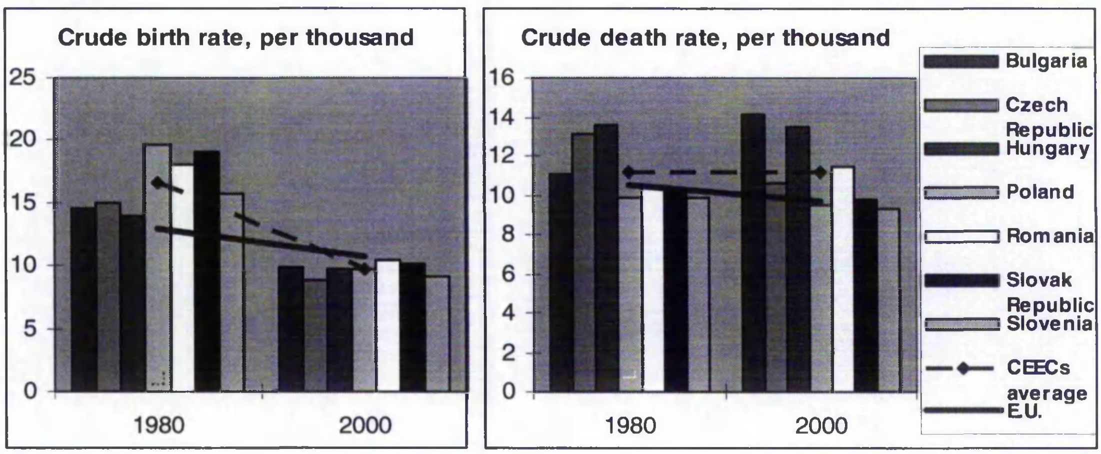
In general, the population ageing occurs as a result of a decline in mortality rates combined with strong fluctuations in fertility. As the following graphs show (Graph 3.6 to Graph 3.10), while there has been little improvement in the mortality rate, the fluctuation of fertility rate has been just as strong as in EU. The fertility rate has been below replacement level (2.1 births per woman) since the 1980s. Studies like Dang, Antolin and Oxley (2001) and EPC (2001) concur that fertility rates in the EU are set to rise in the next decades, converging around 1.7 percent by 2050. However, even this recovery will still be lower than the replacement level.

Graph 3.6



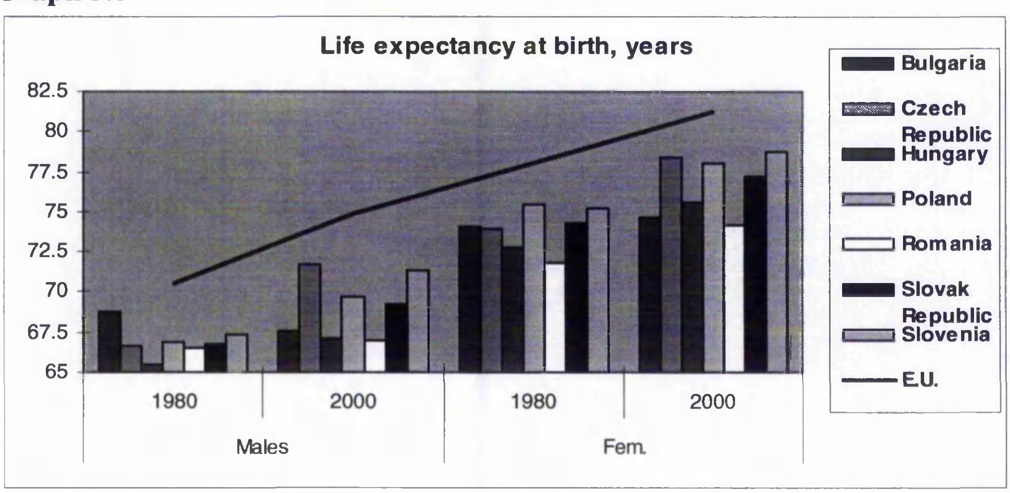
Source: see Appendices, Table B.

Graph 3.7



Source: see Appendices, Table B.

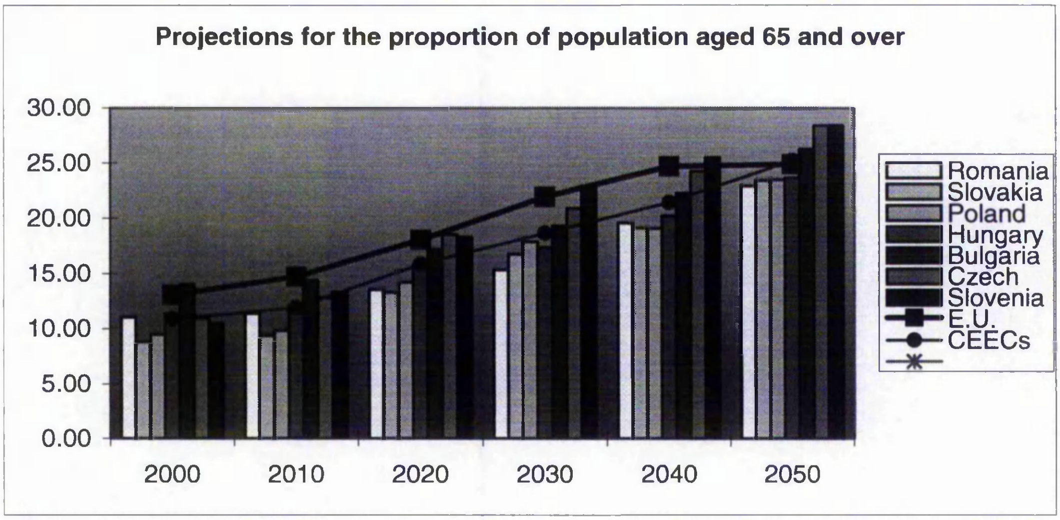
Graph 3.8



Source: see Appendices, Table B.

The main conclusion of the graphs is that populations in CEE are following the trends present in the EU. However, because of the difference in death rates and life expectancy between the two regions, the CEE population is younger than the EU population. The Graph 3.9 also shows that the CEE population is younger on average, but adds that it is ageing slightly more rapidly.

Graph 3.9



Source: see Appendices, Table C.

Still, with respect to pension issues, it could be said that the demographic situation in CEECs today is 'better' than in the EU, in spite of the ageing catching-up process, because of the strange pattern of mortality in the last decades. Nevertheless, the retirement of the baby-boom generation around 2010-20 and their 'echo' in 2040-50 will cause as much problems in the CEECs as it will in other parts of the world.

3.4.2. Pension economics considerations

Pension expenditure

The need to reform arises primarily from budgetary pressure. The ageing process is set to aggravate the state of public finances and push further the level of public expenditure. As mentioned before, in CEECs, the ageing of populations comes on top of the ravishes of transition.

The countries in the region reacted differently to the financial pressure put on the system by the swelling number of pensioners. Some tried to stem the rise in pension expenditure by keeping the growth rate of average pensions below the growth rate of the GDP, mainly by incomplete indexation. Other countries, such as Poland, tried to maintain the replacement rates and, as a result, the pension expenditure-to-GDP ratio rose sharply.

In general, the continuous growth of public expenses on account of social security is highly criticised. First, a steady rise in public expenses can seriously damage an imbalanced budget, triggering an increase in interest rates and a fall in investments, which in turn would lead to a decrease in economic growth. Second, the high-level taxes and raised contributions needed to finance the social security would diminish people's income pushing them towards constant demands for higher wages – a phenomenon which, uncontrolled, would fuel inflation and affect employment.

Table 3.2 Pension-related public expenditure as percentage in GDP

Country	Year	Pension spending share in GDP (%)
Bulgaria	1996	7.3
Czech Republic	1996	9.0
Hungary	1996	9.7
Poland	1995	14.4
Romania	1996	5.1
Slovak Republic	1994	9.1
Slovenia	1996	13.6
Selected CEE average		***9.7***
Non-EU OECD‡	***2000***	***5.1***
EU-15†	***2000***	***10.4***

Source: Palacios and Miralles (2000), ‡Dang, Antolin, Oxley (2001), author's calculations based on old-age pension and early retirement percentages; †EPC (2001)

As the Table 3.2 shows, there is significant variation within the group. Poland has the highest pension spending in the region, while Romania is among the countries with the lowest pension spending over GDP. Many OECD countries spend less on pensions as a share of GDP than do the CEE countries. This strange situation is not based on differences in population age structure – OECD countries have the same share of their population over 60 (see Table 3.3) and longer life expectancies. The discrepancy is largely due to differences in eligibility requirements and the generosity of benefits.

System dependency ratios

High dependency ratios are usually found in countries when a period of high coverage has been followed by traumatic economic shocks that have taken their toll on the contributor base but left the pensioner numbers intact. This is the case of CEE countries.

Table 3.3 Dependency ratios, mid-1990s, selected countries

Country	Pensioners/ Contributors	Population 60+/ Population 20-59	Pensioners/ Population 60+	Pensioners/ Total population
Bulgaria	81.0	38.5	133.5	27.5
Czech R.	53.0	31.3	139.8	24.2
Hungary	78.1	35.7	142.2	27.5
Poland	53.7	29.4	116.1	18.2
Romania	58.3	32.3	88.0	15.1
Slovak R.	58.9	31.3	127.0	22.0
Slovenia	58.9	31.3	127.0	22.2
CEE	***63.4***	***28.4***	***136.1***	***20.1***
OECD	***46.9***	***34.4***	***102.5***	***19.7***

Source: Palacios and Miralles (2000)

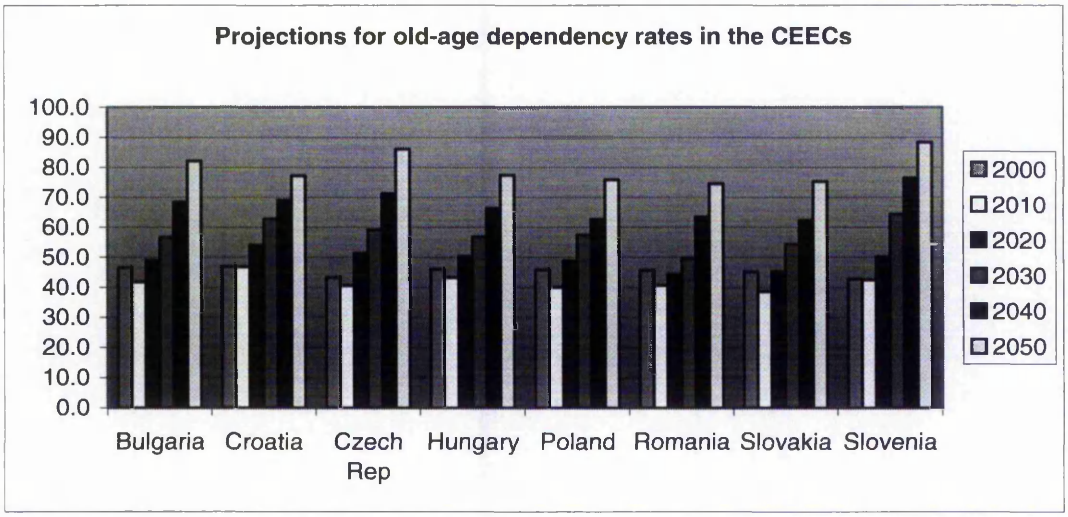
Note: System dependency ratio = number of pensioners divided by number of contributors; Old-age dependency ratio = population age over 60 divided by population age between 20 and 59

Looking at the different dependency ratios one can make some important assertions regarding a pension system. If the old age dependency ratio is bigger than the system dependency ration then it can be assumed that the pension scheme is immature. If the reverse happens, then there are too many early retirees.

The latter situation is true for both the selected CEECs and OECD countries; however, the discrepancy between the two ratios almost does not bear comparison across the two groups. In spite of the relatively stable demographics, the system dependency ratios in the region increased dramatically, due to the extra number of pensioners brought in the system by early retirement and disability facilities. The new pensioners were added to an already maturing system in countries where practically all older persons were entitled to some pension (coverage was universal). The table shows the extra pensioners added when comparing the number of pensioners with the population aged 60 plus. In the CEECs, there were more than 36 percent more retirees then there should have been, with regards to age only.

Moreover, as discussed previously in the demographic trends section, the ageing process is going to affect the region soon. Life expectancy in the EU is projected to increase in the next 50 years by 5 years for men and 4 years for women (Dang, Antolin, Oxley, 2001; EPC, 2001), and as Graph 1.8 showed, the CEECs will also keep the pace. In the EU-15, the old-age dependency ratios based on population 65 plus are projected to nearly double from 26.7 percent in 2000 to 53.5 percent in 2050 (EPC, 2001). The projections shown in Graph 3.10 are just as daunting. The strongest signs of ageing seem to appear in the Czech Republic and Slovenia while Romania still will be considered younger.

Graph 3.10



Source: see Appendices, Table D
Note: The ratios involve population aged 65 plus

Replacement rates

Replacement rates indicate the relationship between pensions and wage levels, showing the relative generosity of a system. Large differences in replacement rates across countries can highlight disparities in income status of pensioners relative to the rest of the population. Attention must be paid to the exact formula of calculation when comparing countries – using income per capita levels in the denominator might provide better approximation of pensioners' status. The average pension is typically estimated as total pension expenditures divided by the number of pensioners.

Table 3.4 Replacement rates of public pension schemes in selected countries

Country	Year	Average pension as share of average wage	Average pension as share of income per capita
Bulgaria	1995	31.0	39.3
Czech Republic	1996	48.6	56.7
Hungary	1996	57.9	33.6
Poland	1995	55.4	61.2
Romania	1994	43.1	34.1
Slovak Republic	1994	42.5	44.5
Slovenia	1996	68.7	49.3

Source: Palacios and Miralles (2000)

There are two groups of country experiences – those who were able to maintain their contributor base and thus largely kept their spending levels during transition (Czech Republic, Poland and Slovak Republic) and those whose contributor base decreased and had their benefit levels cut. Poland and Slovenia have the highest replacement rates while Romania has one of the lowest replacement rates.

There is a notable difference between the numbers corresponding to the two definitions, as, in some cases, the average wage is very different from per capita income. In this regard, an interesting distinction should be made between the selected CEE group and the selected OECD countries. The less affluent OECD countries (such as Ireland or Greece and Spain – not represented in the table) have quite different numbers, usually a higher average of income per capita. The richer countries have rates similar under both definitions. In the case of the selected CEE countries, despite their low income per capita, the rates under the two definitions are either similar or the average pension as share of the average wage is higher than the average pension as share of the income per capita. The explanation for this could be the low level of wages in CEE countries. This comparison between the two indicators can be useful when assessing relative income status of pensioners.

Coverage

There are several definitional issues when discussing coverage. Put simply, it represents the number of contributors to a particular pension plan in a given period of time – as a percentage of the total working age population or labour force, including informal sector workers. Alternatively, the *covered wage bill* definition is amount of labour upon which the payroll tax is levied. This indicator is most of all influenced by the size of informal market and different income exemptions. The trick is that the extent to which these factors reduce the indicator is very difficult to assess, given the scarcity of data on labour. In the following tables, coverage is shown according to three definitions. The three indicators are highly correlated with one another and they are also correlated with income per capita (more than 70 percent of coverage variation is explained by income level – Palacios and Miralles, 2000).

Table 3.5 Coverage in selected countries

Country	Year	Covered Wage Bill/ GDP	Contributors/ Labour Force	Contributors/ Working Age Population
Bulgaria	1994	16.3	64.0	63.0
Czech Republic	1995	35.0	85.0	67.2
Hungary	1996	23.5	77.0	65.0
Poland	1996	26.7	68.0	64.0
Romania	1994	20.9	55.0	48.0
Slovak Republic	1996	34.0	73.0	72.0
Slovenia	1995	42.1	86.0	68.7

Source: Palacios and Miralles (2000)

The low ratios of contributors to labour force show the size of the informal sector. Tax evasion seems highest in Romania, Bulgaria and Poland. The informal activities seem best contained in Slovenia and the Czech Republic, which have a ratio comparable with some OECD countries. The difference between the last two indicators could represent the size of the early and disability retirement, self-employment and the extra voluntary unemployment unenclosed in the usual unemployment rate. This difference is highest in Slovenia and Czech Republic (again, it may be a consequence of their efficient contribution collection system, achieving higher tax compliance), followed by Hungary and Romania. Oddly, Poland, with its massive early retirement programs, has relatively similar numbers, comparable to many OECD countries. Germany is the OECD country, which, in spite of nearly full tax compliance, has a high difference between the contributors to labour force ratio and the contributors to working age population ratio.

Payroll taxes

The OECD countries in CEE (Czech Republic, Hungary and Poland) have social security taxes well above the OECD average, as a result of the combination between high replacement rates and high system dependency ratios. Poland has the highest payroll taxes, both for pension and for all social insurance programs.

Table 3.6 Social insurance taxes, mid-1990s, selected countries (as percent of gross wage)

Country	Pension tax			All Social Insurance Taxes
	Employer	Employee	Total	
Bulgaria	-	-	42.0	47.0
Czech Rep.	20.4	6.8	27.2	48.5
Hungary	24.5	6.0	30.5	60.5
Poland	45.0	0.0	45.0	48.0
Romania	-	-	26.5	33.5
Slovak Rep.	20.6	5.9	26.5	46.0
Slovenia	15.5	15.5	31.0	45.8

Sources: US Dept. of Health and Human Services (1997)

3.5. The CEECs Pension Reform Experiences

3.5.1. The Hungarian case

Hungary started its pension reform in 1993 with the introduction of voluntary private pension mutual funds and continued in 1997 with the reformed PAYG social insurance scheme and the mandatory private funds. Essentially Hungary runs two systems of pension provision (Palacios and Rocha, 1997):

- a reformed PAYG – that includes a higher unisex retirement age of 62 (to be gradually reached in 2009), pension eligibility gained after a period of 25 years of contributions, changes in the benefit formula designed to gradually eliminate redistribution from the pension scheme, a new tax regime and a shift from net wage indexation to a combination price/wage indexation formula (the 'Swiss formula' - 50 percent net wage index and 50 percent consumer price index);
- a multi-pillar system – the first pillar applying the same rules as the reformed PAYG, with the benefit formula scaled in proportion to the size of contribution rates; the second pillar – the fully funded, mandatory pillar and the third pillar - the existing voluntary private pensions based on mutual benefit funds managed exclusively by their members.

The reforms implemented in the public pension system have restored its solvency until the middle of 2030s (Laursen, 2000).

Between January 1998 and August 1999 there was a transition period, during which the workers had the choice to switch to the multi-pillar system. Workers who decided to stay in the reformed PAYG continued to contribute 31 percent[9] of their gross wages. Those who switched to the new system still contribute to the PAYG with 24 percent and have 6 percent going to their second pillar accounts[10] (Simonovits, 1999). However, the workers who chose to switch (not the new entrants) are allowed to switch back to the PAYG once, until December 2002 (about 1.5 percent fund members have done so - Laursen, 2000). The contribution of 6 percent going to the second pillar has been frozen by legislation until 2003 and tax deductions of 25

[9] Percentages vary but the employee contributes 7 percentage points while the employer contributes 24 percentage points.

[10] 1 percentage point of the employee's contribution rate of 7 percent goes to the public pillar, "to create a legal framework to pay only limited sums for the otherwise unlimited employer's contributions" (Simonovits, 1999:10).

percent on all mandatory contributions have been installed, with benefits tax exempted.

Participation in the second pillar is mandatory for all new entrants in the labour force. The benefits of the second pillar are required to be indexed at least to the degree of the first pillar. According to the law, unisex mortality rates have to be used when calculating life expectancy of individuals. There is also a basic benefit in the form of a life-long annuity, which is guaranteed to those contributing a minimum period of 15 years. The minimum pension benefit paid by the second pillar is required to be at least 25 percent of the fund member's first pillar pension. The money for the minimum pension guarantee in the second pillar comes from a central guarantee fund where all funds must pay a percentage of their members' contributions.

The pension funds in the mandatory second pillar are organised as mutual associations, whose members are the co-owners of the funds, just like the previous funds in the third pillar. At the start of 1998, there were 38 licensed funds - a number that, as expected, diminished gradually. At the end of 1999, mergers had reduced it to 25. The private funds have already attracted about 50 percent of the total working population and will continue to expand with the new entrants in the labour force. The private funds market concentration goes along a well-known principle: 80 percent of the participants are registered with 20 percent of the funds – by 1999, the five largest funds accounted for 78 percent of all members and 73 percent of total assets (Rocha and Vittas, 1999).

The investments made by the private pension funds are strictly regulated. Investment portfolios must include different asset classes aiming to reduce the risk. Investments are classified in four risk classes (Vittas, 1996):

- 1st class consists of cash, bank deposits of less than one year, and state securities of less than one year (Treasury bills) – funds are required to invest at least 10 percent in liquid instruments;
- 2nd class comprises longer-term government and central bank bonds, mortgage bonds, and longer-term bonds issued by international organizations - funds are required to invest at least 30 percent in class 2 assets;
- 3rd class includes listed equities and corporate bonds, including bonds guaranteed by financial institutions – investments in this asset class cannot exceed 60 percent of total assets;

- 4th class covers unlisted shares, loans to members, and real estate - investments in this asset class cannot exceed 30 percent of total assets.

In addition, at most 20 percent of the funds' assets may be invested/deposited with the same financial institution. The limit on foreign assets was initially zero, but was changed to 10 percent in 2000, to 20 percent in 2002, and, before long, will be increased to 30 percent of the total assets.

Pension funds must have an internal reserve to be used against fluctuations of more than 15 percent in investment performance compared to the return of a long-term government bond. The minimum return is backed by a minimum reserve equal to 0.5 percent of total member assets.

Administrative fees include various percentage levels for operational costs and about 1 percent for the various contingency reserves. Rocha and Vittas (1999) mention operating costs at much lower levels than in Latin America, 7.5 and 11 percent of contributions. However, they point out that, in Hungary, there are additional charges for asset management and external administration and also, the sponsors of pension funds (usually employers) seem to have subsidised a large proportion of the costs (rent-free premises, staff etc.) and have spent less on marketing. Regarding the rates of returns, Rocha and Vittas (1999) estimated positive values, though close to zero (after deducting inflation and asset management fees).

Initially, the transition deficit in the PAYG due to the switch of the 6 percent contribution (estimated at 1 percent of GDP - Laursen, 2000) was to be debt-financed, however, given the state of the public finances[11], a mixture of tax (reforms in the PAYG) and debt financing was used.

3.5.2. The Polish case

Poland started discussing about reforming the pension system as early as 1992 when a consensus was reached regarding the need to reform the system. Polish pension reform was launched in 1999, following two years of preparation comprised of passing laws crucial to the reform. It is important to make notice that the old system was completely terminated, the reformed system being a completely new one.

The new pension system in Poland embraces the multi-pillar principle (OECD, 2000) but includes a new type of first pillar – the Notional Defined Contributions

[11] According to Palacios and Rocha (1997), in 1997, the public deficit was 4 percent of GDP while the consolidated public debt was 70 percent of GDP.

(NDC) scheme, which was developed as a mixture of traditional PAYG defined benefit and fully funded defined contributions systems. The NDC pillar of the new Polish system remains a PAYG scheme - current contributions are used to pay current pension benefits. However, in the NDC PAYG system, the participants contribute based on a fixed rate and the value is accredited to their notional accounts (the defined-contribution feature of the system). The contributions 'accrue' in the notional account, being indexed in line with wages (75 percent of the wage bill growth). At retirement, the virtual account's balance is divided up into pension annuities, which thereafter are indexed to price inflation. Older workers who have obtained pension rights under the old system have been 'credited' notional capital – unlike other countries that have offered traditional PAYG pensions or Chilean-style recognition bonds for the transition to the new system.

So, the new pension system has three components, all based on individual accounts:

1. the public NDC PAYG scheme - mandatory, defined-contribution, publicly managed by a state institution (the Social Insurance Institution), using notional individual accounts;
2. the universal pension funds scheme – mandatory for people under the age of 30 and optional for those between the ages of 31 and 50, defined–contribution, funded scheme, privately managed by open pension funds and supervised by a committee;
3. the voluntary contributions scheme – optional, privately managed and based on investments accrual, supplementing the first two pillars (consisting of an employee pension fund, a contract with an investment fund, a group life assurance policy with an insurance company or a contract with a mutual insurance society).

The main idea behind the reform of the system was to spread the risk between the redistributive component and the capitalization component. Góra (2001) notes that the pension system was intended to be an instrument commanding efficiency in intertemporal consumption-smoothing and, also, equity in pensions as a social objective – each individual receives from the system the amount he has been contributing plus the return of the investments made with his contributions. The first and the second pillar function in the same way (same minimum retirement age of 60 for women and 65 for men, managed individual retirement accounts, annuitiesed at the day of retirement) the main differences being the returns the accounts in the two pillars generate and the financing of benefits.

The rate of return in the first pillar (the notional interest rate) is linked to the growth of the covered wage bill (labour market performance) while the rate of return in the second pillar is linked to the pensions funds investment efficiency (capital market performance). The long-term target is that half of the system will be funded and half will be NDC PAYG. (Góra, 2001)

Additional to the mandatory (first and second) pillars there is the supplementary third pillar, which consists in long-term saving plans and occupational programmes. There is also a guaranteed minimum pension, financed from other general tax revenues, for individuals who have reached retirement age limit after having contributed for 25 years (men) or 20 year (women).

The contribution rate (which was 45 percent – payroll tax – under the old system) fell to about 36.50 percent, but the method is not that straightforward. The contribution was divided equally between the employee and the employer – each pays the same for old age and disability insurance, the employer covers work injury while sickness is the responsibility of the employee.

Table 3.7. Contribution rates as share of gross wage

Contribution	Employer	Employee	Total
Old age	9.76	9.76	19.52
Disability and survivor	6.50	6.50	13.00
Sickness and maternity	-	2.45	2.45
Work injury	0.4 to 8.12	-	0.4 to 8.12

Source: Chlon, Gora and Rutkowski, 1999: 7

In the new system, the contribution is split in half between the employer and the employee. About 60 percent of all persons between ages of 31 and 50 joined the private pension funds. The three biggest pension funds account for 60 percent of all participants in the pension system and 90 percent of all participants are included in the first ten pension funds. (Moldovan, 2000) The introduction of the second component proved to be a success – the number of people who applied for joining private pension funds exceeded the expectations of the Polish policy-makers. In 2001, the pension fund market in Poland was shared by 20 pension funds with 10.5 million members, together with 38 registered employee pension programs. (Parniczky, 2001) The three largest companies accounted for 55 percent of total members and 65 percent of assets (Müller, 2001). The companies that manage the pension funds are international financial institutions with experience in the administration of private pension funds that have as partners some Polish institutions. The participants preferred companies that were already active in the insurance and financial market at the time of implementation of the second component.

Administrative fees are charged on contributions, assets, and transfers between funds. Average fees in the early years of the system were between 7 and 9 percent of the contributions, with projections to gradually decrease to 5.76 percent in 2020. Asset management fees have been imposed a limit of 0.6 percent per year. (Chlon, Gora and Rutkowski, 1999)

The investments of the pension funds have to be made within the limits specified by the government. Limits include: 40 percent in quoted domestic stock, 10 percent in the secondary stock market, 5 percent in foreign securities (OECD securities), 20 percent in bank deposits, 10 percent in National Bank of Poland papers and 15 percent in municipality bonds, 25 percent in investment funds and up to 100 percent in government securities.

From 2005, the pension fund administrators will be required to provide an additional type of fund with investment restricted to fixed income securities and only with individuals aged over 50 years being eligible to participate. Individuals will not be able to split their contributions between the two types of funds. (Chlon, Gora and Rutkowski, 1999)

The pension funds are subject to a minimum rate of return calculated by the supervisory agency as an average rate of return of all pension funds for the last 24 consecutive months. Rates of return for individual pension funds must fall within either 50 percent of the average rate or be up to 4 percentage points lower than the average rate, whichever is lower. If the individual rate of return is lower than the average by more than mentioned above, the pension fund must make up the difference from a special reserve account (between 1 percent and 3 percent of total fund assets). If the reserves are not sufficient, the pension society's assets have to be used. If the reserve and the assets of the fund-management company do not meet the shortfall in the return, then the fund manager will be declared bankrupt and the additional deficit is covered by the guarantee fund (paid for by 0.1 percent of total assets of all the pension societies). So far, the performance of the Polish pension funds has not been great, net losses being registered. However, things are improving, in 2002/2003 the (KNUiFE, 2004)

Naturally, switching and transferring contribution from the public scheme to the privately managed funds causes a deficit in the social insurance budget (the first component). According to the Polish reform law, this deficit is supposed to be financed from revenues obtained in the privatisation of state enterprises. On the other hand, participation in the private funds reduces the accumulation of implicit debt for the baby-boom cohorts, which helps maintain the public PAYG scheme in the future.

Regarding the tax treatment in the new pension system, in the NDC-PAYG pillar, the contributions are tax deductible and benefits are taxable, in the second pillar, the contributions and earnings are tax exempt but benefits are taxable, while in the last pillar, in the case of occupational plans, only contributions paid by employers are tax deductible, with earnings and benefits tax exempt.

3.5.3. The Bulgarian case[12]

Bulgaria has one of the worst ratios of pensioners to contributors (as shown in Table 3.3), standing at 97.5 percent in 2001. Projections had shown that balancing the system would have required an increase in contribution rates to 60 percent (Tinios and Markova, 2001). Clearly, reform was badly needed.

Bulgaria started its comprehensive reform in 1999 following the World Bank model – a multi-pillar system featuring a reformed mandatory PAYG first pillar, a fully funded mandatory private pillar for the new entrants in the labour force and, last, a fully funded voluntary private pillar. The PAYG pillar has been strengthened by parametric reforms (raising retirement age limits, restricting early retirement, changing pension formula and enforcing contribution-benefits link).

Reform in the first pillar was implemented in January 2000, bringing a phased increase in minimum retirement age limit to 63 years for men and 60 years for women, for the year 2009, an increase in minimum contribution periods and a gradual shift of contribution payment (32.7 percent in 2001) from employer to employee, from a ratio of 80:20 to a ratio of 50:50 in 2007. Certain group privileges and cross-subsidies were greatly reduced. The pension formula is determined by three components: the length of contribution period (every year counts as 1 percent of the average monthly insurable income[13]), a ratio between the individual and national insurable income and the average insurable income from the previous year. Thus, the

[12] The presentation of the Bulgarian case is mainly based on Tinios and Markova (2001).
[13] Approximately gross income.

average replacement rate floats around 35 percent but there is considerable variation because pensions are tax-exempt and can have very different supplements. The pension amount has to be between 115 percent and 400 percent of the social pension[14] (Tinios and Markova, 2001).

The second pillar consisting of universal pension funds and occupational pension funds for early retirement is really meant for individual supplementary pensions. Occupational pensions have a retirement age limit of 60 years (men) and 57 years (women) with early retirement available at ages 56 (men) and 52 (women). Contributions for occupational plans are paid only by the employers (7 to 12 percent of payroll), while the contributions to universal pension funds (currently 2 percent of earnings, to be increased to 5 percent) will be split between employers and employees according to the law. Administration fees have ceilings of 5 percent of contributions and 1 percent of assets. As of January 2001, 9 pension funds for both mandatory and voluntary supplementary pensions were sharing the pensions market, covering around 500,000 individuals.

Investment limits include: a minimum 50 percent in government securities or bank deposits, 5 percent in foreign government securities and municipal bonds; and 5 percent in foreign stocks. The minimum rate of return is determined by the Bulgarian supervisory agency. If a pension fund's rate of return falls below the minimum accepted rate, the Supervision shall determine a deadline for presenting a business plan including strategies for improving the performance (N.S.S.I., 2004).

3.5.4. The Czech Republic case

The pension system reform in the Czech Republic, one of the most transition-advanced countries, has not progressed much mainly because it did not face an immediate problem. However, starting with year 2010, the ageing process will hit the Czech Republic hard, with one of the fastest rising share of population of 65 years and over (as shown in Graph 3.9). As a result, the Czech pension system still features generous benefits, low statutory retirement ages, limited penalties for early retirement, and short minimum contribution periods (Heller and Keller, 2001).

The developments in pensions in the Czech Republic mirror those in other CEECs but to a smaller degree. Compared to the other CEECs, GDP and

[14] Minimum, guaranteed, non-systemic benefit; financed from the state budget.

unemployment fluctuations have been milder, dependency rates have risen rapidly in the 1990s but have remained at slightly lower levels, and the share of pension expenditures in GDP has remained fairly average at around 8-9 per cent. Nevertheless, the overall pension system budget balance has worsened in time, reaching a deficit of more than 0.5 per cent of GDP in 1998 (Laursen, 2000).

The public pension system is a PAYG scheme, mandatory for all workers. It features uniformity of treatment and special benefit-contribution link based on two components: a basic flat rate, ensuring an socially acceptable level of minimum income for low wage earners and a percentage and required not to exceed 15 per cent of the total pension amount, and a percentage, the ratio between total pension and wage (the replacement rate) being meant to fluctuate around 45 per cent. The pension formula also features an earnings period of 30 years (a phased increase until 2015) and indexation to CPI and real wages (Laursen, 2000).

The contribution rate is 26 per cent, paid largely by employers (19.5 per cent). The system requires a period of minimum 25 years of contributions for eligibility to pension rights. Retirement age limit has been raised in 1997, to gradually reach in 2007 the limit of 62 years for men and 57-61 years from women (depending on the number of children reared).

So far, the main reform feature of the Czech system is the state-contributory supplementary pension insurance scheme, introduced in 1994 and amended in 1999. Participation in the scheme is voluntary and on the basis of citizenship. The balance can be paid out after the age of 60 years as a lump sum or annuity, provided that the requirement of minimum period of contribution is satisfied. State and individual contributions are tax exempt but their yields are taxed at 15 per cent. Contribution from employers and employees are tax deductible and benefits paid out are tax exempt. By the end of year 2000 thirty pension funds were registered, covering with supplementary pensions almost 2.5 million people, mostly in their 40s and 50s.

The future reforms considered are further parametric adjustments (increasing the statutory retirement age to a unisex limit of 65 years, extension of contribution period from 25 to 30 or 35 years) or the introduction of Notional Defined Contribution Accounts (Laursen, 2000). Considering the parametric reforms in the other CEECs, in the case of the Czech Republic, an increase in the contribution rate is still feasible (most of the others CEECs have rates around 30 per cent). Maintaining pension system balance would require a gradual increase in the contribution rate to about 32 per cent in year 2020 (Laursen, 2000). Tightening of early retirement provisions and extending the contribution periods necessary for pension eligibility from 25 years to 30-35 years are also possible and desired to put the Czech Republic in line with the other CEECs. The statutory retirement limit is also low compared with other CEECs (like Poland or Romania) and especially with some EU countries (Germany, Sweden).

3.5.5. The Slovak Republic case

The Slovak pension system has also been safe from the financial point of view. The effect of ageing has not yet been felt and, even in the near future, the Slovak Republic will continue to enjoy one of the lowest shares of population of 65 years and over (as shown in Graph 3.9). The absence of indexation mechanisms and a contribution-benefit link that lets benefits decline progressively with higher wages effected a decreasing replacement rate which, in turn, translated into a receding share of pension expenditure in GDP. However, weak tax and contribution collection mechanisms and recent generous enhancements to pensions started exerting some measure of strain on the finances of the pension system. It is also worth noting, as Table 3.2 and Table 3.3 show, that, even in the past, when the Slovak benefits were low, the number of pensioners and amount spent on retirement was higher than the OECD average.

The main feature of the current Slovak pension system is the mandatory PAYG public scheme, administered by the Social Insurance Agency (SIA). The contribution rate is 28 percent of gross nominal wages, split between employers (paying 21.6 percent) and employees (paying 6.4 per cent). A particularity of the Slovak system is the tremendous social tax (contribution) burden. In 2000 individuals paid 50.8 per cent of their gross nominal wages (total including pension, sickness, unemployment, health-related contributions), a figure unmatched in any other CEEC (Jakoby and Gonda, 2001).

In 2000, the government has proposed the transition to a multi-pillar system, featuring a parametrically reformed public pillar. According to that project, the reformed mandatory PAYG pillar would be reduced to the role of social solidarity exponent and continue to be managed by SIA. The second pillar will be a mandatory fully funded, individual accounts based, administered by the same SIA, coordinated and financially guaranteed by the government. The third pillar would consist of the existing voluntary supplementary pension schemes (they were introduced in 1996).

Contributions will be split between the mandatory pillars, 2/3 and 1/3, respectively. The combined resources of the mandatory pillar are targeted to cover 50 to 60 per cent of the life-long average monthly earnings, up to a maximum of 300 per cent of the average monthly wage.

3.5.6. The Slovenian case

Slovenia is the one of the best-positioned countries in relation to the EU accession. Its demographic parameters also follow the EU trends closely, larger than the CEE average. It has had the highest replacement rate and coverage, and a matching large pension spending to GDP ratio. Ageing process will be felt hard in this country too, the projections for the dependency rate being of the worst kind. In January 2000, pension reform was launched not merely to follow the EU trends but to respond to the financial problems.

Slovenia has implemented only parametric reforms. Concerned with maintaining the generous benefits, the amplitude of its parametric reforms is quite big. Slovenia has lowered its incredible replacement rate from 85 per cent to 'just' 72.5 and has risen the statutory retirement ages from 58 to 65 for men and from 53 to 63 for women, along with the full contribution periods from 35 to 40 for men and from 30 to 38 for women.

3.6. Conclusions

The public pension systems in CEE have provided suitable universal coverage until late 1980s; however, the beginning of the next decade saw them heading towards failure in meeting their objectives. The main characteristic of the CEECs, crucial for the study of their pension systems is that, since 1989, these countries have been in a continuous and thoroughgoing transformation. Transition has meant unfaltering change at social, economic and political levels, bringing turmoil and uncertainty in all aspects of life. In the case of the CEECs, the pension systems crisis was due to the juxtaposition of economic transition conditions and past pension commitments. The pension systems in transition featured rising pension expenditures, big discrepancies between systemic and demographic dependency ratios, unsustainable replacement rates, increasing contribution rates and growing evasion. The added pressure of adverse demographic trends and the maturation of existing public pension systems has increased the difficulty level of keeping the pension systems afloat.

Reforming the systems had become inevitable. The strategy goals had to include securing pension benefits, reducing government spending on pensions, decreasing the contribution rate, lowering system dependency ratio, increasing participation rates and improving saving rates. Reform had to be aimed at reducing the systems' exposure to risks (demographic or economic), establishing a strong link between contributions and benefits and creating room for individual choice.

The inspiration for the CEE pension reform has come from the pioneering experiences of a few Latin American countries that have been appropriated and theorised on by the international financial institutions. As already mentioned in the previous chapter, the Chilean pension reform experience is the one responsible for kick-starting the debate on the privatisation of pension systems. Chile is a showcase for systemic substitutive pension system reform. The Argentinean case represents another benchmark that has influenced the debate and altered the outcomes of reform in other Latin American and CEE countries. Argentina is representative of the systemic mixed (multipillar) pension reform.

As the CEE cases have shown, the on-going pension reforms in CEE follow the World Bank multi-pillar model. With the exception of Poland, which has opted for an NDC scheme as first pillar, they do not feature extreme innovations or untried formulas. This is because, from the perspective of the CEE, the pure Chilean reform option is not suitable as it does not diversify risks and it implies remarkable transition costs. The next chapter will argue this point in more detail, as the pension reform cases will be examined more profoundly.

Table 3.8 A synthesised comparison of pension reforms in selected Central and Eastern European countries

		Hungary	Poland	Bulgaria	Romania	Czech Republic	Slovenia	Slovak Republic
Mandatory public pillar	**Reform implemented**	**1998**	**1999**	**2000**	**2001**	**1997**	**2000**	
	TYPE OF PUBLIC PILLAR	Traditional PAYG; complementary to private pillar	NDC, complementary to private pillar	Traditional PAYG; complementary to private pillar	Traditional PAYG; complementary to private pillar	Traditional PAYG	Traditional PAYG	Traditional PAYG
	Min. retirement age limit	62 - unisex	65 – men, 60-women	63 – men, 60 - women	65 – men, 60 - women	62 –men, 57-61 women	65 – men, 63 - women	60 – men, 53 - women
	Contribution rate*	31%	36.5%	32.7%	35%	26%		28%
	Full contrib. period	25 yrs	25 –men, 20 - women	No minimum	35 –men, 30-women	25 yrs	40 – men, 38 - women	
	Contrib. payment: employers - employees	Employers pay 24%	Split 50:50	To be split 50:50	Employers pay 2/3	Employers pay 19.5%		Employers pay 21.6%
	Replacement rate	60% overall		35%	35-50%	45%	72.5%	
	Pension formula	Swiss indexation	Linked to covered wage bill; Life expectancy factor included	Benefits - 115% to 400% of social pension	Points formula, based on the gross average wage in month of retirement	Includes a basic flat rate <15% total pension. Indexed to wages and CPI	Best 18 yrs, less than 400% minimum base pension (64% national average net wage)	Linked to national average wage
Mandatory private pillar	**Reform implemented**	**1998**	**1999**	**2002**	**2007**	-	-	-
	Mandatory or optional	Mandatory for new entrants to labour market.	Mandatory for workers under age 30. Optional between 31 - 50	Mandatory for all workers under 42.	Mandatory for workers under age 35. Optional under 45.	-	-	-
	Indiv. contrib. rate**	6%	9%	7-12%	6% in 8 years	-	-	-
	Min. Contrib. period	15 yrs	Until 65 (60) years			-	-	-
	Additional requirements	At least 25% of 1st pillar pension	Pension linked to capital market performance		Benefits not lower than the cumulated value of contributions, CPI indexed	-	-	-

* total contribution rate of the system (including the percentages directed to the mandatory private pensions pillar)

** the private pensions pillar contribution rate does not include disability and survivors' insurance

CHAPTER 4.

REVIEW OF THEORY IN LIGHT OF CASE STUDY EVIDENCE

4.1. Introduction

This chapter presents a more detailed discussion of the selected Central and Eastern European pension reform cases presented in the previous chapter in a comparative perspective involving the Latin American pension reform cases. The chapter largely follows the structure of the second chapter, focusing on the lessons drawn from the pension reform experience cases.

4.2. Pension Reform in Central and Eastern Europe and Latin America

Central and Eastern European (CEE) economies inherited a comprehensive system of social benefits (except for unemployment) with pensions taking rising share of GDP. Under the old pension systems, social expenditure was financed predominantly through social security contributions, with 50 to 70 percent of pension expenditure financed in this way. Despite these high rates, a rising portion of pension expenditure has had to be financed through state budget resources, thereby widening the general government fiscal deficit. Consequently, high pension expenditure levels have threatened macroeconomic stability, unless other public expenditure was curtailed or revenue increased. Because of a rising number of retirees, the benefit levels have been very low, only providing income support around the poverty level. Thus, all CEE transitional economies have required rapid and comprehensive restructuring of their pension security systems for both macro and microeconomic reasons. Social security reform, economic restructuring and economic growth options are closely linked. (Palacios and Rocha, 1997, Palacios and Miralles, 2000, Holzmann, 1994)

Even if the most urgent need for pension reform has been in the CEECs, such issues are also under scrutiny in many rich countries. Existing pension arrangements in OECD countries are increasingly seen as unsustainable in the future as ageing populations, declining rates of participation and "public social spending overload" are becoming pressing problems (Disney, 1999, Adema and Einerhand, 1998). Many OECD countries face substantial "transition" problems of their own in their attempt to optimise pension arrangements. Although founded on the Chilean reform experience, the World Bank model is already present in the OECD, mainly in Anglo-Saxon countries. However, in the OECD countries, the main priority is reforming the first pillar, while the private fully funded components associated with the second pillar are regarded as optional add-ons to the unfunded scheme (Adema and Einerhand, 1998; Disney, 1999).

While many OECD countries show reluctance towards radical pension reform[1], an increasing number of Latin American and Central and Eastern European Countries (CEECs) have opted for full or partial privatisation of their pension systems. This is truly a remarkable change because it not only reflects the fundamental shift from collective intergenerational old-age support (the PAYG intergenerational contract) to individual responsibility in old-age economic security, but also the change in the social contract, as the state retreats and promotes the market as the main provider of retirement benefits.

Following the cases presented in the previous chapter, the CEECs main features relevant to pension system reform can be summarised as:

- high initial implicit debt;
- weak administration capacity;
- decreasing contributor base;
- numerous privileged groups;
- low retirement age limit.

As detailed in Chapter 3, a vicious circle is visible in the CEECs: on one hand, the transition process has increased the demand for social benefits but, on the other, it has undermined the financing of benefits. As GDP fell, the revenue base decreased, triggering the need to raise taxes and contribution rates, which, in turn, increased the practice of evasion, shrinking the tax base even further (Heller and Keller, 2001). The severe administration problem resides not only in the size of the informal sector[2] but also in the employer-employee contribution payment arrangements. The employee paid minimal contributions directly, and there was a weak link between contribution

[1] OECD old-age related concerns revolve around a "new retirement", involving improved economic security for the older people, encouragement of late retirement and "active ageing" (OECD, 1998, 2000).

[2] For example, as an average for 2000/2001, the size of the informal sector was over 30 percent of GDP in Bulgaria and Romania, around 25 percent of GDP in Poland and Hungary, while in the Czech Republic and Slovak Republic it was around 18 percent of GDP. (Schneider, 2002)

payments and pension benefits with little awareness of the contributions paid by the employer (GVG, 2003).

The Latin American and CEE groups of countries have many features in common. First, like in CEE, the pension systems in Latin American were of Bismarkian tradition as well, with high benefit levels and contribution rates. Contribution rates were already high in both Latin America and CEE and raising them would only have meant stimulating more evasion. Second, there are similarly large discrepancies between the system and demographic old-age dependency ratios. In 1996, in Argentina, there where only 1.5 contributors per pensioner and 3.1 persons of working age per person above 60 years (Quiesser, 1999), situation identical to the one portrayed in Table 3.3, Chapter 3 for the CEECs. Even the reasons behind the discrepancy are also quite similar: low retirement ages, loose early retirement and disability provisions and extensive evasion. Many CEE pension systems also suffer from poor indexation, while as in Argentina, the capital markets are not well developed and poorly regulated. As a result, the two groups of countries faced similar growing financial burdens on their public pension systems.

Variations of the Chilean/Argentinean model have been introduced in Bolivia, Colombia, Mexico, Uruguay, and Peru and other countries. The main common feature present in all the reforms is the mandatory private pension fund pillar, which is either competing with or substituting or complementing the public PAYG pillar. Depending on this relation, the new pension systems have been labelled as "parallel or selective", "substitutive private", and "mixed" (Mesa-Lago, 1997). However, while in Latin America all three types of reform have been followed (substitutive, parallel and mixed), in Central and Eastern Europe the dominant strategy opted was the mixed strategy, following the World Bank multi-pillar model. Latin American countries adopted parametric reforms as well (Mesa-Lago, 1997); however their importance seems lower than in the CEECs, as half of the Latin American countries opted for privatisation.

The World Bank had strongly suggested the CEECs to take necessary steps and apply the multi-pillar type of pension privatisation, giving an optimistic assessment as to the degree in which Poland, Hungary, and the Czech Republic already fulfilled the preconditions necessary before the start of a successful implementation (World Bank, 1994). The cases presented in the previous chapter show that, from the perspective of CEECs, the pure Chilean reform option –

completely turning a PAYG, defined benefit monopoly into a fully funded, mandatory defined contribution system – was not suitable to be followed exactly, for many of the same reasons the OECD countries had not adopted it: it does not diversify risks and it implies remarkable transition costs, difficult to be dealt with in such countries with large maturing PAYG systems. The multi-pillar approach promised diversification of the sources of pension benefits - some guaranteed by the government, ensuring that productivity growth and capital market returns both have roles to play and, consequently, was easier to implement. However, authors such as James (1997a) argue that CEECs find the introduction of a mandatory private pillar very difficult due to high transition costs and political interests, and, as a result, are experimenting with the idea of notional defined contribution pillars and voluntary private pensions.

It can be argued that the Argentinean pension reform, more than the Chilean case, has been especially relevant to most of the CEECs as their pension systems have many features in common with the Argentinean system of the early 1990s. Argentina combined a thorough reform of the public PAYG scheme and the introduction of private pension funds administrators (AFJPs), keeping all the workers in the mandatory public scheme but allowing them to decide on redirecting part of their pension contributions to one of the AFJPs, to the private pillar. The most important differences from the Chilean model (Arenas and Bertranou, 1997) are the following:

- a comparatively slow building up of the mandatory pension fund pillar;
- impossibility of completely opting-out of the public pension pillar;
- the maintenance of the employers' contribution to co-finance the public pillar;
- a compensatory pension arrangement instead of interest-bearing recognition bonds to deal with acquired pension entitlements.[3]

Further, while Argentina was the first country to implement systemic reform through democratic process (Vittas, 1997), the collapse of its old pension system served as a warning against procrastinating reform – at the time of reform, the system was bankrupt, pensioners being paid only fractions of their entitlements (Quiesser, 1999).

[3] There are authors like Vittas (1997) who, in the light of the Argentinean experience, advise on the use of compensatory pensions rather than recognition bonds as a way likely to mitigate the cash flow implications of the reform for government budgets.

4.2.1. First pillar matters

The key difference between the pension reforms is the relative size of the private and public pillars. In Latin America, the majority of the countries have adopted systems based on large private pillars, but there are also important exceptions - as shown in Table 3.1, Chile phased out its public PAYG system, Uruguay chose a large public pillar, and Argentina fell somewhere in between. On the contrary, in the CEECs there is less variation to be observed regarding the first (public) pillar and, against World Bank's recommendations, most pension-reforming countries decided to maintain dominant earnings-related public pillars.

In the beginning of pension reform, all Latin American countries have performed parametrical adjustments to their old systems - downsizing benefits, raising retirement ages, introducing penalties and tightening eligibility for early retirement and disability benefits, and switching to price indexation of benefits in order to reduce the outstanding debt (implicit or explicit) (James, 1997a). The CEECs have implemented similar parametric reforms. Within the first pillar, the CEECs have adjusted the benefit formulas by increasing the number of years (of earnings or contributions) taken into account when calculating the public pension. Redistribution is present in most first pillar pension formulas, with the aim of fighting poverty – Hungary and the Slovak Republic have non-linear formulas while others have flat-rate components (GVG, 2003). Also, minimum statutory ages are being raised with the hope of both adjusting the system dependency ratios and assuring that pension benefits are adequate at older ages (when coupled with the second pillar accumulations). However, in the examined CEECs, benefits in the first pillar are usually indexed to a combination of prices and wages (by Swiss indexation or other methods) except in Poland where the covered wage bill is used in the pension formula. Again, this goes against the World Bank's recommendations (Palacios and Rocha, 1997) that benefits are inflation-protected by indexing to prices and not to wages in order to reduce the public pillar's deficit. The CEE argument is that the deficit reduction thus achieved is in the detriment of old age income maintenance.

Nevertheless, there are differences within the CEE group. While Hungary (and similarly, Bulgaria and Romania) has continued with a reformed PAYG scheme (to which they added the second pillar), Poland has radically changed its first pillar transforming it into a Notional Defined Contribution pillar (see Chapter 2). The NDC pillar functions exactly as the fully funded second pillar, having the same retirement age and pension accounting method (participants contribute based on a fixed rate and the value is accredited to their managed individual retirement accounts which are annuitiesed at the day of retirement). The main differences are the returns of the accounts in the two pillars generate and the financing of benefits: the rate of return in the first pillar (the notional interest rate) is linked to the growth of the covered wage bill (labour market performance), while the rate of return in the second pillar is linked to the pensions funds investment efficiency (capital market performance) (Góra, 2001).

Another very important distinction regarding the Polish NDC pillar is that the individual life expectancy is one of the parameters involved in the individual accounts. The benefits are calculated by dividing the value on the account at the time of retirement to a number based on unisex life expectancy (Chlon, Gora and Rutkowski, 1999). A unisex life expectancy index is used in the Hungarian formula in order to strengthen the correlation between contributions and benefits. Other CEECs' pension reforms perpetuate the inequitable treatment of sexes regarding their retirement benefits from the old public pension system into the new one. First, because first-pillar pensions are calculated on gross wages and periods of contribution, without taking into account the differences in life expectancy, on average, women profit longer than men from pension benefits. Significant redistribution takes place in the system in terms of gender, even if the former communist regime had a profound egalitarian impact on labour force related issues. Second, because minimum retirement ages remain gender-specific in all CEECs, women's pensions under the fully funded pillar will be lower given the shorter contribution period. A greater individualisation of rights – in line with the general trend towards greater individual autonomy – is more appropriate, going beyond gender issues (COM(97)102). For a more in-depth analysis of the gender impact of pension reforms in both Latin America and CEE, see James, Edwards and Wong (2003).

Parametric reform in the first pillar was aimed at strengthening the contributions-benefit link, discouraging labour market exit, increasing coverage and reducing evasion. However, Holzmann and Stiglitz (2001) recognised that in most of the countries undergoing pension reform, the changes implemented were not successful in persuading the informal workers to join the formal sector.

4.2.2. Second pillar matters

Regarding the experiences of implementing fully funded pillars in reforming countries, one key dilemma appears to be the size of the second pillar. Based on the experiences in the region, a study by Lindeman, Rutkowsky, and Sluchynsky (2000) tries to specify some initial boundaries on the feasible size. Setting up a private pillar free of political risk entails certain transition and administration costs – discussed in the following sections. Based on these, the study advances a lower interval of 4 to 6 percent of payroll, below which the pillar would cease to be cost effective. Setting an upper limit is more difficult as it deals mainly with the capacity and willingness to cover a larger transition cost and implement a larger private pillar. The above-mentioned study proposes an upper interval of 7 to 10 percent of payroll.

All the CEE countries that radically reformed their systems share to a very high degree the particulars of the second, mandatory private pillar. As previously argued, this is because of the tremendous effect of the Latin American pension reform experience involving universal private pension funds. The Latin American reform efforts, coupled with the influence of the international financial institutions have set the standards in pension reform.

As a result, like in the Latin American cases presented earlier, within the second pillar, workers have individual pension savings accounts, into which they make tax-deductible monthly contributions of certain percentages of their wages. In general, if a person contributes to a private fund, a corresponding tax deduction is made from the payment to state insurance. The pension societies and the funds administered by them are from the legal point of view separate entities. There is freedom of entry and of exit into the industry, even for foreign companies, once a minimum limit on capital has been reached. Pension funds charge fees on contributions and monthly commissions on assets for the services they provide – fixed and variable commissions, a percentage of the worker's taxable income, which includes premiums for life and disability insurance. Upon retirement, typically after the same retirement age limit as stipulated in the first pillar, the workers usually buy lifetime annuities from insurance companies (additionally there are lump sum benefits and programmed withdrawals, once some annuity requirements have been met).

In the new systems, the government is no longer the sole provider but plays two important roles – as a regulator of the system and as the last-resort guarantor. First, the government has established new independent supervising agencies in order to initiate and coordinate the pension reform, which oversee the entire private pensions, mainly by regulating the pension societies. Second, the government will provide a minimum pension from the budget or will supply the extra money needed to provide the minimum pension for workers meeting the required service period. Also, the government has the obligation to provide pension fund information and advice, assisting individuals in pension fund choice.

A secondary aim in establishing the independent agencies was to re-establish the credibility of the pension system, restoring individuals' confidence in pensions (Mitchell, 1998). The cases have shown the importance of regulation in maintaining the individuals' confidence in the newly established institutions. As a result, effective supervision has to be in place and laws have to set out explicitly the conditions which pension societies must meet – portfolio restrictions, minimum rates of return required and obligations to contribute to 'profitability fluctuation' reserves etc. Lindeman, Rutkowsky and Sluchynsky (2000) classify the responsibilities of the supervising agencies into five groups: institutional control – licensing, information disclosure, performance assessment, financial activities monitor – collection, asset valuation, returns calculation and investment limits, regulation of membership – monitoring the transfers from one fund to another, benefit payments regulation and supervision, analysis and planning – developing new regulations.

On important common attribute in the pension reforms featured is, in the majority of cases, the large extent to which the new systems are mandatory. As Table 3.8 in Chapter 3 shows, in CEE, most countries have mandated the workers to participate in both. The voluntary schemes are, in effect, saving incentives. In Latin America, though mandatory participation is still prevalent, there is, however, more choice - Peru and Columbia have allowed their private funded and public PAYG systems to coexist and compete, with workers able to choose to participate in one or the other, while Argentina allows individuals to choose between a funded and a PAYG option for the second pillar.

First, promoting mandatory pension contributions stems from the idea that individuals lack self-control, exhibit myopic consumption behaviour as argued by in the first two chapters. Second, individual choice-based privatisation strategies have not been pursued on account of huge transaction costs and the fear of individuals not being able to assess the relative returns and risks attached to different schemes, thus being prone to making wrong choices (Disney, Palacios and Whitehouse, 1999;

Thompson, 1998). Third, the existence of a minimum guaranteed pension introduces into the system the element of moral hazard – there is the risk of some individuals not making the effort to ensure their own pensions, relying instead on the government. Mandatory contribution ensures that individuals who qualify for the minimum pension have made at least some contribution towards it. From the previously presented pension reform cases it is clear that mandatory membership is prevalent while voluntary pension provision is treated as supplementary.

Transition costs

As discussed in Chapter 2, the PAYG transition cost of implementing a FF pillar depends on the size of the percentage contribution shifted from the PAYG to the private pillar and the number of individuals mandated or given the option to join the new private pension funds. As mentioned in the pension reform cases, determining the number of private pension funds participants is difficult. The consensus in the CEECs seems to be requiring all newly entrants into the labour force (less than 30 years old) to participate, while offering an option to the mature workers (aged between 30 and 50 years who have already started accumulating pension rights). As the cases of Poland and Hungary show, many mature workers choose to exercise the right to switch. Estimating the numbers has been tricky – for instance, in Hungary, twice that many individuals as initially estimated chose to switch voluntarily, so the forecast of the deficit was exceeded – James and Brooks (2001) speculate this was the result of using a minimum rate of compensation set too high. As a result, policy makers tried to contain it by shifting a lower percentage (6 percent – see Table 3.8 in Chapter 3) of the contribution rate to the second pillar than initially planned (GVG, 2003). Thus, a safe prediction is that, given the choice, more than half of the mature individuals will shift part of their contribution to the private pillar. Lindeman, Rutkowsky and Sluchynsky (2000) argue that a second pillar financed by a contribution rate of 8 percent of the gross wage would require around 2.5 to 3.2 percent of GDP during the initial years if all the workers are covered.[4] Not the same consensus can be seen in Latin America where Colombia and Peru run parallel systems giving individuals a

[4] They estimate that if initial participation in the second pillar is constrained at around 50 percent of the labour force, the resources needed to cover the transition deficit are between 1.25 to 1.9 percent of GDP (Lindeman, Rutkowsky, and Sluchynsky, 2000)

choice between the old system and the new (Uruguay also gives more choice to individuals, though the system is mixed).

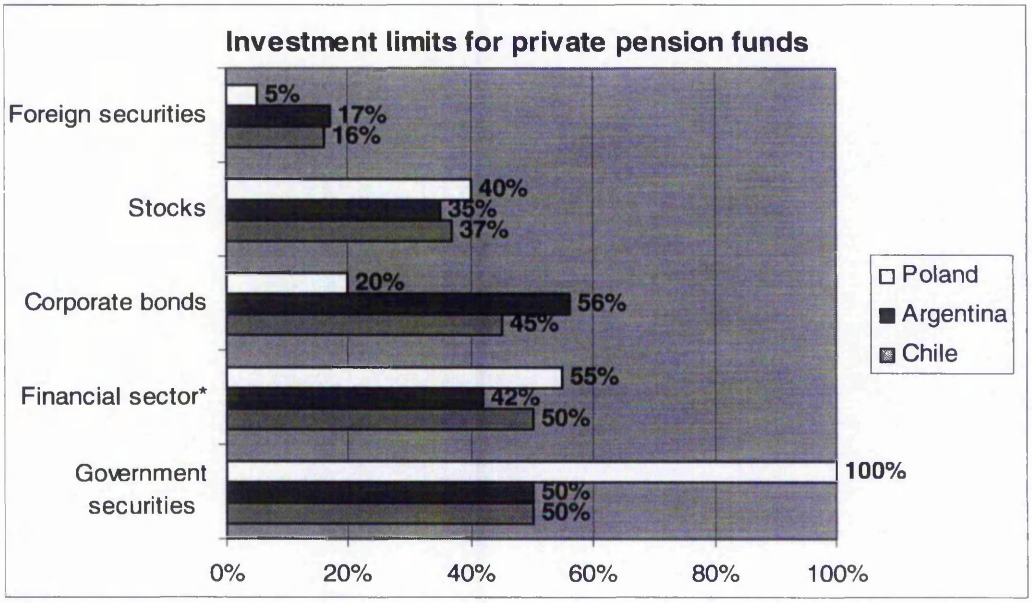
In terms of financing the PAYG transition deficit, there seems to be no final choice, however, increasing taxes or contributions has not proven to be a viable way, given the overall tax burden, the size of the informal economy and the prevalence of contribution evasion in the region. Virtually all Latin American countries used debt financing (James, 1997a), while Bulgaria and Hungary have compensated by using state budget subsidies, and Poland by using privatisation revenues. It is also worth noting that, in the case of CEECs, debt financing has an extra dimension as well – the process of accession to the European Union requires that the national (explicit) debt remains below 60 percent of GDP and the annual deficit stays below 3 percent of GDP.

Portfolio regulation implications

Another major issue in adopting second fully funded pillars is the difficulty in investing the capital. First, in many of these countries, capital markets suffer from lack of liquidity and transparency, are underdeveloped and, frequently, the only domestic option for pension funds is to invest in government bonds, which makes the claim of implementing 'radically reformed' systems entirely unsubstantiated. As discussed in Chapter 2, if a large share of the assets portfolio is held in government securities then the system will remain largely unfunded. Thus, there is the constant risk of low returns and political interference in pension fund management. It can be speculated that at least a partial investment of the contributions in private financial assets would generate a supplementary stream of funds towards the capital markets, raising prices. In the case of the CEECs where privatisation is still taking place, this could help the governments acquire more privatisation revenue, which could help cover the transition cost.

Second, pension funds have been imposed portfolio investment restrictions proving that the rhetoric for liberal investment regulation was not fully accepted politically given precedence to a domestic development perspective. Similar to Latin America, in the new CEE pension systems, investment in foreign securities was not allowed at the start and remains strongly restricted. It can be argued that decisions on investment control reflect the institutional framework and the degree of economic development in these countries, wit the expectancy that the level of control will change depending on the degree of trust individuals have in the various institutions. In Latin America, Chile has been gradually relaxing restrictions for investment in foreign securities, currently the limit for all types of funds being 30 percent (SAFP, 2004, Appendix A, Table A14). Similarly, in the CEECs, Hungary gradually relaxed its limit from 0 percent to 20 percent - soon to become 30 percent. However, Poland only allows 5 percent of the capital to be invested outside national borders.

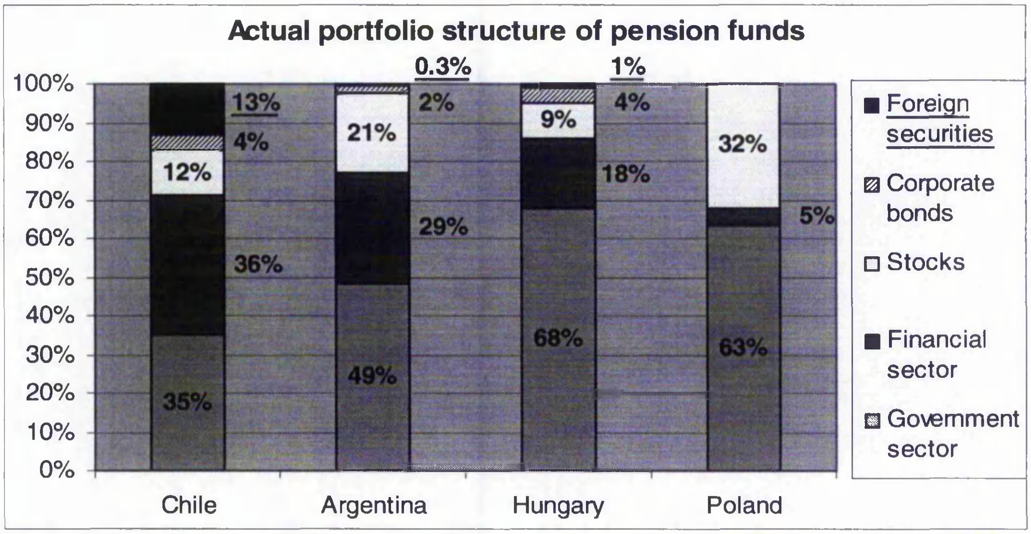
Graph 4.1



Source: Chlon, Gora and Rutkowski (1999), Kritzer (2000), Rofman (2000)
* Including bank deposits, mutual funds, mortgage bonds, cash etc.

Also, imposing portfolio investment restrictions means that individuals cannot make choices according to their tolerance for risk. However, this issue is starting to be acknowledged. As mentioned in the Chapter 3, Chile has already made changes in this direction, the pension funds administrators now being required to offer 5 types of funds with varying degrees of risk and accordingly set investment limits (SAFP, 2004, Appendix A, Table A14). Poland moved in a similar direction – from 2005, the pension fund administrators are required to provide two types of funds – type A, the regular funds, and type B, restricted to fixed income securities. However, unlike in Chile, individuals cannot split their contributions between the two types of funds (Chlon, Gora and Rutkowski, 1999). So there is evidence that it is possible to give contributors the freedom to adjust the level of risk/reward in their investments.

Graph 4.2



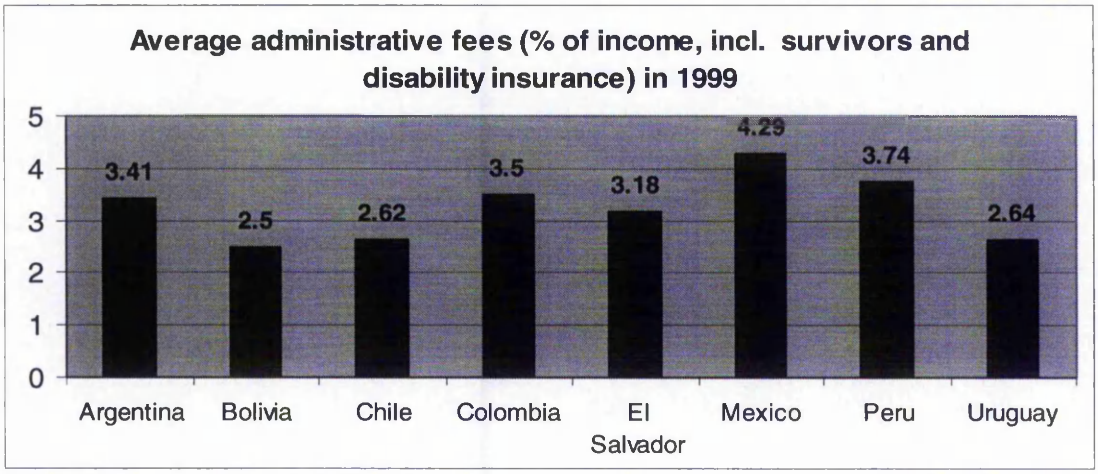
Source: The Hungarian Financial Supervisory Authority (2002), KNUiFE (2004), Kritzer (2000), Rofman (2000)
Note: Chile and Argentina data for 1999, Hungary data for 2002, Poland data for 2003.

Third, an important common feature in the reformed pension systems in both CEE and Latin America is the minimum return requirements of the pension funds – minimum individual pension fund returns set as a certain percentage of average real rates of return of all the pension funds or linked to long-term government bonds performance (as in Hungary). Unfortunately, there is evidence that minimum profitability rules generate herding behaviour among pension fund administrators, as, in order to maintain short run profitability, pension funds replicate one-another's assets portfolio composition (Kritzer, 2000). Thus, the safeguards put in place could generate the moral hazard problem mentioned in Chapter 2 – in periods of downturn, all funds will under perform and sustain losses, as pension funds are better off mimicking each other's losses, not incur government penalties and have their member's benefits covered by the government. As a result, individual choice among the funds becomes irrelevant. As a result, competition between funds takes on forms that push marketing costs ever higher, with dire results for administration fees.

Administration matters

Valdés-Prieto (1998) acknowledged that, in Latin America, one of the most important problems that would need to be addressed is concerning the selling costs. The large proportion of the costs associated with marketing expenses also reveals the pervasiveness of poor investor education. Whitehouse (2001) found that, in a series of pension-reforming countries, there is no correlation between the number of members attracted and the pension fund fees. The fees charged appeared not to be an important factor in choosing a fund. The study concluded that individuals have insufficient information on the impact charges have on their pensions.

Graph 4.3



Source: Kritzer (2000)

Regarding the high administration costs evident in Latin American pension reform experiences, the answer in the CEECs has been setting charge ceilings. However, as Whitehouse (2001) points out, a ceiling often becomes a minimum charge and setting the limit itself is tricky – setting the ceiling too high would have no effect while setting it too low could put too much pressure of the costs of pension fund administrators, limiting competition and portfolio choice.

Another important aspect of the second pillar related to the administration of the pension funds concerns whether the individual is charge of the deciding where to invest the funds or not. Here the parallel between the two groups can easily be seen – all pension-reforming countries have based their private pillars on the retail market approach with individual choice among competing pension funds. However, there are differences regarding the method of collecting contributions. In some cases the collection is centralised, the contributions being channelled through a special governmental agency (as in Argentina, Bulgaria and Poland). In others (for example, Hungary and Chile), the employers are in charge of sending the contributions to the various pension fund administrators, on behalf of their employees. This brings up issues of administrative efficiency and acceptable burden on employers. When pension funds are maintained by administrators independent of employers, a decentralised approach to contribution collection might prove costly and burdensome for employers. Lindeman, Rutkowsky and Sluchynsky (2000) list the following reasons for choosing a centralised collection approach: economies of scale, reduced burden on employers when dealing with only one agency, information barrier between employers and pension funds - minimising employer pressure on pension fund choice for employees, information barrier between fund managers and individuals – potentially lowering costs as the funds would work with aggregate amounts of assets and not individuals, and greater investment flexibility - making division of contributions and investment in multiple funds easier. However, in the presence of corruption and distrust of public authorities, the decentralised collection might be a safer way.

In an effort to minimise the principal-agent problem, in all the cases except Hungary, the pension societies and the funds administered by them are separate entities from the legal point of view. Hungary is a case apart because its pension funds are set up as non-profit organisations co-owned by members and not managed by companies.

Individual saving account decumulation matters

In the case of second pillar pension benefits, a strong difference between Latin American countries and the CEECs can bee seen. The Latin American pension reform experiences have shown that it is possible to provide individuals with flexibility in accessing their pension savings. In Latin America, only Bolivia mandated annuity purchases, while, in countries like Argentina, Chile, El Salvador, Mexico and Peru, once certain minimum annuity requirements[5] have been met, individuals are entitled to lump sum benefits and programmed withdrawals (James and Vittas, 2000; Kritzer, 2000). On the contrary, the CEECs with second private pillars (Poland and Hungary), typically stipulate mandatory purchases of lifetime annuities from insurance companies – usually, in CEE same retirement age limits apply to both pillars.

In Latin America, programmed withdrawals are recalculated regularly on the basis of remaining life expectancy a stipulated rate of return. Also, in Chile, annuities are protected against inflation through the use of index-linked government and private

[5] Usually, individuals need to have bought an annuity that offers them a 70 percent replacement ratio or 120 percent of the minimum guaranteed state pension. Programmed withdrawals are also permitted to individuals whose accumulated balances do not allow the purchase of an annuity equal to the minimum guaranteed pension.

bonds. However, in Argentina, the use of inflation-protected instruments has not been encouraged by the authorities (James and Vittas, 2000).

Not much information or analyses can be found in the reforming CEECs on the subject of decumulation. It may be speculated that the issue of annuities is bound to come up in the future debates – given the annuities' unpopularity in developed countries, it can be expected that the political pressures to remove the compulsory status of annuities will increase as the first generation of individuals relying on second pillar pension benefits approaches retirement.

4.2.3. Political Economy Matters

As discussed before, a most important issue is the political viability of the radical pension reform. Chile, the first to completely switch from public PAYG pensions to individually funded private pension accounts had long been seen as an isolated case. Many political scientists and economists had then explained the feasibility of radical reform through the presence of strong, authoritarian regimes and vigorous political leaders. Later developments - the pension reforms in the other Latin American countries and the debut of pension reform in CEECs – have shown that full or partial privatisation is possible under a variety of democratic regimes. (Chlon, Gora and Rutkowski, 1999; Quiesser, 1998, 1999; Palacios and Rocha, 1997)

Inferences between the two groups of countries are not a novelty. Still, little literature is to be found on the subject of area-specific comparisons. In spite of the large number of papers dealing with the Latin American pension reform experiences, Müller (2001) can be singled-out as particularly focused on old-age security reform comparisons between the two regions.

Regardless of the socio-economical and political differences there are strong similarities between the two transitional regions. Probably one of the most significant of them is the one that provides the evidence for supporting Orenstein's first hypothesis – the legacies of previous pension systems. As mentioned previously, CEE and Latin American countries faced similar financial burdens in their Bismarkian public pension systems due to similarly high benefit levels and contribution rates, large dependency ratios, low retirement ages, loose early retirement and disability provisions and extensive evasion. As a further confirmation of Orenstein's first hypothesis, in Argentina and Uruguay where, as in most CEECs, the coverage has been very high (thus the implicit debt was very high), the reform ended up as a mixed type. On the contrary, in Bolivia, where coverage amounted to only 12 percent of labour force (Müller, 2001), the implicit debt was much smaller and substitutive pension reform was feasible. (Orenstein hypothesis 1)

It can be argued that the efforts for pension reform in the CEECs only gained focus after the Latin American pension reforms became well known globally (Orenstein's hypothesis 4) - direct diffusion effects from Latin America into CEE were weak in the beginning. The local debates taking place in CEECs had been triggered by forecasts of population ageing and the popularisation wave of pension reforms in Latin America, and, consequently, reflected the international controversy over pensions. Even if it cannot be entirely said that the CEECs have had a positive attitude towards privatisation, at least they have always shown distrust in the public sector – a legacy of their communist past that has helped privatisation in general (Cangiano, Cottarelli and Cubeddu, 1998). However, before the international financial institutions took interest in the Chilean model and started putting it on the agenda of international pension discourse (publications and conferences sponsored by the World Bank, IMF etc.), the CEECs were looking to the EU in search for models and not elsewhere, particularly not in Latin America, which was seen as being a less developed region and an improbable ground for springing adequate models. Müller (2001) argues that, preoccupied with the concerns of EU accession, CEECs were slow to recognise the lack of a EU mainstream pension model. Given the extended heterogeneity in old-age provision in the EU, the accession negotiations contained nothing of a reform model. In fact, administrative reform as a whole was not required by the acquis communaitaire[6], everything being left for decision at member state level. As a consequence, the post-enlargement EU pension landscape is even more diverse. Orenstein (2000) argues that the World Bank and the IMF have been the most influential in CEE pension reform, through all forms of technical assistance, financial assistance and involvement of World Bank employees in national policy offices. His arguments are confirmed once more when noting that this support only came when the pension reform went along the lines of the World Bank's views on pension reform – i.e. inclusion of a private pillar. Also, whereas in Hungary, the IMF and World Bank involvement were kept low-key, in Argentina policy makers specifically asked the

[6] The entire body of European laws, including all the treaties, regulations and directives passed by the European institutions as well as judgements laid down by the Court of Justice, that EU candidate countries must adopt, implement and enforce in order to join the EU.

pension privatisation to be included in an IMF accord as a form of blame avoidance (Müller, 2001). (Orenstein hypothesis 4)

Confirming Orenstein's second and third substantiated hypotheses regarding the number of veto and proposal actors and their distance from interest groups, we can see the similarities between the pension reform processes in the two regions. Chile and Khazakhstan passed substitutive pension reforms, the first, because of its dictatorial regime, the second, because of its presidential system that dismissed the Parliament as an institutional veto actor. Argentina and other Latin American countries, like Hungary and Poland, have parliamentary democracies, in which governments are formed by coalitions of parliamentary parties. This gave partisan veto actors and civil society interest groups a much greater role in policy outcome. The result was the passing of mixed reforms, because policy environment in these countries was far more challenging for fundamental reform. Thus, it can be argued that the Argentinean pension reform has been crucial for the CEECs because it has shown that radical pension reform is feasible through democratic political process, although it is exactly because of its democratic conditions that Argentina ended up with a mixed type of reform, even if though it was aiming at replicating the Chilean model (Tomassi, Bambaci, Saront, 1999; Vittas, 1997). Müller (2001) stresses the importance of political leadership: courageous, committed individuals who succeeded in expressing a coherent neo-liberal vision on pension reform. Carlos Menem, Dominco Cavallo (Argentina), Sanchez de Lozada (Bolivia) and Bokros (Hungary) and Baczkowski (Poland) are personalities without whom radical reform packages would have been impossible to push through. Interestingly, in all these four countries, the governing parties that implemented the reforms had antecedents of left wing or populist actions. Even more, confirming the implications of James and Brooks (2001) on multipartism, in Hungary, after the May 1998 elections, the center-left-leaning coalition government that had designed and implemented the pension reform was succeeded by a center-right-leaning coalition that demonstrate little support or the reform - evident in its efforts to maintain the initial low contribution rate to the private pillar instead of raising it (Rocha and Vittas, 1999). (Orenstein hypotheses 2 and 3)

An important positive role in radical reform was played by the Ministries of Finance and/or Economy, staffed with neo-liberal economists, backed by the support of international financial institutions and the local interest groups. The dominating position of the Ministries of Finance and/or Economy is largely motivated by the poor financial shape of these countries (financial crisis and budgetary inadequacies also served in eroding public confidence in old policy arrangements). The governmental opposition was mainly made-up by the Ministries of Labour, Welfare or Health, but who were too weak to prevent radical reform. In many cases, the opposition was limited or by-passed by setting-up small special pension reform committees for drafting legislation. (Orenstein hypotheses 5 and 6)

Among the interest groups that opposed pension system privatisation were trade unions, pensioners' associations and privileged pensions beneficiaries. James and Brooks (2001) highlight the case of Mexico where technocrats initially designed and ratified a Chilean-style pension reform in one of its federal states but failed to consult with public sector unions – as a result public protests and strikes annulled the reform implementation. In order to implement a national pension reform, Mexico had to exempt all public sector workers. In Argentina, Hungary and Poland, trade unions had strong ties with the governing parties, fact that proved ambivalent. On one hand, these ties were helpful in softening opposition, on the other, they insured the political presence of the trade unions and forced pension reformers to negotiate and make concessions. Among these concessions was allowing trade unions to own pension funds (James and Brooks, 2001). Regarding winning over the support of existing pensioners and older workers, it can be observed that in all the cases efforts have been made to assure them of secure and improved pension rights and to exempt them from the new systems. Financing the transition deficit at least partially with debt has also helped in neutralising their opposition (for most of the existing pensioners, tax financing would have no effect either). (Orenstein hypothesis 6)

Related to Orenstein sixth hypothesis is the issue of the tactical packaging in reforms - Schmähl and Horstmann (2002) mention the "reform package illusion", where series of necessary but non-radical reform steps have been bundled together under the label of "fundamental reform", which has been more easily accepted, while Müller (2001) underlines the idea that the political costs of reform can be lowered by increasing its complexity. Both country groups resorted to 'bundling up' unavoidable and politically sensitive reforms to the PAYG pillar with the very visible introduction of individual pension fund accounts. This way, reformers highlighted the gains and shaded the envisaged cutbacks. A similar technique was used in Argentina - only it was used the other way around. Opposition against radical pension reform was softened by keeping the first pillar as a public PAYG scheme, the embodiment of such concepts as solidarity and redistribution, which offered a universal basic pension of about 30 percent of the average covered wage, thus, helping in enhancing the social acceptance of radical pension reform (Vittas, 1997). Maintaining large parts of their old PAYG system also helped to appease opponents of pension reform such as the bureaucrats and unions involved in running the old system (James, 1997a). Thus, arguing the World Bank multipillar model's public-private mix with risk diversification feature, made easier 'selling' the transition problem to interest groups (Disney, Palacios and Whitehouse, 1999).

On a related note, given that the benefits of the systemic reform are subject to uncertainty and would only be observable in the long run, the policy-makers publicised them more heavily towards the younger generations - James and Brooks (2001) observe that the countries that have privatised their systems to a larger extent had a younger population. Also, various government guarantees (minimum rates of return specified, fluctuation reserves, state benefits etc.) have been employed to allay workers' fears of downside investment risk in the FF pillar. Müller (2001) argues that, in most Latin American and CEECs, the drawbacks related to pension privatisation (such as the major issue of transition costs, the effects of portfolio restrictions etc.) were successfully shielded from public debate. Thus, public faith in the strengths and advantages of the new system may be shaken when ignored financial burdens will start showing.

4.3. Conclusions

As discussed in the previous chapter, all CEE transitional economies have required rapid and comprehensive restructuring of their pension security systems for both macro and microeconomic reasons. For them, social security reform, economic restructuring and economic growth options have been closely linked. There are many parallels between the Latin American and CEE groups of countries: large amounts of state control, poorly developed financial markets, and the Bismarkian tradition of social insurance with high benefit levels and contribution rates, low retirement ages, loose early retirement and disability provisions and extensive evasion. As a result, the World Bank model of pension reform, which incorporates the Latin American experiences and promises risk diversification, has proven popular, perhaps precisely because of its much criticised focus on economic growth and development. Also, the combined analysis of the two groups of countries has confirmed many of the postulates of the political economy of pension reform, among them that the implication of the international financial institutions in the CEECs has been instrumental in making multipillar reform a reality.

In essence, the CEECs have adopted the Latin American strategy of reform – by starting with the parametric reform of their old PAYG systems and then moving on to the introduction of the private pillars. Poland was the exception by radically changing the first pillar, replacing the old PAYG with a NDC scheme. All the CEE countries that radically reformed their systems share to a very high degree the particulars of the second, mandatory private pillar (modelled on the Latin American 'standards') – mandatory private individual pension savings accounts managed by pension societies that charge fees and commissions, whose accumulated balances are used to purchase annuities upon retirement. However, in terms of the PAYG transition deficit, no single financing strategy could be identified. In the newly introduced private pillars, the role of the government is crucial as regulator and last-resort guarantor - for more than asymmetric information considerations. Similar to the Latin American reforms, the CEECs have imposed portfolio investment restrictions, which have serious implications for the degree to which the new private pillars can be regarded as funded (in most of the countries examined, a large share of assets portfolio of the private pension societies is held in government securities). Similarly, both the Latin American and the CEE government have imposed minimum profitability rules for the private pension funds, with negative effects on pension fund behaviour. Further regulation was brought in regarding the administration fees and commissions charged by the pension funds - a knock-on effect of the fact that competition between pension funds is only loosely based on portfolio performance. Nevertheless, one point where the CEE and Latin American reforms diverge concerns the provision of benefits from the second pillar: the CEECs stipulated mandatory purchases of lifetime annuities from insurance companies, while the Latin American countries were usually more flexible, also allowing lump sum benefits and programmed withdrawals.

Thus, it can be said that the CEE pension reform has the trappings of a specific unified multipillar strategy. The following chapters will deal with the question of to which extent this type of reform is applicable in the case of Romania. Chapter 5 begins this analysis with the detailed examination of the Romanian pension system.

CHAPTER 5.
THE ROMANIAN PENSION REFORM

5.1. Introduction

The present chapter marks the point in the thesis where the focus is turned on the Romanian pension reform. In the wave of CEE pension reform, Romania is a relatively latecomer, only recently, in 2000, having passed the first law in a legislative reform package. First, the chapter introduces the Romanian case, presenting the pre-reform pension system and its problems. Due to the diversity and complexity of its pension system, it took years to build up a framework in which comprehensive pension reform involving private pensions could be effective. Even now, the reform is approached in an iterative way. The chapter then proceeds to present the features of the reform and comment on its various aspects.

5.2. Short History of Social Insurance in Romania

Romania is one of the countries with a strong tradition of social insurance. Legislative attempts in this area have been made since the middle on nineteenth century, albeit the regulations passed then were limited in benefits and coverage. The first pension-specific laws (although restricted to government clerks) were passed in 1868[1] stipulating benefits based on the last 5 years' income. The law of 1895[2] brought the idea of mandatory insurance for workers and established important institutions[3]. The first extensive law was adopted in 1912[4] stipulating mandatory insurance for all and benefits for disability and old-age pensions as well as for work accidents, sickness and pregnancy. The pension contribution was split equally between employers and employees and benefits were paid to all insured workers aged 65 and over who had previously made contributions for a minimum of 1200 weeks.

The period between the two world wars was characterised by fervent economic, social and political activity, which brought about important new ideas and regulation developments that remained prominent references thereafter. Law no.

[1] "The Pensions Law".
[2] "The Mining Law".
[3] The House for Pensions ("*Casa de Pensii*") and The House for Help ("*Casa de Ajutor*"), with funds made up from equal contributions from employers and employees.
[4] "Law for the Organisation of Trades, Credit and Worker Insurance" or the "Nenitescu Law".

55/1933[5] was crucial in setting a nationally unified social insurance practice, stressing important principles:

- a contribution rate of 6 percent of wages, equally shared by employers and employees;
- a state subsidised social insurance fund;
- enhancements in health and work accidents regulation. [6]

This law was improved in 1938 by extending the coverage, diversifying and increasing benefits, including means-tested. The new 1938 law became a model for all social insurance related laws passed afterwards.

Significant changes in the law were made by the new political regime in the years following World War II. The 1949 law[7] started to reform the social insurance according to new principles set by the communist regime. The Central House of Social Insurance and the Central House of Pensions were abolished and the public and pension funds were taken over by the state, incorporating the social insurance in the government budget. The law brought several new rules:

- the state had the obligation to make contributions on workers' behalf;
- universal coverage;
- pensions calculated as a differentiated percentage on wages, ranging from 50 to 85 percent, varying with the length of the full contributions period; [8]
- different retirement ages for men and women (60 and 55 years, respectively);
- the right to free medical assistance for labour, clerks and their families;
- regulation of survivor pensions.

In 1959[9] a classification was introduced separating workers in four groups, as a way to establish the varying pension percentages:

- 1st work group – for very hard and very harmful work – 58-85 percent;
- 2nd work group – for hard and harmful work – 56-80 percent%;
- 3rd work group – for the rest of the labour – 54-75 percent;[10]

[5] "Law no. 55 for the national unification of social insurance" of the "Ioanitescu Law".
[6] It has to be mentioned that, despite the improvements, one of its biggest shortcomings was the lack of unemployment insurance.
[7] Law no. 10/1949.
[8] Designating the period of time a person was employed having a work contract, years spend working on the job.
[9] Decree no. 292/1959.

- 4th work group – the rest of personnel – 50-70 percent.

The benefits of the 1st and 2nd work groups were in effect subsidised by the other two. Pensions for the 1st work group were up to 15 percent higher than for the 4th work group and the retirement age limit for the 1st group was as low as 50 years. The decree also had another important innovation: it stipulated all pensions to be calculated based on the length of contributions period, work group and actualised wage from the last 12 months before retirement, a requirement that furthered the ends of social equality. Pensioners with the same job and with the same length of contributions period received equal pensions.[11]

In 1966 a new pension law was introduced[12], the most comprehensive piece of legislation on social insurance up to that date. Pension was based on the indexed past years average wages corresponding to the functions held within the period chosen as relevant. Given the high percentages allowed by the law, the pension could have equalled the wage. In addition, the right to a *supplementary pension* was introduced, with the idea that a pensioners' income should not be lower than active workers' income. Under some circumstances, pensioners were allowed to cumulate the pension with a wage. In those years, Romania had one of the highest levels of pensions in the world and certainly the highest in Eastern Europe (Ghimpu, Ticlea, Tufan, 1999).

During 1968-1972, several changes were made to the 1966 law that sought to reduce the level of benefits by cutting percentages used in calculations by 5 to 10 percentage points and using gross wages instead of indexed real wages.

The last social insurance regulation was adopted in 1977. Law no. 3/1977 summarised previous legislation and introduced several restrictions regarding benefits:

- the extension of the contribution period required for a full pension by 5 years, from 20 to 25 for women and from 25 to 30 for men;
- reductions in calculation percentages for both social insurance and supplementary pensions;

[10] Socialist labour market concepts do not translate easily. Social insurance entitlements were linked to job function and educational attainment. In this paper, three terms are used specifically in accordance to the following definitions: 'labour' – unskilled, low-skilled and skilled workers; 'clerks' – civil servants, administration clerks; and 'others' – the rest of labour force, with degrees, diplomas and other, more than on-the-job training.

[11] Some negative aspects were the actualisation of clerks' wages at lower levels than labour wages and the possibility of losing some pension rights on political grounds (the workers who had previously held positions in the former 'bourgeois' state apparatus and those convicted on political grounds).

[12] Law no. 27/1966.

- 3rd degree disability pension conditioned by prior employment.

This remained the main body of legislation for social insurance until 1989. The social insurance system that operated during 1949-1989 was dominated by centralisation and state control in every aspect of financing, administration and benefits payment, together with unreasonable global treatment over big categories of risk.

5.3. The Pre-reform Pension System in Romania

The old Romanian pension system reflected, to a large extent, the structure and ideology of a centrally governed economy but, at the same time, had some specific features different from what could have been met in the other formerly central planned economies. The old type of economy can be recognized in the regulations concerning the pensions, which totally ignored the essential motivational considerations. The redistributional objectives were meant to be met in the framework of a centralized employee system build on the premise that every adult individual is automatically employed. There was also the ideological issue of price constancy, which granted freedom from calculation of benefits and periodic adjustment due to price movements (thus, no need for indexation or subsidized prices).

The years from 1990 to 1992 were spent in improving the system without changing the basic principles, adding to the system the components needed to maintain its functionality during the major implementations of a market economy and trying to right some wrongs created by the communist regime.

One of the changes that had significant effects concerned the use of the pension system as an exit from the labour market. Faced with the unemployment threat of economic restructuring, early retirement requirement were relaxed. The Decree-Law no. 60/1990[13] reduced the retirement age limit by 1 to 5 years for workers requesting retirement until 31.12.1990, while the Law no.73/1991 reduced the retirement age limit for the 1st and 2nd work groups proportionally with the time spent working in these work groups. Additionally, some categories of workers were switched into higher work groups, reducing their retirement age limit and raising their pension benefits levels.[14]

[13] The main law responsible for the surge in early-retired pensioners.
[14] Decision no. 267/1990, which also lowered the retirement age limit for railway workers from 55 to 50 years for men and increased survivor pension rights.

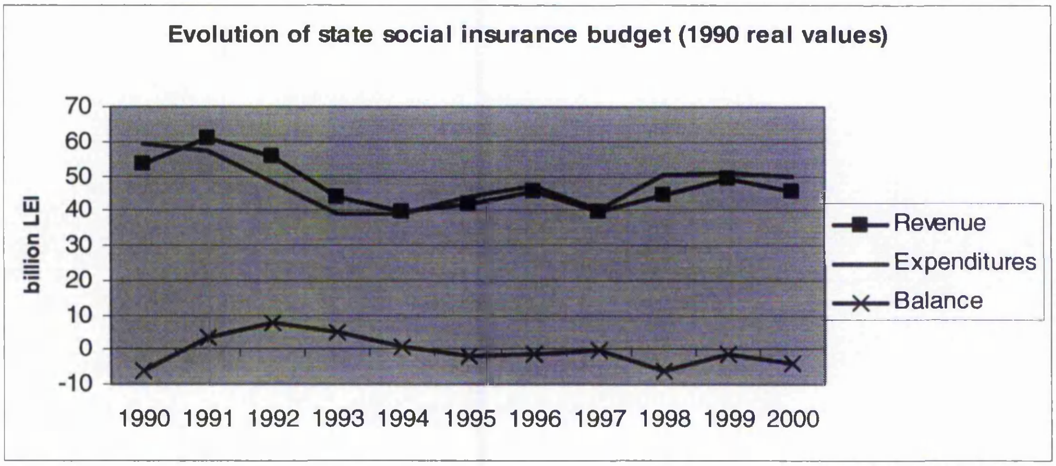
The new regulations and other free-market effects such as inflation and negotiated wages created incompatibilities and inequalities in pensions and correlation mechanisms had to be set up to try to maintain some degree of social equity. The replacement rate for a standard number of years in work varied with previously earned wages, a decreasing percentage as the wages increased. The regressive formula was part of the redistribution process and it was not a peculiarity of the Romanian system, being found in developed countries as well. Different levels of pension were set for different levels of income – benefits calculated based on the salary of 5 consecutive years chosen from the last 10 years prior to retirement. As a result, large differences started appearing between public and private sector retirees (who had been paid higher wages). Discrepancies in pensions received also appeared between employees retired in different years, but having the same work category and the same number of contribution years. The correlation process involved indexation, compensations and benefit increases – usually in the form of a fixed sum - as a way of keeping the pensions in payment at fair levels vis-à-vis prices, wages and other pensions in general. These ad hoc corrections have put pressure on the state social insurance budget and have further undermined the workers' trust in the public pension system. These corrections have continued to be a major nuisance in the system until the reform was implemented in 2001.

The Romanian pension system has displayed several specific features. Delayed economic restructuring, rising unemployment marked by increased long-term unemployment for young workers and a financial sector that has been slow in development characterise the hostile economic environment that has aggravated all the other pension-specific problems. Reform had become important, with objectives commonly known in any other country undergoing reform: enhanced coverage and higher benefit levels provided by a financially stable system.

Many deficiencies of the pension system were clearly visible. The major impediment in reforming or adjusting the system has been its complexity, which resided in the high degree of pension diversification. Prior to 1989, the system was comprised of 6 parallel pension schemes (belonging to different sectors or trades) - the state social insurance; the farmers'; the artisans'; the artists', writers' and music composers'; the lawyers' and the clergy's -, though more than 70 percent of the system's beneficiaries belonged to the state social insurance. Besides the high administration costs incurred, the multitude of pension arrangements created horizontal inequality, generated rigidity in labour force and gave the system an all-around inflexibility to changes. This situation has been unique in Central and Eastern Europe (Ghimpu, Ticlea, Tufan, 1999).

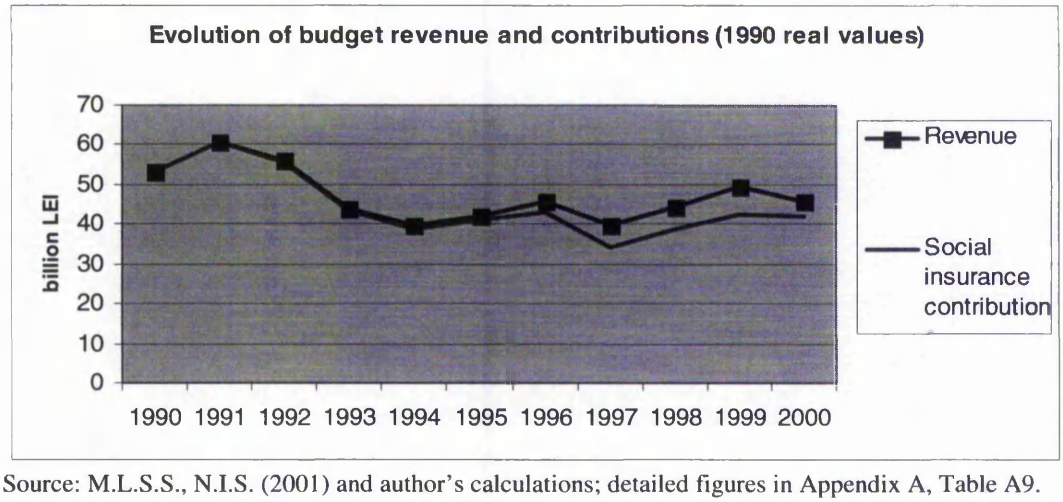
Thus, simplifying the system had become a prerequisite of consistent reform, even more so when several independent schemes had shown financial instability. Beginning with the second half of 1992, several independent pension schemes were integrated into the main state social insurance scheme. The complete integration of all schemes was accomplished only in 2000 with Law no. 19/2000, which will be detailed in the following pages. One of the negative consequences of the integration process has been the worsening of the social insurance budget balance as Graph 5.1 shows.

Graph 5.1



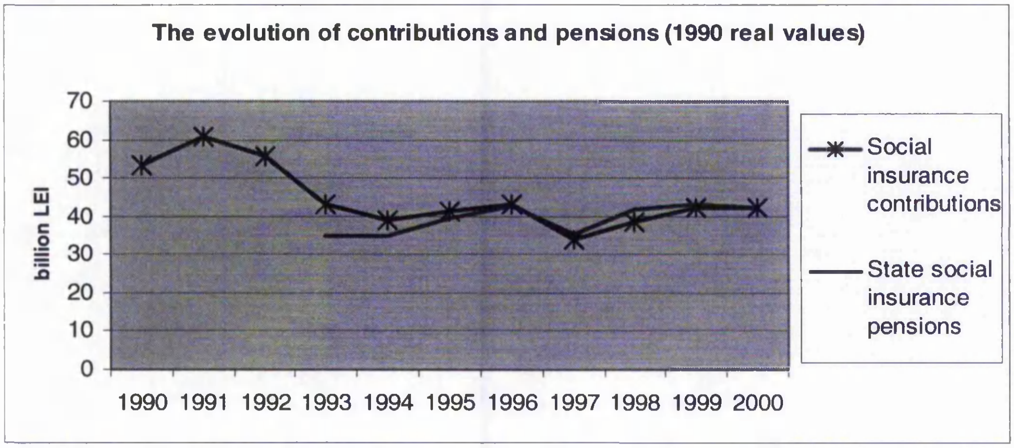
Source: M.L.S.S., N.I.S. (2001) and author's calculations; detailed figures in Appendix A, Table A9.

Graph 5.2



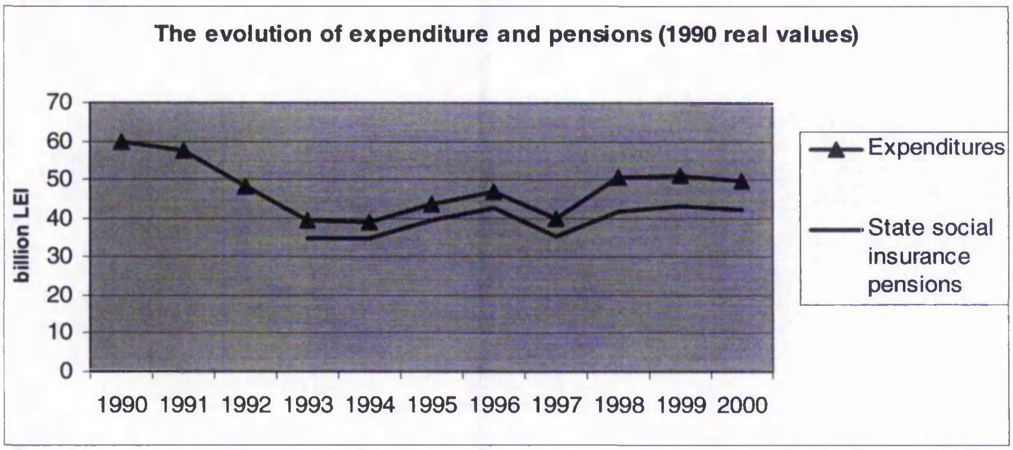
Source: M.L.S.S., N.I.S. (2001) and author's calculations; detailed figures in Appendix A, Table A9.

Graph 5.3



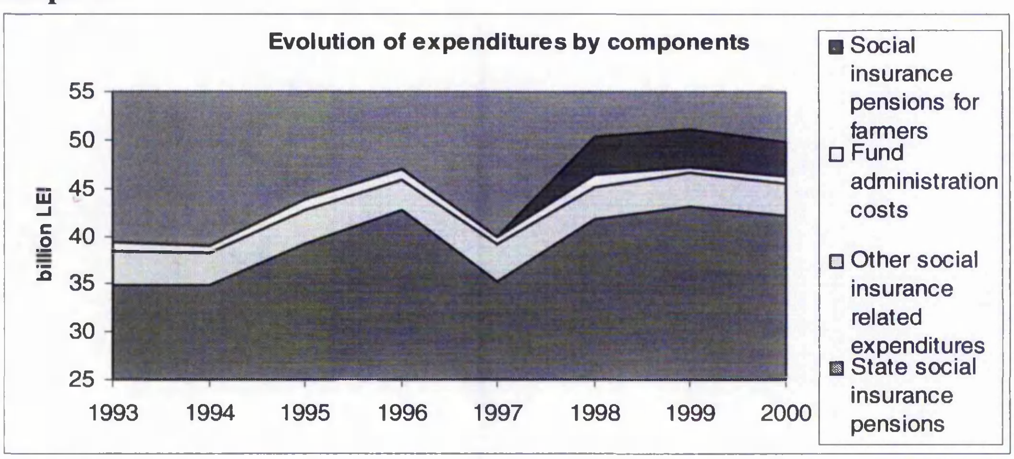
Source: M.L.S.S., N.I.S. (2001) and author's calculations; detailed figures in Appendix A, Table A9.

Graph 5.4



Source: M.L.S.S., N.I.S. (2001) and author's calculations; detailed figures in Appendix A, Table A9.

Graph 5.5



Source: M.L.S.S., N.I.S. (2001) and author's calculations; detailed figures in Appendix A, Table A9.

As Graph 5.2 shows, the amount of state budget subsidies needed to meet the social insurance obligations has been increasing substantially since 1998 but most of the subsidies were meant for paying other items than state social insurance pensions (Graph 5.3 and Graph 5.4). The main explanation for this gap is that, since 1998, the social insurance pensions for farmers have been paid from the state social insurance fund (Graph 5.5). Once again, it is clear that the aggregated pension system cannot function without the central state budget subsidies.

The overall deterioration of the system is based on many factors. First, the evident fall in contributions can be explained by the decrease in payroll. The ever-decreasing number of contributing workers has shrunk the financial base of the system. If in the beginning of 1990 there were over 8 million wage earners, their number fell continually so that by 1995 there were only over 6 million and by 2000 the number hit a worrying total of just 4.5 million (N.I.S., 2001). Part of these numbers can be found in the steadily rising unemployment (see Graph 3.2, Chapter 3).

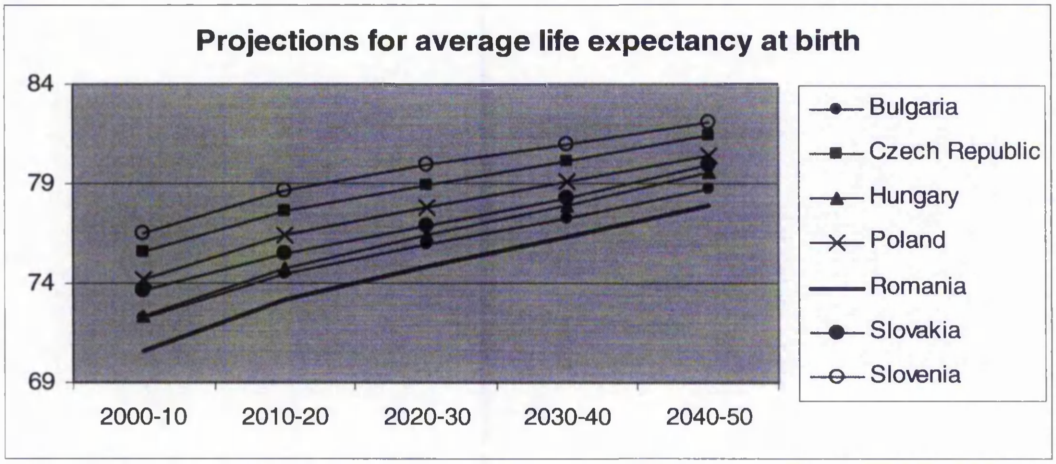
Second, as mentioned in Chapter 3, there have been considerable delays in the payment of contributions due by companies – mainly the state-owned companies. Tolerating the unpaid contributions bills by rescheduling them and by writing-off the penalties for delays can be considered to be a form of subsidy, which has had repercussions on the social insurance budget. Also, the development of the shadow economy has seriously affected the budget revenues.

Third, the system suffered from low retirement ages, early retirement incentives and the intensifying ageing process (see Chapter 3). Retirement age limits have been lower than in other countries – 60/62 for men and 55/57 for women. In reality, the effective retirement age has been with 4 to 5 years lower (because of easy qualification for special work group advantages and the early retirement regulations introduced between 1990 and 1995[15]). Disability pensions also had a part to play – for example, at the end of 1998, the number of retirements due to disability was 540,000, almost 14 percent of the total (in 1989, only 9 percent were disability pensions).

From the demographic point of view, the projections in Graph 5.7 show that life expectancy will improve but will still remain at the lowest level in CEE.

[15] For example, Law no 2/1995 allowed unemployed individuals to request early retirement up to 5 years below the retirement age limit (55 and 60 years).

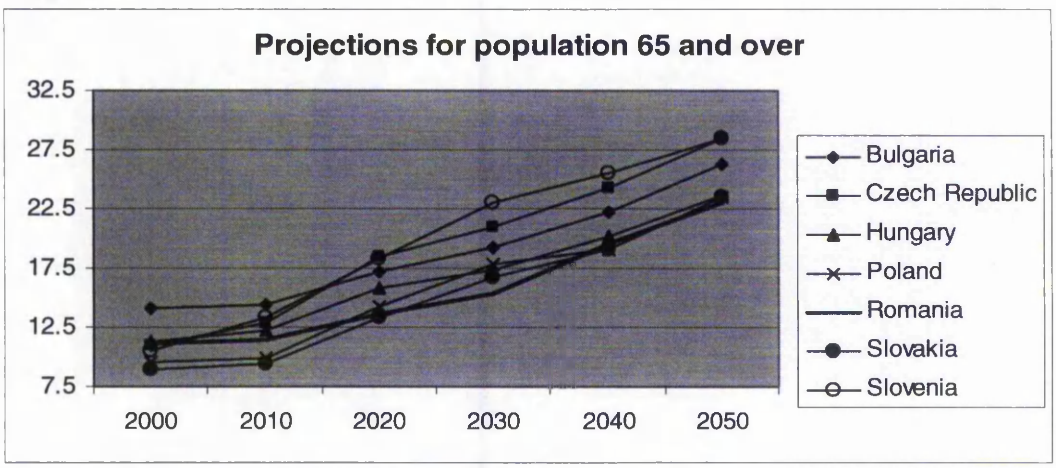
Graph 5.7



Source: World Bank (2004); detailed figures in Appendix A, Table A1.

Crude birth rates and fertility rates have been in line with the evolutions in other CEE countries, while the crude death rate has been among the highest in CEE (see Appendix A, Table A2). As a result, in spite of the ageing process, Romania will remain the youngest country in CEE, especially younger than the EU countries, with the lowest share of population aged 65 years and over (Graph 5.8).

Graph 5.8



Source: World Bank (2004); detailed figures in Appendix A, Table A2.

Table 5.7 contains selected pension systems indicators for several CEECs. Compared to the other CEE countries Romania has low replacement rates, decreasing number of contributors combined with considerable tax evasion and long delays in contribution payment. On the plus side, it has the lowest ratio of pension expenditure to GDP, is one of the CEECs with the lowest (system and old-age) dependency rates – projections showing that even if the rates will increase in the future they will still be among the lowest. Romania also used to have some the lowest levels of social insurance contribution rates; however, after several increases this is no longer the case (14 percent in 1991, 25.5 percent in 1992, to 34 percent in 2003).

Table 5.1. Selected pension indicators mid-1990s

Country	Replacement rate	Contributors/ Labour Force	Pension Spending / GDP	Dependency rate
Bulgaria	**31.0**	64.0	7.3	81.0
Czech Republic	48.6	85.0	9.0	**53.0**
Hungary	57.9	77.0	9.7	78.1
Poland	55.4	68.0	14.4	53.7
Romania	**43.1**	**55.0**	**5.1**	**58.3**
Slovak Republic	42.5	73.0	9.1	58.9
Slovenia	68.7	86.0	13.6	58.9

Source: Palacios and Miralles (2000); Replacement rate: ratio between average pension and average wage; Dependency rate: ration between pensioners and contributors; Figures in bold are the column minimums.

As a result, it is clear that Romania suffers from the same ailments that prompted pension reform in other countries. The process of population ageing is starting to be felt, dependency rates are rising and the situation of state finances is dire, all which is forcing the rise in contribution rates and the fall in pension benefits. In 1999, alarming predictions about the implicit debt of the system were made by Romanian policy makers: the present value of obligations towards future pensioners was estimated to be more than twice the size of the (then) current GDP, over-running by far the present value of the designated tax revenue and warning about the long-term financial sustainability of the system (M.L.S.S., 1999:230) (see Graph 5.9, years 1991-2000).

5.4. Pension Reform Characteristics

Like the other reforming CEECs, Romania has embraced the World Bank's view that old-age financial security and economic development can be best pursued through a pension system that comprises many complementary components and diversifies risk. Similar to the general format of CEE pension reforms, the structural reform of the pension system in Romania involves the following:

- 1st pillar – a mandatory reformed pay-as-you-go (PAYG) public pension scheme, redistributive and publicly managed - anchored in Law no. 19/2000;
- 2nd pillar – a mandatory fully-funded, defined-contribution, privately managed pension scheme – anchored in Law no. 411/2004 on private pension funds;

- 3rd pillar - a voluntary fully-funded, privately managed scheme, intended for individuals whose incomes are higher than the public scheme ceiling – anchored in Law no. 249/2004 on optional pension funds.

In other words, Romania has opted for the 'mixed' type of reform (see Chapter 1), with a dominant, parametrically reformed, PAYG pillar, complemented (and not substituted) by a mandatory private pillar and voluntary personal private pensions.

The laws have been submitted for Parliamentary approval individually at different times, marking the different stages of reform. The law on the public pension system and other social insurance rights was submitted to the Parliament in the end of 1999, was passed by the Parliament in April 2000 as Law no. 19/2000 and was implemented with the start of April 2001. The law on private pension funds was passed in October 2004 as Law no.411/2004. The Law on optional pension funds has been passed by the Parliament and adopted in June 2004 as Law no. 249/2004.

5.4.1. The new public pension pillar – the reformed PAYG (R-PAYG)

The new public pension system is governed by an autonomous tripartite institution, CNPAS (Casa Nationala de Pensii si Alte Drepturi de Asigurari Sociale – The National House for Pensions and other Social Insurance Rights), which is jointly administered by government, unions, employers and pensioners.[16] A most important fact is that it integrates all other public independent pension schemes and the previous supplementary pension scheme. Its mandatory cover was extended to all individuals whether they are employees or self-employed.

The reforms implemented by the government so far in the first pillar are typical of the way all the other defined benefit PAYG schemes have generally responded to the labour market demographic trends - parametric reforms such as adjusting the replacement rate, the contribution rate, the pension formula etc. The reform of the public pillar aims, in essence, to increase incomes and reduce expenditures.

The new retirement age limit is raised from 57 at 60 years for women and from 62 to 65 years for men, to be reached progressively throughout a period of 13 years starting from April 2001. Consequently, the full contributions period is to be raised from 25 to 30 years for women and from 30 to 35 for men, and minimum

[16] On its administration board: 5 members from the government, 5 representatives from employers and 8 representatives of behalf of the insured – 5 members form representative unions and 3 members from national pensioners' organisations (Ordinance no. 171/2000).

contribution period is also raised from 10 to 15 years (for both sexes) to be reached similarly in the 13-year period. Early retirement is allowed from the age of 50 for women and 55 for men with benefit penalties; also, individuals can retire up to 5 years early with no penalties, provided that they have exceeded the full contributions period by at least 10 years.

The social insurance contribution is split between employers and employees, roughly 2/3 for employers and 1/3 for the employees.[17] The contribution rates are set annually by the state social insurance budget law for each work category. For the year 2003 contribution rates for normal working conditions were set at 34 percent (Law no 632/2002). The new public pensions system differentiates workers into three categories, based on work conditions - normal, exceptional and special[18], making special stipulations for workers in the last two categories. Generally, they are required higher contribution rates (set for 2003 at 39 percent for exceptional and 44 percent for special work conditions) and allowed lower retirement ages (retirement from 45 years with minimum 20 years of contributions).

The reformed PAYG pillar has a new pension formula, based on points, similar to the German system. The pension system implies a relatively strong contribution-benefit link – individuals' contributions confer them pension rights (points) that are evaluated in relation to national average earnings. The value of a monthly pension under the points system is the following:

$$p = v \frac{\sum_{i=1}^{n} \frac{Iw_t}{Aw_t}}{n} \tag{5.1}$$

where p is the value of the monthly pension to be received, v is the value of a pension point, Iw_t is the individual monthly wage at time t, Aw_t is the gross average national monthly wage at time t, n is the number of months of contribution, n=420 (12 months * 35 years full contributions period).

The pension formula now takes into account the contribution paid by an individual throughout his active years. Each contribution year will equal a certain amount of points (which cannot be higher than 3 points per calendar year). The points

[17] According to Ordinance no. 147/2002, the employee individual contribution rate is set at 9.5 percent regardless of work conditions.

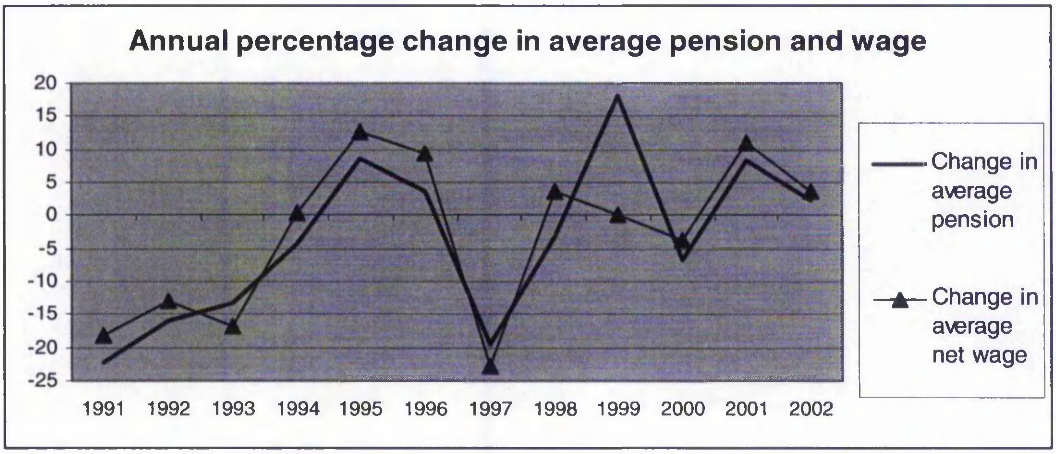
[18] The workplaces in exceptional conditions are those in which the employees' capacity of work is permanently or regularly threatened by exposure to high risks. Among the workplaces in special conditions are the mining units, nuclear material related activities (research, exploration, exploitation or processing), civil aviation etc.

awarded monthly reflect the ratio between the individual gross monthly wage and the national gross average monthly wage from the same month. Effectively, the law sets up a ceiling for the insured earnings at 3 times the national gross average wage. Upon retirement, an insured individual will have a number of points made up by summing the annual score points earned throughout his working period. The pension is calculated by multiplying the average number of points per contribution year with the value of one pension point at the month of retirement. The average number of points per contribution year (annual score) is calculated by dividing the total number of points awarded throughout the contributions period to the corresponding number of years for full length of contributions period. The value of one point is set by law and is guaranteed to be at least 30 percent of the national gross average monthly wage projected for the year of retirement, but no more than 50 percent.[19] Thus an individual who has earned each month the national gross average wage and has contributed at that level for the full length of contributions period is guaranteed a monthly pension equal to at least 30 percent of the national gross average wage projected for the month of retirement.

The formula makes it clear that the insured individuals who earn higher wages for longer active periods will obtain higher pensions and vice-versa. Also, it is possible to receive a pension (if meeting full contributions period and retirement age limit requirements) and continue working. Additional pension points are thus earned that can be included in the pension every 12 months of contributions. The new law also tightens restrictions on early retirement and adds a last re-correlation for existing pensions in order to reset the relationship between pensions to the situation in year 1990. The aim is to eliminate the pension discrepancies existing between same category employees after having retired in different years.

[19] Condition set by Law no. 338/2002. For example, the set value for a pension point in 2003 is 39 percent of the monthly national gross average wage (Law no. 632/2002).

Graph 5.8

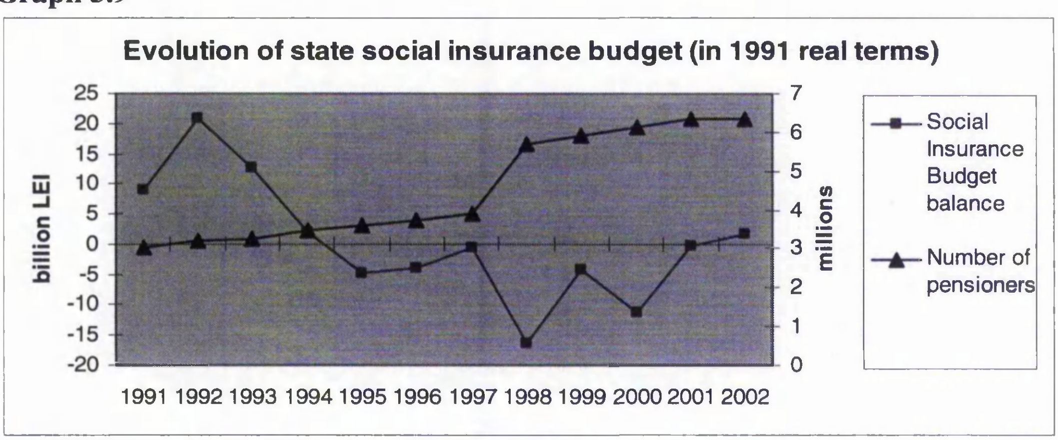


Source: N.I.S. (2001) and author's calculations; detailed figures in Appendix A, Table A8.

Graph 5.8 shows that, until the year 2000, the average pension has usually fallen faster and risen more slowly than the average net wage. Under the new law, pensions for both old and new pensioners are indexed every quarter in order to account for inflation. It is the first time since 1990 that a system for full price indexation has been in use. The indexing percentage differs among employee categories. The value of a pension point is also indexed by around 6 percent.

The Law no.19/2000 promotes a financially balanced state social insurance budget by stipulations that target an increase in the number of contributors, an incremental adjustment of retirement age limits up to a new higher retirement age, an enhancement of pension eligibility criteria and a change in the formula for calculating pensions. Put simply the law aims at increasing incomes and reducing expenditures.

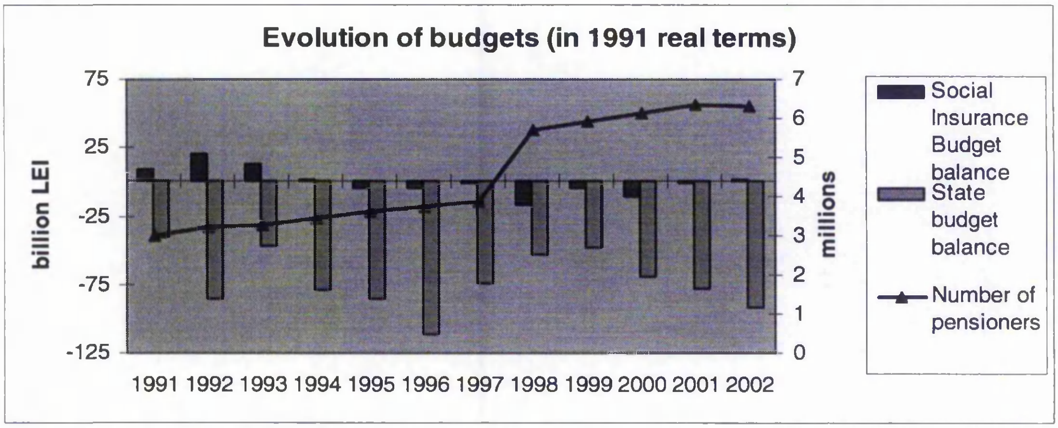
Graph 5.9



Source: N.I.S. (2001) and author's calculations; detailed figures in Appendix A, Table A6.

Graph 5.9 shows that the state social insurance budget balance has been improving although, as Graph 5.10 shows, there is increasing pressure on the state budget. For example, in 2001, the deficit of state social insurance budget was only 114.2 billion ROL (current prices), but the subsidies from the state budget for year 2001 summed 1,500 billion ROL (Law no. 191/2001).

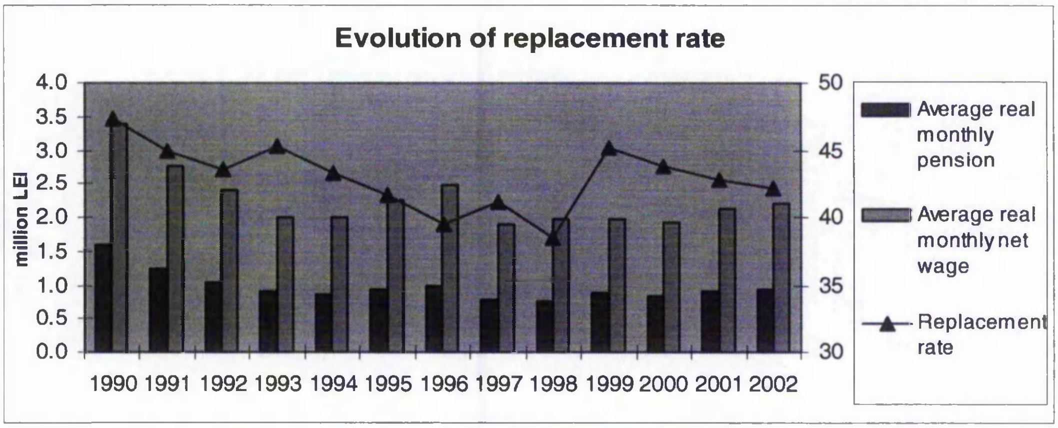
Graph 5.10



Source: N.I.S. (2001) and author's calculations; detailed figures in Appendix A, Table A6.

Expenditures are reduced by further decreasing the pension replacement rate, by gradually increasing the duration of contributions period and raising the retirement age limit. The replacement rate has only fallen from 47.4 percent in 1990 to 42.1 percent in 2002 (Appendix A, Table A7) yet the average pension has lost 42 percent of the purchasing power.

Graph 5.11



Source: N.I.S. (2001) and author's calculations; detailed figures in Appendix A, Table A7.

Regarding incomes, efforts are being made to improve the contribution collection process, in the form of a retrieval program for contributions due and fines for late payment. The system still suffers from cash flow problems because of the large amount of arrears, usually accumulated in the accounts of state enterprises and institutions.

5.4.2. The private pension pillars

The mandatory private pension funds

Since the initial proposals on the introduction of a private pension pillar, subsequently passed laws have seen the size of the private pillar progressively diminished. The private pillar was first regulated in 2000 by urgent governmental ordinance OUG no. 230/2000. While the initial draft versions of the law proposed that workers diverted a contribution rate of 10 percent of their gross monthly wages to a privately managed pension fund of their own choosing, the 2000 law stipulated a 5 percent contribution rate to be switched to the private pillar, mandatory participation in the private pillar for all individuals with more than 20 years left until retirement (aged 45 maximum) and optional participation for workers with more than 10 years left until retirement (aged 55 maximum). The 2000 law was, however, annulled following the change in government and a new law was passed only four years later. The Law nr.411/2004 stipulations are much more limited - a contribution rate to the private pillar of only 2 percent in the first year, to be gradually increased until reaching 6 percent in 8 years, mandatory participation in the private pillar for new entrants and individuals aged 35 years or less and optional participation for individuals aged 45 years or less. The Government anticipates around 700,000 participants in the first year.

The system of private pension funds is regulated and monitored by the newly created Comisia de Supraveghere a Sistemului de Pensii Private (CSSPP - Commission for the Supervision of the Private Pensions System).[20] Private pension funds are established according to the Civil Code and are required to have a minimum of 50,000 participants (gathered over 3 years) and a statutory capital of at least 5 million euro. The contributions to the private pension funds are collected by the Ministry of Public Finance, who then remits them to the chosen pension funds. Individuals are free to transfer between funds subject to a transfer penalty fee. Workers have individual accounts where their contributions are converted into 'units of account'. The value of the total units of account for a pension fund will always equal the total asset value of the fund. A pension fund's rate of return is calculated every quarter for the last 24 months. The rate of return is defined as the difference between the average value for a unit of account in the last day of a quarter-ending month and the value in the last day of the month preceding a 24-month period.

[20] Actually introduced by urgent ordinance OUG no.50/2005.

The CSSPP calculates the average rate of return of all pension funds in the system and sets a minimum required rate of return. Pension funds cannot go bankrupt. If a pension funds fails to meet the minimum rate of return for 8 consecutive quarters, its licence will be suspended by the CSSPP. Pension funds are required to set aside reserve funds – in order to maintain minimum profitability and to compensate fund members. The pension funds also have administration fee ceilings – commissions of less than 3.5 percent of the value of contributions and less than 10 percent of the value of the annual capital gains.

The pension funds are firmly specified the classes of assets in which they can invest and the strict limitations on the percentage of total value of pension fund assets that can be invested in one asset class:

- money market instruments, including bank accounts and deposits – less than 20 percent;
- government securities issued by the Ministry of Public Finance and securities issued by the National Bank of Romania – less than 70 percent;
- bonds issued by the public administration authority – less than 30 percent
- stocks traded on regulated markets (Bucharest Stock Exchange, RASDAQ) - less than 50 percent;
- bonds issued by foreign governments and central banks – less than 10 percent;
- bonds issued by foreign non-governmental entities – less than 10 percent;
- other investments regulated by the CSSPP – less than 5 percent.

Individuals are subject to the same retirement age limit as in the public pension pillar. Upon retirement individuals are entitled to receive at least the sum of their contributions indexed to the prices, minus the administration fees and transfer penalties. The account balance can only be used to by a private pension in the form of an annuity. The Law also makes provision for a Pension Guarantee Fund, financed by contributions from pension administrators, which will safeguard the benefits acquired by individuals.

The optional occupational pension funds

The activity of occupational pension funds will also be regulated, controlled and coordinated by the CSSPP[21]. In the third pillar, employers and unions have a large role to play – they decide jointly on setting up an occupational pension schemes, choosing a pension fund administrator, and on the level of employee contributions. Individual contributions are limited to 15 percent of the gross monthly wage and tax exempt up to the sum of 200 euro per year. Banks, insurance companies and investment trusts are allowed as licensed administrators of the optional occupational pension funds, in charge of collecting contributions, investing their resources and paying benefits just like the private pension fund administrators. The minimum size of an optional pension fund is 100 participants.

Optional occupational pension funds face the same limitations on investment as the pension funds in the second pillar, but are not required to guarantee any minimum rate of return. The CSSPP will regularly publish the pension funds rates of return. Regarding the administration fees, the CSSPP imposes a 5 percent limit on both the commission levied on the sum of contributions and on capital gains. The optional pension benefits can be received subject to the following requirements: meeting a unisex age limit of 60 years and a minimum of 90 monthly contributions. The law also mentions the creation of an Optional Pensions Guarantee Fund - made up from contributions from all the pension-providing institutions.

The third pillar, although favoured over the mandatory private pension pillar, has been debated long and has suffered many modifications. However, glaring omissions have persisted: public sector employees (including medical doctors and teachers) and employees in companies with budget arrears were excluded, while there are still no regulations for companies with more than one union.

[21] Initially, both laws on private pension pillars conditioned the operation of private pension funds on the existence of a prudential supervision and regulation agency and stipulated the creation of separate supervisory agencies. The employers and unions saw the two pillars are very different and separate entities as, in the third pillar, pension fund administration relied on existing insurance companies, banks and investment societies, where as the second pillar regulations stipulated the legal separation of pension funds from their administrators. However, in April 2005 the World Bank stepped in and granted Romania a loan for the organisation and development of a single Commission for the Supervision of the Private Pensions System (World Bank loan 4146 RO).

5.5. Financing the Transition Cost

Regarding the mandatory second pillar of private pension funds, the Governance Programme 2001-04 (Romanian Government, 2000) clearly stated that it would only be implemented when a reliable source to cover the transition deficit is found. Given the problems in the old PAYG system, its undeveloped financial system prone to abuse and corruption (see previous financial scandals) and the realities of pension reform revealed in other reforming CEECs, it is understandable why successive Romanian governments have been reluctant to implement fully-funded private pillars. Worries about the mandatory private pillars set-up, regulation, supervision, administration and investor education costs and the adequacy of sources to finance the transition cost have contributed to the delay in the private pillars implementation. This thesis agrees with government's decision to delay the implementation of private pillars and to focus first on the development of the third pillar (voluntary private pensions) while making preparations for the future introduction of the second pillar. A conservative estimate of the PAYG deficit in the first year of second pillar implementation is around 24 million euro (Capital, 2004a). As discussed in Chapter 2, the PAYG deficit would have to be matched either by raising taxes, increasing budget transfers or by acquiring debt.

First, given the already high level of the contribution rate and the deficit of the central government budget (Graph 5.12) from which already crucial transfers to the PAYG are being made, tax financing is not really an option. Second, under debt financing, the general idea is that the revenue diverted to the private funds pillar would find its way back to the government through increased demand for government bonds from the private pension funds and so the deficit would be financed without affecting inflation. However, debt financing of a large actuarial deficit of the public system would take a long time and could put additional financial pressure on the government. Third, unlike Poland – which expressly set out to finance the gap with privatisation revenues, in the case of Romania, privatisation revenues may not be enough. One positive implication of the added fiscal pressure generated by debt financing would be impelling the government to accelerate the process of privatisation.

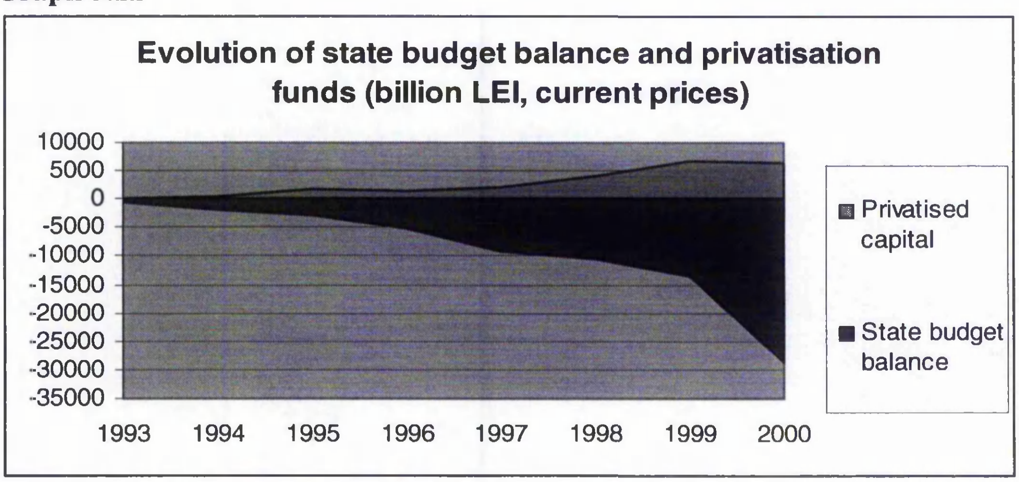
Table 5.2. Methods of privatisation of state owned enterprises

	Direct Sales	Vouchers	MEBO*
Bulgaria	Primary	Secondary	n.a.
Czech Republic	Secondary	Primary	n.a.
Hungary	Primary	n.a.	Secondary
Poland	Primary	n.a.	Secondary
Romania	Secondary	n.a.	Primary
Slovak Republic	Primary	Secondary	n.a.
Slovenia	n.a.	Secondary	Primary

* MEBO stands for Management-Employee Buyout n.a. = not applicable or small scale
Source: World Bank (2002: 75)

When it comes to maximising revenue earnings from privatisation, the obvious method would be direct sales. On the contrary, as Table 5.2 shows, Romania was one of the few countries in which MEBO method played the major role. Negrescu (1999) emphasizes that MEBO, instead of being a fallback solution secondary to other methods, became the preferred method with privileges set by law, which effectively prevented the application of other methods of privatisation. Despite the media and government hype, the Mass Privatisation Programme (vouchers, certificates of ownership) only managed to privatise 5.5 percent of the state owned capital (Earle and Telegdy, 1998). The main reason for the introduction of the MPP was to accelerate the privatisation process, being considered a good method for fast mass transfer of ownership. However, it did not prove to be a quick process and had the major drawback of complicating the subsequent direct sales privatisation (Negrescu, 1999). For most of the transition period, privatisation has been confined to small and medium enterprises, large companies starting to be involved only since 1997-98 (OECD, 2001).

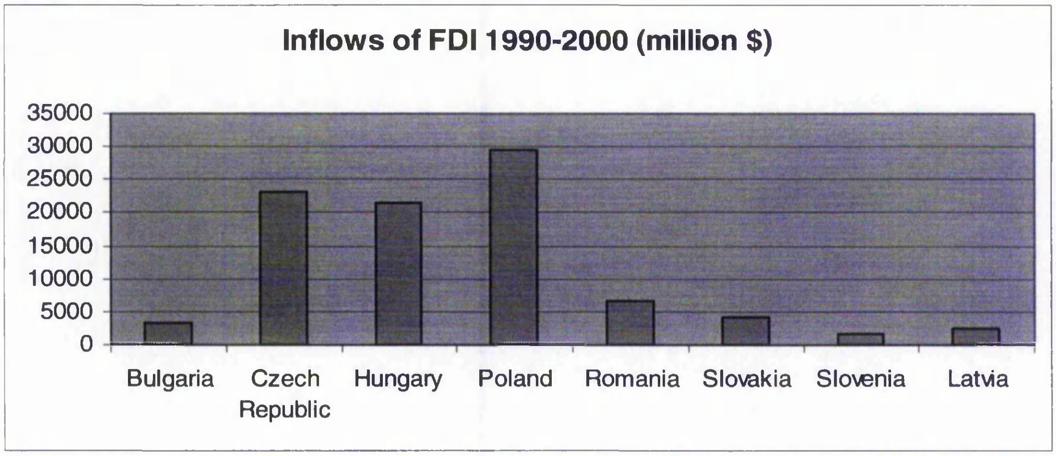
Graph 5.12



Source: APMSO (2002); detailed figures in Appendix A, Table A11.

Thus, Romania is among the 'credit-starved' group of countries in Central and Eastern Europe, like Bulgaria and Albania. The only advantage Romania had – as opposed to the other CEECs - was the fact that it had no external debt so the state owned enterprises had limited liabilities. In many other CEECs, these state owned enterprises were viewed as collateral for this external debt and much of the funds gained from privatising them went to service the debt (OECD, 1999). Despite this fact, the money Romania has raised through privatisation and FDI does not amount to much (Graph 5.12 and Graph 5.13).

Graph 5.13



Source: United Nations (2003); detailed figures in Appendix A, Table A10.

This thesis does not dwell on the causes of this discrepancy in total FDI receipt, the distribution of FDI by country and its main determinants in CEECs has been analysed by many economists (Bevan and Estrin, 2000; Krkoska, 2001; Resmini, 2000). One basic conclusion is that, unlike Czech Republic, Hungary and Poland, who received FDI based more on gravity factor (EU accession countries closest to the EU), FDI in Romania has been largely based on market size. The difference in EU accession stages has been important. Karstensen and Toubal (2003) find that both the level of privatisation (private market share) and the method of privatisation (as proxy for the quality of corporate governance) had considerable impact. Romania has paid the price for the slow transition process and the previous stop-and-go macroeconomic policies that have increased the perceived risk for investments and, thus, influenced the redirection of FDI to other countries or required the application of discounts to the privatisation price of the state-owned companies. The macroeconomic and legal environment has become more stable and attractive for investment only since 2000.

5.6. Conclusions

Romania has a strong tradition of social insurance, having made its first legislative attempts in the area of pensions in the middle on nineteenth century. Over the next decades, a universal social insurance system was built up and expanded. Since World War II, following the arrival of the communist regime, there have been many significant changes in pension provision such as incorporation of social insurance into the state budget, replacement rates as percentages of normalized wages based on various classifications of categories of workers, restructuring of the many component schemes etc. After the 1989 revolution, reforming efforts have been aimed at making the system compatible with the economic realities of transition such as inflation, unemployment and wage differentials which were causing inequity within and across generations of pensioners. Ten years of halting reforms and steady deterioration were to pass until the creation of a single framework that correlated benefits and united the fragmented pension system. At the end of the 1990s, the Romanian pension system featured a shrinking contributor base, contribution evasion and arrears, low retirement ages, early retirement incentives and the intensifying ageing process. Systemic reform had become imperative. In 2000, Romania passed the first law in a legislative reform package designed to implement a multipillar system, thus following in the footsteps of the other CEECs. Romania now features a parametrically reformed points-based PAYG as the first pillar that provides an income floor of sorts, and is making preparations for the introduction of the second and third (private pensions) pillars. The envisioned pillars are drafted along the same lines as similar pillars in the other CEECs. However, their implementation has been delayed over and over since 2000, with the main reason being the high transition costs predicted, the lack of a reliable financing source for these costs and the government's misgivings about the country's undeveloped capital markets. The latter concern constitutes the focus of the following chapter.

CHAPTER 6.

THE ROMANIAN FULLY FUNDED PENSION PILLAR

6.1. Introduction

The first section of the chapter will present in a comparative fashion the weaknesses of the Romanian financial sector. Romania needs to devote significant resources to the development of its financial sector. The capital market needs strengthening, as does the people's trust in pension reform and private institutional investors. The promotion of new saving vehicles such as occupational and private pensions has to be a priority. Next, the chapter proceeds to build a potential hypothetical rate of return for investments in the yet to be implemented fully-funded pillar. The results are intended to compensate for the lack of historical data on investment efficiency of pension assets in Romania and to help in future comparisons and for use in later chapters (helping to determine the suitable size of the private pillar). The artificial time series is created based on investment regulations envisaged for the private pension funds, past investment experiences of mutual funds and returns of the main asset classes. At the end, the chapter will employ factor analysis in order to provide the rates of return generated more credibility.[1] Thus, if the second pillar had been in place since 1997, there is sufficient evidence to support the calculated rates of return.

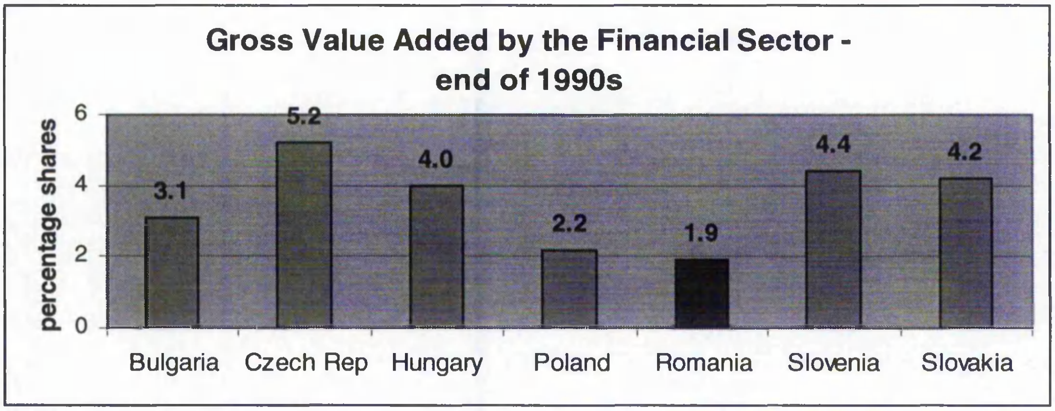
6.2. Financial Sector Aspects in Romania

6.2.1. General features

In the EU15, the business and financial services sector is the most important, and its share in GDP is rising. In 2001, the business and financial services accounted for 26.6 percent of the total gross value added (European Communities, 2002b). Not the same can be said about CEE financial sectors.

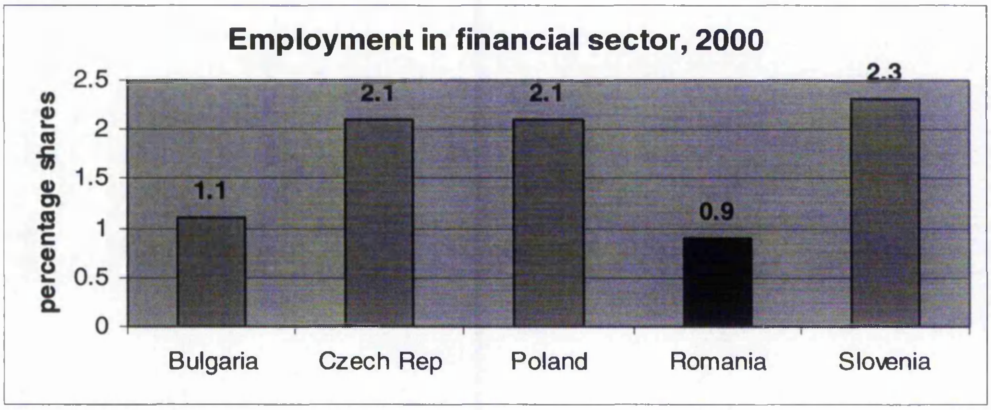
[1] Had the private pensions already been implemented, actual rates of returns would have been available and it could have been possible to perform factor analysis and identify the factors relevant to their evolution. Here, the reverse process will be applied: given that the analysis identifies factors resembling reality, the generated HR becomes more credible.

Graph 6.1



Source: European Communities (2002a)

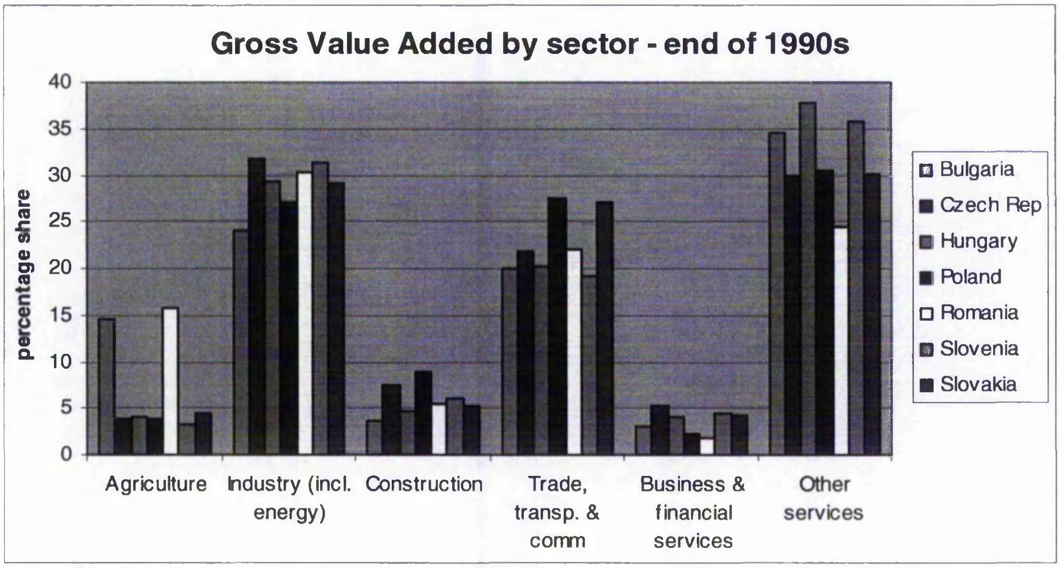
Graph 6.2



Source: N.I.S. (2001)

Graphs 6.1 and 6.2 show that Romania can be singled-out with the smallest financial sector, with the lowest contribution to the value added in the economy and the lowest employment figures. In the CEE economies, manufacturing has the highest share in Gross Value Added (GVA, Graph 6.3) and, with the exception of Romania (where, like in Bulgaria, agriculture still accounts for a large share), the value added by it has been relatively fast growing. Romania is the odd-one-out in terms of the entire services sector. Even Bulgaria, with an agricultural sector of similar size, has larger GVA contributions from the services sector. By referring to Graphs 3.1 and 3.2 in Chapter 3, further evidence can be seen of Romania and Bulgaria standing apart from other countries –experiencing a fall in GDP recovery after 1996.

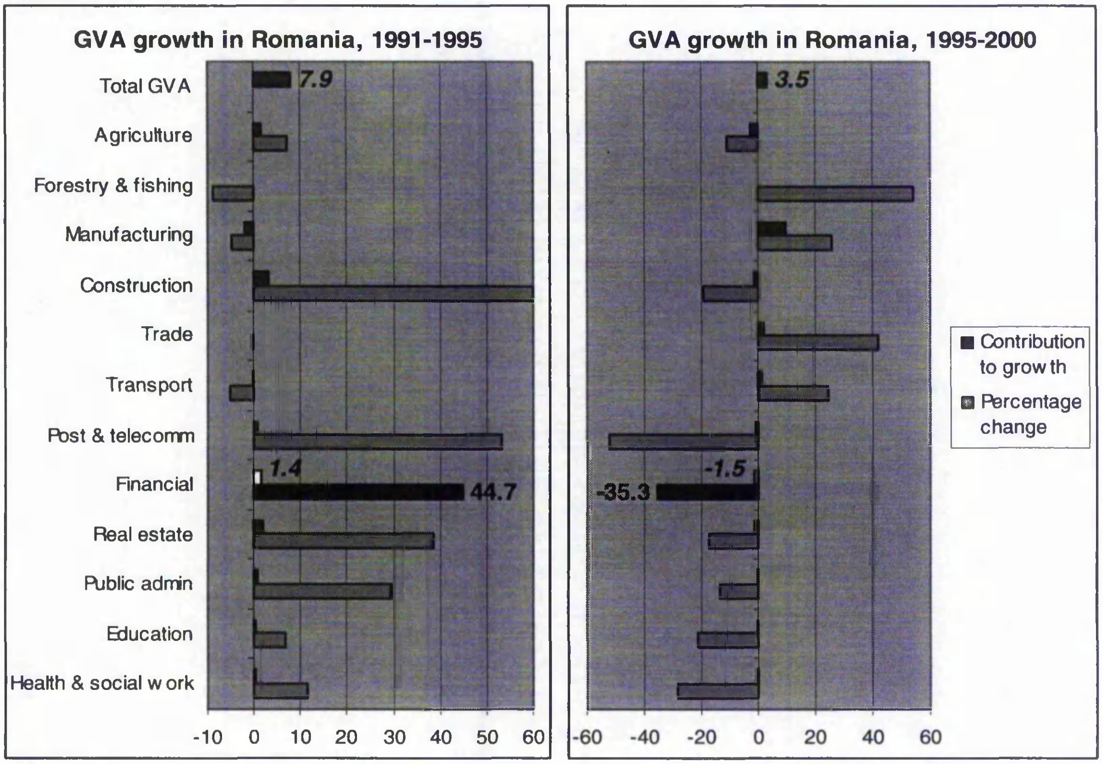
Graph 6.3



Source: European Communities (2002a)

Two periods can be easily discerned – the period 1990-1995, which includes the first two years of 'wild free-fall transition' and the years of macroeconomic stabilisation, and the period 1996-2000, of recession.

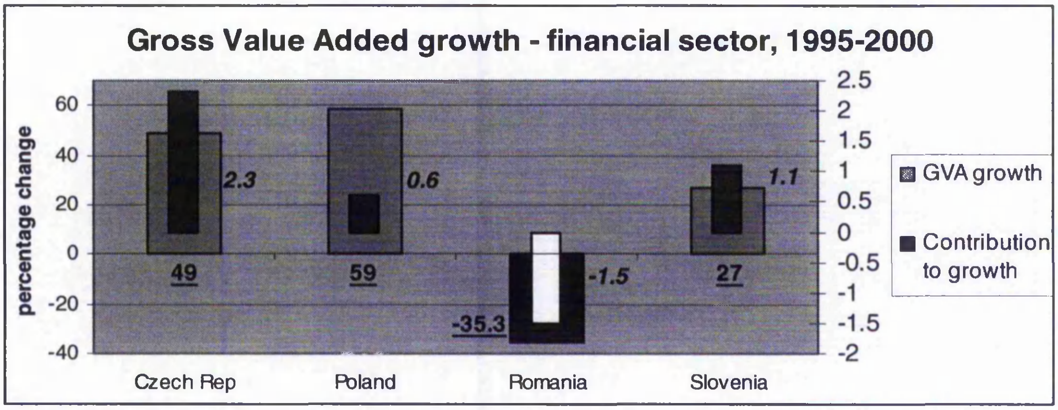
Graph 6.4



Source: see Appendix B, Table B1.

The differences from other CEECs are not only in the size of the contribution of the financial sector but also in its dynamics. Unlike other CEECs, for the last five years running to 2000, the GVA by the financial sector has decreased by 35.3 percent, which translated into a fall of 1.5 percent in overall GVA growth. In other CEECs, the financial sector had a positive influence, as shown in Graph 6.5.

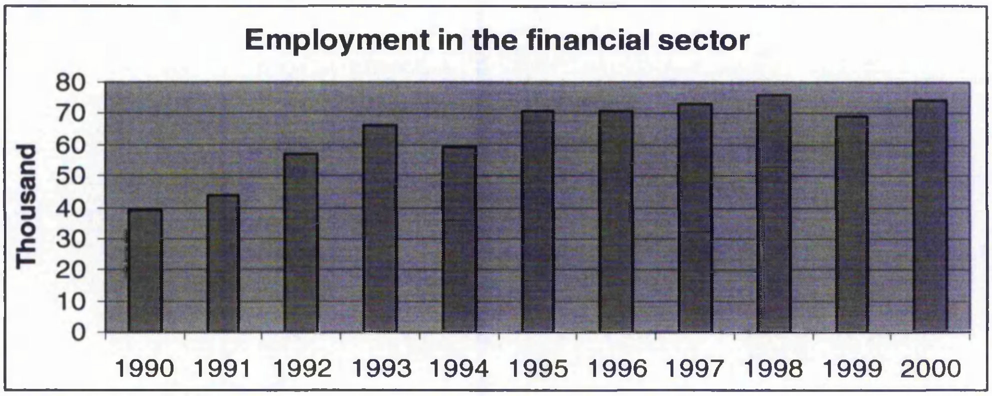
Graph 6.5



Source: European Communities (2002a), N.I.S. (2001) and author's calculations.

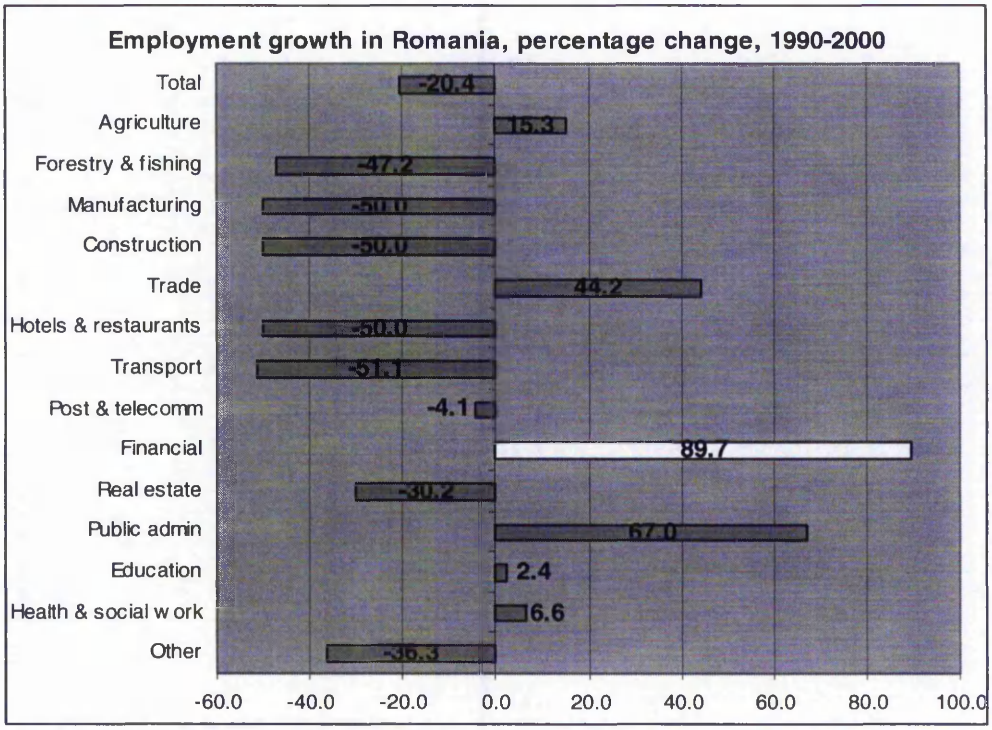
Many things happened between 1995 and 2000 that created confusion in the financial sector: the Mass Privatisation Programme, the establishment of the Bucharest Stock Exchange, the first credit rating from major international agencies (BB-minus by Standard and Poor's and Ba3 from Moody's Investors Service). Politically, this is the period after a centre-right coalition, the Democratic Convention of Romania, won the general election against the Party of Social Democracy of Romania (PDSR). The brief period of elation ended when it was clear that the 'political algorithm' - on which the new coalition government was founded, promoted economic gridlock and not full–scale economic reform.

Graph 6.6



Source: N.I.S. (2001)

Graph 6.7



Source: see Appendix B, Table B2

Oddly, the contraction in GVA in the financial sector happened in spite of the continually increased employment. It may be speculated that the contraction of the financial sector was based on the lack of skilled personnel with experience in free market issues (see Chapter 2). From this point of view, the Romanian financial sector seems in need of much further development.

6.2.2. Banking

In the CEECs, reforming the financial system has meant focusing on the banks. The banking system plays a key role in any economy, its reform being seen as critical for pension reform in developing countries. The banking sector is seen as essential for pension reform, because not only are part of the private pensions funds' assets held in banks, but also the investments made by pension funds on capital markets involve the presence of banks, so insolvent banks threaten future pension provision. A stable banking environment has be a priority for the CEE governments. Many banks in CEE have bailed out several times, fraudulent pyramid schemes have been rife (especially in Albania, Hungary and Romania) and, as will be detailed later, the public must be guided into stable long-term investments. An important position in the process of privatising and restructuring the banking system has been occupied by foreign banks.

In the beginning, the CEE original banks had the monopoly in their markets but suffered from lack of products and credibility. Even now, few CEE banks are able to compete without having support from foreign banks. Foreign ownership has had positive spill over effects, bringing better governance and improved access to capital, along with previously non-existent financial services such as leasing, mortgages, credit and debit cards, asset management. Also, foreign banks who have taken over regional banks, have given them credibility and stability in the eyes of customers, foreign ownership bringing the idea of respectability, higher standards and the presence of an implicit safety net.

However, it should be noted that the foreign banks most involved in CEE belong to the second-tier club. At the end of 2002, Citibank Romania SA[2] had a share capital of $22 million, while BRD[3] had a share capital of $123 million[4] and Raiffeisen Bank SA[5] had an even higher share capital of $125 million[6].

It is expected that privatised and private banks, including foreign-owned ones, to gain market share at the expense of the state banks (Fries and Taci, 2002). At the end of 2000, in Romania, 21 of the 33 banks had foreign capital, 1 was completely state owned while in 4 other banks the state had a controlling share. State-owned banks are still the most important players in the Romanian market, with 43 percent of the capital base and 47 percent of assets (OECD, 2001a). On one hand, this could be a good thing, as the economy has not been overly reliant on foreign financing, whose future presence would be unpredictable. EU banks have a strong presence in all CEECs, increasing their dependence on the economic developments in the EU (GVG, 2003). On the other hand, however, coupled with the slow pace of complementary enterprise reforms[7], these banks have indirectly subsidised troubled companies, which, in turn, has slowed the progress of banking reforms (Fries and Taci, 2002).

[2] Citigroup's branch in Romania.
[3] The Romanian Bank for Development, where Groupe Société Générale has a controlling stake.
[4] Based on data for October 2003: share capital of 4,181,408,040,000 ROL at 33,903 ROL/$, the National Bank of Romania exchange rate (URL: http://www.brd.ro, accessed 18 November 2003)
[5] Raiffeisen Group's branch in Romania, resulted in 2002 from the acquisition of 99.2 percent of a large state-owned bank
[6] Share capital of 6,961,478,628,000 ROL at 33,500 ROL/$, the National Bank of Romania exchange rate for December 2002 (URL: http://www.banca-agricola.ro, accessed 21 November 2003)
[7] Such as bankruptcy laws, corporate governance regulations, enterprise budget constraints (Fries and Taci, 2002).

6.2.3. Stock markets

Reforming banks can only go so far in transforming the financial system. Krkoska (2001) argues that both banking sector reforms and capital market improvements are beneficial for capital formation, the domestic financial sector being particularly useful to the expansion of domestic enterprises. When it comes to pension reform, stock market development is crucial when the newly adopted pension system includes a fully funded component that involves long-term investments.

The main problem in CEE has been the slow development of the capital markets. Stock exchanges have been operating in all CEECs since mid-1990s however, capital has not been attracted. Insufficient transparency, high volatility and too little volume have kept foreign capital away, while the very weak presence of pension and insurance funds - institutions vital to capital markets - has kept domestic capital in bank deposits. Information problems, corruption and lack of enforcement have also contributed (World Bank, 2001). Given the underdeveloped state of capital markets in most CEECs, local banks have been shouldering most of the financial intermediation (Pissarides, 2001).

Thus, CEE stock markets are not places where firms can raise new capital. Of the hundreds of companies listed, only a score of them are actively traded, few of them blue-chips. Poland and Romania, with populations of around 40 and 22 million, should be able to sustain national stock markets. What most of these countries lack is a strong domestic class of institutional investors - pension funds, mutual funds and private portfolio investors.

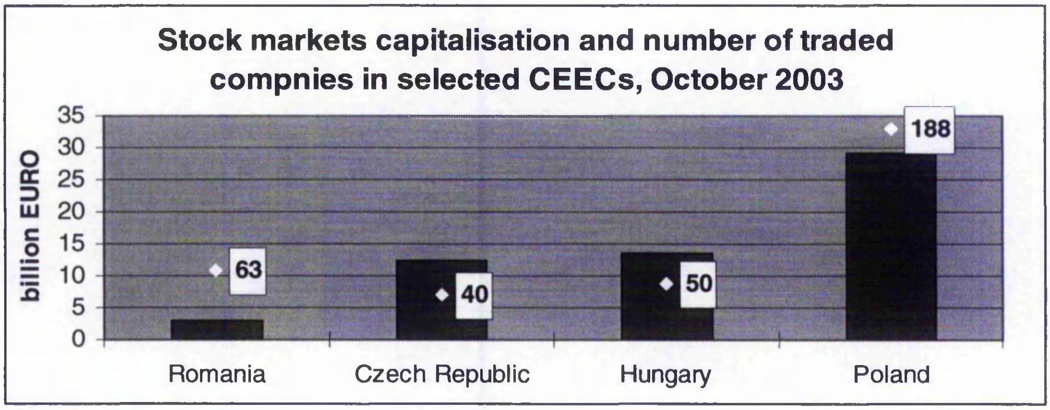
Table 6.1 Stock market capitalisation in selected CEECs, October 2003

	Stock market capitalisation (billion EURO)	Number of traded companies
Czech Republic	12.29	40
Hungary	13.49	50
Poland	28.98	188
Romania	2.86	63

Source: The Federation of European Securities Exchanges (http://www.fese.be, accessed 12/11/2003) and The Bucharest Stock Exchange (http://www.bvb.ro, accessed 12/11/2003)

As discussed previously, more developed financial systems should improve access to capital for businesses and households, parallel with attracting more savings, and thus spur growth. However, CEE experiences suggest that, while the expansion of financial activity is associated with growth in output, there is evidence supporting that government borrowing is crowding out private borrowers (Fries and Taci, 2002).

Graph 6.8



Source: see Table 6.1

It should be noted that Hungary and Poland had a head start in capital markets against Romania. When the Bucharest Stock Exchange (BSE) opened in 1995, the Polish stock exchange already had 65 companies listed and a turnover average value of 55 million ZL - approx. $22 million. (CSO, 2003) The BSE reached that value only in 1997. Poland is better positioned than the rest CEECs for other reasons as well. First, it has benefited from much stronger law enforcement, better disclosure standards, transparency requirements and takeover regulations (Coffee, 1999). Second, it has already implemented mandatory private pensions.[8] Since 1999, an individual contribution rate of 9 percent of the monthly wages has been steadily transferred into private pension funds accounts. This assures the predictable expansion of the Polish institutional investors' assets it sends encouraging signals towards other capital markets. Hungary also reformed its pension system and introduced private pension funds, however its pension funds are growing more slowly – individual contribution rate is 6 percent and the size of the equity market is still small. Most attractive companies have been privatised directly and are not listed on the stock exchange. The future of these stock markets is uncertain, especially in the context of EU enlargement and when considering the European financial consolidation. An optimistic view is that the blue chips will migrate to European multinational exchanges, while national stock markets continue to service small and medium sized businesses.

However, it may not be all bad news, these countries may not need to allocate vast resources in trying to expand their stock markets. Given the countries' investment

[8] Mandatory for all employees born after 1969, and optional for employees born between 1949 and 1968. (Chlon, Gora and Rutkowski, 1999)

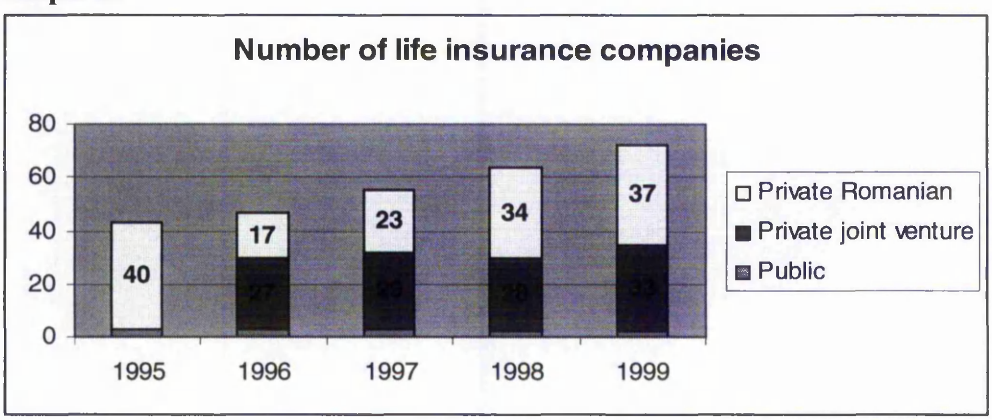
portfolio limitations of the second pillar pension funds, government securities will play a significant role, easing the pressure on the stock markets. This will be reflected later on in the chapter by the experience of the Romanian funds. Also, the global bond market is becoming accessible to developing countries. As mentioned in Chapter 2, by facilitating pension funds' access to global assets, small and volatile domestic capital markets would benefit from internationally diversified pension portfolios involving economies of scale, financial expertise and lower volatility in returns. In this regard, the point has been raised in previous chapters that most pension reforming countries have severely limited foreign investment (see the individual cases and the discussion in Chapter 4).

6.2.4. Investment funds and insurance sector

The success of the fully funded pensions pillar also depends on the development of the insurance sector, which intervenes in the decumulation phase of the individual pension accounts in the form of annuity markets. Under a funded system, saving for retirement implies accrual of contributions leading to annuities purchase.

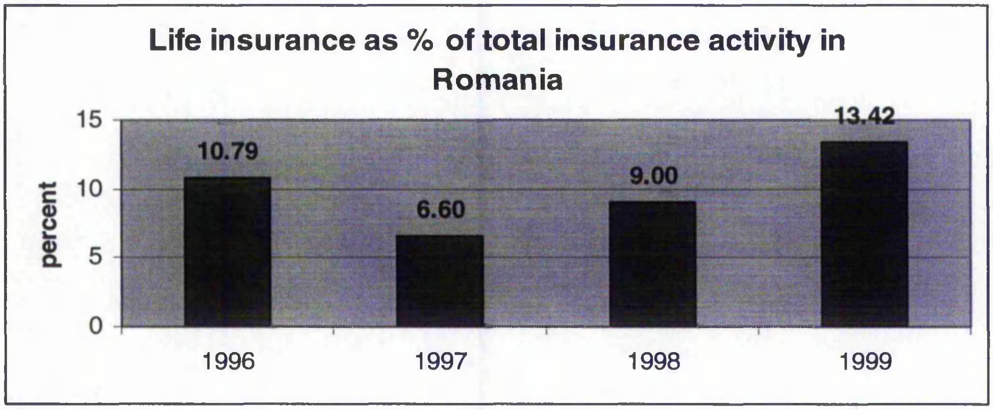
Within the envisaged Romanian pension system, private insurance companies that manage voluntary contributions for life, private pension insurance and the recently legislated optional occupational pension funds are included in the third pillar. As Graph 6.9 shows, the presence of private insurance companies has started being felt. However, life insurance activity, with pensions in particular, is still in the incipient phase (Graph 6.10 and Graph 6.11).

Graph 6.9



Source: N.I.S. (2001)

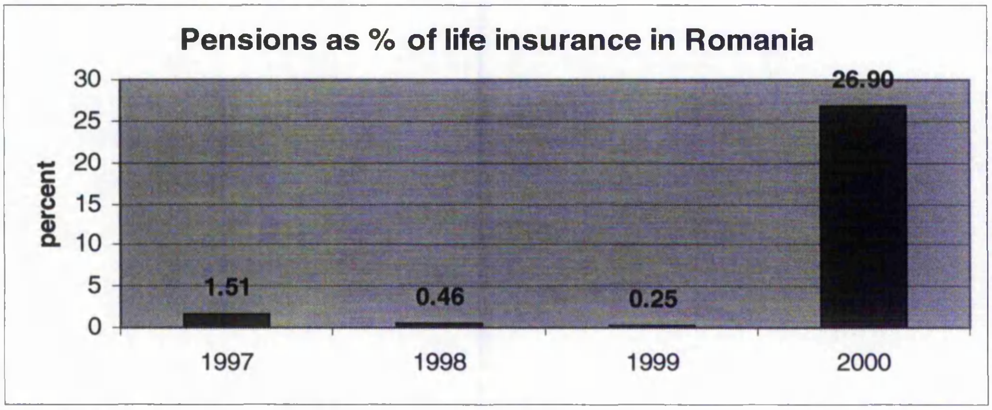
Graph 6.10



Source: N.I.S. (2001)

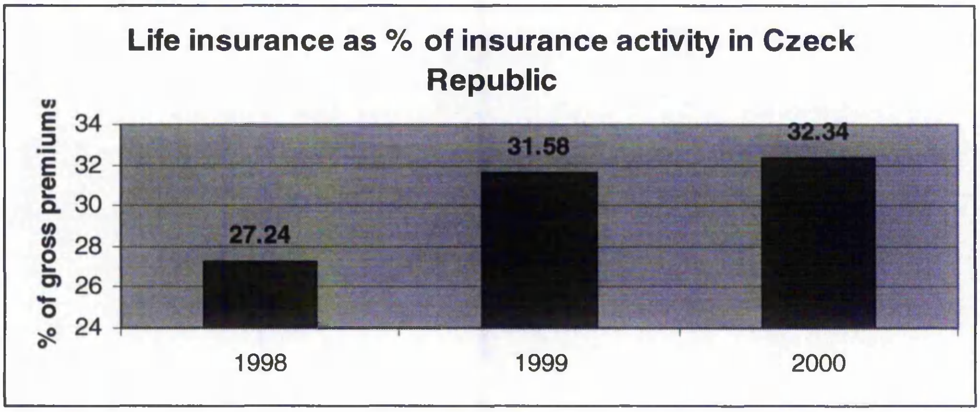
Until the year 2000, the third pillar seemed negligible. The figures are small, even when looked at in isolation. When compared with other CEECs, large discrepancies can be seen. Graph 6.12 shows the importance of life insurance in the Czech Republic.

Graph 6.11



Source: N.I.S. (2001)

Graph 6.12



Source: C.Z.S.O (2002)

Nevertheless, progress can be seen - regulating pensions proved to be a boon. Graph 6.11 shows that the Law 32/2000 instilled life into pension-related insurance activities. Actual implementation of the optional occupational pension funds should provide another much-needed boost.

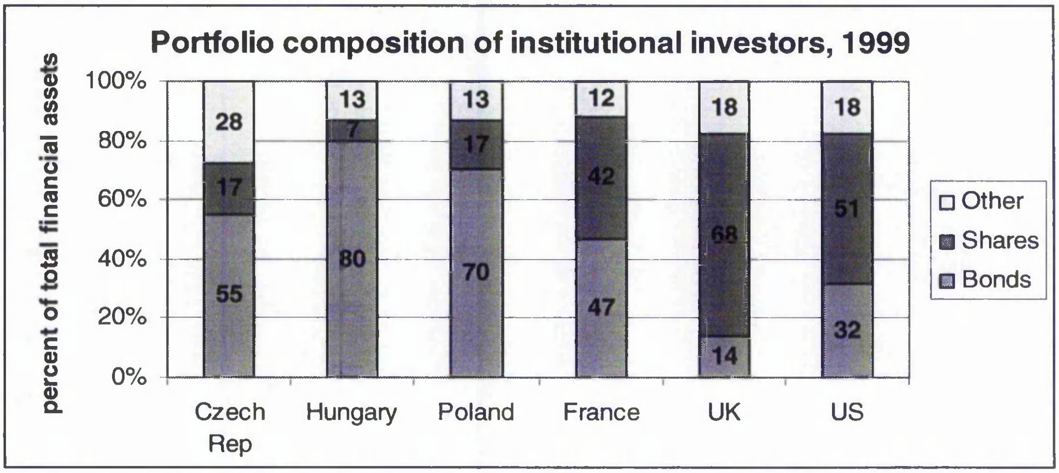
6.2.5. The portfolio preferences of companies and individuals

Analysing the compilation of non-consolidated financial balance sheets from EU candidate countries for the year 1999 (European Communities, 2003b) helps further highlight the differences between Romania and the rest of the CEECs.

In terms of structure of financial assets per total economy, currency and deposits are most important in Romania (25 percent), similar to Czech Republic (24 percent); shares and other equity are most important in Poland (33 percent).

In terms of the structure of assets of the financial corporations[9], Romania is again a case apart, putting more emphasis on currency and deposits (29 percent) and securities (28 percent) while for most of the CEE financial corporations loans are the predominant asset (as high as 54 percent of total in Hungary). Overall, securities - and not shares, represent a large proportion of total financial assets of CEE financial corporations, around 30 percent. These contrasts are accentuated by narrowing the focus to institutional investors, comparing Graph 6.13 and Table 6.2.

Graph 6.13



Source: OECD (2001c)

[9] For non-financial corporations, high interest rates on company loans have made "other accounts receivable" (trade credit, advances and other items due to be received) the most important item in the structure of assets in most CEECs, Romania being no exception.

Table 6.2 Life insurance companies' investment portfolio - Romania

	1997	1998	1999 (<1yr)	1999 (>5yrs)
T-bills	0.67	19.35	72.40	
Bank deposits	98.11	77.68	27.60	86.53
Equities				3.64
Mutual funds	1.15	2.96		0.27
Others	0.08			9.56

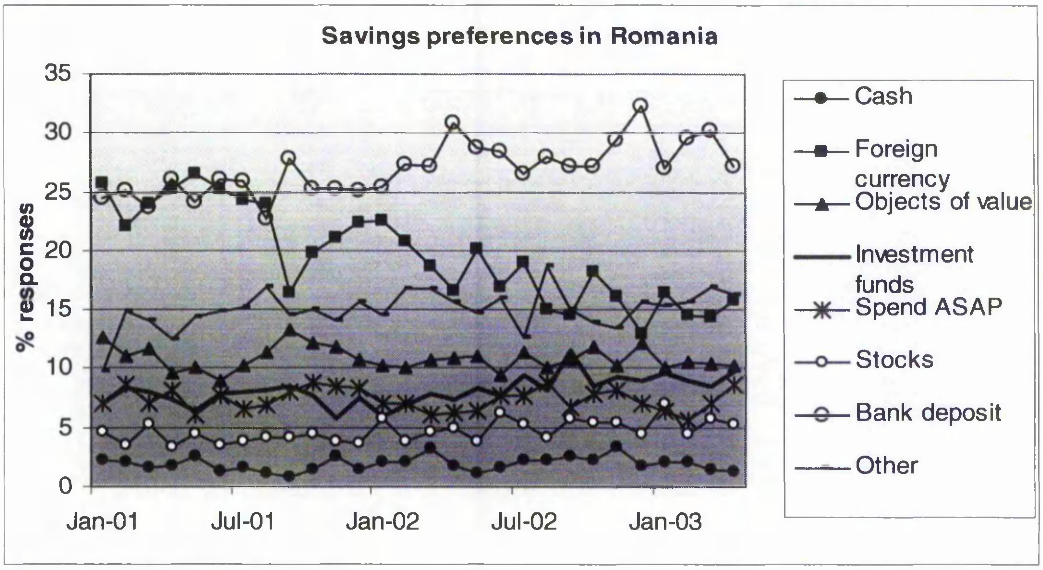
Source: N.I.S. (2001) and author's calculations. See Appendix B, Table B3.

Regarding the financial assets of general government, shares and other equity are the most important in all CEECs *except* Romania. In Romania, 44 percent of total general government financial assets are in loans.

When it comes to households' assets currency and deposits are the main financial instrument in all CEECs, however, Romania shows the highest percentage (93 percent of financial assets of households, compared to 49 percent in Hungary and 55 percent in Poland). The following section deals with households more in depth.

The following table and graph show the trends in the individuals' preferences for savings assets evident from a popular poll that is regularly taken by the Institute for Marketing and Surveys (IMAS, 2003). The graph shows responses for the period January 2001 – April 2003.[10]

Graph 6.15



Source: IMAS (2003)

[10] In May 2003, an extra category was introduced in the questionnaire ("Invest in a business"). For consistency, the months following May 2003 have been excluded.

Table 6.3 Savings preferences – average values and variation of responses

	Cash	Foreign currency	Valuable objects	Invest. funds	Spend ASAP	Stocks	Bank deposits	Other
Jan 2001	2.3	25.8	12.7	7.1	7.1	4.7	24.5	9.7
Apr 2003	1.3	15.9	10.3	9.7	8.7	5.3	27.1	16.3
Average	***1.9***	***19.6***	***10.9***	***8.1***	***7.4***	***4.7***	***26.9***	***15***
Coefficient of variation†	31.7	20.6	9.3	14.8	12.5	19.5	8.3	11.4

Source: IMAS (2003) and author's calculations. † The coefficient with values multiplied by 100.

It can be seen immediately that foreign currency and bank deposits still take precedence in individuals' choice of savings assets. If anything, Romanians were consistent (low coefficient of variation) in choosing bank deposits as the major savings asset, with the percentage slowly increasing.

Foreign currency suffered a serious 'downgrading' in percentages. The historical depreciation tendency for the ROL is diminishing, undermining the speculation of the Euro/USD against ROL. Even if a trend seems set, the large variation in values has to be noticed, pointing at volatility.

With foreign currency becoming less attractive and bank interest rates falling, more individuals found themselves without a 'safe', 'tried and tested' traditional savings asset. The number of people who chose 'Other' has risen with little variation. This suggests that individuals would like to place their savings in other instruments than the ones presented. This also shows their reluctance towards investment funds and stocks.

As inflation becomes subdued, the returns from money market investments should come down as well. The long-run possibility of growth should be stocks, as falling interest rates push investments towards the stock market. However, the distrust of investments funds and stocks is evident. Both numbers for stocks and mutual funds have increased, but people's opinion about them varied tremendously (high coefficients of variation).

Structural weaknesses in the regulatory system (lax legislation) and failure to monitor non-banking financial institutions' activities - mutual funds in particular - led to serious infringements of capital market rules, culminating with the FNI crisis (Fondul National de Investitii – National Investment Fund, a major unit trust fund) in May 2000. The mutual funds market suffered severely after that, distrust pushing down the number of investors. The number of investors only started rising again in 2002. Further more, the very poor performance of the Bucharest Stock Exchange pushed people away to other instruments. Treasury bills have been the most attractive investments.

The evolution of people's perception of cash under the mattress is interesting, considering the falling inflation rate. On average, the percentage of people choosing cash as the major saving asset has been small and seems to go on decreasing even further; however, there has been considerable variation over time.

6.3. Generating a Hypothetical Rate of Return for the Romanian Fully Funded Universal Pension Funds

6.3.1. Investment limits

The following table lists the limits imposed on pension funds' investment portfolios in the Law no.411/2004 on private pension funds (see Chapter 5). The strong bias towards bonds and the limited access to foreign investments is clear, which may both have serious implications for the rate of returns on investments (as will be discussed in the following sections). However, these limits (up to 25 percent in foreign securities, 50 percent in domestic stocks) are generous when compared with those imposed in Argentina, Chile, Hungary and Poland (see Graph 4.1, Chapter 4 or individuals cases in Chapter 3).

Table 6.4 Investment limits for private pension funds (% of total fund assets)

Type	Description	Limit
Cash	Monetary funds, incl. bank accounts and deposits	20%
T-bills, bonds	Government securities (Ministry of Public Finance)	70%
Bonds	Bonds issued by the public administration authority	30%
Equity	Stocks issued on the Bucharest Stock Exchange	50%
Bonds	Bonds issued by other countries	10%
Bonds	Bonds issued by foreign non-governmental entities	10%
Mixed	Mutual funds – foreign and domestic	5%

Source: Law no.411/2004 on private pension funds.

6.3.2. Portfolio composition

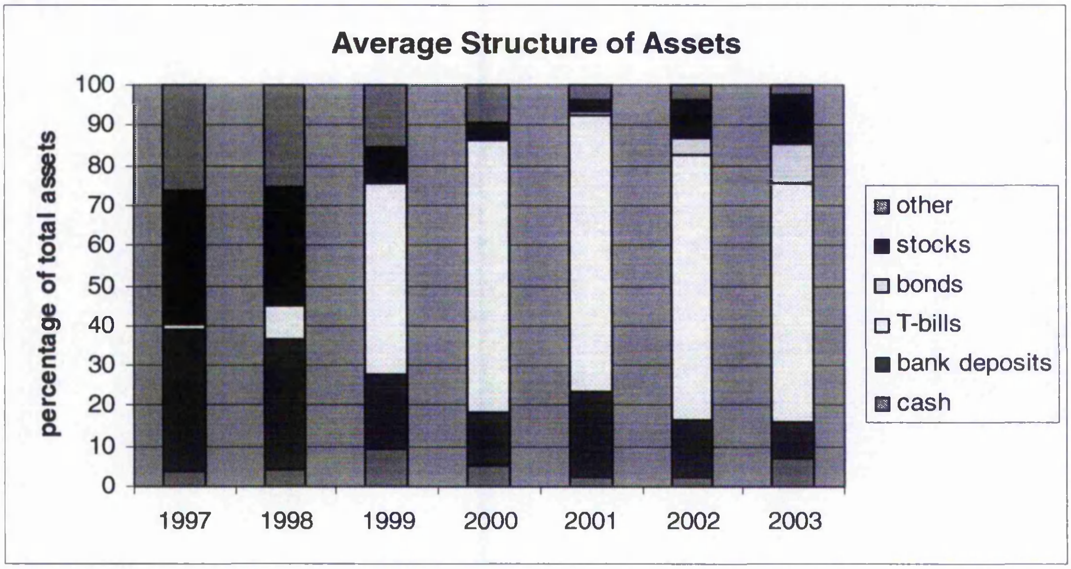
Building a realistic hypothetical potential rate of return (HR) requires a more accurate idea of how assets portfolios are made-up in Romania, so that the returns of different assets can be weighted appropriately. Table 6.5 shows the evolution of the average composition of assets in mutual funds (yearly averages for all funds, regardless of size), on which the proportions used in the HR will be based.

Table 6.5 The Average Structure of Assets of Romanian Mutual Funds (%)

	1997	1998	1999	2000	2001	2002	2003
Cash	3.7	4.3	9.2	5.0	2.6	2.6	6.9
Bank deposits	35.4	32.6	18.7	13.1	21.1	13.9	9.0
T-bills	1.1	8.2	47.9	68.2	68.9	66.3	59.8
Bonds				0.4	1.1	4.0	9.6
Stocks - listed	11.6	9.7	2.6	4.2	2.2	9.3	12.3
Stocks - unlisted	21.8	20.0	6.0	9.1	0.3	0.1	2.5
Other assets	26.4	25.3	15.6	5.0	3.9	3.7	6.9

Source: author's calculations (arithmetic averages) based on UNOPC annual reports (UNOPC, 2004)

Graph 6.16



Source: Table 6.5.

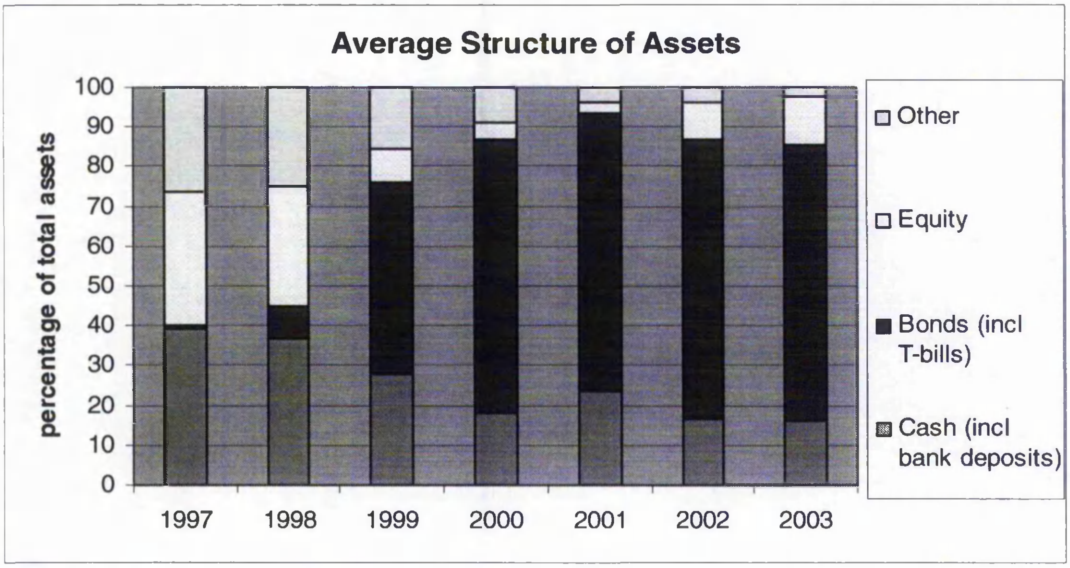
If the asset classes from above are imposed the Table 6.5 becomes:

Table 6.6 The Average Structure of Assets of Romanian Mutual Funds (%)

	1997	1998	1999	2000	2001	2002	2003
Cash (incl. bank deposits)	39.1	36.8	27.9	18.1	23.6	16.5	15.9
Bonds (incl. T-bills)	1.1	8.2	47.9	68.6	70.0	70.3	69.3
Equity	33.4	29.7	8.6	4.2	2.4	9.4	12.3
Other	26.4	25.3	15.6	9.1	3.9	3.7	2.5

Source: author's calculations based on Table 6.5

Graph 6.17



Source: Table 6.5.

The poor evolution of the stock market has prompted existing funds towards a stock-bond assets allocation heavily skewed towards government bonds and it is clear that the same distrust in the domestic stock market is shared by the government. The need to finance the state budget appears to be the main reason behind the investment limits set by the law project. The common allocation strategy followed by pension funds in the US and the UK is a 60:40 split (see Graph 6.13, OECD, 2001c), the opposite of the 30:70 evident from the table above. Of course, consideration is being given to stability and low risk, but the government's desire to make pension funds channel a considerable share of their assets in government debt is highly visible.

Ever since their launch, there has been a stable and predictable demand for Treasury bills which makes financing the budget easier. However these limits/incentives imply an opportunity cost for the individuals. Compulsory investment in safer instruments lowers the expected rate of return of pension portfolios.

6.3.3. Computation methodology of the hypothetical rate of return (HR)

Building the HR involves using the investment limits set for the future occupational pension funds and some of the past portfolio choices made by mutual funds. The HR will show the rate that would have been obtained, if the private pension funds (with the investment limits) had been present in the past. It is a hypothetical allocation of assets based on *past* portfolio choices and *future* investment limitation. The monthly rates can be found in Appendix B, Table B5.

The HR is computed as a weighted average of the monthly returns on the different asset classes from the funds' portfolios. The weights are based on the proportion each asset class holds in the total. Table 6.7 shows the structure of assets (weights) assumed for the hypothetical pension funds. Again, the assumption is that, if pension funds existed, their investment strategy would have been similar to that of the actually existing mutual funds (Table 6.6), but also incorporating the investment limits imposed by law (Table 6.4). Table 6.4 contains data from Table 6.6 modified by the investment constraints in Table 6.4 and the monthly performance of individual asset classes (in hindsight).

$$HR_i = \sum_j R_{i,j} * W_{i,j} - I_i \qquad (6.1)$$

where HR_i is the hypothetical potential rate of return in year i, $R_{i,j}$ is the individual rate of return of the asset class j in year i, $W_{i,j}$ is the weight of the asset class j in year i and I_i is the rate of inflation in year i.

Table 6.7 Assumed structure of assets (weights) for HR (%)

	1997	1998		1999	2000	2001	2002	2003
	HR97	HR98-1	HR98-2	HR99	HR00	HR01	HR02	HR03
Cash (€)			5	10	5		5	5
Bank deposits	20	20	15	15	15	20	10	5
T-bills	5	30	35	50	65	70	65	60
Stocks - BSE	55	30	20	10	5		10	15
Foreign bonds	20	20	20	10	5	5	5	15
Mutual funds			5	5	5	5	5	

For example, in 1997, the highest average return was from T-bills but the evidence from mutual funds shows that only 1 percent was invested in these. Also, the funds invested 3.7 percent in cash and 35.4 percent in bank deposits. However, the pension fund limit is 20 percent for both asset classes (Table 6.4) and the average return was higher for bank deposits than cash (Appendix B, Table B5). So the HR has been adjusted accordingly - 20 percent in bank deposits and 5 percent in T-bills. Further, the mutual funds invested 26.4 percent in 'Other assets'. The hypothetical pension funds would have had the possibility of investing abroad, so the 26.4 percent translate into 20 percent (the full limit) that would have been invested in foreign assets. The rest of assets (55 percent) are assumed invested in domestic stocks.

One important assumption is that the funds invest the maximum allowance (their full investment limit) in the highest yielding instruments. Also the cash is kept in foreign currency (€). The limits for foreign bonds (governmental and corporate) were added together so the limit for foreign investment is 20 percent.

Until 2001, Romanian private companies have rarely issued bonds and next to no information existed on the few issues that were made. Since then, the number of bond public offerings has increased - mostly on account of municipal bond issues (local authority bond issues) – there were 2 public offerings in 2001, 8 in 2002 and 12 in 2003. As a result, in the HR computations, the relatively low percentages allocated for domestic bonds (Table 6.4) are assumed to be included in other assets (the allocations for stocks, mutual funds or foreign bonds).

The returns for the foreign bonds also include the gains from the exchange rate (using the Deutsche Boerse index *iBoxx € Overall*, so the bond change in price index is compounded with the gain of *euro* against the Romanian currency). As the iBoxx € Overall index was only introduced in 1999, the HR computation for the years 1997 and 1998 use the returns from *Dow Jones Stoxx TMI*. Regarding the returns on the Bucharest Stock Exchange, the *BET index*[11] is used for 1997 and the beginning of 1998. From April 1998, a more encompassing index is used, the *BET-C index*[12].

Year 1998 has two different sets of asset allocations (weights) because the UNOPC Mutual Funds Index became available in June 1998 and so the asset class 'mutual funds' could be added to the HR computation.

It is very important to note that the returns are monthly, assuming a one-month investment cycle (at the end of the month all the interest due is requested and all the assets are reinvested – i.e. interest is earned only for the month in question).

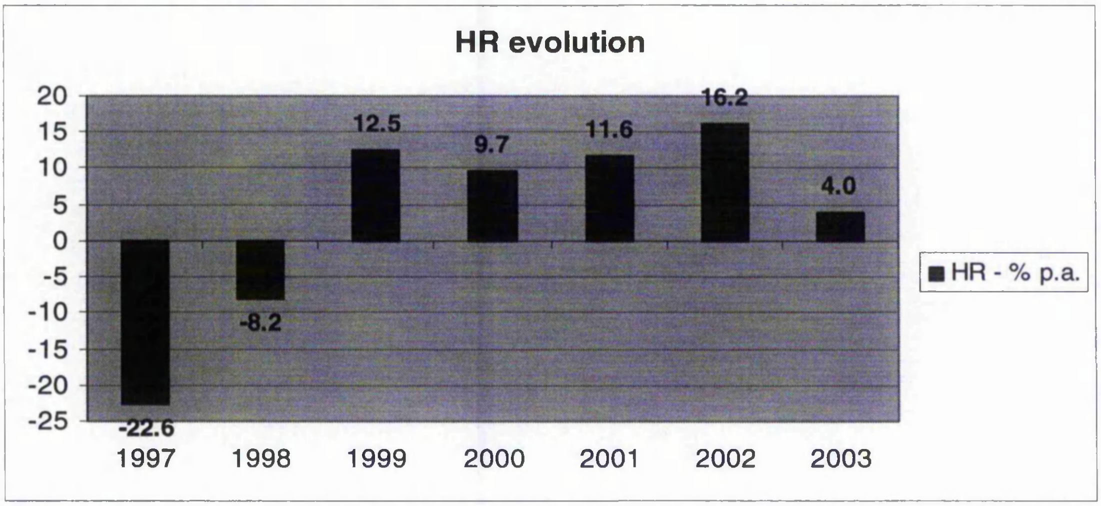
The HR is underestimated. At the end of 1997 and the beginning of 1998, the issue of T-bills was erratic. As the data sheets show there were months without issue, thus, no monthly return in the way we explained it above. For those months the HR is very low because no assets were considered invested in T-bills (because they were not issued); instead, because the limits for the other instruments had been reached, the assets were considered as invested in equities, even though the BSE reported loses in that period. Also, for the years 2000 to 2003, the returns on the Bucharest Stock Exchange could have been higher if another index was used - the *BET-FI index*, a

[11] Based on the prices of the 10 most liquid stocks traded at The Bucharest Stock Exchange
[12] Based on the prices of all listed companies

sectoral index of investment funds introduced in November 2000, which performed far better than the overall *BET-C index* (Appendix B, Table B5). The *BET-FI index* is based on the evolution of the 5 SIFs (the Financial Investment Societies) resulted from the Mass Privatisation Programme, characterised by large number of shareholders and important assets. However, in the end, this index was not used because of reservations on the true value of the assets in SIFs funds (see Orszag and Stiglitz remarks in Chapter 2).

All the above computations are condensed into the time series displayed in the following Graph 6.18.

Graph 6.18 The potential evolution of the hypothetical pension funds



Source: Appendix B, Table B5

However, one important factor is missing from the calculations - the administration costs associated with the set up of individual accounts and the management of assets in the fully funded private pensions pillar. Thus, it is worth bearing in mind that the *net* HR would differ considerably from the HR calculated (see the experience of other pension reforming countries, Chapter 3).

6.4. Background Analysis for the Rate of Return Generated

This section is aimed at analysing the general evolution of the asset classes involved in the make-up of the HR for the period December 1998 to December 2003. Had the private pensions pillar already been implemented, actual rates of returns would have been available and it would have been possible to perform factor analysis in order to identify the factors determining their evolution. Here, the reverse process will be applied: if the factors identified reasonably resemble Romanian reality, more credit will be given to the generated rates of return.

Based on values that can be found in Appendix B, this section employs factor analysis in order to reduce the number of variables (asset classes) to a more manageable set and to explain the underlying structure and evolution trends of the data set. All these variables are included in the potential rate HR, so by explaining the pattern of the HR components, the performance of the aggregate will be clarified. First, the variable-to-variable correlations must be analysed.[13] As Table 6.11 shows, there are numerous strong correlations within the data set.

Table 6.11 Correlation matrix for the HR asset classes

	BET-C	MFI	Tbills	Banks	€ euro	iBoxx	Stoxx	Inflation
BET-C	1.000							
MFI	.834**	1.000						
Tbills	-.716**	-.913**	1.000					
Banks	-.770**	-.967**	.950**	1.000				
€ euro	.867**	.992**	-.888**	-.953**	1.000			
iBoxx	.550**	.296*	-.114	-.184	.406**	1.000		
Stoxx	-.807**	-.692**	.547**	.576**	-.744**	-.794**	1.000	
Inflation	-.580**	-.703**	.779**	.707**	-.675**	-.204	.527**	1.000
** P<0.01; * P<0.05; df=61								

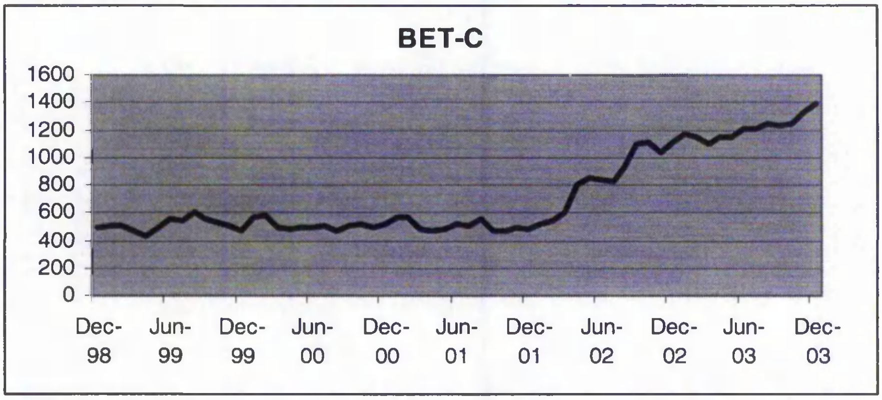
Unusual patterns can easily be discerned. For instance, the Mutual Funds Index is highly positively correlated with BET-C (0.834) but, equally strongly, negatively correlated with the evolution of Treasury bonds (-0.913) and bank deposits (-0.967), which would point out that the performance of mutual funds is not based on what would at first appear to be the first choice for investment (see Table 6.5).

BET-C and the Mutual Funds Index are negatively correlated with the international stock index (-0.807 and –0.692), fact that underlines the relative isolation of the Romanian economy from the international environment (see Graph

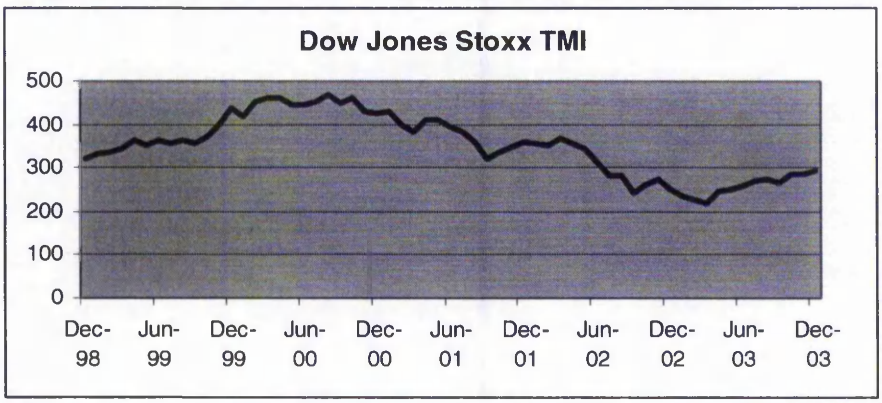
[13] It is important to note that the time series for the euro exchange rate and the inflation have been included with a time lag of one month.

6.20a and 6.20b). Also, BET-C and, especially, the Mutual Funds Index are highly positively correlated with the ROL/euro exchange rate (0.867 and 0.992, respectively – as if all their investments are made in euros).

Graph 6.20a Evolution of the Bucharest Stock Exchange



Graph 6.20b Evolution of the international capital markets



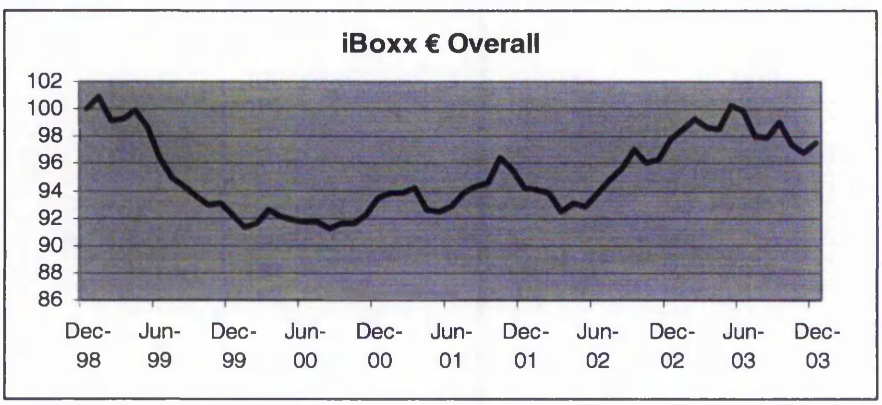


Table 6.12 contains the communalities – the percentage of a variable's variance that contributes to the correlation with other variables. In other words, the proportion of variance of a particular asset class that is due to common factors (shared with others). The percentage of variation extracted is at high levels (above 85 percent, except for Inflation).

Table 6.12 Communalities

	Initial	Extraction
BET-C	1.000	.863
MFI	1.000	.960
Tbills	1.000	.953
Banks	1.000	.952
€ euro	1.000	.952
iBoxx	1.000	.948
Stoxx	1.000	.930
Inflation	1.000	.662

Extraction Method: Principal Component Analysis.

Table 6.13 shows how much of the variance in the data set can be represented by underlying constructs (the extracted factors). Usually, factors with Eigenvalues greater than 1 are extracted (the factor extracts at least as much variance as the equivalent of one original variable). Thus, the first factor explains more than 72 percent of the total variance, while the second accounts for 17.5 percent.

Table 6.13 Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factors	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	5.909	73.862	73.862	5.909	73.862	73.862
2	1.312	16.395	90.258	1.312	16.395	90.258
3	.429	5.362	95.619			
4	.160	2.002	97.622			
5	.009	1.236	98.857			
6	.007	.883	99.740			
7	.001	.203	99.943			
8	.0004	.005	100.000			

Extraction Method: Principal Component Analysis.

The objective is to generate a first factor that will have the maximum explained variance – delimiting the largest pattern of relationship in the data. Then, with the first factor and its associated loadings fixed, a second factor is located that is independent of the first. The two factors extracted are not correlated. The extracted factors are shown in Table 6.14.

Table 6.14 Factor Matrix

	Factor	
	1	**2**
BET-C	**-.903**	.215
MFI	**-.970**	-.143
Tbills	**.901**	.377
Banks	**.936**	.275
€ euro	**-.972**	-.008
iBoxx	**-.503**	**.833**
Stoxx	**.825**	**-.500**
Inflation	**.766**	.274

Extraction Method: Principal Component Analysis; 2 components extracted.

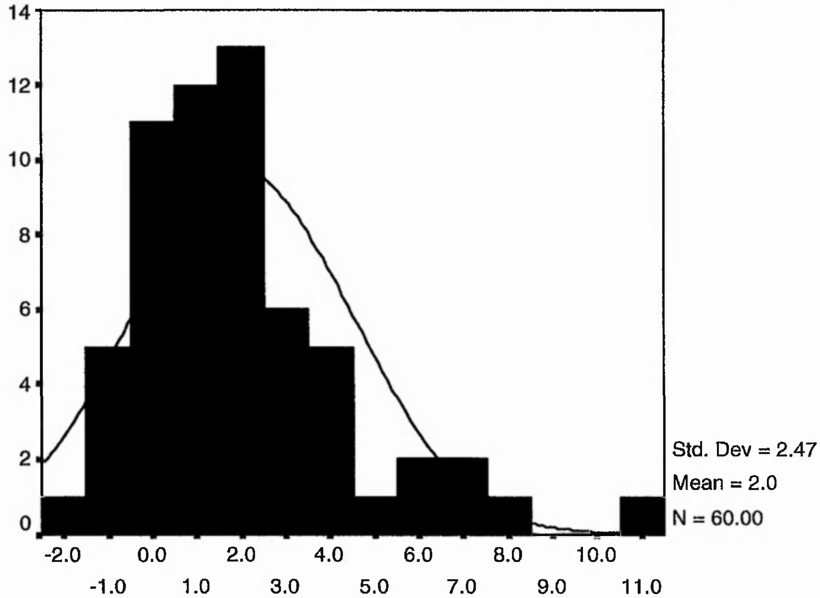
Naming the factors is not important in its self; however, an attempt is made here. The first factor could be named *'Macroeconomic stabilisation'*, positively linked with interest rates, inflation and international stocks, and negatively linked with the domestic stock market, mutual funds, the euro exchange and international bonds. The second factor could be named *'International portfolio diversification'*, positively linked with international bonds, negatively linked with international stocks. The second factor is mainly based on international stocks and bonds, reinforcing the negative correlation already seen in Table 6.11. Since 2000, the world stock markets have been on decline, and investors have sought refuge in bonds.

Macroeconomic stabilisation has acted as follows. As inflation was brought under control, interest rates also came down[14], rendering investment instruments like Treasury bills and bank deposits less attractive. More and more investors started looking to switch to other types of investments, both domestic and foreign. Given fact that the Romanian stock market appeared to be out-of sync with the rest of the world, a boost was given to the domestic stock market and investment funds. In the HR computation it was assumed that some investment abroad was permitted (namely in bonds) which, given the negative correlation between international stocks and international bonds, has proven propitious for the HR. In any case, increased demand for foreign investment instruments has pushed up the exchange rates. However, in reality, the limits imposed by government on foreign investment stepped in, and investment in foreign currency itself picked up, tilting the exchange rate even further. The exchange rate has the highest loading within the structure of the first factor.

Analysing the evolution of the euro exchange rate gives interesting conclusions. Even at the beginning of the analysis, the peculiarity of the exchange rate was evident. In Table 6.11, the euro exchange rate appears negatively correlated with the monthly inflation rate (-0.675), which, at first appears odd. As the economy stabilises and inflation is brought under control, the domestic currency should at least hold its ground, especially when considering that interest rates, though they are decreasing, are still at high levels. However, the lack of investment alternatives has pushed investors towards investments aboard and placements in foreign currency.

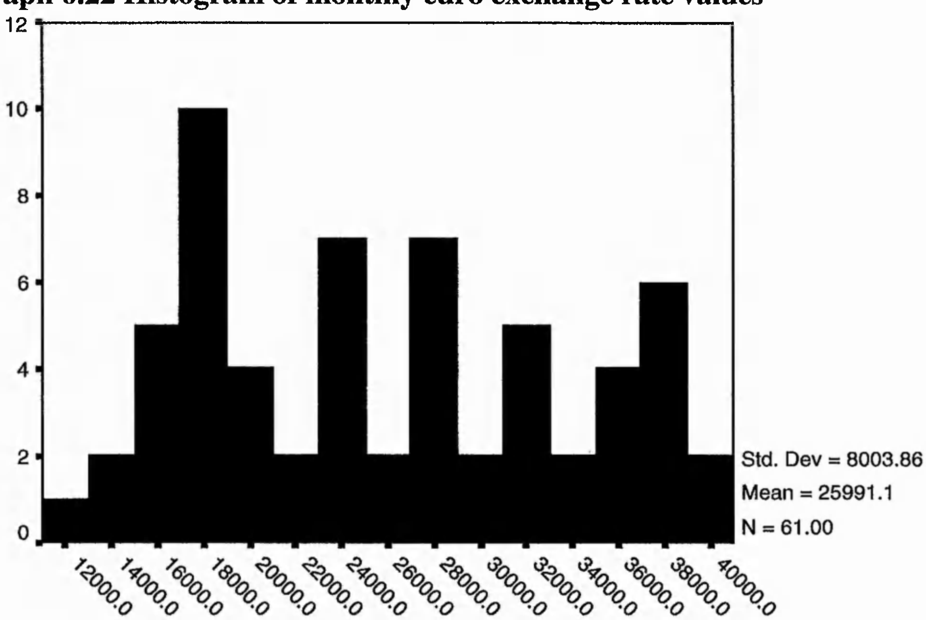
[14] A study by IMF (2004) confirms that interest rates have had a very small contribution to disinflation for the period considered.

Graph 6.21 Histogram of monthly percent changes in euro exchange rate

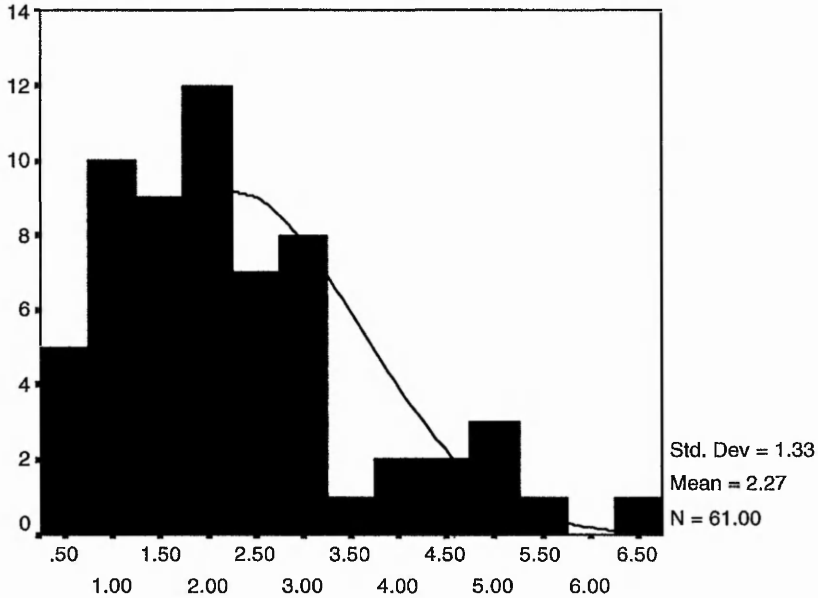


Further, the distribution of monthly changes in the euro exchange rate (Graph 6.21), looks acceptable – the distribution is normal (Kolmogorov-Smirnov tested), with a positive skew. However, plotting the evolution of the nominal rates presents a different picture (Graph 6.22). The rate appears manipulated, with efforts made regularly to keep it between certain intervals and then releasing it under pressure. Indeed, in reality, the National Bank of Romania has funnelled the exchange rate in line with the disinflation target (IMF, 2004).

Graph 6.22 Histogram of monthly euro exchange rate values



Graph 6.23 Histogram of monthly inflation rate



Returning to the HR, its good performance was the result of the stabilisation efforts of the government together with the limitations on foreign investment. The fact that Romanian stock markets have been isolated from the rest of the world has worked to the HR's advantage. It was propitious that the investment in foreign bonds was allowed[15] at a time when world stock markets were declining, however, had the world economic situation been reversed, the restriction of access to foreign stocks would have translated in loss of opportunity for possibly higher returns (given the negative correlation between international stocks and bonds).

6.5. Testing the Choice for a Multipillar System in Romania

As discussed in the previous chapters, the reason the multi-pillar system has proven to be popular resides in the idea that it helps diversify risk. The mix of unfunded and fully-funded pensions creates a sort of pension system portfolio. A balanced portfolio should be based on assets with returns that are, ideally, negatively correlated.

The assets in this case are an unfunded pillar with a rate of return based on wage growth and a funded pillar whose rates of return have just been calculated. The performance (albeit hypothetical) of the pension funds is shown in Graph 6.18 and the evolution of the national average gross wage, can be found in Appendix B, Table B6.

[15] Bearing in mind that the HR was artificially created using regulations non-existent throughout the time period involved. Private pension fund investment in foreign bonds is only now regulated – the returns made from investment in foreign bonds have not exited in reality. However, for the hypothetical rate of return of private pension funds created previously, the investment in bonds have been 'real'.

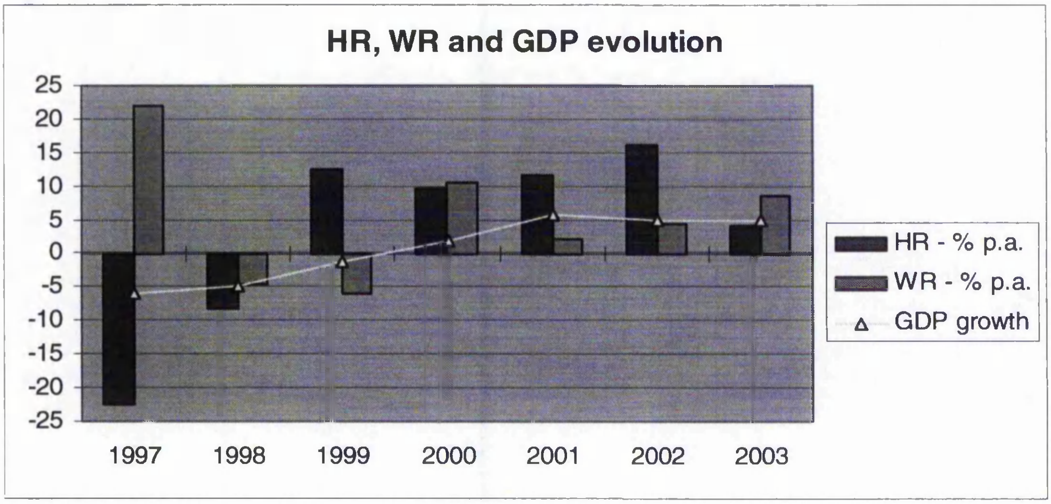
Table 6.8 shows the combined evolutions of the hypothetical rate of return for the pension funds (HR), the real wages growth rate (WR) and the GDP growth rate.

Table 6.8 Evolution of HR, wages and GDP

	1997*	1998	1999	2000	2001	2002	2003
HR - % p.a.	-22.6	-8.2	12.5	9.7	11.6	16.2	4.0
WR† - % p.a.	22.0	-4.7	-6.0	10.4	2.2	4.4	8.5
GDP growth	-6.1	-4.8	-1.2	1.8	5.7	4.9	4.9

† Real Gross (average) Wage growth rate - as annual percentage rate based on the monthly change rate
* The period from September to December, except for the GDP growth rate which is for the entire year.

Graph 6.19



Disney (1999) argues that the returns of the two pillars are more likely to be positively correlated as both profits and productivity growth are pro-cyclical and labour force growth affects the marginal product of capital (rate of return of investments). However, he points out that empirically there is little evidence of covariance between equity returns and productivity growth. Thompson (1998) finds non-significant correlation coefficients for many OECD countries. For Romania, the data in Table 6.8 is used to produce the following statistics results:

Table 6.9 Pearson's correlation coefficients

	HR	WR	GDP
HR	1.000		
WR	-0.530*	1.000	
GDP	0.806**	-0.134	1.000
** P<0.05; * P>0.1; df=5			

The basic assumption of the multi-pillar approach is thus confirmed – the public pillar based on wage growth and the private fully funded pillar based on capital accrual complement each other. The correlation coefficient is slightly low[16] but the negative correlation cannot be deemed as irrelevant. The value of covariance coefficient is a pretty large –60.78.

Table 6.10 Average annual rates

	1997-99	2000-03
HR	-6.11	10.36
WR	3.75	6.36
GDP	-4.03	4.33

The private pension funds pillar, operating at the above-determined HR performs better than the public pillar in periods of growth, while the reverse is true in recessions (strong positive correlation between HR and GDP growth). In other words, in periods of growth the fully-funded private pillar can increase the value of the pensions, while in periods of recession the gross-wage–based public pillar can at least conserve the value of pensions (no significant correlation between WR and GDP).

Projections for economic growth are favourable, with average yearly growth rates above 5 percent for the next 20 years (United Nations, 2002). It is also foreseeable that the efforts towards inflation control will continue in the future. However, the process of European integration will result in less isolation from the world economic trends. Even at present, Romania's foreign trade relies on EU, with the EU accounting for 70 percent of exports and 55 percent of imports (N.I.S. 2004), making the EU economic trends highly relevant for long run economic development in Romania. Improved access to international capital markets will become crucial for keeping the HR at the high rates registered for the last years.

6.6. Conclusions

As the discussion of the second chapter has highlighted, the general expectation is that systemic pension reform could be facilitated by the existence of a well-performing financial infrastructure. Romania may be following the same pension-reforming path that other CEECs have taken but a comparative review of its financial sector singles it out in a negative light. The poor performance of the Romanian financial sector can be blamed on many events, in particular the Mass Privatisation Programme and political

[16] Critical value is 0.669 at 0.1 alpha level. If data is computed on a four-months basis then, Pearson's r for WR and HR is –0.333 with the critical value being 0.389 at 0.1 alpha level (Appendix B, Table B7), while the covariance drops to –25.24, still a high value.

change. It is disconcerting that the poor sector performance was accompanied by increased employment in the sector. Future performance improvements might lead to job losses (as it is uncertain whether productivity growth in financial services can generate compensating increases in demand for the services). However, it might also be speculated that employment in the sector will not be affected, since the privatisation of state-owned banks and the expansion of foreign financial instructions in Romania will require labour.

The sectors' reliance of banking is evident, fact that could prove detrimental. If the government is to pursue the multipillar strategy and implement private pension pillars featuring the envisioned portfolio limitations (presented in the previous chapter), it needs to devote more resources into developing the stock market and the insurance sector. Alternatively, it could relax its regulations and facilitate access to international capital markets.

Nevertheless, the conclusion of the analysis performed in this chapter is that there is scope in pursuing a multipillar strategy. There is sufficient grounding for supporting the introduction of a private pensions pillar. Even with the portfolio limitations legislated, the rates of return generated for the hypothetical private pension funds pillar have proven to be suitably correlated with the wage-based existing PAYG. The weaknesses of the Romanian financial sector might also prove to be its future opportunities, having the potential to increase the rates of return in the private pillar. The next chapter will turn the focus of analysis on the first pillar, evaluating the reforms performed so far in the light of a theoretical alternative.

CHAPTER 7.

THE ROMANIAN PUBLIC PENSION PILLAR - A CASE FOR NDC

7.1. Introduction

Most of the changes implemented in the first pillar have been typical of the parametric reforms implemented by most PAYG schemes in response to the labour market demographic trends – adjustments in retirement ages, replacement and contribution rates etc. In particular, the adoption of a new point-based formula for pension benefits has powerful implications. In essence, the reform implemented tries to increase incomes, reduce expenditures, and promote a stronger benefit-contribution link and greater equity in benefits. The present chapter is aimed at evaluating the merits of the PAYG reform actually implemented against those of its nearest alternative – the NDC-PAYG scheme.

7.2. Discussion of the Reform Implemented Compared to the Notional Defined Contribution scheme (R-PAYG v. NDC)

As described previously, the reformed PAYG (R-PAYG) has a new pension formula, based on points, similar to the German system. The pension system implies a relatively strong link between contributions and benefits. Individuals' contributions confer them pension rights (points) that are evaluated in relation to national average earnings (see Equation 5.1, Chapter 5).

The NDC system functions in a way completely dissimilar to the point system (see Equation 2.1, Chapter 2) – pension benefits are exclusively dependent on the sum of contributions whereas, under the R-PAYG the pension value accumulated depends on the arbitrary value of a pension point, which is set annually to reflect fiscal considerations. However, as already mentioned in Chapter 2, the key parameters in the NDC formula are political decisions, being determined by the government.

Under a R-PAYG, contributions remain seen as a tax and not as an insurance premium. Evidence about the effects of taxes on labour remains inconclusive – on one hand taxes reduce income, meaning more work is needed to preserve a given level of consumption, whilst, on the other hand, taxes impose a penalty on work, reducing the marginal value of labour. This also means that workers will make an effort to keep their earnings outside the formal economy. They will try to evade the contributions just like they do the regular taxes. As mentioned in Chapter 5, the Romanian pension system still suffers from cash flow problems due to the large amount of arrears, usually accumulated in the accounts of state enterprises and institutions.

The big issue is that the R-PAYG arrangement gives the government flexibility in meeting its pension obligations – deficits can be erased by increasing contributions or diminishing benefits, so that, potentially the pension system can always be in balance. However, this flexibility could mean unfairness to the individuals. The new R-PAYG uses the pension points as proxies that eliminate the need for the periodic (monthly/yearly etc.) indexation of contributions (the case of the notional rate of return in the NDC). The points awarded each month represent the ratio between the individuals' earnings and the national gross average wage, regardless of these variables' evolution. The value of the pension point is set each year so as to keep the social insurance budget balanced.

Additionally, there are other positive changes in the R-PAYG: the pension points remove the inequalities in pension benefits that could arise between individuals with similar earnings, working conditions and full contribution periods but retiring in different years - as mentioned previously, the correlation of pensions has long been a problem in the Romanian system. With a points formula, the two individuals would receive the same pension, having acquired the same number of points (and the same value of a point being attributed each year).

This equitable correlation would not happen automatically in NDC (see Chapter 2). Further, the simulations run in the present section will confirm that a continuously balanced NDC account is impossible; however, as mentioned in Chapter 2, a small indexation change is all that is needed to balance the budget over a chosen period (see the case of the Romanian simulation).

Nevertheless, even though the short-run fiscal sustainability of the R-PAYG pension system is potentially achieved, the long-run overall sustainability is still in question because demographic change is ignored. The R-PAYG promotes equality of pensions, but this may not be fair to different generations of pensioners. As the simulations in the following section will show, when, for demographic reasons, the labour force contracts, the R-PAYG pensions decrease. So, individuals who have contributed all their lives substantial portions of high wages end up receiving severely reduced pensions. Vice-versa, in the case of labour force growth, the less numerous older generations, despite having contributed all their lives less on lower wages, end up receiving higher pensions. Similarly, in time, if the earnings ceiling for points is raised or mandatory membership is extended the generations already participating are disadvantaged.

The big absentee in the R-PAYG formula is life expectancy, which leads to significant redistribution, like in the traditional PAYG. The R-PAYG allows differences in wages to be reflected in different pension points totals accumulated. High earning workers (currently capped at up to 3 times the national average wage) will receive more pension points, so wealthier individuals, who tend to live longer, will receive higher benefits for longer periods. Thus, groups with longer life expectancy are effectively subsidized by those with shorter life spans. The new regulations differentiate between workers based on working conditions. While this classification has value from the perspective of the (unmentioned) lifespan expectations that subsequently affect the contribution period, the pension amounts and levels of indexation (as compensation), there is no reference to gender, income and education as predictors for life expectancy. Significant redistribution takes place in the system in terms of gender; however, considering the labour market inequality, this is not undesirable.[1] The NDC formula tries not to allow these problems to happen, paying each individual his due and making efforts to maintain the replacement rate (pension to wage ratio). As mentioned previously, in an NDC system, life expectancy is a major factor in deciding the level of benefits.

Another issue is the fact that, under R-PAYG, pension benefits and pension points are indexed to prices and not wages, making them sensitive to changes in economic growth. If productivity growth is low (or negative), the total wage sum from which pension benefits are paid decreases, a higher contribution rate being needed to pay the pension obligations. Under a NDC, the contributions would earn a wage-related notional rate of return while pension benefits would be indexed based on wage growth, so benefits and contributions develop similarly.

The R-PAYG points formula goes a long way towards establishing a link between benefits and contributions. There is a proportional relationship between the

[1] It should be noted that women participate in employment at a fair level; still, they receive lower benefits as the result of the fact that the earnings of women, on average, are lower than those of men For example, in Romania, in 1999, women participation in employment was 48 percent, while the gross average wage earned by men was 20 per cent higher than that earned by women (N.I.S., 2001). However, women assert numerous positive transfers (transfer payments unlinked to any previous contributions such as maternity assistance and, to some degree, paid leave for child care/rearing) and their lower earnings also mean lower taxes paid.

monthly pension and the lifetime contributions, but there is a ceiling on the earnings from which the contributions are made. Because the ceiling is indexed to prices, as real wages grow successively larger portions of population will earn wages above the ceiling.

As individuals become more affluent their preferences may lean more towards leisure and early exit should not be prevented. One advantage of the NDC is that workers can retire and start drawing a pension while also continuing work, with the new contributions going towards increased recalculated benefits. Similarly, the R-PAYG also creates the possibility of retiring and drawing a pension, earning additional pension points. However, there are serious limits – full length of service and retirement age limit that prevent early retirement. It is understandable that budgetary considerations have pushed for regulations locking-in the contributions but this makes the R-PAYG system unfair.[2]

In a NDC, one would always know that balance on their individual account and be able to make decisions regarding work. The points formula makes things more confusing because of the changing value of a pension point. If the benefits deriving from additional work are less than the benefits already acquired, workers are likely to choose taking the benefits they already have instead of working to get more.

In summary, the new reformed PAYG has many positive features, but it is specifically designed to give freedom (financial and political) to the government. Flexibility in the hands of government could mean unfairness in individual entitlements. Replacing the R-PAYG with a NDC system would further the reforms implemented so far in the public pillar and would be actuarially fair - from the standpoint of inter- and intra- generational redistribution. The NDC is transparent and flexible, with increased individual responsibility and government accountability.

7.3. OLG Model Simulations of NDC and R-PAYG Pensions in a Stylised Economy

This section adapts the model of intergenerational risk-sharing used by Kruse (2002) to compare the outcomes from reforming the Romanian public pension pillar in two different ways. Several scenarios within a stylised economy present the effects and evolution of pension rights when reforming the Pay-As-You-Go (PAYG) either by

[2] As mentioned in chapter 2, 'locking-in' is possible under NDC as well.

implementing a Notional Defined Contribution (NDC) system or by adopting a pension points system (R-PAYG).

The over-lapping generations (OLG) model involves four generations (cohorts): three actively working - WY (young workers), WM (mature workers) and WO (elder workers), and one generation of pensioners – R. It is assumed that each cohort is the same size - 4.5 million (i.e. migration and mortality in the working cohorts are ignored). Each period is 15 years long, the active life lasting 45 years (20 to 64) and retirement lasting 15 years (65-80). Thus, in steady state, the dependency rate is 0.33.

All cohorts are earning the same wage - w, which, for convenience, takes the value of €1 in steady state. The wage growth rate formula is based on a variant of the Aaron-Samuelson condition and is considered to be:

$$g = (1 + z)(1 + \lambda) \tag{7.3}$$

where z is change in productivity and λ is change in labour force.

Reforming the PAYG system into either of the two schemes will keep the PAYG framework and maintain the unfunded feature of the system. Thus, the rate of return for both pension systems will be the same - the sum of labour force growth rate and the productivity growth rate (see Chapter 1 for Aaron-Samuelson criteria). The main assumption is that productivity growth exists even in the absence of population growth, depending on the level of investment in the physical and human capital. So, in the case of the pension-point PAYG (R-PAYG), the rate g is considered to be the implicit rate of return, while, in the case of the NDC, the notional account balances are explicitly indexed by g.

Also, in the NDC, given the fact that the life expectancy of R cohort is 1 period, the annuity divisor (the factor by which the account balance is transformed into pensions, which is based on life expectancy) is considered to be 1. The contribution rate is considered to be 30 percent. Given the fact that the pension point reflects the ratio between individual earnings and the average wage, and because all the workers earn the same wage, the pensioners in the R-PAYG simulation will always have 1 point. Continuing work after retirement would only bring in additional pension rights if their earnings were higher than the average wage, which is not the case here. However, their pensions will be higher because of their supplementary contributions in the system. The steady state is shown in Table 7.2.

Table 7.2. Period 0 - Steady state

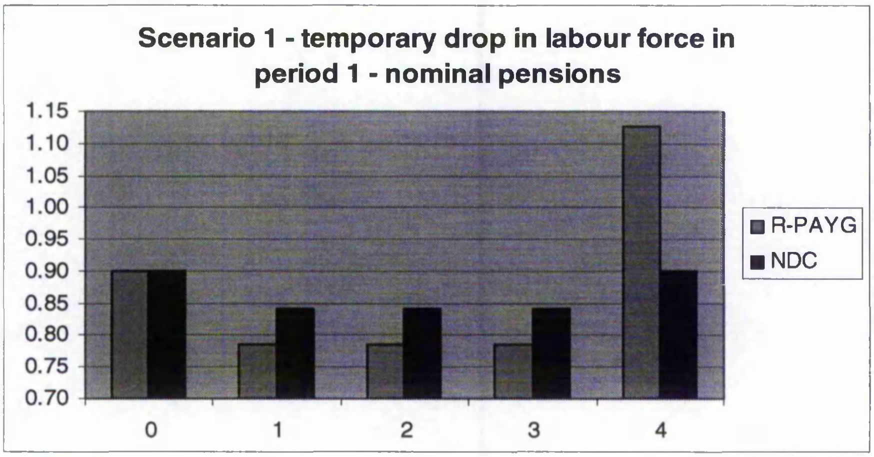
	WY	WM	WO	R	Total
W, R (million)	4.50	4.50	4.50	4.50	
Wage, *w* (€)	1.00	1.00	1.00		
Cohort income (million €)	4.50	4.50	4.50		13.50
Contributions (30%) (mil €)	1.35	1.35	1.35		4.05
R-PAYG points (million)				4.50	
Value of pension point (€)				**0.90**	
R-PAYG replacement rate				**0.90**	
NDC funds accumulated (mil €)	1.35	2.70	4.05	4.05	12.15
Value of NDC pension (€)				**0.90**	
NDC replacement rate				**0.90**	

As Table 7.2 shows, in the steady state, both variants of the PAYG give the same results, with a replacement rate of pension per capita of 0.9. For the R-PAYG, the value of the pension benefit is the value of a pension point, calculated by dividing total contributions (€4.05 million) by total number of pension points (4.5 million). For the NDC, the value of the pension is calculated by dividing the NDC funds accumulated by the retiring cohort (€4.05 million accumulated previously – in steady state there is no wage growth so the €1.35 million in each period's contributions are simply added together) by the size of the cohort (4.5 million).

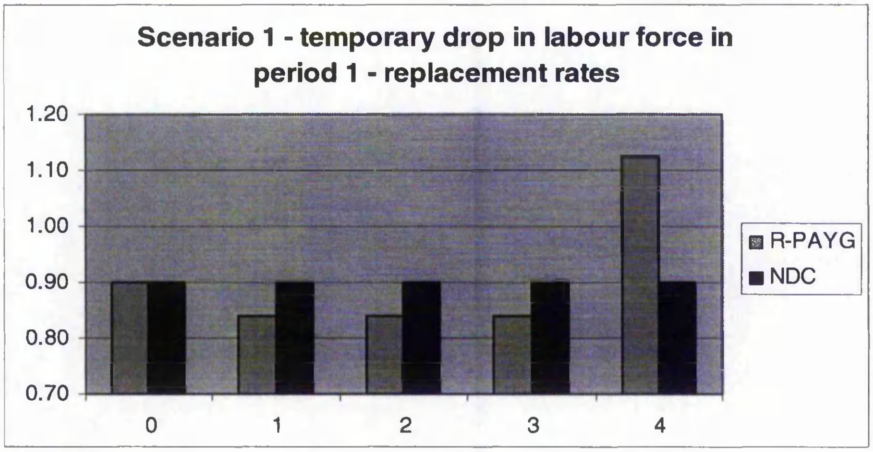
7.3.1. Scenario 1

Introducing a temporary drop in the size of the new cohort entering the system – for example, caused by many couples deferring to have children for one period. The new WY cohort is 20 percent lower than the normal cohort in steady state. Afterwards, the cohorts are back to their steady state level – the couples have as just many children as before only the period in life to have them is pushed back.

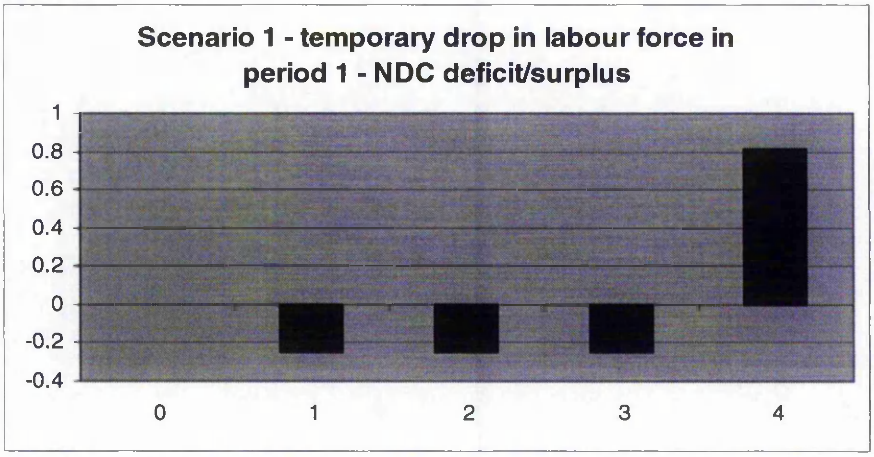
Graph 7.1a



Graph 7.1b



Graph 7.1c



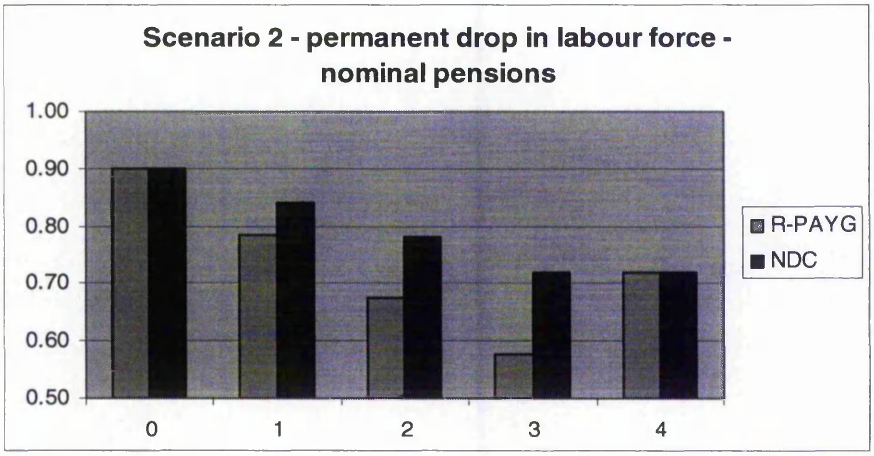
Source: Appendix C, Scenario 1

The temporary drop in labour force generates a fall in wages, which decreases the total amount contributions. The R-PAYG pensions decrease as the lower total contributions are divided among the pensioner cohort (which is the same size as in the steady state). The NDC pensions are based on past contributions and are less affected by this. However, they decrease as well, as the account balances are indexed to the (now lower) wages. As it can be seen, the NDC nominal pension distribution is smoother than the R-PAYG pension. In the R-PAYG, the smaller cohort has much higher benefits at retirement than the steady state and the previous retired cohorts (Graphs 7.1a and 7.1b). The NDC does not allow this to happen. The NDC will try to pay each cohort its due, and for the first three periods, this means deficits. However, the retirement of the smaller cohort in the fourth period generates growth (being replaced by a 'normal-sized' cohort), and, so, enough surplus is created to offset the previous deficits (Graph 7.1c).

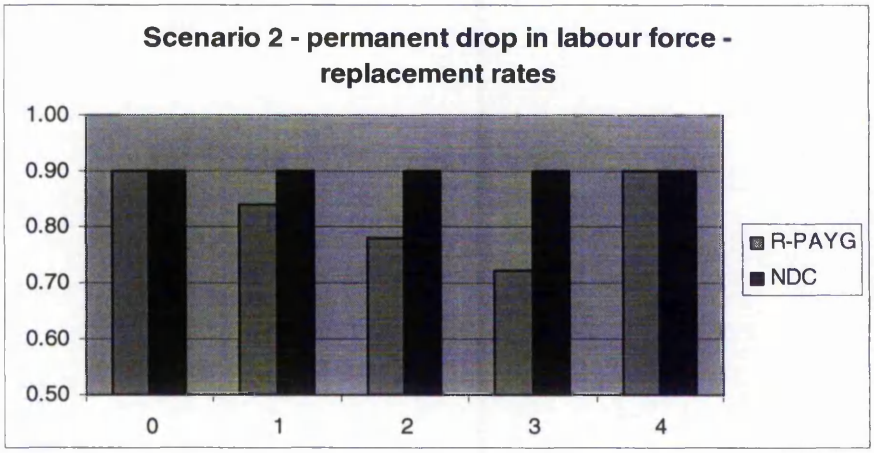
7.3.2. Scenario 2

Introducing a permanent drop in the size of the cohorts entering systems, all the new WY cohorts are 20 percent lower than in steady state.

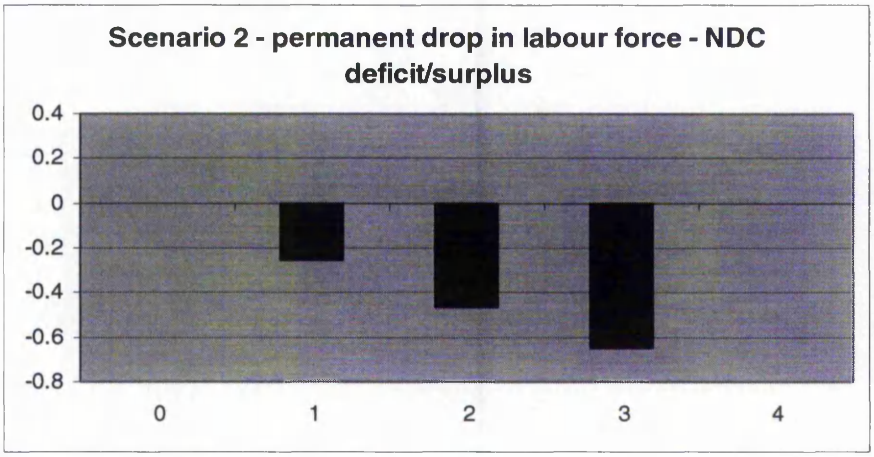
Graph 7.2a



Graph 7.2b



Graph 7.2c



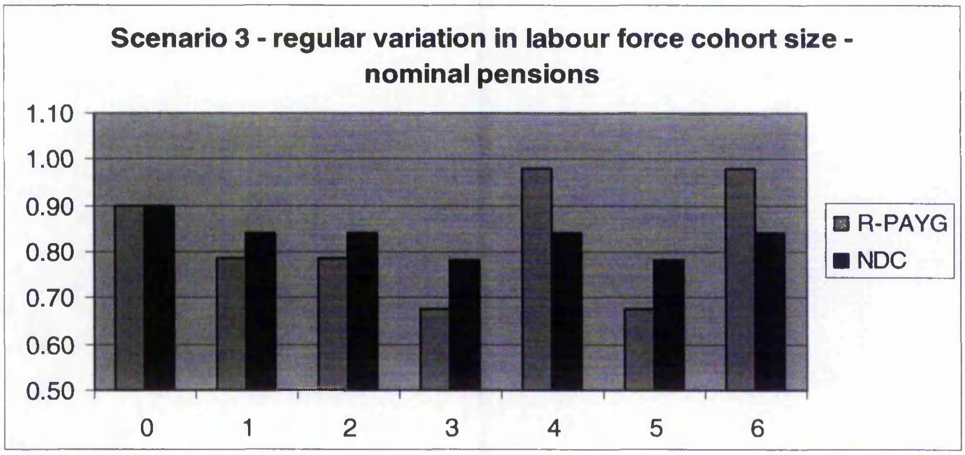
Source: Appendix C, Scenario 2

For three periods, the decreasing labour force causes wages to decline, with strong effects on the R-PAYG pensions (Graphs 7.2a and 7.2b). The NDC tries to preserve the pension value for the older cohorts as they retire, as always, maintaining the replacement rate – pensions in all periods are worth 90 percent of the wages. The value of the deficits is sizeable – a larger number of people obtain bigger pension rights by contributing in periods with higher wages (Graph 7.2c). The largest deficit is incurred in the third period, when the last 'normal-sized' cohort retires. Preserving those rights causes deficits that are not offset once the new steady state is reached.

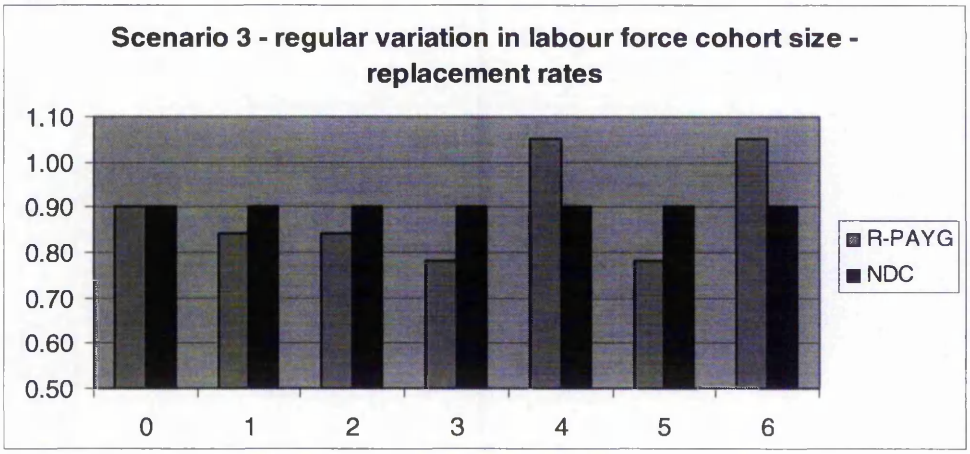
7.3.3. Scenario 3

The cohorts entering the systems are different sizes – in the first period, the WY cohort is 20 percent lower than in the steady state, in the second period, is back to steady state level, in the third period is 20 percent lower and so on.

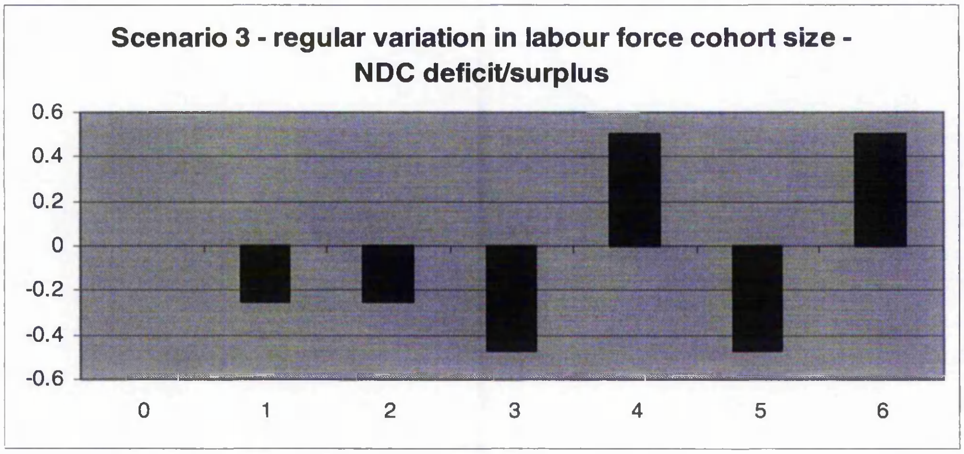
Graph 7.3a



Graph 7.3b



Graph 7.3c



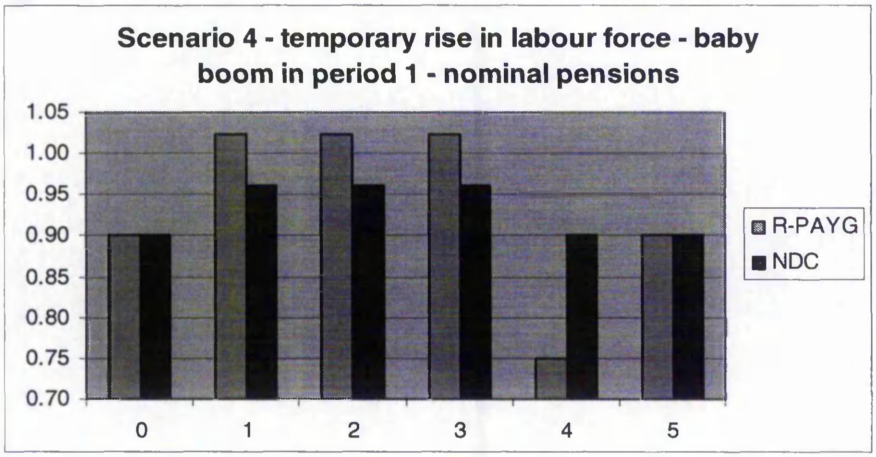
Source: Appendix C, Scenario 3

This scenario is similar to the previous two: for the first three periods, the decreasing labour force pushes wages down and the value of both types of pensions. The big difference is after the fourth period, when the labour force reaches a 'stable variation' from period to period – two 'normal-sized' cohorts and one small cohort followed by two small cohorts and one 'normal-sized' cohort. The R-PAYG pension reflects the demographic changes – the pension value (nominal and relative to wages) alternatively overshoots and undershoots the value of the steady state pension (Graphs 7.3a and 7.3b). The labour force changes are seen in the NDC pension as well – in either period, the labour force is smaller than in the steady state so the NDC pension is always lower than in the steady state. Like the R-PAYG pension, the NDC pension fluctuates as well but to a smaller degree – the differences between different pensioner cohorts are not as great as in the case of the R-PAYG (Graph 7.3a). Again, maintaining the replacement rate generates deficits in the NDC. However, after the fourth period, the deficits and surpluses alternate and cancel each other out (Graph 7.3c). Overall, the NDC offers more stable and equitable pensions.

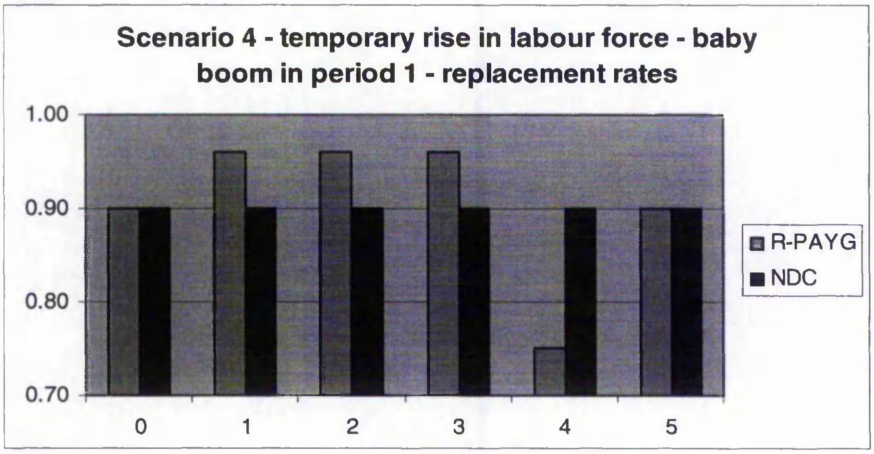
7.3.4. Scenario 4

Introducing a temporary increase in the first cohort entering the systems – a baby boom generation, the new WY cohort is 20 percent larger than in steady state.

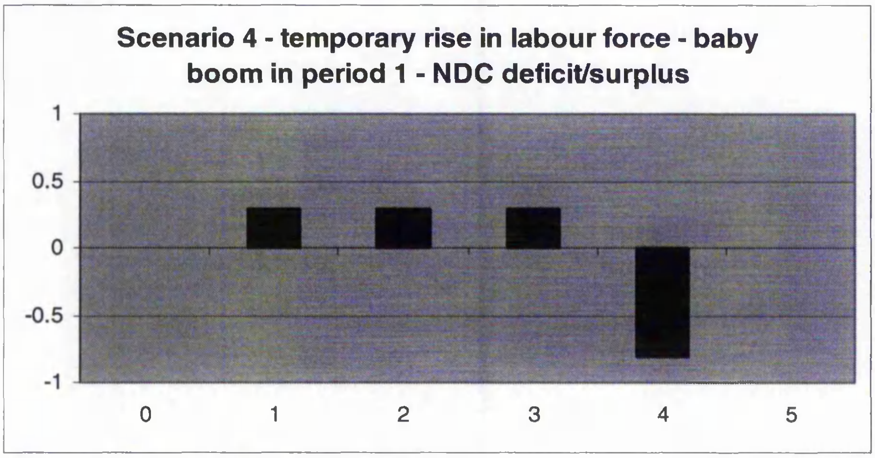
Graph 7.4a



Graph 7.4b



Graph 7.4c



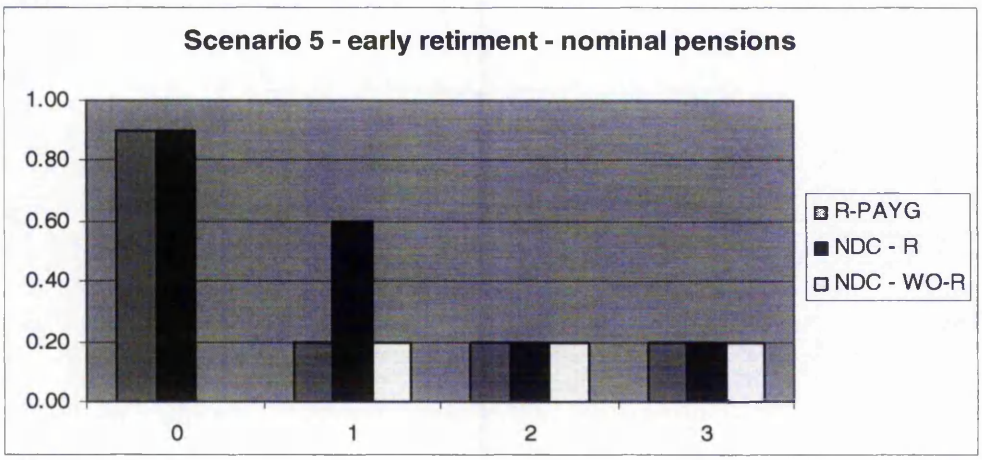
Source: Appendix C, Scenario 4

This is the reverse situation than in the first scenario. An increased labour force generates wage growth. For the first three periods, the 'normal-sized' cohorts profit by retiring on higher pensions – due to the higher volume of contributions, in the case of the R-PAYG, and due to the accumulation based on higher wages, in the case of the NDC (Graphs 7.4a and 7.4b). Once again, the fourth period is the crucial one – the retirement of the baby boom cohort. The drop in labour force is entirely reflected by the R-PAYG pension but not by the NDC pension. The NDC pays exactly the same pension as the steady state (Graphs 7.4a and 7.4b). This is because, under NDC, the baby boom cohort has accumulated contributions from a larger wage, but, upon retirement, the drop in wages is also reflected on the accumulated balance. In terms of the aggregated NDC pensions, the retirement of the baby boom causes a deficit, however, this deficit is easily offset by the surpluses generated previously when the baby boom cohort was in the labour force (Graph 7.3c).

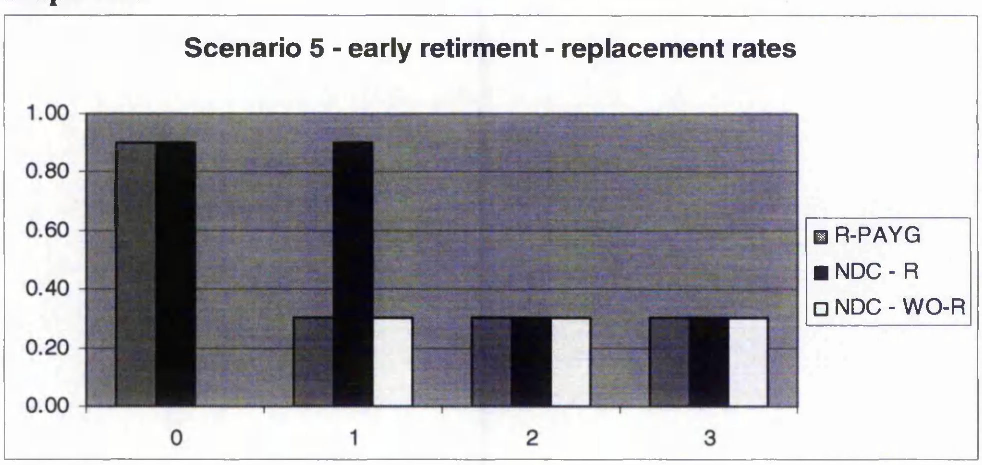
7.3.5. Scenario 5

Simulating early retirement – retirement age limit becomes 50 years and the entire WO cohort decides to retire.

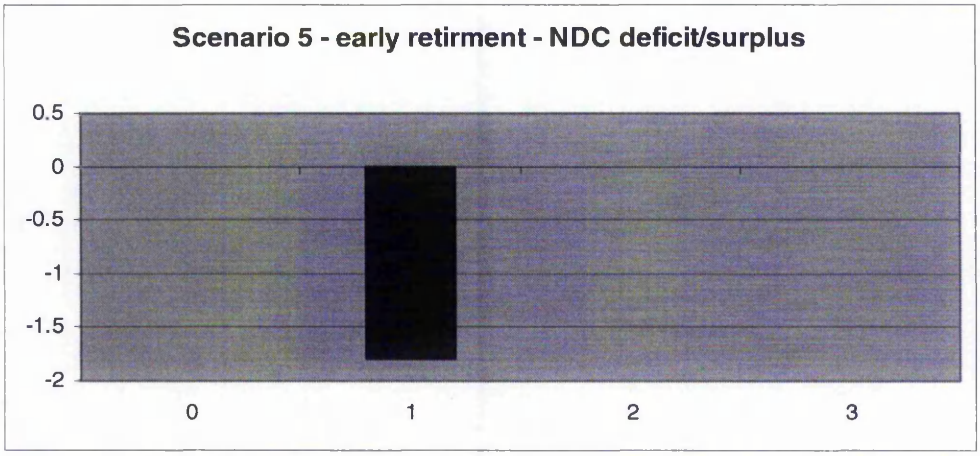
Graph 7.5a



Graph 7.5b



Graph 7.5c



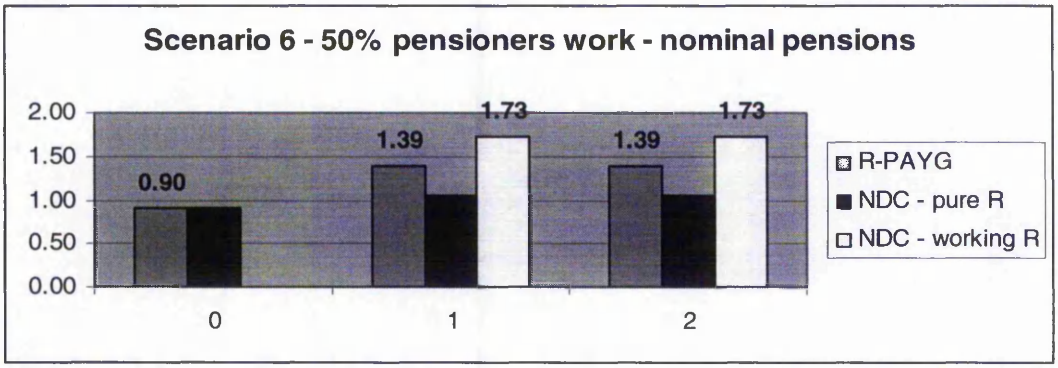
Source: Appendix C, Scenario 5

As stated in the beginning, for cohort R, the NDC annuity factor is 1. However, cohort WO has a life expectancy of two periods - retiring early means the factor becomes 2. There are no surprises in this scenario: the early retirement of an entire cohort immediately reduces the labour force – total contributions in the R-PAYG decline dramatically, wages decrease and accumulation in the NDC suffers. Under R-PAYG, the early retirees are entitled to the same pensions benefits as the 'rightful' pensioners (the cohort due for retirement under the old retirement age limit), so both cohorts receive the same low pensions (Graphs 7.5a and 7.5b). The NDC formula would work in favour of the old pensioners by taking into account the contributions they have made for three periods (not just two like the early retirees). The NDC pensions based on past contributions are only affected because the account balances are indexed in line with wages (which fall). The compensation creates the deficit in NDC.

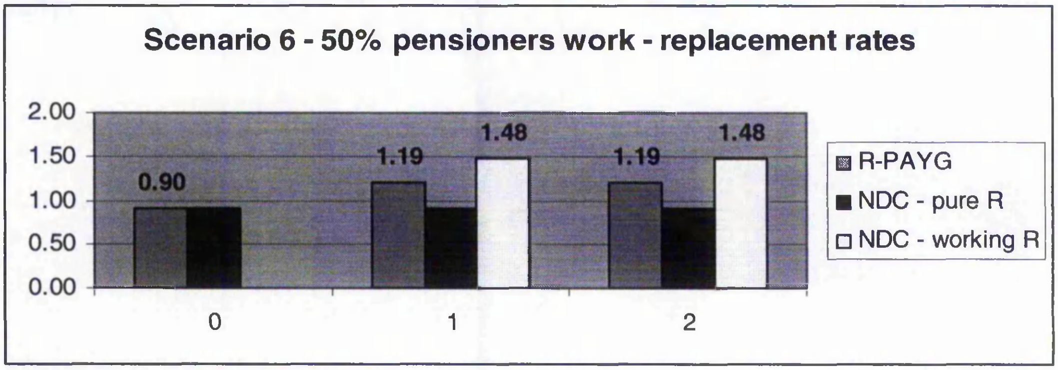
7.3.6. Scenario 6

Simulating the effects of 50 percent of pensioners continuing work.

Graph 7.6a



Graph 7.6b



Source: Appendix C, Scenario 6

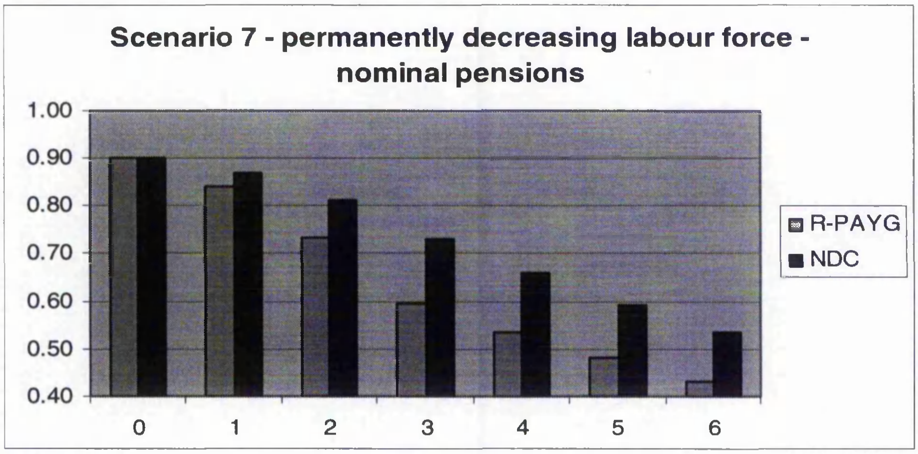
Under the R-PAYG, because the working pensioners are earning average wage, no additional points are created in the system. Each pensioner still has only one pension point, which, because of their additional contributions into the system is worth more. The pensioners who do not work are free riders – their pensions increase because of the contributions of the pensioners who continue work.

In this scenario, the NDC budget is always balanced. As opposed to the R-PAYG, in the NDC there is no redistribution from pensioners who decide to continue work to the 'pure' pensioners. Pure pensioners continue receiving a pension representing a replacement rate of 0.9, while the working pensioners receive a pension representing replacement rate of 1.48. There is a greater individualisation of pension rights.

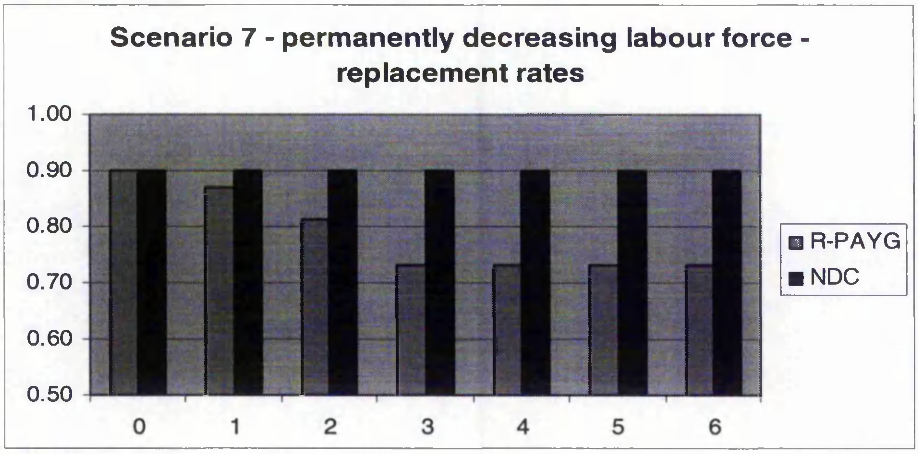
7.3.7. Scenario 7

Simulating the effect of having permanently smaller cohorts entering systems - the new WY cohort is always 10 percent lower than previous one.

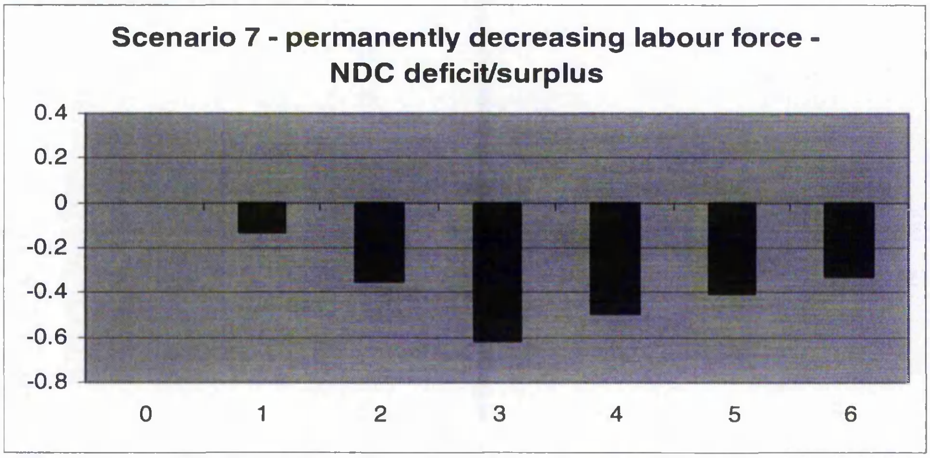
Graph 7.7a



Graph 7.7b



Graph 7.7c



Source: Appendix C, Scenario 7

Under the main simulation assumptions, the permanently decreasing labour force means permanently decreasing wages. Nominal pensions are always falling under both formulas (Graph 7.7a). It is interesting to see how, under R-PAYG, after the third period, the replacement rate stabilises. From that period on, although the new cohorts are always 10 percent lower than their precedents, the dependency rate stays constant (Graph 7.7b). As usual, the NDC formula will maintain the original replacement rate, take into account past contributions made from higher wages and pay higher pensions than the R-PAYG at the cost of incurring (this time) serious deficits. The worst deficit occurs in the third period – the retirement of the last 'normal-sized' cohort, who have acquired pension rights in periods with higher wages than the wage at their retirement. Thereafter, the deficits decrease from period to period, as the account balances are based on ever-lower wages (contributions), but will always be present.

7.4. OLG Model Simulations for Romania

This section combines the previous scenarios into one simulation based on real Romanian labour force data. The OLG model involves 12 cohorts grouped into four generations: three actively working - WY (young workers), WM (mature workers) and WO (elder workers), and one generation of pensioners – R. As before, the active life is considered to last 45 years (20 to 64 years) with retirement of 15 years (65 to 80 years). The initial size of each cohort is calculated by multiplying the population of an age group with the participation rate (Table 7.3). This applies to retirees as well – in 2000, 35.7 percent of pensioners were still working.

The simulations run for a total of 90 years – 18 periods, with each period being 5 years long. It is assumed that cohorts advance as periods succeed, the size changing only due to mortality – after one period, WM3 becomes WO1, after deducting the 5.1‰ mortality rate. For the simulation of the first four periods, the size of the cohort aged 20-24 (i.e. WY1) is based on progressing the young cohorts from Table 7.3. From period five, after year 2025, the size of the WY1 cohort is based on data from demographic projections (World Bank, 2004).

Table 7.3. Romanian population, mortality rate and participation in labour force by age group (2000)

Age Group (years)	Population	OLG Code	Mortality rate (per thousand)	Participation rate (percent)
0-4	1,144,825	**I1**	4.5	0
5-9	1,218,267	**I2**	0.4	0
10-14	1,734,988	**I3**	0.6	0
15-19	1,661,778	**I4**	0.6	43.1†
20-24	1,855,437	**WY1**	0.7	43.1
25-29	1,806,725	**WY2**	0.9	84.5
30-34	1,837,519	**WY3**	1.4	84.5
35-39	1,285,188	**WM1**	2.4	85.0
40-44	1,594,845	**WM2**	4.0	85.0
45-49	1,592,356	**WM3**	6.1	85.0
50-54	1,322,506	**WO1**	8.6	57.8
55-59	1,060,721	**WO2**	13.1	57.8
60-64	1,234,537	**WO3**	18.8	57.8
65-69	1,095,114	**R1**	27.6	35.7
70-74	891,832	**R2**	43.4	35.7
75-79	598,029	**R3**	106.0	35.7

Source: N.I.S. (2000) † participation rate for I4 cohort is not taken in consideration.

Also, it is assumed that all cohorts are earning the same wage - *w*, with a starting value of €10,366.7 in period 0 – calculated as a simple sum over one period of 5 years, based on the national average monthly gross wage in December 2000 of 3,975,929 ROL at the exchange rate of 23,011 ROL/euro. As previously, the wage growth rate is based solely on changes in productivity and changes in labour force and the contribution rate is considered to be 30 percent. Initially, the simulation is run under the assumption of zero productivity growth.

Within the points-based reformed PAYG, given the fact that the pension point reflects the ratio between individual earnings and the average wage, and because all the workers earn the same wage, the pensioners in the R-PAYG simulation will always have 1 point. Also, the model assumes that there is no fixed replacement rate within the R-PAYG – the value of a pension point is calculated by dividing the sum of contributions to the number of retirees.

In the NDC, given the fact that the life expectancy of retirees is 3 periods (i.e. there are three cohorts of retirees), the annuity divisor is considered to be 3 (the life expectancy-based factor by which the account balance is transformed into pensions).

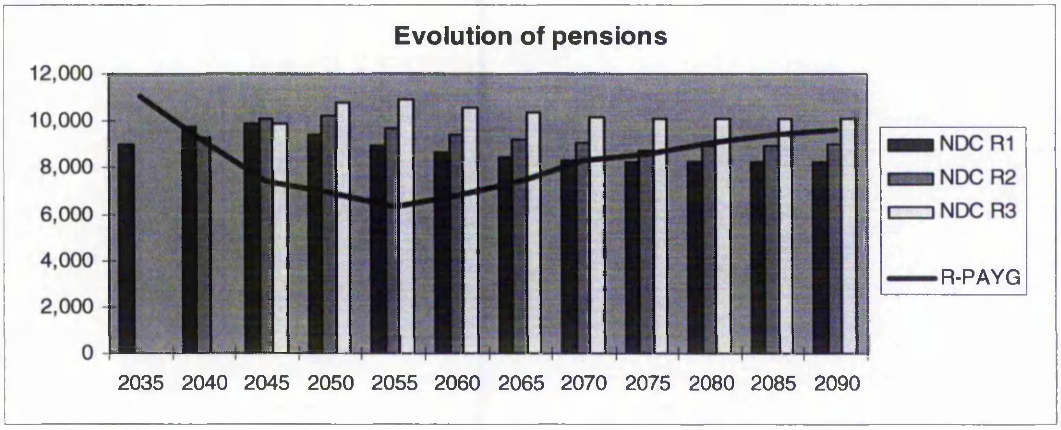
Table 7.4 shows the situation at the beginning of the simulation.

Table 7.4. Period 0 – year 2000, individuals under 35 years start under the new system (wage = €10,366.7, dependency ratio R/W = 26.5%)

	WY1	WY2	WY3	WM1	WM2	WM3	
Cohort - million	0.800	1.527	1.553	1.092	1.356	1.354	
Cohort income (million €)	8290.2	15826.6	16096.4	11324.7	14053.3	14031.3	
Contributions (million €)	2487.1	4748.0	4828.9	3397.4	4216.0	4209.4	
NDC funds accumulated (mil. €)	2487.1	4748.0	4828.9				
	WO1	**WO2**	**WO3**	**R1**	**R2**	**R3**	**Total**
Cohort - million	0.764	0.613	0.714	1.095	0.892	0.598	
Cohort income (million €)	7924.4	6355.8	7397.3	4052.9	3300.6	2213.2	**110866.6**
Contributions (million €)	2377.3	1906.7	2219.2	1215.9	990.2	664.0	**33260.0**
Value of pension point (€)						12866.7	
R-PAYG replacement rate						**1.241**	
R-PAYG surplus if replacement rate 40%							**22540.9**
NDC funds accumulated (mil. €)							**12064.0**

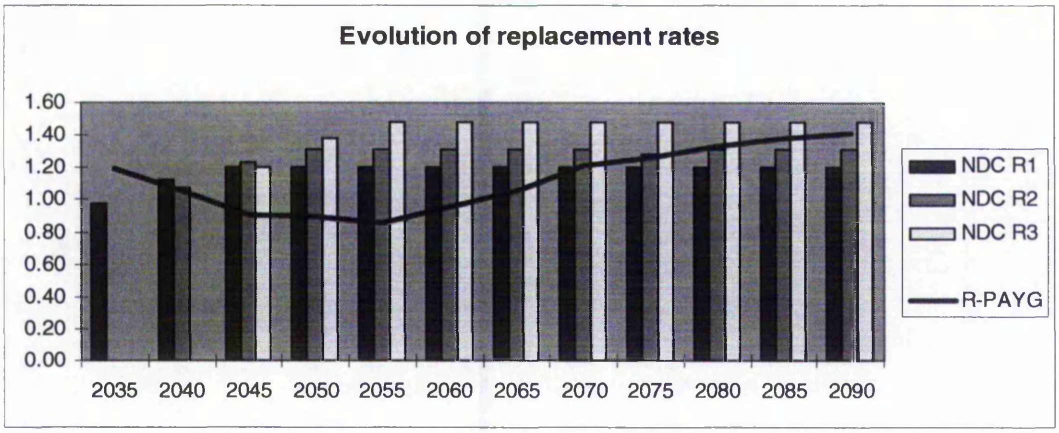
For comparison, in 2000, the total revenue of the state social insurance budget was 51,016,390 million ROL (see Appendices, Table A5); at the above mentioned exchange rate of 23,011 ROL/euro, this amount comes up to €2,217.04 million. As one period in the simulation contains five years, the total revenue for a period would be €11,085.20 million. From Table 7.4, the total amount of contributions needed for a 40 percent replacement rate can be calculated: €10,719.1 million (the difference between the total amount of contributions and the R-PAYG simulation surplus if the replacement rate for pensions were 40 percent). The numbers approximately match. This also shows how big the tax (contribution) evasion problem in Romania (see also Chapter 3). In the real world, contribution rates even higher than in the simulation have only managed to bring a third of the total simulation revenues. Nevertheless, it can be said that, if contribution collection was not a problem, the figures in Table 7.4 are not that far from reality. The simulation does not consider contribution evasion, informal economy and unemployment. However, as discussed previously, the implementation of an NDC pillar would alleviate many problems with contribution collection by making the link between contributions and pensions more evident to both employee and employer.

Graph 7.8a



Source: Appendix C, Table C1

Graph 7.8b

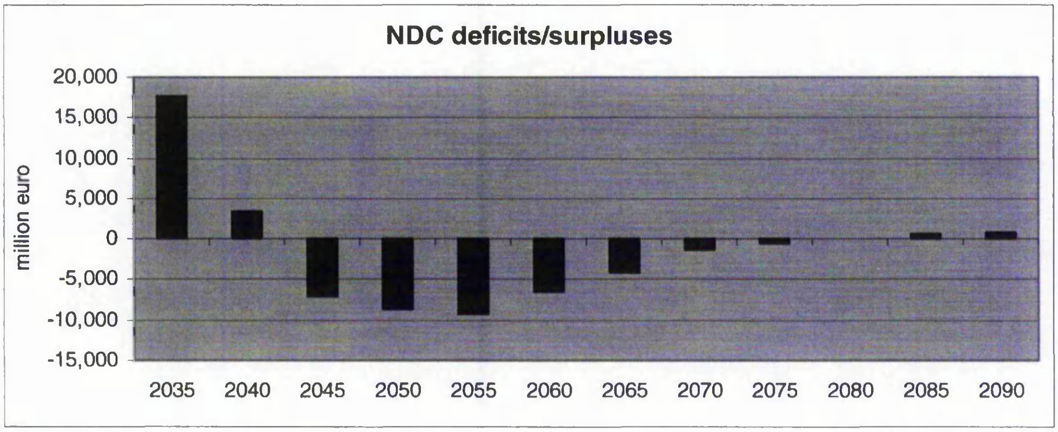


Source: Appendix C, Table C2

In Graphs 7.8a and 7.8b, the NDC nominal pensions include additional benefits from continuing to work – pension values are calculated as a weighted average of the cohort-respective NDC pensions - 35.7 percent of pensioners have additional pensions from continued work while the other 64.3 percent receive the 'pure' NDC pension.

It is worth bearing in mind that, for example, the 2035 NDC R1 cohort becomes cohort NDC R2 in 2040 and, after another period, NDC R3 in 2045. In each period, the NDC R3 cohort has the highest benefits, having acquired pension rights for longer than the other two pensioner cohorts. Also, because of the decrease in wages (caused by the decrease in the labour force), those rights were acquired under more auspicious conditions (higher wages).

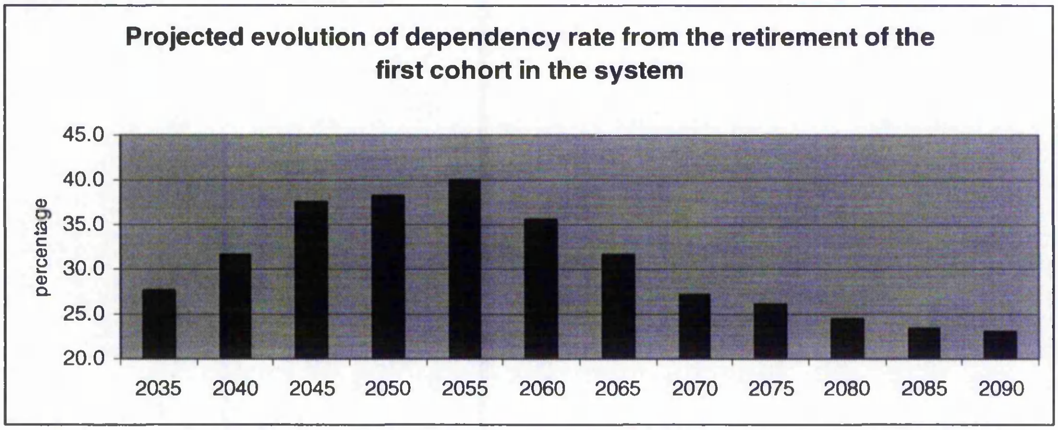
Graph 7.8c



Source: Appendix C, Table C3

The high replacement ratios in NDC will generate the above budget deficits. Of course, balancing the budget will mean lessening the replacement ratios. However, even if this happens, given the framework of the NDC, there will be no redistribution between categories of pensioners (working and non-working). Each pensioner will receive a smaller share of his notional account balance but in proportion. Overall balance, year 2090 €-15,088.1 million, when total cohort income is €47,781.8 million.

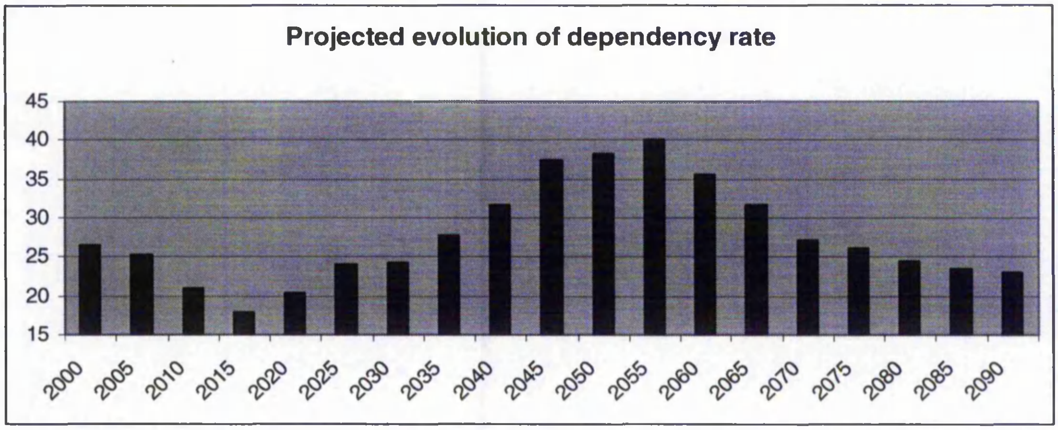
Graph 7.8d



Source: Appendix C, Table C4

Like in the previous simulation scenarios, the highest deficit occurs when the dependency ratio is at its highest level (in this case, in 2055, when the dependency ratio is projected to be 40 percent).

Graph 7.8e

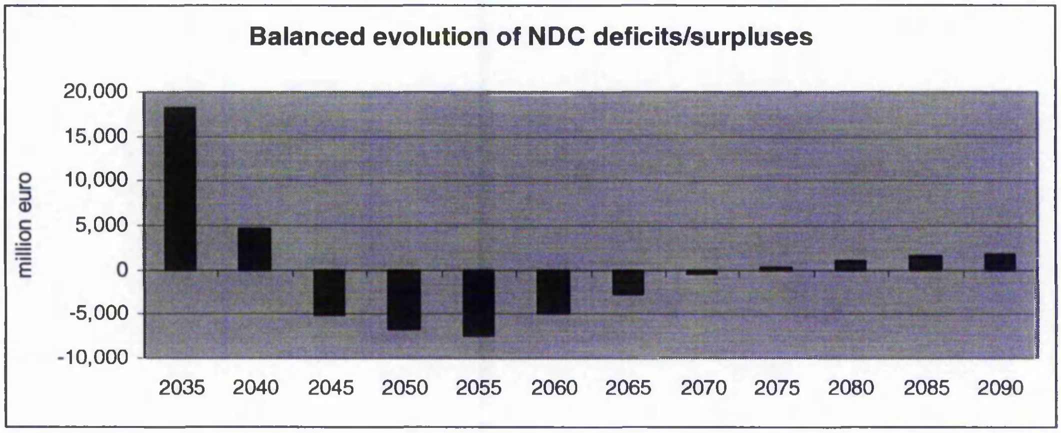


Source: Appendix C, The Romanian Simulation, all periods

It is very important to note that, in all of the above simulations the annuity divisor (the conversion factor by which the notional capital accumulated is transformed into a pension stream) was considered to be based solely on life expectancy (here, the number of periods of life in retirement). Also, note the large replacement ratios – NDC pensions are, on average, well above 100 percent of the wages, in all periods, making for a very comfortable retirement. These high replacement ratios cause the deficits. However, fiscal solvency is achievable, albeit with sacrifices. It is possible to balance the deficits and surpluses over the period considered. As mentioned in the beginning of the chapter, the formula is still subject to political risk. So, the government can adjust the parameters (accrual of contributions, annuity transformation etc.) of the NDC scheme to insure financial sustainability.

For example, in Poland, the balance of the notional account is indexed in line with only 75 percent of the wage bill growth. In this simulation, for simplicity, it is assumed that the period annuity divisor is the one to be changed – individuals will transform into pensions only a proportion of their notional account balance. For the Romanian data considered above, with zero productivity growth, the proportion that balances the NDC surpluses and deficits over the period considered (2035-2090) is 93.25 percent. In this way, the typical replacement rates of 121, 132 and 148 percent (Appendix C, Table C2) become 113, 123 and 138 percent – a minor reduction.

Graph 7.8f

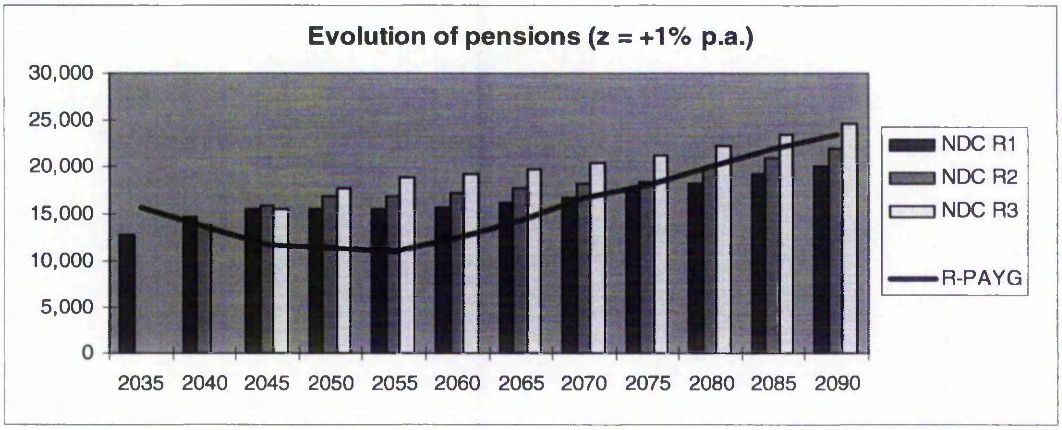


Source: Appendix C, Table C10

<u>Sensitivity analysis – varying the productivity growth rate</u>

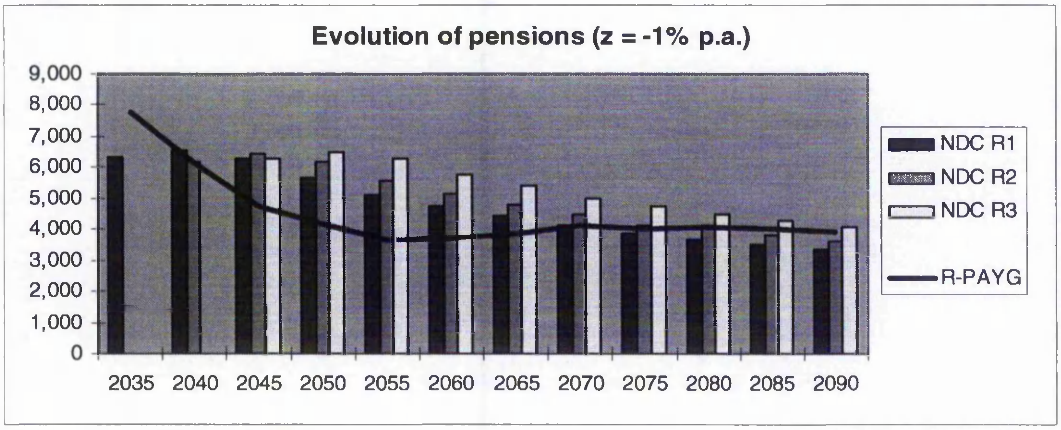
A study by Dang, Antolin and Oxley (2001) on the fiscal implication of ageing uses the assumption that labour productivity in OECD countries will converge to a trend rate of 1.75 percent per year. However, regarding countries like Czech Republic, Hungary and Poland productivity growth rates were considered significantly higher. The projected growth rates for labour productivity in these countries were more than 2.4 percent for Czech Republic, more than 3 percent for Hungary, about 2 percent for Poland. The analysis for the present Romanian simulation applies a conservative figure of one percent change in productivity.

Graph 7.9a



Source: Appendix C, Tables C5

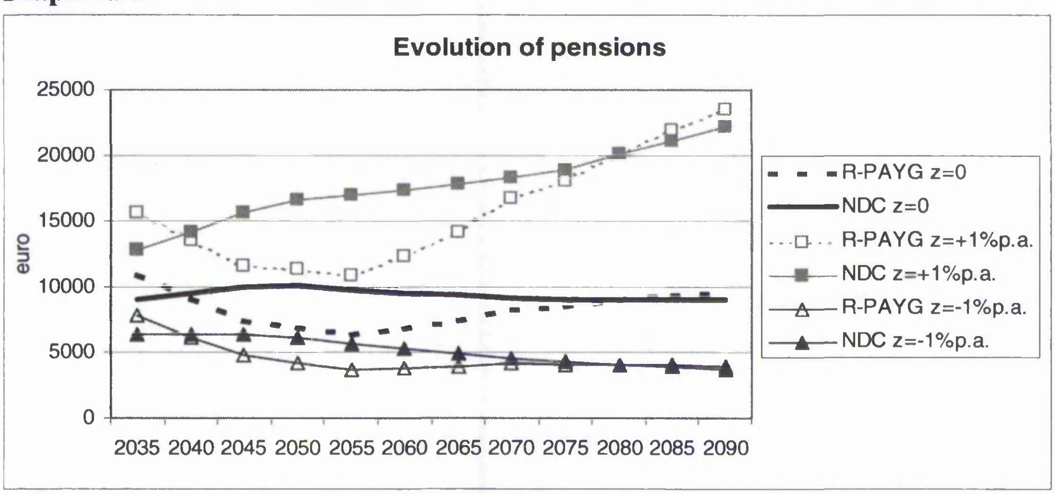
Graph 7.9b



Source: Appendix C, Table C7

In any case, varying the productivity rate only affects the nominal values so that the previously drawn conclusions (with zero productivity growth) apply whether productivity increases or decreases. While the dependency and replacement ratios remain the same as in the original simulation, the nominal value of pensions increases or decreases in line with the change in productivity (Graph 7.9c). Productivity growth affects the accrual of the nominal contributions – positive productivity growth will increase the value of pension liabilities and thus increase the deficit. The R-PAYG will always be in fiscal balance, so the gap between the NDC and the R-PAYG pensions gives an indication of the deficit accumulated step by step. So, the gap is larger when under positive productivity growth and smaller under negative productivity change.

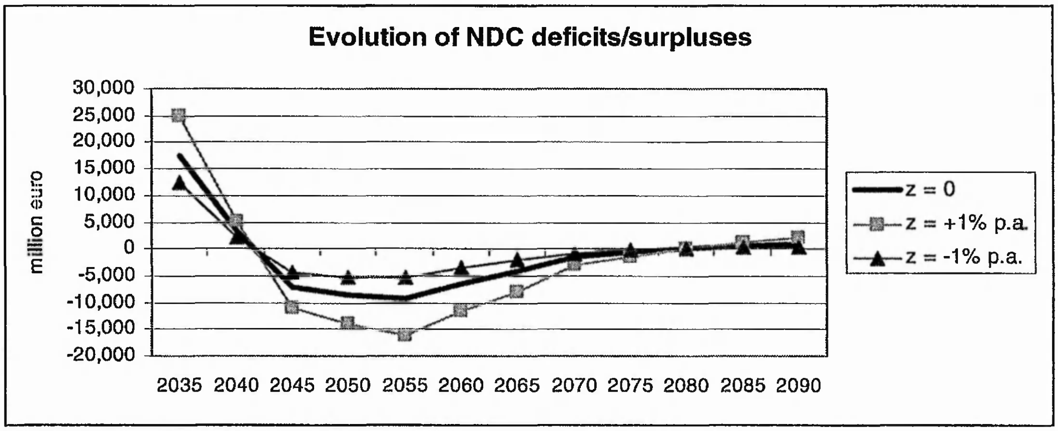
Graph 7.9c



Source: Appendix C, Table C1, TableC5 and table C7

When considering the case of a balanced fiscal evolution for the NDC, size matters, as the value of 93.25 percent for the conversion factor needed to alter the regular annuity divisor changes to 92.37 (for +1 percent productivity growth) and 94.78 (for –1 percent productivity change). Ironically, when productivity increases, individuals get to convert into pension annuities a lower proportion of their notional balances.

Graph 7.9d



Source: Appendix C, Table C3, Table C6 and TableC8

7.5. Conclusions

The previous chapter has settled that a multipillar system is a valid reform option for Romania and, so, the analysis turns to reviewing the choice for a PAYG scheme in the first pillar. As discussed in the second chapter, the only alternative to a parametrically reformed PAYG (short of switching to a completely fully funded private system) is the newly popularised NDC-PAYG scheme.

The implemented pension-point-reformed PAYG has many positive features, chiefly that it always has a balanced budget and that it eliminates, to a certain extent, the pension benefit inequalities among individuals. On the contrary, under the NDC scheme, balancing the budget requires parametric adjustments and perpetuates wage and benefit inequalities between individuals. While the R-PAYG is focused on redistribution and equality, the NDC is centred on actuarial fairness.

The simulations run on an OLG model of intergenerational risk-sharing have highlighted this distinction across several scenarios. The simulation on Romanian data has continued in a similar vein. Overall, the NDC creates the framework for greater individualisation of pension rights, giving each individual what he is due. Thus individual responsibility and reward is enhanced, as individuals enjoy more from the fruits of their labour than under the R-PAYG. Without redistribution, replacement rates are potentially higher, continued labour market participation after retirement is encouraged and contribution evasion lessened. Of course, in some situations these will come at the cost of social insurance budget deficits. However, as already discussed, it is possible to balance the deficits over a chosen period of time by adjusting accrual or annuity parameters. These deficits should help make government more accountable to individuals. The overall recommendation is in support of Romania adopting an NDC-PAYG pillar within its multipillar pension system.

The analysis of the Romanian case so far has concluded that multipillar pension reform is viable, that the introduction of a mandatory second pillar based on private pension funds is likely to give the desired results and that the NDC-PAYG would make for a better first pillar. The following chapter will bring to a close the discussion of a multipillar strategy for the Romanian pension reform by looking at the optimum sizes for the two mandatory pillars.

CHAPTER 8.

DETERMINING THE SIZES OF THE PUBLIC AND PRIVATE PILLARS

8.1. Introduction

Regarding the pension reform experiences reviewed in Chapter 4, one key dilemma appears to be the size of the second pillar. As the analysis in the chapter has shown, the percentage point of payroll allocated varies widely across countries. The feasible sizes of the funded pillars should be based on analysing both the constraints suffered by the state social insurance budget and the performance of both pension pillars. No studies for feasibility and efficiency of mandatory private pensions could be conducted, as, prior to legislation implementation, no pension fund societies existed. Thus, there were no historical data on investment efficiency and no costing analyses for pension assets investments on this scale (meaning 'mandatory' private pension participation). This particular problem has been tackled in Chapter 6, in which a time series for a potential hypothetical rate of returns for investments has been built.

The present chapter tries to apply the state preference theory framework (see Chapter 1) to create a simple method to determine the way the pension contribution should be split between the public and private pillar, based on the scenario of Romania having an NDC public pillar instead of the reformed PAYG actually implemented. In a way, it is another exercise that supports the implementation of an NDC scheme.

8.2. The Simple Portfolio Approach Model

The previous chapters have advocated reforming the public pillar under the auspices of the NDC framework. This section tries to apply state preference theory to create a simple method to determine the way the pension contribution should be split between the public and private pillar, based on the Romanian economy. This exercise comes in support of the NDC values. It employs simple techniques helping decision making in pension investment. This whole 'what if' approach is based on the scenario of Romania having an NDC public pillar instead of the points-scheme PAYG system actually implemented.

The two pension pillars (the notional defined contribution pillar – NDC, and the fully funded pillar - FFP) will be treated as being two securities in which people invest. The pension contributions are abstracted to securities prices and the pension benefits to securities' end-of-period payoffs. The objective is to try to create a framework for finding an optimal individual investment decision in the two pillars under uncertainty.

Just like pension arrangements, securities inherently have a time dimension. In the state-preference model, the uncertainty can be represented as a vector of possible payoffs at a future date, each one associated with a mutually exclusive state of nature. Each individual's portfolio of investments is a matrix of possible payoffs on the different securities that compose the portfolio. Individuals have to invest (contribute) in both securities (pillars) – so the portfolio is made of two securities. Also, the simplest case is considered, having only two mutually exclusive states of nature (only two possible outcomes) that can occur with equal probability.

The capital market is considered to be complete, in the sense that the two securities are made up of linearly independent state-contingent payoffs (the benefits from the two pillars are linearly independent). In theory, by dividing the investment in a particular way among the available securities the uncertainty about the future value of the payoffs could be reduced. This would be equivalent to constructing a portfolio holding equal amounts of pure securities[1]. The portfolio would have the same payoff in every state even though the payoffs of individual securities varied over states.

8.2.1. Model assumptions

The two states of nature considered are of equal probability: state 1 (S_1) of 'prosperity' with 4.33 percent growth and state 2 (S_2) of 'recession' with -4.33 percent growth. Interest rates (rates of return for investments, see previous sections for HR) for the 2 states are considered to be 10.36 percent and -10.36 percent. The state S_1 is made up of figures discussed previously[2] while S_2 is an extreme case, the exact opposite of S_1.

Choosing the rate of return for the unfunded public pillar applies Samuelson's (1958) reasoning that, in the long run, the growth rate of wages can only match the

[1] A pure security is defined as a security that pays €1 at the end of the period if a given state occurs and nothing if any other state occurs.
[2] The figure is appropriate, as according to a forecast study by United Nations (2002), the average yearly growth rate of GDP per capita in Romania between 2000 and 2040 is 4.5 percent.

overall economic growth rate. Thus, the calculations will use the figure of 4.33 percent for both economic growth rate and the growth rate of wages. The rate of return for the fully funded pillar is assumed to be 10.36 percent, the rate determined in the previous chapter. In this way, the rate of return differential is considerable but not inconceivable[1], in accord with the dynamic efficiency arguments presented in Chapter 1.

As mentioned before, the model plays around with the idea of a multi-pillar system. It should be pointed out that, in a dynamic economy, all the parameters that constitute the rate of return in the unfunded pillar (the NDC) are endogenously determined and so the investments associated with the fully funded pillar may end up changing those underlying parameters (e.g. the rate of economic growth). (Disney, 1999) This last fact is ignored in the model - the rates are assumed constant.[2]

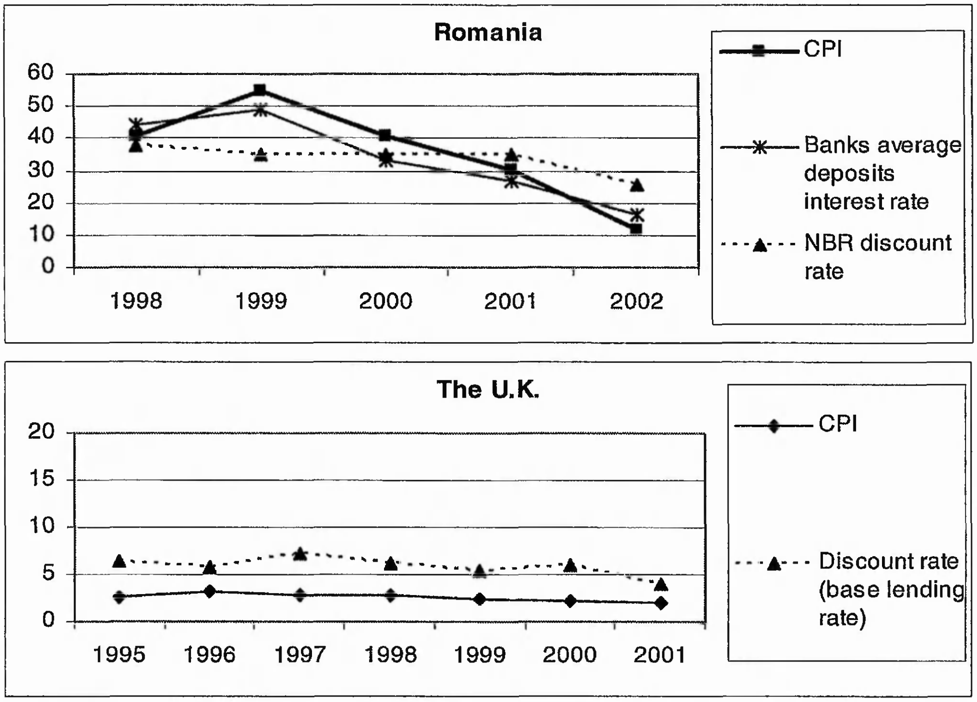
The discount rates are set at 8.17 percent for S_1 and –2.64 percent for S_2. The discount rate for S_1 is the *real* discount rate in December 2003 at the National Bank of Romania (20.41 percent nominal NBR discount rate minus 14.24 percent inflation for 2003). The figure for S_2 is not based on real conditions but it is needed to manipulate the data. If the approach indeed involved analysing securities, their initial price would not change depending on the future states. But, as mentioned before, the two pillars necessitate regular investment in time – their price is stretched in the future – there is no initial one lump-sum price. The present value of all future contributions is used as the equivalent of price. Given the fact that the value of contributions varies in time depending on the state of nature occurred, it is necessary to make sure that the present value of contributions (the initial price) is the same at the beginning, regardless of what state of nature occurs in the future. The discount rates are used to ensure this fact. In essence, the following equality must happen:

$$\frac{1+g_1}{1+d_1}=\frac{1+g_2}{1+d_2}$$, where g_i = growth rate in S_i, d_i = discount rate in S_i, i = 1,2

Using the Romanian setting of pension arrangements presents challenges even for the simple calculations needed for this portfolio exercise. The evolutions of Romanian indicators are specific to the period of transition - clearly at the opposite side of the more predictable, regulate evolutions in advanced economies.

[1] For example, in a study on the US pension system, Feldstein (1997), uses rates of 2.6 percent for PAYG and 9.3 percent for private capital.
[2] There is the issue of investing abroad – see Chapter 6, computing the HR. It is assumed the marginal product of capital does not decline when there is with a fall in labour force

Graph 8.1



Source: Romanian National Institute of Statistics (http://www.insse.ro) and UK National Statistics (http://www.statistics.gov.uk)

The starting value for the national average gross wage (per year) is considered €2386.25 (the approximate equivalent of 8,068,932 ROL per month in December 2003 at the corresponding exchange rate of 40,577 ROL/euro). The pension system contribution tax is 30 percent, split between the public NDC pillar (two thirds) and the private FF pillar (one third). The following assumptions are made: the contribution period to be 35 years, the retirement age limit to be 65 years and the average life expectancy to be 70 years, so that the average retirement period is 5 years. Also, it is assumed that the retirees are forced to take annuities (no lump-sum withdrawals) from the amount accumulated in their FF and NDC pillars account.

Subsequently, the value of the average pensions offered by the two systems corresponding to the two states of the economy is computed. The main formulas used are the following:

$$\text{Funds accumulated (future value)} = \mathit{Contribution} * (1+r)^n * \frac{1-\left(\dfrac{1+g}{1+r}\right)^{n+1}}{1-\dfrac{1+g}{1+r}},$$

$$\text{Present value of contributions} = Contribution * \frac{1+g}{1+d} * \frac{1-\left(\frac{1+g}{1+d}\right)^n}{1-\frac{1+g}{1+d}},$$

where r = value of HR, g = rate of growth economy/average wage, d = discount rate, n = number of active working life years (35).

The following tables summaries the data generated using the above information:

Table 8.1

S_1 – HR 10.36%, growth rate 4.33%, discount rate 6.17%		**S_2 – HR – 10.36%, growth rate -4.33%, discount rate -2.64%**	
Average wage at the beginning	€2,386.25	Average wage at the beginning	€2,386.25
Average wage at retirement	€10,520.54	Average wage at retirement	€506.84
Sum accumulated in FFP	€119,397.89	Sum accumulated in FFP	€726.96
Sum accumulated in NDC	€73,643.81	Sum accumulated in NDC	€3,547.86
Present value FFP contributions	€6,192.50	Present value FFP contributions	€6,192.50
Present value NDC contributions	€ 12,384.99	Present value NDC contributions	€12,384.99
FFP pension annuity	€31,787.06	FFP pension annuity	€ 103.48
NDC pension annuity	€16,696.05	NDC pension annuity	€620.12

8.2.2. Deriving the pure securities

The essential information from Table 8.1 is gathered into Table 8.2. As mentioned previously, the two pension pillars are treated as two market securities, the present value of all future contributions being used as the equivalent of price, while the balances of the FFP and NDC accounts are used as the equivalent of securities end-of-period payoffs.

Table 8.2

	Total cost†	**Total retirement returns***	
		S_1	S_2
FFP	€ 6,192.50	€119,397.89	€ 726.96
NDC	€ 12,384.99	€ 73,643.81	€ 3,547.86

† The total cost is calculated as the present value of the future contributions for the state-contingent discount rate

* calculated as the value of the sum accumulated in the FFP and NDC accounts

The linear combinations contained in Table 8.2 represent our opportunity set of state-contingent portfolio payoffs. The main objective is to preserve the value of the individual's investments (contributions). Initially, the individual is making investments of €18,577.49, cumulated in the two pillars, representing 7.79 times the value of an average wage at the present. The aim is to preserve this ratio in the future. Table 8.2 becomes:

Table 8.3a

Value in 'wages'	Total cost	Total retirement returns	
		S_1	S_2
FFP	2.60	11.35	1.43
NDC	5.19	7.0	7.0

Dividing everything by 7.79 (the target ratio):

Table 8.3b

Compared to initial ratio	Total cost	Total retirement returns	
		S_1	S_2
FFP	0.33	1.46	0.18
NDC	0.67	0.92	0.92

In order to reduce the uncertainty of the average individual's wealth, the creation of a set of 'pure securities' is attempted.

$M = \begin{pmatrix} 1.46 & 0.18 \\ 0.92 & 0.92 \end{pmatrix}$ and $V = \begin{pmatrix} 0.33 \\ 0.67 \end{pmatrix}$. Solving $M * q = V$ results in $q = \begin{pmatrix} 0.15 \\ 0.59 \end{pmatrix}$, which represents the price of the pure securities[1].

Essentially, the payoff matrix M needs to become (1,0,0,1). The inverted matrix will give indications of actions to be taken depending on the state of nature as shown in Table 8.4.

$$M^{-1} = \begin{pmatrix} 0.7852 & -0.1609 \\ -0.7852 & 1.2731 \end{pmatrix}$$

Table 8.4

	Outcome	Action	Investment	Future value
Pure Security 1	1 0	buy FFP	€ 4,862.46	€ 93,753.44
		short-sell NDC	- € 1,992.64	- € 11,848.67
PS1 price: € 2,869.82				€ 81,904.77
Pure Security 2	0 1	buy NDC	€ 15,766.91	€ 4,516.66
		short-sell FFP	- € 4,862.46	- € 570.82
PS2 price: € 10,904.45				€ 3,945.84

[1] Prices of the pure securities should be interpreted as follows: for a pure security FFP a €0.15 payment is required for a promise of a payoff of €1if State 1 occurs and nothing if the other state occurs. However, in our case 1 represents 7.79 times the average wage so, a promise of a payoff of 1 = €18,577.49 is obtained by making a payment of 0.15 = €2,869.82.

If state S_1 is anticipated to occur, the intention being to preserve the value of our contributions based *entirely* on the FFP (the outcome 1,0), the necessary investment in FFP is 78.52 percent of the initial FFP contributions (0.7852 in M^{-1}, meaning €4,862.46), while short-selling (see below) 16.09 percent of the initial NDC contributions (-0.1609 in M^{-1}, meaning €1,992.64 worth of NDC).

If State S_2 is anticipated, outcome 0,1 is accomplished by short-selling FFP to the value of 78.52 percent of initial FFP contributions (-0.7852 in M^{-1}) while investing in NDC 127.31 percent of initial NDC contributions (1.2731 in M^{-1}, meaning €15,766.91).

Obtaining the pure securities (PS1 and PS2) requires adapting the method of *short-selling* stocks to the situation of pension pillars. Short-selling is an investing technique involving the sale of a stock that is not owned. An investor, believing the price of a security will decrease in the future, borrows the security and sells it. At a later date, he will buy back the security (called covering) and return it. If, during this time, the price has dropped, the investor makes a profit, and vice-versa.

In the case of the pension pillar portfolio, the above investor is the government. In order to reduce uncertainty in the pension system portfolio payoff, the government could frame arrangements with an external partner following the directions of the model (for example, an international financial institution, such as the IMF). Since contribution payments are centrally collected, aggregating the amounts needed for following the model's instructions and creating the pure securities would be possible. The government could short-sell the rights for the future pension payoffs under the obligation of purchasing them later. The external financial institution would buy the rights for the future pension payoff and supply part of the funding needed in the beginning. Earning the estimated high rate of return in the fully funded pillar needs investment of real funds. The money coming from short-selling to the external partner would largely be invested in the fully funded pillar. Later, the government would buy back the rights to the pension payoffs, paying the different amounts corresponding to the future. In essence, the uncertainty about the future would be transferred to the external financial institution. For simplicity, the sections below will continue using the individual as an investor (and not the government), as the amounts are based on individual wages and contribution rates.

Returning to the Table 8.4, in order to achieve the imposed limit on wealth (7.79 times the average wage) by way of pure securities, not only is investment in one security (FFP or NDC) needed, but so is making a profit or a loss on the other security. Short-selling indicates that the individual does not own the security he is selling. In the case of PS1, in S_1, investment in FFP alone will go beyond the target wealth limit, so, to reach the limit, a loss has to be made on the NDC security. The loss can be achieved by short-selling €1,992.64 'shares' of NDC, and covering at retirement – buying back the shares which by then are worth €11,848.67. Investing €4,862.46 in FFP will generate €93,753.44. After covering the NDC shares, the wealth remaining will be €81,904.77, which is 7.79 times the average wage in S_1. The price of the PS1 is 0.15 (see the pure price vector *p* from above). This value has to be transformed because in '1' represents the value of the total initial investment (€18,577.49). Thus, 0.15 becomes €2,869.82, and in the case of PS2, 0.59 becomes €10,904.45.

Summarising, buying one share of PS1 (a net investment of €2,869.82) would guarantee €81,904.77 in the future (7.79 times the average wage in S_1), if S_1 occurs. Similarly, buying one share of PS2 (a net investment of €10,904.45) would guarantee €3,945.84 in the future (7.79 times the average wage in S_2), if S_2 occurs.

So, by using this approach, a total investment of €13,774.27 in one share of each of two pure securities, would guarantee complete security no matter what state of nature is occurring in the future. Observe that investing in the pure securities also comes cheaper than the initial cost of €18,577.49.

8.3.3. R-PAYG v. NDC revisited

The above instructions make up a portfolio that has the same payoff in every state. The intention is to preserve wealth, eliminate uncertainty by creating a mix of securities that perform in one state but not in the other. The portfolio is altered so that FFP pays off in S_1 while the NDC pays in S_2. The NDC will always return the same value relative to wages, but the exercise shows that the two pillars complement each other. In the same line of thinking, if the payoffs from the fictional NDC are compared to the actual reformed PAYG, the implications are easy to see. The R-PAYG makes for a poor substitute. Under the parameters set by the law, the R-PAYG performs worse in either state of nature.

Table 8.5

	Total cost*	Total retirement returns**	
		S_1	S_2
NDC	€18,577.49	€73,643.81	€3,547.86
R-PAYG	€18,577.49	€19,972.07	€962.17

* the total cost is calculated as the present value of the future contributions for the state-contingent discount rate
** in the case of R-PAYG, the value of future pensions at the moment of retirement, calculated as the present value - at the moment of retirement - of the yearly future pension payments (as a string of annuities for the 5-year retirement period).

Following the above transformations relating to the initial wage and the 7.79 target ratio, Table 8.5 becomes:

Table 8.6

Compared to initial ratio	Total cost	Total retirement returns	
		S_1	S_2
NDC	0.67	0.90	0.90
R-PAYG	0.67	0.24	0.24

So, from the government's point of view, R-PAYG (the actual public pillar) is the appropriate choice – it is ultimately cheaper. For the individual, however, implementing a NDC pillar would make an immense difference. The conclusions of the exercise confirm the ideas presented in the previous chapter.

8.3. Implication for Shifting Pension Contribution Percentages Between Pillars

If FFP and NDC were indeed proper market securities, then the pure securities from above could be derived from them by short-selling and a new investment allocation could be made that would guarantee the same payoff of 7.79 times the value of the average wage indifferent to the state of nature occurring. However, the reality is that FFP and NDC are not securities, contributions are mandatory and there can be no short-selling of contributions/benefits.

However, if this model's assumptions were real (i.e. there could only be the two possible future states of nature – the next 35 years are either years of growth or years of recession), arrangements could be made to make short-selling possible. The government could intermediate the pension investment in the two pure securities. Contracts could be made to match the Table 8.4 distribution of investments.

For example, 'buying' PS1 involves contributing €4,862.46 in FFP and short-selling €1,992.64 worth of NDC, which means receiving €1,992.64 at the present on condition that in the future, if state S1 occurs, €11,848.67 will be paid into NDC. The sum of €1,992.64 can be spread over the years – in the first year the individual would receive €76.79.

The investment of €4,862.46 in FFP implies a first year contribution of €187.37. The contract could stipulate that, within the framework of PS1, the NDC pillar will contribute €76.79 to the FFP pillar on behalf of the individual, so that the only the remaining €110.58 are paid from wages. In effect, 7.85 percent of the wages would be contributed into the FFP, but the individual would pay only 4.63 percent of the wages.

Similarly, 'buying' PS2 involves contributing €15,766.91 into NDC which implies a first year contribution of €607.57. Within the framework of PS2, the contract could stipulate that the FFP pillar will contribute €187.37 to the NDC pillar (first year value of payment from short-selling €4,862.46 worth of FFP, received on condition that if S_2 occurs €570.82 will be paid into FFP), with the individual making up the difference of €420.20 from wages. In effect, 25.46 percent of the individual's wages would be paid into the NDC, but the individual would only contribute 17.61 percent of wages.

As the individual must have a share of each pure security, under this arrangement, the overall pension contribution rate would be 22.24 percent of wages, noticeably less than the 30 percent currently being contributed. This sort of pension contributions management arrangement is complicated, but it would cost the individual less.

The only uncertainty in the model is which of the two states of nature occurs in the future. In order to achieve complete certainty in retirement income, the individual would have to surrender part of his future gains. Under the terms of the contract, in exchange for complete security, the individual would commit himself to cover the 'necessary' losses.

The individual owns one share of each PS1 and PS2. If state S_1 occurs in the future, PS2 would pay nothing – the gains from investing €15,766.91 in NDC (€ 93,753.44) would be offset by the amount needed to cover the FFP shares short-sold (in S_1, the future value of €4,862.46 when invested in FFP is €93,753.44). PS1 however, would pay €81,904.77 (after covering the NDC shares short-sold, which, in S_1 are worth €11,848.67).

Table 8.7

	Investment		Future value	
			S1	**S2**
Pure Security 1	buy FFP	€ 4,862.46	€ 93,753.44	€ 570.82
	short-sell NDC	- € 1,992.64	- € 11,848.67	- € 570.82
PS1 payoff			**€ 81,904.77**	**€ 0.00**
Pure Security 2	buy NDC	€ 15,766.91	€ 93,753.44	€ 4,516.66
	short-sell FFP	- € 4,862.46	- € 93,753.44	- € 570.82
PS2 payoff			**€ 0.00**	**€ 3,945.84**
Total payoff			**€ 81,904.77**	**€ 3,945.84**
Average wage at retirement			**€ 10,520.54**	**€ 506.84**
Ratio of payoff to wage			**7.79**	**7.79**

If states S_2 occurs in the future, the reverse would be true – PS1 would pay nothing - the gains from investing €4,862.46 in FFP would be offset by the amount needed to cover the NDC shares short-sold.

Using the matrix computation has peculiar implications as, within the two pure securities, the retirement balances generated by the FFP and NDC pillars match exactly in each state. This affects the amount that has to be short-sold in each situation to create the outcomes (1,0) and (0,1) – in S_1 only PS1 (based on FFP) pays off the retirement income (€ 81,904.77 - 7.79 times the average wage) and so the entire NDC accumulation (€ 93,753.44) has to be 'lost' by short-selling. The same 'share' of FFP is invested in and short-sold at the same time.

In either state of nature the ratio of the loss incurred from short-selling to the average wage is 1.126. Thus, by investing in the pure securities derived above and with the obligation of making a single lump-sum contribution of 112.6 percent of the average wage on retirement, an individual can acquire the certainty of retiring with a pension account balance worth 7.79 times the average wage. Under such an arrangement, the individual annual contribution rate would be 22.24 percent of the average wage, split between the FFP and NDC pillars (4.63 percent in the FFP and 17.61 in NDC).

8.4. The Optimal Individual Portfolio Decisions

In the previous sections the calculations were made with the aim of finding what percentage of the current average wage should be invested in the FFP and NDC securities that would guarantee complete security, no matter what happens in the future. It was shown how, if investment in the FFP-NDC composite *pure* securities is possible, a total investment of €13,774.27 would guarantee preserving the value of all pension contributions (guaranteeing a ratio of 7.79 between retirement wealth and average wage at retirement, no matter what state of nature occurs in the future).

This section will take the calculations to the level of individual preferences. The question this time is what would be the optimal portfolio allocation of the two pure securities, assuming that the individual is in complete control of his wealth and preservation of contribution is not an issue.

The individuals face the problem of deciding how much of their initial wealth to spend for consumption and what portfolio of securities to hold for the future. The assumption is that FFP and NDC are real market securities, the capital market is complete and, so, any portfolio payoff pattern can be constructed from the pure securities obtained. The problem will be framed in terms of the pure securities developed earlier (Table 8.4). The problem is to maximise the expected utility of working life consumption and retirement consumption (the end-of-period wealth) subject to the wealth constraint:

$$\max\left[(1-\beta)U(C)+\beta\sum_s \pi_s U(a_s)\right] \tag{8.1}$$

$$\text{subject to} \sum_s q_s a_s + C - W \tag{8.2}$$

where s = state of nature; π_s = probability of state of nature s occurring; q_s = the price of the pure security s; a_s = the number of pure securities paying if state s occurs; W = initial wealth; C = consumption. An individual's expected utility of end-of-period wealth is written as $\sum \pi_s U(a_s)$. Factor β is introduced as a discount factor for consumption, weighting the retirement consumption versus working life consumption.

Bringing data from the previous section (Table 8.4): s = 1,2; π_1 = ½; π_2 = ½; q_1 = 2869.82; q_2 = 10904.45. Since retirement is considered to be 5 years long and working life is 35, β is assumed 1/8 (0.125). Because we are not dealing with real market securities, the initial wealth is actually lifetime wealth, considered to be the present value of all working life wages and future benefits:

$$W = w_0 * \frac{1-\left(\frac{1+g_s}{1+d_s}\right)^{n+1}}{1-\frac{1+g_s}{1+d_s}} + \frac{PV(Ras)_s}{(1+d_s)^n} \tag{8.3}$$

where *Ras* = retirement accumulated sum in FFP (for s = 1) or NDC (for s = 2) as in Table 8.4 (or Table 8.7). For w_0 = €2,386.25, n = 35 years, g = 4.33, d = 6.17, wealth W is €75,843.70.

Using Lagrange multiplier method:

$$L = (1-\beta)U(C) + \beta\sum_s \pi_s U(a_s) - \lambda(\sum_s q_s a_s + C - W) \tag{8.4}$$

Considering a logarithmic utility function of wealth and substituting, the Lagrangian function is

$$L = \frac{7}{8}\ln C + \frac{1}{8}\frac{1}{2}\ln a_1 + \frac{1}{8}\frac{1}{2}\ln a_2 - \lambda(2869.82\mathrm{a}_1 + 10904.45\mathrm{a}_2 + C - 75843.70) \tag{8.5}$$

and the first order conditions are

$$\frac{\partial L}{\partial C} = \frac{7}{8}\frac{1}{C} - \lambda, \text{ implying } C = \frac{7}{8\lambda}, \tag{8.6}$$

$$\frac{\partial L}{\partial a_1} = \frac{1}{8}\frac{1}{2a_1} - 2869.82\lambda, \text{ implying } a_1 = \frac{1}{45917.12\lambda}, \tag{8.7}$$

$$\frac{\partial L}{\partial a_2} = \frac{1}{8}\frac{1}{2a_2} - 10904.45\lambda, \text{ implying } a_2 = \frac{1}{174471.2\lambda}, \tag{8.8}$$

$$\frac{\partial L}{\partial \lambda} = 75843.7 - 2869.82a_1 - 10904.45a_2 - C = 0. \tag{8.9}$$

Substituting a_1, a_2, and C into equation 8.9:

$75843.7 = \frac{7}{8}\frac{1}{\lambda} + \frac{1}{8}\frac{1}{2\lambda} + \frac{1}{8}\frac{1}{2\lambda}$, implying $\lambda = \frac{1}{75843.7}$. Thus, C = €66,363.23, a_1 = 1.65; a_2 = 0.43.

So, consumption is €66,363.23, retirement wealth in the PS1 is $q_1 a_1$ = €4,740.23 and in the PS2 is $q_2 a_2$ = €4,740.23. So, the individual divides the lifetime wealth between working life consumption (7/8) and retirement consumption (1/8), investing equally in the two pure securities, but 'buying' 3.8 times more of the State 1 pure security (PS1) since the expected rate of return on the State 1 is greater. In effect, the optimal investment is to buy 1.65 shares of the PS1 (which cost €2,869.82) and 0.43 shares of the PS2 (which cost €10,904.45).

Table 8.8

Recommendation	Investment		Future value	
			S_1	S_2
1.65 of Pure Security 1	buy FFP	€ 8,031.58	€ 154,857.44	€ 942.85
	short-sell NDC	-€ 3,291.35	- € 19,571.07	- € 942.85
			€135,286.37	**€0.00**
0.43 of Pure Security 2	buy NDC	€ 6,853.97	€ 40,755.19	€ 1,963.42
	short-sell FFP	-€ 2,113.74	- € 40,755.19	- € 248.14
			€0.00	**€1,715.28**
Total payoff			**€135,286.37**	**€1,715.28**
Average wage at retirement			**€ 10,520.54**	**€ 506.84**
Ratio of payoff to wage			**12.86**	**3.38**

Given the same premises for the future states of nature and the same wealth as previously but without the constraint of preserving contributions value, the optimal decision marks the average individual as more bullish. Given the data, the optimal investment limit for the individual appears to be €9,480.46, much less than the previously calculated total, relying heavily on the pure security 1 (with a strong FFP component, a higher performance in State 1).

'Buying' 1.65 shares of PS1 involves contributing €8,031.58 in FFP which implies a first year contribution of €309.49. Within the framework of the PS1 contract, the NDC pillar will contribute €126.83 to the FFP pillar on behalf of the individual (first year value of payment from short-selling €3,291.35 worth of NDC, received on condition that if S_1 occurs €19,571.07 will be paid into NDC), so that the only the remaining €182.66 are paid from wages. In effect, 12.97 percent of the wages would be contributed into the FFP, but the individual would pay only 7.65 percent of the wages.

'Buying' 0.43 shares of PS2 involves contributing €6,853.97 into NDC which implies a first year contribution of €264.11. Within the framework of the PS2 contract, the FFP pillar will contribute €81.45 to the NDC pillar (first year value of payment from short-selling €2,113.74 worth of FFP, received on condition that if S_2 occurs €248.14 will be paid into FFP), with the individual making up the difference of €182.66 from wages. In effect, 11.07 percent of the individual's wages would be paid into the NDC, but the individual would only contribute 7.65 percent of wages.

Looking at the ratio of pension payoffs to wages, it could be said that the portfolio allocation looks unbalanced. And the amounts needed to cover the short-sold shares are very different - 186.02 percent of the average wage in S_1 and 48.95 percent of the average wage in S_2. In effect, the individual is balancing the contribution percentages and not the state-contingent securities payoffs. The overall contribution rate is 15.31, equally split between the two pure securities.

8.5. Sensitivity Analysis

The model assumes the two mutually exclusive states of nature as follow: S1 with HR 10.36 percent, wage growth rate 4.33 percent (discount rate 8.17 percent) and, the extreme opposite S2 with HR -10.36 percent, wage growth rate -4.33 percent (discount rate -2.64 percent) – same rates, opposite signs. The following table summarises the implications of changing the rates assumed for the pure securities model discussed previously against the initial contribution rates and amount of contributions.

Table 8.9

		Contribution rates (percentages)							PV contributions
		FFP	**Ss NDC**	**PS1**	**NDC**	**Ss FFP**	**PS2**	**Total**	
Without pure securities		***10***			***20***			30	€ 18,577.49
Initial assumptions (HR +/-10.36%, WR +/- 4.33)	(P)	***7.85***	-3.22	**4.63**	***25.46***	-7.85	**17.61**	22.24	€ 13,774.27
	(O)	***12.97***	-5.32	**7.65**	***11.07***	-3.42	**7.65**	15.30	€ 9,480.46
HR 1 percentage point lower (+/-9.36)	(P)	***10.25***	-4.77	**5.48**	***27.02***	-10.25	**16.77**	22.24	€ 13,774.27
	(O)	***14.46***	-6.73	**7.73**	***12.45***	-4.72	**7.73**	15.46	€ 9,568.55
HR 1 percentage point higher (+/-11.36)	(P)	***6.10***	-2.22	**3.88**	***24.46***	-6.10	**18.36**	22.24	€ 13,774.27
	(O)	***11.96***	-4.35	**7.61**	***10.14***	-2.53	**7.61**	15.22	€ 9,423.93
WR 1 percentage point lower (+/-3.33)	(P)	***5.16***	-1.89	**3.27**	***21.01***	-5.16	**15.85**	19.11	€ 10,169.89
	(O)	***11.58***	-4.25	**7.33**	***9.71***	-2.39	**7.33**	14.66	€ 7,798.49
Both HR and WR 1 percentage point lower (+/-9.36&+/-3.33)	(P)	***6.66***	-2.75	**3.91**	***21.86***	-6.66	**15.20**	19.11	€ 10,169.89
	(O)	***12.54***	-5.18	**7.36**	***10.59***	-3.22	**7.36**	14.72	€ 7,833.11
HR 1 percentage point higher and WR 1 percentage point lower (+/-11.36&+/-3.33)	(P)	***4.03***	-1.33	**2.70**	***20.44***	-4.03	**16.41**	19.11	€ 10,169.89
	(O)	***10.89***	-3.58	**7.31**	***9.10***	-1.79	**7.31**	14.62	€ 7,775.50
WR 1 point higher (+/-5.33)	(P)	***12.15***	-5.62	**6.53**	***31.70***	-12.15	**19.56**	26.09	€ 18,945.59
	(O)	***15.22***	-7.04	**8.18**	***13.26***	-5.08	**8.18**	16.36	€ 11,882.89
HR 1 percentage point lower and WR 1 percentage point higher (+/-9.36&+/-5.33)	(P)	***16.23***	-8.62	**7.61**	***34.70***	-16.23	**18.48**	26.09	€ 18,945.59
	(O)	***17.79***	-9.45	**8.34**	***15.67***	-7.33	**8.34**	16.68	€ 12,119.99
Both HR and WR 1 percentage point higher (+/-11.36&+/-5.33)	(P)	***9.33***	-3.79	**5.53**	***29.88***	-9.33	**20.55**	26.09	€ 18,945.59
	(O)	***13.62***	-5.54	**8.08**	***11.75***	-3.67	**8.08**	16.16	€ 11,738.60

The first contributions' allocation based on pure securities (P - for *preserving* the value of contributions) would guarantee the ratio between the retirement balance and the average wage at the time of retirement to be the same as the ratio between the present value of contributions and average wage at the start (initially 7.79). The second allocation (O - for *optimal* individual portfolio) is optimal for maximizing individual's expected utility of working life and retirement consumption.

Due to the build of the model, the total contribution rate does not change with every alteration of the model parameters. As long as the ratio between the growth rate and the discount rate is constant, most changes will generate a shift within the pure securities (with the corresponding changes in pillar contributions).

8.5.1. Changing the rate of return of the fully funded pillar by one percentage point (HR+/-9.36% and +/-11.36)

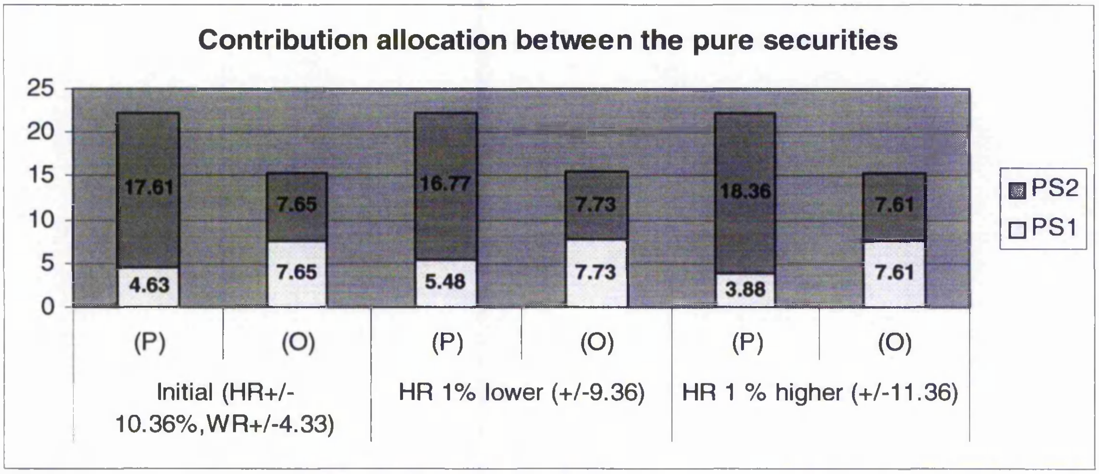
Within the (P) allocation, changing the rate of return of the FFP only generates a shift in contribution allocation between the two pure securities. Because the wage rate and the discount rate are unchanged, the present value factor is unchanged; the future wage is the same as in the original calculations and so is the target ratio of contributions to wages (7.79). Because the model requires the two pillar payoffs to happen in different states of nature, it makes recommendations on contribution allocation accordingly.

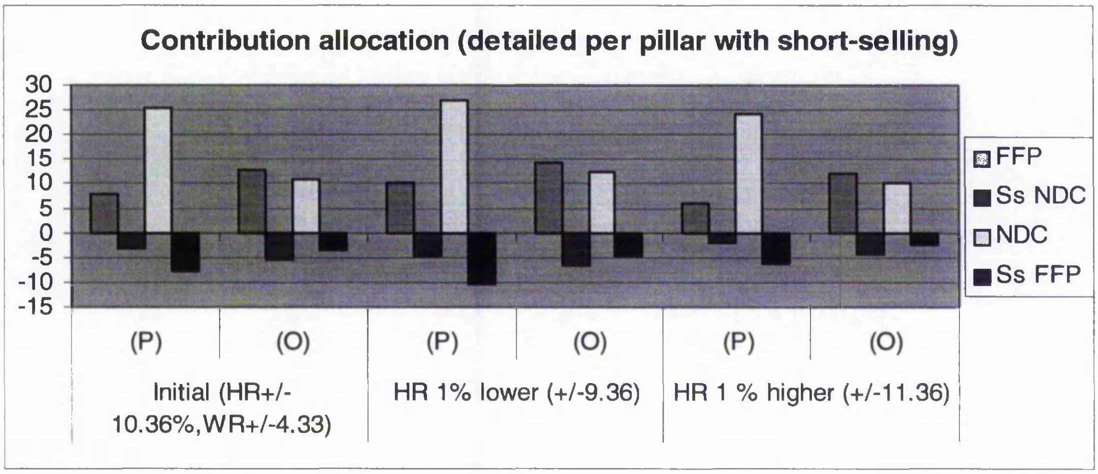
Table 8.10

		HR -1%		HR +1%	
		(P)	(O)	(P)	(O)
Change in contribution rates (percentages)	***FFP***	***2.40***	***1.49***	***-1.75***	***-1.01***
	Ss NDC	-1.55	-1.41	1.00	0.97
	PS1	**0.85**	**0.08**	**-0.75**	**-0.04**
	NDC	***1.55***	***1.38***	***-1.00***	***-0.93***
	Ss FFP	-2.40	-1.30	1.75	0.89
	PS2	**-0.85**	**0.08**	**0.75**	**-0.04**
	Total	0.00	0.15	0.00	-0.08
Change in PV of contributions		0.00	0.93	0.00	-0.60

When the HR is 1 percentage point lower than originally, the model recommends increasing the share of contributions into the FFP pillar in order to compensate – the ratio of future retirement income to wages has to remain the same. Pure security 1 (based on FFP) is designed to payoff 7.79 times the average wage in state S_1 and, since the HR is lower (9.36 percent) it will require more to be invested for that to happen. More money is put in FFP that will have to be 'lost' if the state S_2 happens. When computing for S_1, a HR rate of 9.36 percent will yield a lower return than if HR was 10.36 percent. However, the opposite state S_2 is considered to have the same rates as S_1 but with negative signs. In this case a rate of –9.36 percent will yield lower *losses* than with the initial 10.36 percent. As mentioned before, the matrix matches the amounts generated by the FFP and NDC pillars within the two pure securities for both states. An increase has to happen in the NDC contribution as well. Also, PS2 has to have no payoff if state S_1 occurs, so all the NDC balance has to be offset by short-selling FFP.

Graph 8.2





When HR is 1 percentage point higher than initially, the gap between the two rates increases and it becomes easier in either state to obtain the funds that would maintain the ratio of 7.79 of retirement income to average wage at retirement. Thus, less has to be invested in the FFP pillar for state S_1 and so less has to be lost from the FFP in the event S_2 occurs. Also, as the matrix matches the amounts from the two pillars within the pure securities, less has to be invested in the NDC. The contribution to the FFP pillar appears very sensitive to a rise or decrease in the rate of return (1 percentage point change in HR generates changes in the FFP contribution of more than 1 percentage point). The reaction seems stronger when the HR decreases.

Regarding the (O) allocation, when HR is 1 percentage point lower, the individual also reacts by increasing the FFP pillar contribution, however, the increase is more tempered and more in line with the increase in the NDC contribution. Overall there is a modest (0.15 percentage points) increase in total contribution, even after deducting the amounts short-sold. Similarly, when HR is 1 percentage point higher, the individual takes the opportunity to reduce contributions. Again, the reaction is stronger in when the HR is lower. A 1-percentage point increase in HR generates a 1.01 percentage point reduction in FFP contribution. Overall, after accounting for the effects of short-selling, there is even less of a change in the total contribution (0.08 percentage points).

Regarding the ratio of payoff to wage, a decrease of 1 percentage point in the HR causes the ratio to decrease from 12.86 to 10.98 in S_1, but to increase from 3.38 to 3.59 in S_2. So it could be said that a reduction in the HR pushes the individual towards a more even distribution. When the HR increases, individual's bias towards PS1 is evident as the ratio increases in S_1 to 15.27 while decreasing in S_2 to 3.23.

Looking at the present value of contributions, again it can be said that the computations are more sensitive to a decrease in HR. A 1 percentage point decrease causes the total investment to rise by almost 1 percentage point, while a 1 percentage point increase causes total investment to fall by only ½ percentage point.

8.5.2. Lowering the wage rate by one percentage point (WR +/-3.3%)

Changing the wage rate will affect the discount rate needed for S_2 (see section 5, the present value of contributions has to be the same regardless what happens in the future, so the ratio $\frac{1+g}{1+d}$ has to remain constant). The discount rate for S_2 changes to –0.67 percent, while the cost of investment without pure securities changes to €15,962.86 (down from €18,577.49). Because of this, the target ratio for the (P) allocation becomes 6.69.

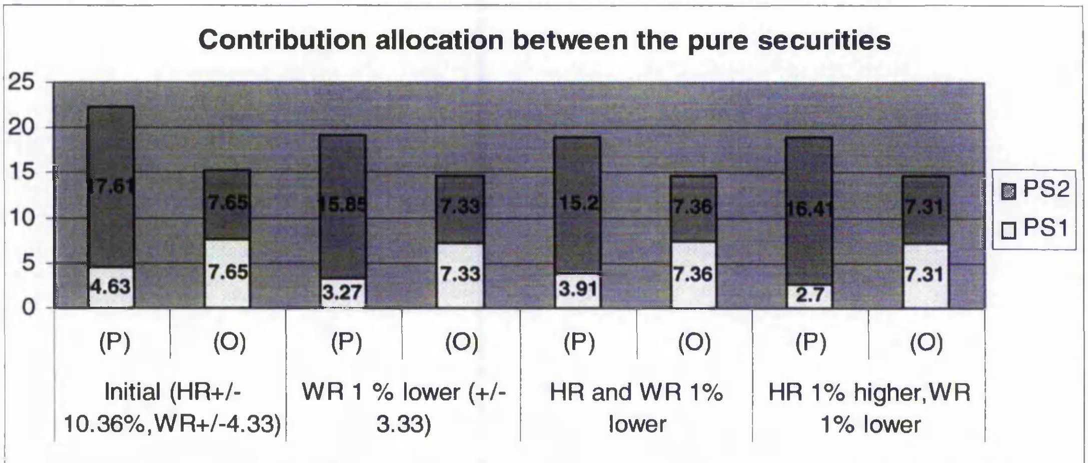
When the WR decreases, the contribution percentages fall in comparison to the initial allocation. That is because it becomes easier to satisfy the conditions of the model. The gap between HR and WR increases in both states in the desired way – in S_1, FFP now performs even better now than NDC (HR=10.36, WR=3.33) while in S_2, the NDC offers even lower losses than the FFP (HR= –10.36, WR= -3.33). The effect is extreme, the FFP and NDC contributions decrease by, respectively, 2.69 and 4.45 percentage points for a 1-percentage point decrease in WR. The present value of contributions in the (P) allocation decreases by more than 26 percentage points.

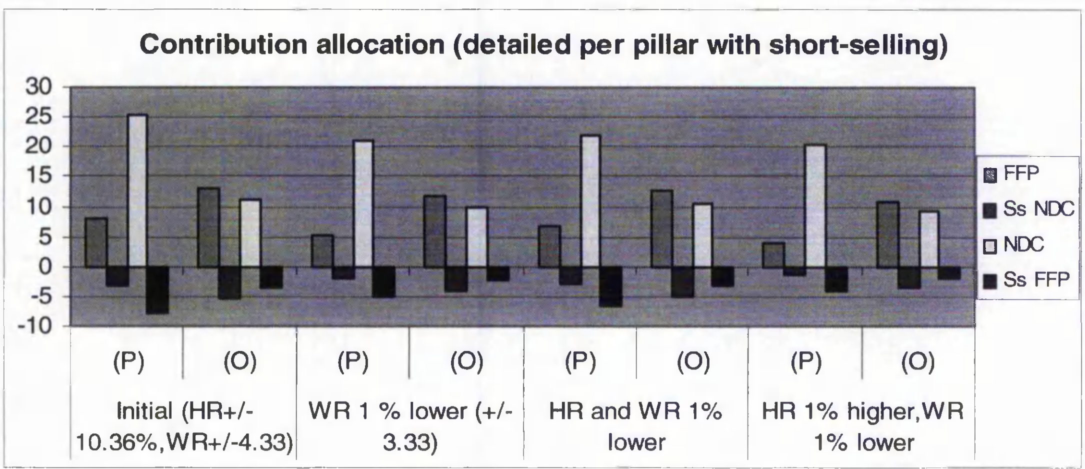
Table 8.11

		WR -1%		HR&WR -1%		HR+1% & WR -1%	
		(P)	(O)	(P)	(O)	(P)	(O)
Change in contribution rates (percentages)	***FFP***	***-2.69***	***-1.39***	***-1.19***	***-0.43***	***-3.82***	***-2.08***
	Ss NDC	1.33	1.07	0.47	0.14	1.89	1.74
	PS1	**-1.36**	**-0.32**	**-0.72**	**-0.29**	**-1.93**	**-0.34**
	NDC	***-4.45***	***-1.36***	***-3.60***	***-0.48***	***-5.02***	***-1.97***
	Ss FFP	2.69	1.03	1.19	0.20	3.82	1.63
	PS2	**-1.76**	**-0.32**	**-2.41**	**-0.29**	**-1.20**	**-0.34**
	Total	-3.13	-0.64	-3.13	-0.58	-3.13	-0.69
Change in PV of contributions		-26.17	-17.74	-26.17	-17.38	-26.17	-43.55

Note: Figures represent differences from the original contribution allocation with pure securities (HR+/-10.36%, WR+/-4.33%)

Graph 8.3





In respect to the (O) allocation, again the individual's preference for PS1 is evident. The allocation allows the ratio of retirement income payoff to wages to become 15 in S_1 and 3.09 in S_2. Although the gap between the two rates becomes the same as in the case of HR being 1 percentage point higher, the effect on the contribution allocation percentages is stronger. The reduction in each pillar's contribution exceeds 1.3 percentage points whereas in the case of HR being 1 percentage point higher the reduction was 1.01 and 0.93.

With regards to the combined influence of changing the HR when the WR is 1 percentage point lower, it is evident, much less is being invested in NDC. When both HR and WR are lower, although the gap between the two rates is the same as before, the impact on the present value factor and wage progression is strong. Contributions to both pillars decrease mainly because of the decrease in the ratio of retirement income to wage (now 6.69 instead of 7.79). However, the impact on the (O) allocation is modest (reductions of 0.45 percentage points on average for both pillars) and minimal impact on the ratio of retirement income payoff to wages (12.59 in S_1 and 3.24 in S_2 compared to the initial 12.86 in S_1 and 3.38 in S_2). So, when both rates are lower, the (P) allocation suffers and the individual is poorer- even relatively to wages. However, the (O) allocation is less affected, the absolute individual wealth decreases compared to the initial conditions but, relative to wages, the retirement income is comparable.

When the HR increases by 1 percentage point while WR decreases by the same amount, the implications are simple - strong reductions in the contributions of both pillars. The gap between the two rates increases in the way required by the model assumptions. The two pillars have larger payoffs in different states with even less contributions needed to be invested. In the case of the (O) allocation, the unbalance between the two pure securities' payoffs in their respective states increases to its maximum – 18.07 in S_1 and 2.98 in S_2.

It is interesting to compare the impact of changing the HR when the WR has been lowered by one percentage point with the 'pure effects' of changing **only** the HR (see Table 8.10). In Table 8.10 the differences are based on WR=+/-4.33 percent. Table 8.12 considers the initial allocation to be based on HR=+/-10.36 percent and WR=+/-3.33 percent and contains the impact on the contribution allocations when HR varies by one percentage point. Comparing the two tables shows that the effects of changing the HR are much subdued when the WR is lower.

Table 8.12

		HR&WR -1%*		HR+1% & WR -1%*	
		(P)	(O)	(P)	(O)
Change in contribution rates (percentages)	***FFP***	***1.50***	***0.96***	***-1.13***	***-0.69***
	Ss NDC	-0.86	-0.93	0.57	0.67
	PS1	**0.64**	**0.03**	**-0.56**	**-0.02**
	NDC	***0.86***	***0.87***	***-0.57***	***-0.61***
	Ss FFP	-1.50	-0.84	1.13	0.59
	PS2	**-0.64**	**0.03**	**0.56**	**-0.02**
	Total	0.00	0.07	0.00	-0.04
Change in PV of contributions		0.00	0.44	0.00	-0.29

* Figures represent differences from the contribution allocation based on WR +/-3.33%.

The effects are the same – an increase in the HR causes a decrease in contributions, while a decrease in the HR prompts an increase in contributions, but the extent of the changes is less than in the cases of 'pure' HR influence – the figures in the two columns are consistently lower than the figures in Table 8.10, whether for FFP/NDC percentages or changes in the present value of contributions. The lower WR makes the whole exercise less sensitive to changes in HR.

8.5.3. Increasing the wage rate by one percentage point (WR +/-5.3%)

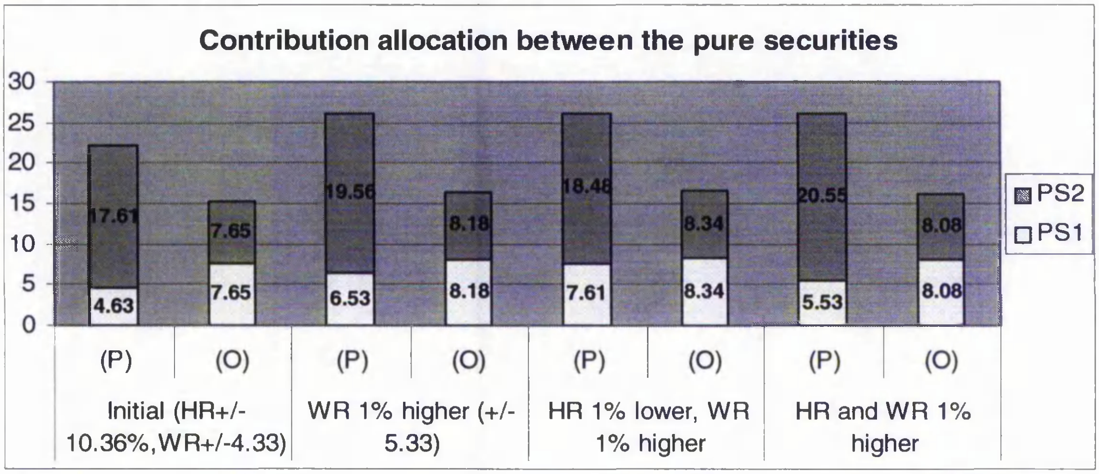
Once again, the potency of changing the WR is evident. In this case, the discount rate for S_2 changes to -4.58 percent, while the cost of investment without pure securities increases to €21,787.46 (from €18,577.49). Because of this, the target ratio for the (P) allocation becomes 9.13. In turn, the increased target ratio creates the need for higher contributions. Table 8.13 shows considerable increases in the contributions to both pillars and very large raises in the present value of contributions.

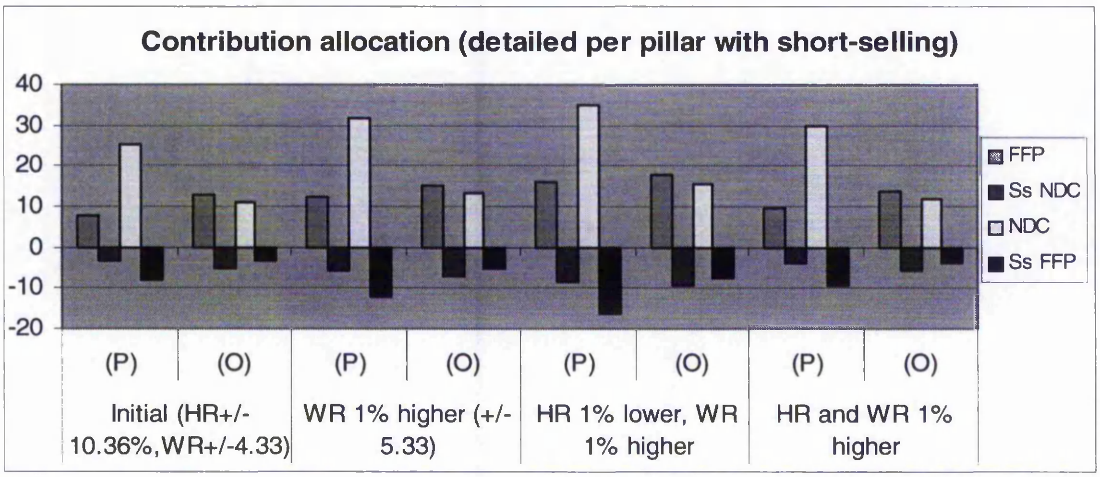
Table 8.13

		WR +1%		HR -1% & WR +1%		HR & WR +1%	
		(P)	(O)	(P)	(O)	(P)	(O)
Change in contribution rates (percentages)	***FFP***	***4.30***	***2.25***	***8.38***	***4.82***	***1.48***	***0.65***
	Ss NDC	-2.40	-1.72	-5.40	-4.13	-0.57	-0.22
	PS1	**1.90**	**0.53**	**2.98**	**0.69**	**0.90**	**0.43**
	NDC	***6.24***	***2.19***	***9.24***	***4.60***	***4.42***	***0.68***
	Ss FFP	-4.30	-1.66	-8.38	-3.91	-1.48	-0.25
	PS2	**1.95**	**0.53**	**0.87**	**0.69**	**2.94**	**0.43**
	Total	3.85	1.06	3.85	1.39	3.85	0.86
Change in PV of contributions		37.54	25.34	37.54	27.84	37.54	23.82

Note: Figures represent differences from the original contribution allocation with pure securities (HR+/-10.36%, WR+/-4.33%)

Graph 8.4





The 1 percentage point increase in WR reduces the gap between the rates of the two pillars (same as when decreasing HR). In respect to the (O) allocation, the ratio of retirement income payoff to wages increases in both states comparatively to the ratio when HR is lower (11.44 in S_1 and 3.82 in S_2 compared to 10.98 in S_1 and 3.592 in S_2). Again, although the gap between the two rates is the same as in the case of HR being 1 percentage point lower, the effect of the WR on the contribution allocation percentages is stronger. The increase in each pillar's contribution exceeds 2 percentage points whereas in the case of HR being 1 percentage point lower the increase is less than 1.5 percentage points.

The biggest changes to the contribution allocation occur when the HR is 1 percentage point lower while the WR is 1 percentage point higher. The gap between the two rates is at its lowest, and works against the model assumptions. In state S_1, it becomes much harder for the PS1 to attain the 9.13 ratio payoff and more costly to make PS2 not payoff - more has to be short-sold to match the higher performance of PS2. As a result, contribution percentages increase in both pillars.

The reduced gap also has influences on the (O) allocation. The unbalance between the two pure securities' payoffs in their respective states decreases to its minimum – 10.01 in S_1 and 4.12 in S_2. When both rates are 1 percentage point higher, the gap between them is the same as in the original conditions, but the target ratio is higher. So, contributions in both pillars increase. The increase in contribution percentage in the NDC pillar is larger than the increase in FFP contributions because, as mentioned before, the matrix matches the amounts generated by the FFP and NDC pillars within the two pure securities for both states. Because the target ratio has increased to 9.13, the FFP contribution has to increase so that PS1 pays off that ratio in state S_1. The matrix forces the same amount to be accumulated in the NDC pillar and, as WR is still lower than HR, a larger increase in contributions in NDC is needed for that to happen.

As in the case when both HR and WR are 1 percentage point lower, increasing both HR and WR maintains the gap between the two and the impact on the (O) allocation is modest (0.65 and 0.68 percentage point increases). However, the impact on the ratio of retirement income payoff to wages is stronger than in the case of both HR and WR being lower (13.33 in S_1 and 3.59 in S_2 compared to the initial 12.86 in S_1 and 3.38 in S_2 or the 12.59 in S_1 and 3.24 in S_2 for HR and WR both 1 percentage point lower). So, when both rates are higher, both the (P) allocation and the (O) allocation are positively affected, the individual is richer than initially – in both absolute terms and relative to wages.

The following table repeats the procedure for isolating the effects of changing the HR when the WR has been raised by 1 percentage point. Table 8.14 considers the initial allocation to be based on HR=+/-10.36 percent and WR=+/-5.33 percent and shows the impact on the contribution allocations when HR varies by one percentage point. Making the comparison with Table 8.10 shows that the effects of changing the HR are much stronger when the WR is higher.

Table 8.14

		HR -1% & WR +1%*		HR & WR +1%*	
		(P)	(O)	(P)	(O)
Change in contribution rates (percentages)	***FFP***	***4.08***	***2.57***	***-2.82***	***-1.60***
	Ss NDC	-3.00	-2.41	1.83	1.50
	PS1	**1.08**	**0.16**	**-1.00**	**-0.10**
	NDC	***3.00***	***2.41***	***-1.83***	***-1.51***
	Ss FFP	-4.08	-2.25	2.82	1.41
	PS2	**-1.08**	**0.16**	**1.00**	**-0.10**
	Total	0.00	0.33	0.00	-0.20
PV of future contributions		0.00	2.00	0.00	-1.21

* Figures represent differences from the contribution allocation based on WR +/-5.33%.

Once again, the effects are the same – an increase in the HR causes a decrease in contributions, while a decrease in the HR prompts an increase in contributions, but the change is larger than in the cases of 'pure' HR influence – the figures in the two columns are consistently higher than the figures in Table 8.10, whether for FFP/NDC percentages or changes in the present value of contributions. The higher WR makes the contribution allocations more sensitive to changes in HR.

8.6. Conclusions

One of the biggest problems in implementing systemic pension reform is financing the transition cost. Introducing fully funded private pension pillars diminishes the flow of contributions into the public PAYG pension which, because of the continued need to honour the promises made to older generations, a deficit is created (or increased, if already present due to the ageing process, early retirement, etc.).The larger the percentage of contribution shifted to the private pillar, the bigger the deficit. On the other hand, setting up and administrating fully funded private pillar carries costs, whose relative importance decreases as the size of the private pillar increases.

The percentage shifted to the private pillar varies widely across pension reforming countries. The feasible sizes of the funded pillars should be based on analysing both the constraints suffered by the state social insurance budget and the rates of return of both pension pillars. Using the rates of return for the second pillar already determined and employed in Chapter 6, this section applies state preference theory to create a simple method to determine the way the pension contribution should be split between the public and private pillar, under certain feasible assumptions, based on the scenario of Romania having a NDC public pillar instead of the reformed PAYG actually implemented.

The portfolio model treats the two pillars as being two securities in which people invest, the uncertainty about the future is represented as a vector of two possible payoffs at a future date, each one associated with a mutually exclusive state of nature. The choice of the two states of nature is deliberately exaggerated – in essence one 'state' implies 35 years of wage growth at 4.33 percent p.a. and investment returns at 10.36 percent p.a., while the other implies 35 years of constant recession, negative wage growth of –4.33 percent p.a. and investment returns of –10.36 percent p.a.

The underlying idea is that, by dividing the contributions in a particular way between the two pillars, the uncertainty about the future value of the pension payoffs could be reduced; the ideal portfolio would have the same total pension payoff in either state even though the payoffs of individual pillars varied over states (the private pillar would payoff in periods of growth, and the PAYG would payoff in recession). Creating such a portfolio required the creation of pure securities by adapting the method of short-selling stocks to the situation of pension pillars. Short-selling is an investing technique involving the sale of a stock that is not owned – by borrowing the security, selling it and, at a later date, buying it back and returning it (with the aim of making a profit in the process). In order to reduce uncertainty in the pension system portfolio payoff, the government could frame arrangements with an external partner following the directions of the model (an international financial institution, such as the IMF, would serve the purpose well). Since contribution payments are centrally collected, aggregating the amounts needed for following the model's instructions and creating the pure securities would be possible. The government could short-sell the rights for the future pension payoffs under the obligation of purchasing them later. The external financial institution would buy the rights for the future pension payoff and supply part of the funding needed in the beginning. Earning the estimated high rate of return in the fully funded pillar needs investment of real funds. The money coming from short-selling to the external partner would largely be invested in the fully funded pillar. Later, the government would buy back the rights to the pension payoffs, paying the different amounts corresponding to the future. In essence, the uncertainty about the future would be transferred to the external financial institution.

The study showed that, under the above assumptions, it is possible to build a portfolio of pure securities that would offer pension payoff balances at a constant ratio to the average wage in the moment of retirement no matter which of the two states occurs in the future (7.79 times the average wage under the initial conditions). Under the arrangement, the individual annual contribution rate would be 22.24 percent of the average wage, split between the fully funded and NDC pillars (4.63 percent in the fully funded and 17.61 percent in the NDC) - noticeably lower than the 30 percent contribution rate considered initially which is made with no guarantees regarding future payoffs.

The initial target of the model was preserving the value of the contributions made in the system. However, this need not be the only objective in managing future uncertainty. The model can easily be adjusted to other targets. The individual preferences can be taken in consideration - optimal portfolio allocation, assuming that the individual is in complete control of his wealth and preservation of contribution is not an issue. The individuals face the problem of deciding how much of their initial wealth to spend for consumption and what portfolio of securities to hold for the future. The overall contribution rate in this case is 15.31 percent, equally split between the two pure securities.

Even though the model makes significant assumptions, its simplicity is seductive. Better-suited parameters can easily be used for defining the two future states of nature such as one state of higher wage growth (e.g. 6 percent p.a.) versus another of lower growth (e.g. 0.5 percent p.a.). If required, additional states of nature can be added to the model. The time span can be easily modified to fit decision making agenda - e.g. only based on projections concerning the next 5 years. The exaggerated assumptions are meant to show the potency of the model – even in the most adverse conditions (S_2, the second state of nature, perpetual recession), a portfolio can be created that will preserve the value of the contributions. Even in S_2, the ratio between the value of the S_2 pension payoff and the average wage in S_2 is the same as the ratio between present value of the contributions and the average wage in the beginning. The model could represent a simple method of assessing the need to shift percentages between pillars or for anchoring specific PAYG parametric changes (e.g. applying to delayed or early retirement).

CHAPTER 9.
DISCUSSION AND CONCLUSIONS

9.1. Introduction

The present chapter ties together the arguments of this thesis. The analysis of the Romanian pension reform is finalised in the first section with the aim of highlighting its relevance for the theory of pension system reform. The next sections focus on gathering final reflections on the methodology employed by the simulations run in the thesis and on going through the practical recommendations generated. The last section concludes with a brief summary.

9.2. Final Discussion on the Romanian Case with its Implications for the Theory of Pension Reform

Romania is among the last countries in CEE to start implementing comprehensive reform, even though talks about comprehensive pension reform started to happen as early as 1992-93. As detailed in Chapter 5, Romanian's pension system legacies - coverage fragmented across multiple schemes and policies and regulations incompatible with the market economy that led to pension benefit inequities, have been the major factor delaying comprehensive reform. Its progress is in keeping with its general transition performance, as all governments, irrespective the political orientation, have shown little appetite for tough reforms, delivering only under the pressure of external institutions.[1] Hence, credibility in the government's ability and motivation to implement reform programmes has always been low.

Romania's experience in pension reform has been different from Hungary and Poland. Unlike the other CEE countries leading in pension reform, Romania had more of a staggered and disjointed pension reform (see Table 9.1). Hungary has passed pension reform as an entire single package and started implementing comprehensive reform in the public and private pensions at once. In Poland, while the full reform legislation could not be passed before the end of parliamentary term in September 1997, the new parliament shortly carried on with the reform.

[1] Since the 1989, Romania has successfully concluded only one IMF standby agreement (approved in October 2003). Previously, it had failed five IMF agreements.

Table 9.1 Timeline of pension reform in Hungary, Poland and Romania

	Hungary	**Poland - stage 1**	**Poland - stage 2**	**Romania - stage 1** public pensions	**Romania - stage 2** private pension funds	**Romania - stage 3** optional pension funds	**Romania - stage 2** private pension funds
1. Government takes official action to begin planning reform	June 1995	Dec. 1994		May 1999			
2. Reform laws submitted to parliament	May 1997	June 1997	May 1998	Dec. 1999		Dec. 2003	Sept. 2004
3. Parliament passes reform laws	July 1997	Aug. 1997	Dec. 1998	April 2000	Nov. 2000*	June 2004	Oct 2004
4.Reform implemented	Jan. 1998		Jan. 1999	April 2001		July 2006	2007

Source: Orenstein (2000) and M.L.S.S.

* The Law on universal pension funds was passed by urgent governmental ordinance (OUG no. 230/2000)

The political economy hypotheses, presented in Chapter 2 and discussed in Chapter 4 in the context of the CEECs pension reforms, are relevant to the Romanian pension reform as well, but there are differences. Unlike in Hungary and Poland, where reform proposals came from the Ministry of Finance, in Romania, reform was initiated by the Ministry of Labour and Social Solidarity. While in Hungary and Poland, trade unions have been, respectively, in opposition and in support of the reform, in Romania, they have played only a minor role (but have mostly supported the reform and only occasionally intervened in order to obtain positions in the monitoring of the system).

Regarding the first pillar (public pensions), opposition to parametric reforms came mostly from pensioner associations. In overcoming this opposition, the government used many of the strategies employed by the other pension-reforming countries. First, the public opinion was alerted to the fact that the public pensions were in a crisis situation. Second, various requirements of the IMF and World Bank and the larger EU accession reform process were used to push through the reform. Third, the government has highly advertised the positive features of the reform (such as lower contribution rates, elimination of pension benefit inequities, partial linking of benefits to the national average wage), while playing down the negative ones (higher retirement ages, longer required contribution periods). In order soften opposition from workers approaching retirement, the reform specified an incremental introduction of higher retirement ages and longer contribution periods.

Privatisation of the pensions system has never been a major point of debate between parties before elections. Relevant political promises have focused mostly on ensuring voters of future increases in public pensions' replacement rates and purchasing power. In Romania, the first law on private pension funds was rushed through as a government ordinance by the centre-right coalition government,[2] without a consistent Parliamentary debate, at the end of their mandate in 2000. The new centre-left government[3] formed after the 2000 elections annulled all previous private pensions initiatives and only revisited private pensions in 2004, at the end of their mandate. Reticence against investment funds (the National Investment Fund scandal, see Chapter 6), and transition costs fears had given the PDSR government little motivation in adopting private pensions schemes. Legislation and implementation of the two private pension pillars has been gradually pushed back. Officially, the PDSR government was very supportive of the third, voluntary pillar, seeing it as enhancing participatory labour contracts, being instrumental in increasing savings and improving productivity. In reality, its implementation and development was held back for fiscal reasons.[4] Also, as mentioned in chapter 5, compared to the initial proposals on the mandatory private pillar, the 2004 law on mandatory private pension funds further restricted the scope of the second pillar. The 2004 elections saw the return to power of the centre-right opposition[5] but little changed in the attitude towards private pensions. Initially supposed to become operational in 2005, the private pension pillars have seen

[2] The first centre-right government of the transition period, created from the Democratic Convention – an electoral alliance of PNTCD (National Peasant Party Christian Democrat), PNL (National Liberal Party), PNL-CD (National Liberal Party - Democratic Convention) + PAR (The Alternative of Romania Party) + PER (Ecologist Party of Romania) + FER (Romanian Ecologist Federation).
[3] Coalition government formed by P.D.S.R.(Democratic-Social Pole of Romania) and UDMR (Democratic Union of Hungarians in Romania).
[4] The Law on optional occupational pension funds was passed in June 2004, but, technically, the third pillar had already been active since 2000, in the form of voluntary private life and pension insurance companies (regulated by Law no. 32/2000). It is important to notice that, on paper, private insurance contributions were allowed a tax exemption - same tax exemption as the one currently applying for optional occupational pensions contributions: contributions and benefit rights exempt from tax up to the sum of 200 euro per year. However, the tax exemption was never applied because of state budget deficit considerations.
[5] Coalition government formed by PNL (National Liberal Party), PD (Democratic Party), UDMR (Democratic Union of Hungarians in Romania) and PUR (Humanist Party).

their implementation pushed further back (Table 9.1), although their coverage has been subsequently extended.[6]

In the cases of Hungary and Poland, the government has been the main proponent of privatisation and the reform solution gradually became diluted because of strong opposition and subsequent negotiations. On the contrary, in Romania, apart from the initial reform regulations of the year 2000, the governments' drive for privatisation has been overridden by their desire to contain the forecasted deficits public pension scheme. Chapter 5 has already stated that the biggest problem with Romania's reform has been identifying potential sources to finance the transition deficit. A recent estimate of the transition deficit amounted to 1.5 billion euro for the first 5 years of private pensions pillar implementation (Jurnalul National, 2005). Thus, pension system's policy legacies, in the form of high implicit pension debt, have been the major factor influencing the shape of the private pension pillar. Consequently, Romanian governments have been pushing for very limited private pension pillars, while the opposition came mainly from actors in financial markets (mostly insurance companies) who were protesting half-measured reforms (contrary to the Hungarian or Polish experiences discussed in Chapter 4). So, in Romania, the limited role of the envisaged private pension pillar in the multipillar system is not based on political negotiations and tradeoffs, but is the result of the country being 'credit starved' and unattractive for foreign investment (see Chapter 5).

The first major role in the viability of private pensions was played by the improvement in the country's international ratings. Despite its low levels of public debt,[7] Romania has been disadvantaged by poor credit ratings. Since the beginning of transition, 2004 was the first year in which macroeconomic performance (high growth, decreasing inflation) and improvements in the business environment (such as stronger financial discipline) have prompted international rating agencies to include Romania in the "low investment risk" category.[8] Since 2004, Romanian government bonds have been 'investment grade' with fixed interest around 4.5 percent for 15 years (compared to around 11.5 percent fixed for 5 years back in 2000). This is one of

[6] Once it started considering introducing a lower flat tax rate in 2005, the current government scrapped the tax exemptions on private insurance contributions for all individuals except the self-employed.
[7] Around 30 percent of GDP and decreasing calculated with data from the National Bank of Romania Annual Reports.
[8] Fitch Ratings changed the qualifications from BB to BBB- for long term-debt in foreign currency, from BB+ to BBB for long-term debt in Romanian currency and from B to F3 for short-term debt in foreign currency. (http://www.fitchratings.com)

the major lessons from the Romanian pension reform. A second instrumental influence on financing the transition deficit has been the World Bank, who agreed to help with loans and expertise. A third important source of deficit finance appeared once Romania concluded negotiations for accession to the EU. As part of the accession process, funds will become available in meeting the requirements of the acquis communautaire, which would allow part of the sum to be allocated towards the private pension system.[9]

However, the Romanian government's programme for the mandate of 2005-08 (Romanian Government, 2004) poses potential problems for the social security system. The government aims to steadily reduce the social contribution rate within a larger effort to reduce the level of taxation in the economy (a move towards a flat tax rate). The government's predictions are that tax revenues will increase on account of a higher tax base (a diminishing shadow economy), higher company profits and sales figures. At the same time the government commits to increased social security expenditures – increased pension benefits (up to 30 percent in real terms staggered over the mandate), provision of a minimum social pension, extended non-contributory health services. All this change is in the context of promoting the independence of the state social insurance budget from the central budget. The hopes of the policy-makers are put on the higher social contribution and tax compliance induced, the private pillars expected to generate higher economic growth, the recovery of arrears and the execution of debtors.[10]

Among the conclusions of this thesis is that these hopes might be misplaced. The Programme's objectives will make covering the PAYG deficit even harder. First, contributions will continue to be evaded, especially because contributions in the first pillar will still be perceived as taxes (see Chapter 1 and Chapter 7). As mentioned in Chapter 4, this is corroborated by the evidence from other pension reforming countries. Second, this thesis has highlighted the substantial reservations - theoretical and case-proven – over the link between pension system privatisation, savings and economic growth (see Chapter 1). Third, the government's commitment to the recovery of arrears cannot be depended on – regardless of their political colour, all post-1989 governments have been found guilty of weaknesses and favouritisms in their dealings with big debtor companies, which are largely state owned. Time and

[9] Funds in the sum of 7 billion euro, available from 2009 (Jurnalul National, 2005).
[10] Total arrears amount up to 22 billion euro (39 percent of GDP) (Capital, 2004b).

again, the governments have written-off the arrears, giving the companies a clean slate; however, in the absence of restructuring, the debts quickly recurred.[11]

9.3. Conclusions on Methodology

The simulations run in this thesis based on the case of Romania, have sought to investigate the feasibility of multipillar reform strategy, the choice of a NDC framework for the public pensions pillar, and the size of pension contributions and of the private pensions pillar.

The multipillar reform involves putting together a pension system portfolio of public unfunded and private fully-funded pensions with the aim of diversifying risk. The strategy is centred on the idea that the returns of the portfolio assets - the pension pillars, are negatively correlated. Testing the existence of this relationship in the case of Romania has significant limitations, which have already been discussed in Chapter 6. Implementing changes such as introducing pension fund administration costs would probably drastically reduce the evidence of negative correlation. On the contrary, relaxing the regulations on investment limits (especially the ones regarding foreign assets) would enhance the correlation.

The NDC as the scheme of choice for the public PAYG pensions pillar has been analysed in Chapter 7. The simulations have focused on the comparison between the NDC-PAYG scheme and the pension-point–reformed PAYG (R-PAYG) scheme in an OLG framework. The simulations have essentially compared the effects of the different 'accrual' methods of pension contributions involved, assuming the same wage growth based on the Aaron-Samuelson condition. Several stylized economy scenarios have provided support for NDC schemes. Applying the basic simulation formulae to the Romanian data has also provided support for NDC, though a large number of assumptions were made. The simulation was based on population and not labour force data and, so, does not consider contribution evasion, informal economy and unemployment. As a result, the findings have only a limited practical relevance. A more thorough investigation within the framework of generational accounting

[11] For example, the latest write-off exercise worth billions of euro occurred in December 2005 involving a railways company, several mining companies and a utilities company. The electricity company alone has been written-off 1.2 billion euro in addition to the 500 million euro already written-off in the last five years. (Capital, 2005)

would provide a more stable grounding for the comparison of the two alternative PAYG schemes.

The last chapter of the thesis has addressed the issue of determining the size of the private pension pillar in the new multipillar pension system by adopting a portfolio investment approach. The size of the private pillar was judged using the percentage of pension contribution 'invested' in the private pillar as a proxy. In terms of method, a choice had to be made between state-preference theory and mean-variance portfolio theory. The simulations run in Chapter 8 have employed the Arrow-Debreu state preference model whose appeal rested on its theoretical consistency with the problem of inter-temporal consumption optimisation (consumption smoothing), as shown in Chapter 1, and on the ease with which the analysis could be shifted between the individual and the market. The model's practical application has many limitations such as assuming complete markets and requiring a set of mutually exclusive and exhaustive states of nature with given probabilities of occurrence. However, the model with two securities and one future period initially appeared to lend itself well to the multipillar pension puzzle. Pension contributions are invested in two securities (the public and private pension pillars), there is one future period (the retirement of individuals, when the pension 'payoffs' are received) and the aim is to reduce uncertainty (prevent benefit losses – the pension benefits ought to be at least equal to the value of contributions made).

One advantage of the Arrow-Debreu model, which also acts a limitation of the model, is that it bases uncertainty on the occurrence of various mutually exclusive states of nature. The model needs as input the probability of each state of nature occurring - the simulation run in Chapter 8 assumed equal probabilities of occurrence for the two states of nature that were defined as 'economic growth' and 'recession'. In this respect, the model is flexible as the probabilities can be easily changed to reflect different forecasts. As the probabilities have to be exogenously determined, a solution could come from bringing in information markets,[12] which could be used to estimate the likelihood of states of nature such as 'growth' and 'recession'.

Related to the issue of 'states of nature', applying the model in the context of pension system investment has another limitation: the simulations used ex-post data with relationships assumed unchanged for the entire investment period – i.e. states of

[12] The potential of information or prediction markets is discussed in studies such as Wolfers and Zitzewitz (2004) and Hahn and Tetlock (2004).

nature with 35 years with fixed rates of wage growth and investment returns. However, the states of nature and time span characteristics could be changed to fit current forecasts and policy making agendas, although there are questions regarding the Arrow-Debreu model's applicability in multi-period markets.

Application of the model to the situation of pensions poses further problems – the issue of pure securities. A framework would have to be arranged (by government and with international participation), the nature of which needs further research. Even though the simulations give an indication of how the pension contributions could be split between pure securities, there is a conflict between this recommendation and the freedom of choice that individuals have when investing within the private pillar (choice of pension society, investment profile etc.). In this respect, the implications of the simulations could be verified and improved by employing the Capital Asset Pricing Model, which focuses on measuring portfolio risk and estimating expected portfolio returns associated with risk. Thus, an efficient set of portfolios could be found that combines a 'risk-free' asset (the public pension pillar) and a 'risky' market portfolio (a private pension pillar portfolio, potentially similar to the ones used to generate the HR in Chapter 6).

The simulations did not reveal anything new regarding the state preference theoretical framework. Nevertheless, the overall findings have been rewarding and have justified the choice of model for the simulations. Even though the creation of pure securities is debatable, recommendations for the division of pension contributions between private and public pension pillars are possible under various scenarios that could act as benchmarks in policy making. There are also theoretical implications. The simulations pointed out that, if pure securities could be created, a government-run pension scheme would be able to minimise investment risk and reach an optimal contribution allocation. On the one hand, this comes in support of the theoretical arguments presented in Chapter 1 regarding the benefits of government-run universal pension programmes, which are able pool risk and minimise transaction costs. On the other, it highlights the importance of the existence of a private pension pillar. As already mentioned, further investigation is needed into the role of the government in the simulations and the implications for the pension reform strategies involving privatisation.

9.4. Final Recommendations for the Romanian Pension Reform

9.4.1 Conclusions on the first pillar

As Chapter 3 and Chapter 5 have shown, the old Romanian pension system had serious structural problems, some which have not yet been improved by reform. The system featured extreme dependency rates caused by the extension of pension coverage to include the agricultural sector workers, and high unemployment and contribution evasion rates. Also, Romania is a special case among the CEECs due to its exceptionally low replacement rate. Given the structural problems in the old Romanian pension system, it can be argued that the implemented form of parametrically reformed PAYG is suitable for Romania at the present stage. It features a strong benefit-contributions link, ensures a balanced social insurance budget and reduces pension inequities – a big problem in the Romanian pension system.

However, based on the analysis of Chapter 7 and Chapter 8, this thesis argues the shortcomings of the R-PAYG compared to an NDC-PAYG, especially regarding actuarial fairness. Despite its limitations,[13] the OLG simulation of a NDC pillar stresses the higher, fairer and more stable replacement rates offered by the NDC, which are important for Romania, especially in light of its low replacement rate. The reform in the first pillar does not eliminate evasion. Under the R-PAYG pillar, the still large contributions remain seen as a tax and not as an insurance premium. On one hand, taxes reduce income, meaning more work is needed to preserve a given level of consumption. On the other hand, taxes impose a penalty on work, reducing the marginal value of labour. Either way, individuals will make an effort to keep their earnings outside the formal economy. They will continue evading the contributions just like they do the regular taxes. The NDC structure would help diminish the scope of contribution evasion further than the pension points system implemented. The results of the demographic simulation reiterate the arguments of intergenerational fairness and government accountability under a NDC. The recommendation is that on the stable basis provided by the R–PAYG, Romania implements an NDC pillar in the future.

[13] The fact that the NDC OLG simulation was subject to major assumptions has important implications as, given Romania's evasion and unemployment problems, the real worker cohort numbers are much lower. As mentioned in Chapter 5, in 2000, while the active population was 11.5 million and registered unemployment was 1 million, there were only 4.5 million contributors and 6 million pensioners – 1.33 employees needed to support 1 pensioner.

9.4.2. Conclusions on the second pillar

As argued in Chapter 6, Romania needs to devote significant resources to the development of its financial sector. People's trust in pension reform and private institutional investors need to be consolidated and the financial markets need strengthening in terms ore regulations, capital and personnel skills. As highlighted in Chapter 2, the latter will be a major problem in introducing the private pension pillar. For example in 2004 there were only two licensed actuaries[14] in Romania. Obtaining the qualification of actuary requires relevant work experience and can take up to 6 years. Further, studies completed at Romanian schools (Faculty of Cybernetics and Faculty of Mathematics) are not recognised as sufficient for practicing in the European Union. However, this sort of problems is, by no means, limited to Romania – Hungary, Poland and Bulgaria are in similar situations.

The regulations for the Romanian second pillar are typical of the pillars introduced in the cases review in Chapter 4. The major difference between Romania and the other CEECs rests on the size of the second pillar. As discussed above, the large transition costs expected have been the main factor in choosing for the contribution percentage to be small at the beginning, with the prospect of gradual increase. However, the restrictions in the size of the second pillar (too low a contribution rate and few participants) could deter financial companies from getting involved in mandatory private pension fund management on profitability grounds (the fees charged might not be enough to cover asset management activities), especially in the presence of relatively high statutory capital requirements. As mentioned above, unlike the other CEECs, Romania will largely finance the deficit with debt.

The Romanian regulation on private pensions sets pension fund investment portfolio limits similar to the other pension reforming countries. However, it overlooks providing any information regarding investment in products with different degrees of risk. As mentioned in Chapter 4 this is not atypical - few reforming countries have allowed pension funds to tailor investment products based on the risk profile of their members. Also, the portfolio limits will have to take into consideration Romania's future accession to the European Union, which will cancel the implied discrimination between domestic and European securities.

[14] Responsible for calculating the costs related to assuming a risk, the premiums that ought to be imposed on life insurance policies, and the sums an insurance company ought to pay when a certain risk becomes a reality. The job requires knowledge not only of mathematics but probabilities, economics, finance, accounting and legislation.

Another major difference between Romania and the other CEECs, concerns the minimum rate of return requirement. Whereas, other countries have expressly linked the individual pension fund performance to the average performance of all the funds, in Romania, the minimum rate of return is set by the supervisory agency. The regulations are vague - an average rate of return for all the pension funds will be calculated but there are no details on how this will be used in determining the minimum rate required. However, there is still a lot of time until implementation and additional regulations and clarifications on this are sure to be added.

Similar to the other CEECs, in Romania, the present regulations stipulate, without elaboration, mandatory annuity purchases. As mentioned in Chapter 4, the issue has so far been completely disregarded in Romanian pension reform debate, arguably because the active role in discussions rests with financial market actors and the government (who have a major interest in this feature see chapter 2) while individuals suffer from myopia and poor financial education. Regarding the administration of the second pillar, Romania has opted for the centralised collection of contributions and, like the other CEECs, has imposed ceilings on administration fees. Given the fact that the financial market actors are already complaining about size of the second pillar, it is almost certain that the fears highlighted in Chapter 4 will be realised – the ceilings will become the de facto fee level.

However, the analysis in Chapter 6 has shown that, even within the limited regulations envisaged so far, the rates of return in the second pillar will be sufficiently high to warrant the diversification of the Romanian pension system based on the World Bank model. Further, regarding the recurring issue of the second pillar's size, the thesis has experimented with determining the appropriate size of the mandatory fully funded pillar. The simulations in Chapter 8 have shown that, subject to various rates of return, larger second pillar sizes are advisable. The model devised in Chapter 8 has also shown the advantage of pursuing a multipillar reform strategy, maintaining a mandatory public pillar, and that, by dividing the contributions in a particular way between the public and the private pillars, uncertainty about the future value of the pension benefits could be reduced.

9.5. Final Summary

This thesis is an attempt at theoretically expanding the boundaries of knowledge on pension reform. The thesis has expressly contributed to the literature on the Romanian pension reform and has prompted the need for further study into issues with major implications for the theoretical framework of pension reform such as multipillar reform strategies, high implicit pension debt, access to international capital markets, NDC schemes, size of the private fully-funded pillars.

The thesis has brought further evidence supporting the view that the World Bank's multipillar pension reform model, by diversifying risk, is suitable to be adopted in countries with high implicit debts, even in the presence of underdeveloped financial markets. At the same time, it has confirmed many of the criticisms and worries identified in the literature on pension reform regarding the introduction of private pillars. In particular, it has stressed the paramount importance of high public pension system implicit debt and the role of access to international capital markets in debt-financing the transition costs. Further, its simulations have brought additional support for the NDC scheme as a promoter of intra- and inter-generational actuarial fairness, while emphasising the shortcomings of the public schemes reformed along the lines of the 'German point system'.

Regarding the political economy of pension reform, the Romanian experience has confirmed several hypotheses and has brought new issues into the debate. It has underlined the fact that, although some common strategies and outcomes can be identified, pension reform remains a country-specific process. The Romanian case is illustrative of how long pension reform commitment building can take, given crippling policy legacies and governments unwilling to undergo reform.

The models designed, while limited, could easily become important planning tools for policy-makers, helping simulate rates of return and sizes for private pillars. The models could be used for the periodical monitoring of the pension system, highlighting the need for corrective measures such as shifting contribution percentages between pillars or for anchoring specific PAYG parametric changes. Further, the models in this thesis could be a starting point in the analysis of the potential fiscal, economic and distributional effects of private pension pillars introduction, especially since the impact of private pension pillars cannot be easily tested before their actual implementation. Thus, with further improvements, they could help the design and management of multipillar pension systems.

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Table A1. Projections for life expectancy at birth

	2000-05	2005-10	2010-15	2015-20	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50
Bulgaria	71.6	72.8	73.9	75.0	75.6	76.3	76.9	77.6	78.3	79.1
Czech Republic	75.0	76.1	77.1	78.1	78.6	79.2	79.8	80.4	81.1	81.7
Hungary	71.8	72.9	74.2	75.3	76.0	76.8	77.5	78.3	79.1	80.0
Poland	73.7	74.7	75.9	76.9	77.5	78.1	78.7	79.4	80.1	80.7
Romania	69.9	71.3	72.6	73.8	74.5	75.2	75.9	76.7	77.4	78.3
Slovakia	73.1	74.1	75.0	75.9	76.5	77.2	77.9	78.7	79.5	80.3
Slovenia	75.9	77.1	78.2	79.1	79.6	80.2	80.7	81.2	81.8	82.3
Selected CEECs	**72.6**	**73.8**	**74.9**	**76.0**	**76.6**	**77.3**	**77.9**	**78.7**	**79.4**	**80.1**
E.U. 15	**77.6**	**78.3**	**79.0**	**79.6**	**80.0**	**80.5**	**80.9**	**81.4**	**81.9**	**82.3**

Source: World Bank (2004) projections (Health, Nutrition, and Population Statistics, http://devdata.worldbank.org/hnpstats/) and author's calculations.
Note: the CEECs and EU averages have been calculated as weighted averages using data from the above-mentioned sources.

Table A2. Projections for the proportion of population aged 65 and over

	2000	2010	2020	2030	2040	2050
Bulgaria	13.99	14.34	17.17	19.28	22.25	26.25
Czech Republic	10.88	12.76	18.51	20.88	24.23	28.38
Hungary	11.32	12.15	15.79	17.31	20.21	23.66
Poland	9.49	9.84	14.21	17.85	19.10	23.47
Romania	11.04	11.36	13.53	15.34	19.58	22.94
Slovakia	8.83	9.36	13.28	16.77	19.13	23.41
Slovenia	10.43	13.28	18.27	22.91	25.48	28.41
Selected CEECs	**10.85**	**11.87**	**15.82**	**18.62**	**21.43**	**25.22**
E.U. 15	**13.03**	**14.69**	**18.04**	**21.91**	**24.69**	**24.89**

Source: World Bank (2004) projections (Health, Nutrition, and Population Statistics, http://devdata.worldbank.org/hnpstats/) and author's calculations.

Table A3. Demographic indicators for CEECs

			Bulgaria	Czech Republic	Hungary	Poland	Romania	Slovakia	Slovenia	E.U.15
Natural increase		**1980**	3.4	1.8	0.3	9.6	7.5	8.9	5.8	**2.5**
		1999	-4.8	-2.0	-4.8	0.0	-1.4	0.7	-0.7	**0.7**
		2000	-5.1	-1.8	-3.8	0.3	-0.9	0.4	-0.2	**1.0**
Crude birth rate	**(per 1000)**	**1980**	14.5	14.9	13.9	19.6	18.0	19.1	15.7	**13.0**
		1999	8.8	8.7	9.4	9.9	10.4	10.4	8.8	**10.6**
		2000	9.9	8.8	9.7	9.8	10.4	10.2	9.1	**10.7**
Fertility rate	**(per woman)**	**1980**	2.1	2.1	1.9	2.3	2.5	2.3	2.1	**1.8**
		1999	1.23	1.13	1.29	1.37	1.30	1.31	1.21	**1.45**
		2000	1.25	1.14	1.33	1.34	1.30	1.20	1.25	**1.53**
Crude death rate	**(per 1000)**	**1980**	11.1	13.1	13.6	9.9	10.4	10.1	9.9	**10.5**
		1999	13.6	10.7	14.2	9.9	11.8	9.7	9.5	**9.9**
		2000	14.1	10.6	13.5	9.5	11.4	9.8	9.3	**9.7**
Life expectancy at birth	**M**	**1980**	68.7	66.7	65.5	66.9	66.5	66.8	67.4	**70.5**
		2000	67.6	71.7	67.1	69.7	67.0	69.2	71.3	**74.9**
	F	**1980**	74.0	73.9	72.7	75.4	71.8	74.3	75.2	**77.2**
		2000	74.6	78.4	75.6	78.0	74.2	77.2	78.8	**81.2**

Source: Eurostat, Council of Europe – Statistics in focus, Population and social conditions, Theme 3 – 15/2001, KS-NK-01-015-EN-1

Table A4. Projections for old-age dependency rate in the CEECs (%)

	2000	2010	2020	2030	2040	2050
Bulgaria	46.5	41.8	48.9	56.6	68.4	82.1
Croatia	46.9	46.8	53.9	62.7	69.0	77.2
Czech Rep	43.3	40.6	51.3	59.1	71.3	86.1
Hungary	46.0	43.3	50.2	56.8	66.3	77.4
Poland	45.8	40.0	48.7	57.4	62.6	75.9
Romania	45.6	40.7	44.3	49.7	63.4	74.6
Slovakia	45.1	38.6	45.2	54.3	62.2	75.3
Slovenia	42.7	42.5	50.1	64.3	76.5	88.4

Source: World Bank projections (Health, Nutrition, and Population Statistics, http://devdata.worldbank.org/hnpstats/) and author's calculations.
Note: the World Bank definition for old-age dependency rate is the ration between the number of people over 60 years and the number of people with ages 20-59.

Table A5. Selected indices, billion ROL, current prices, unless otherwise indicated

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
State budget expenditure	537.87	1626.97	4128.78	10930.32	15858.01	23732.00	52896.59	77616.58	106886.66	149167.82	194422.20	237832.15
State budget balance	-41.10	-263.08	-521.19	-2070.20	-2969.72	-5359.20	-9062.07	-10401.04	-13646.85	28825.58	-41305.80	-59410.10
Social insurance expenditure	155.07	404.34	1174.73	2760.68	4090.45	6096.92	13221.91	26539.40	39170.77	55626.92	83590.70	113357.06
Social insurance budget balance	9.00	64.13	140.39	51.28	-165.08	-186.76	-57.73	-3207.41	-1234.30	-4610.53	-114.20	995.70
GDP	2203.90	6029.20	20035.70	49773.20	72135.50	108919.60	252925.70	371193.80	545730.20	800308.10	1145126.40	1512256.60
Social insurance budget balance (% in GDP)	0.41	1.06	0.70	0.10	-0.23	-0.17	-0.02	-0.86	-0.23	-0.58	-0.01	0.07
Consumer Price Index (1991=100)		310.40	1105.33	2616.33	3461.40	4804.42	12241.67	19476.50	28396.73	41374.04	53207.02	65178.59

Source: N.I.S. (2001) and N.I.S. (2000)

Table A6. Selected indices, in 1991 real terms (billion ROL)

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
GDP		2203.90	1942.40	1812.64	1902.41	2084.00	2267.07	2066.10	1905.85	1921.81	1934.32	2152.21	2320.17
State Budget	Expenditure	537.87	524.15	373.53	417.77	458.14	493.96	432.10	398.51	376.40	360.53	365.41	364.89
	Balance	-41.10	-84.76	-47.15	-79.13	-85.80	-111.55	-74.03	-53.40	-48.06	-69.67	-77.63	-91.15
Social Insurance Budget	Expenditure	155.07	130.27	106.28	105.52	118.17	126.90	108.01	136.26	137.94	134.45	157.10	173.92
	Balance	9.00	20.66	12.70	1.96	-4.77	-3.89	-0.47	-16.47	-4.35	-11.14	-0.21	1.53
Number of pensioners (million)		3.02	3.20	3.25	3.44	3.60	3.74	3.88	5.70	5.89	6.11	6.37	6.33

Source: N.I.S. (2001) and author's calculations.

Table A7. Replacement rate (million ROL)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Avg. real monthly pension	1.60	1.24	1.04	0.91	0.87	0.94	0.98	0.79	0.76	0.90	0.84	0.91	0.93
Avg. real monthly net wage	3.38	2.76	2.40	2.00	2.01	2.26	2.47	1.91	1.98	1.98	1.91	2.12	2.20
Replacement rate	47.38	45.00	43.49	45.35	43.23	41.68	39.49	41.13	38.42	45.23	43.81	42.74	42.12
Average monthly pension	1.60	3.36	8.76	27079	61370	88108	126842	259947	400489	688789	937170	1305121	1634945
Average monthly net wage	3.38	7.46	2.014	5.97	141.95	211.37	321.17	632.09	1042.27	1522.88	2139138	3053598	3881178
Cons. Price Index (1990=100)		270.0	838.8	2987.0	7071.9	9353.4	12983.4	33076.9	52624.2	76728.0	111792.7	143765.4	176112.6

Source: N.I.S. (2001) and author's calculations.

Table A8. Annual percentage changes in average monthly pension and net wage (%)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Change in average pension	-22.39	-16.01	-13.18	-4.28	8.55	3.71	-19.56	-3.16	17.96	-6.62	8.29	2.26
Change in average net wage	-18.28	-13.10	-16.74	0.40	12.58	9.46	-22.75	3.64	0.21	-3.59	11.00	3.76

Source: Author's calculations based on TableA7.

Table A9. Evolution of state social insurance budget (billion ROL, real values based on 1990)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Revenue	53.27	60.77	55.85	44.03	39.76	41.97	45.52	39.80	44.34	49.44	45.63
Expenditure	59.58	57.43	48.21	39.33	39.04	43.73	46.96	39.97	50.43	51.05	49.76
Balance	***-6.31***	***3.34***	***7.65***	***4.70***	***0.73***	***-1.76***	***-1.44***	***-0.18***	***-6.09***	***-1.61***	***-4.12***
Social insurance contributions	53.16	60.71	55.72	43.22	38.71	41.28	42.97	34.02	38.63	42.41	42.01
Revenue from other sources*	0.11	0.06	0.13	0.81	1.05	0.78	2.55	5.77	5.71	7.04	3.62
State social insurance pensions	-	-	-	34.90	34.80	39.23	42.73	35.26	41.69	43.15	42.10
Social insurance pensions for farmers	-	-	-	-	-	-	-	-	4.09	3.82	3.55
Fund administration costs	-	-	-	0.85	0.89	0.97	1.06	0.85	1.14	0.68	0.75
Other social insurance related expenditures†				3.58	3.34	3.53	3.17	3.86	3.51	3.41	3.36

Source: Ministry of Labour and Social Solidarity (M.L.S.S.) statistics, N.I.S (2000) (for the Consumer Price Index) and author's calculations.
* contributions for treatment and rest ("watering cure and rest") and state budget subsidies, the biggest other-source revenue since 1997
† including temporary disablement benefits, maternity allowance, paid leave for child care, social assistance for demise and prosthesis, treatment and rest, health insurance quota for people during medical leave and interest due to the state treasury.

Table A10. Inflows of FDI (million $)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total
Bulgaria	4	56	42	40	105	90	109	505	537	819	975	3282
Czech Republic	132	513	1004	654	869	2562	1428	1300	3718	6324	4595	23099
Hungary	311	1459	1471	2339	1146	4453	2275	2173	2036	1970	1957	21590
Poland	10	117	284	580	542	1132	2768	3077	5129	6471	9461	29571
Romania		40	77	94	341	419	263	1215	2031	1041	998	6519
Slovakia	18	82	100	168	250	202	330	161	508	330	2075	4224
Slovenia	4	65	111	113	128	177	194	375	248	181	181	1777

Source: United Nations, 2003

Table A11. Evolution of privatisation funds

	1993	1994	1995	1996	1997	1998	1999	2000
Privatised capital	44.63	348.5	1840	1337	2166	4103	6784	6290.1
State budget balance	-521.19	-2070.20	-2969.72	-5359.20	-9062.07	-10401.04	-13646.85	-28825.58

Source: Romanian Authority for Privatization and Management of State Ownership – 2002 Report

Table A12. Evolution of replacement rates in Romania

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001*
Average Total Pension	44.7	45.1	43.6	45.2	42.6	40	38.5	40	36.2	34.9	34.3	36.2
Old age, full length of service	***60.8***	***53.2***	***53.7***	***56.2***	***54***	***50.5***	***48.6***	***50.8***	***46.2***	***46.2***	***45.1***	***47.4***
Old age, incomplete length of service	*35.1*	*39.2*	*36.3*	*38.5*	*35.2*	*32.7*	*31.2*	*31.8*	*27.9*	*25.2*	*25*	*26.1*
Disability, 1st degree	*52.8*	*51.5*	*49.2*	*50.6*	*46.2*	*42.5*	*40.6*	*41.9*	*37.2*	*34*	*34.9*	*38.6*
Disability, 2nd degree	*39.5*	*39.5*	*38.1*	*40*	*36.5*	*34*	*32.4*	*33.2*	*29.5*	*26.9*	*26.6*	*29.4*
Disability, 3rd degree	*23.6*	*33.8*	*28.6*	*29.4*	*26.5*	*24.6*	*23.4*	*23.6*	*21*	*19.1*	*17.9*	*18.2*
Survivor	*23.4*	*31.6*	*28.5*	*27.3*	*25.4*	*24.6*	*24.2*	*25.1*	*21.9*	*19.7*	*17.8*	*18.2*
Supplementary	5.9	3	3.6	5.2	5.9	6.9	6.1	5.9	5.5	5.4	5.1	4.9

Source: Ministry of Labour and Social Solidarity statistics.

* provisional data

Table A13. Inequity between sexes at retirement - Romania

	Men	Women
Life expectancy (2000)	67.0	74.2
Minimum retirement age limit allowed (with full contribution period)		
Work in special conditions	50 (20 /25years)	45 (20/25 years)
Work in normal conditions	65 (35 years)	60 (30 years)

Source: N.I.S (2001) and Law no. 19/2000.

Table A14. Investment Limits per instrument (as a function of the Value of the Fund)

INSTRUMENT	MAXIMUM LIMITS PER TYPE OF FUND				
	FUND A	FUND B	FUND C	FUND D	FUND E
1. Securities issued or guaranteed by the State of Chile.	40%	40%	50%	70%	80%
2. Time deposits, bonds and other securities representing deposits issued by financial institutions.	40%	40%	50%	70%	80%
3. Securities guaranteed by financial institutions.	40%	40%	50%	70%	80%
4. Letters of credit issued by financial institutions.	40%	40%	50%	60%	70%
5. Bonds of public and private companies.	30%	30%	40%	50%	60%
6. Convertible bonds of public and private companies.	30%	30%	10%	5%	---
7. Open corporation shares.	60%	50%	30%	15%	---
8. Shares of open real estate corporations.	60%	50%	30%	15%	---
9. Investment fund and mutual fund shares.	40%	30%	20%	10%	---
10. Commercial Paper issued by public and private companies.	10%	10%	10%	20%	30%
11. Foreign securities*	The sum of the investment of the types of Funds belonging to a single Administrator in foreign securities, plus the amount of investment made abroad through domestic mutual and investment funds, has as a maximum limit of 30%.				
12. Other authorised public offering instruments**	Between 1 and 5 percent of the value of the respective Fund.				
13. Investments in foreign currency without exchange hedging	40%	25%	20%	15%	10%
14. Operations or contracts aimed at the loan or mutuum of financial instruments of local issuers, calculated as a function of the financial instruments loaned	15%	10%	5%	5%	5%
15. Time deposits, bonds and other securities representing deposits issued by financial institutions, and securities guaranteed by financial institutions.	40%	40%	50%	70%	80%
16. Bonds of public and private companies and bonds of public and private companies which are convertible for shares	30%	30%	40%	50%	---
17. Shares of open corporations and shares of open real estate corporations	60%	50%	30%	15%	---

Source: SAFP (2004)

* 11. Credit securities or negotiable instruments issued or guaranteed by foreign states, central banks or foreign or international banking institutions; stocks and bonds issued by foreign companies; shares issued by foreign mutual funds and investment funds; foreign securities representing share indexes; short-term deposits; operations with the sole aim of hedging the financial risks mentioned in this paragraph, referring to fluctuation risk in the case of different foreign currencies or interest rate risk in a single foreign currency; investment abroad involving investment in shares issued by investment and mutual funds as referred to in number 9 above, where these have more than 50% of their assets invested abroad.

** 12. Other public offering instruments whose issuers are supervised by the Superintendency of Securities and Insurance or the Superintendency of Banks and Financial Institutions, as appropriate, as authorized by the Central Bank of Chile

Table B1. Gross Value Added growth in Romania.

	1991-1995		1995-2000		1991-2000	
	%†	*Contrib.*‡	%	*Contrib.*	%	*Contrib.*
Agriculture	6.9	*1.6*	-11.0	*-2.5*	-4.9	*-1.1*
Forestry & fishing	-9.0	*-0.1*	54.1	*0.3*	40.3	*0.2*
Manufacturing	-4.8	*-2.0*	26.0	*9.7*	20.0	*8.5*
Construction	59.9	*3.1*	-19.4	*-1.5*	28.9	*1.5*
Trade	-0.3	*0.0*	41.8	*2.1*	41.4	*2.3*
Transport	-5.4	*-0.3*	24.7	*1.1*	17.9	*0.9*
Post & telecomm	53.2	*0.7*	-52.1	*-1.0*	-26.7	*-0.4*
Financial	**44.7**	***1.4***	**-35.3**	***-1.5***	**-6.3**	***-0.2***
Real estate	38.5	*2.0*	-17.6	*-1.2*	14.1	*0.7*
Public admin	29.3	*0.9*	-13.9	*-0.5*	11.4	*0.4*
Education	6.6	*0.2*	-21.3	*-0.8*	-16.1	*-0.6*
Health & social work	11.3	*0.3*	-28.3	*-0.7*	-20.2	*-0.5*
Total GVA	**7.9**		**3.5**		**11.7**	

Source: N.I.S. (2001) and author's calculations. † Percentage change. ‡ Contribution to growth

Table B2. Employment growth in Romania, by sector

	Employment (000s)			Percentage shares		Growth (%)	
	1990	**2000**	**1990-2000**	**1990**	**2000**	**Percentage change**	**Percentage contribution**
Agriculture	3055	3523	468	28.2	40.8	15.3	4.3
Forestry & fishing	89	47	-42	0.8	0.5	-47.2	-0.4
Manufacturing	4005	2004	-2001	36.9	23.2	-50.0	-18.5
Construction	706	353	-353	6.5	4.1	-50.0	-3.3
Trade	538	776	238	5.0	9.0	44.2	2.2
Hotels & restaurants	186	93	-93	1.7	1.1	-50.0	-0.9
Transport	667	326	-341	6.2	3.8	-51.1	-3.1
Post & telecomm	97	93	-4	0.9	1.1	-4.1	0.0
Financial	**39**	**74**	**35**	**0.4**	**0.9**	**89.7**	**0.3**
Real estate	388	271	-117	3.6	3.1	-30.2	-1.1
Public admin	88	147	59	0.8	1.7	67.0	0.5
Education	411	421	10	3.8	4.9	2.4	0.1
Health & social work	320	341	21	3.0	4.0	6.6	0.2
Other	251	160	-91	2.3	1.9	-36.3	-0.8
Total	10840	8629	-2211			-20.4	

Source: N.I.S. (2001) and author's calculations

Table B3. Investment portfolio of life insurance companies (billion ROL)

	1997	**1998**	**1999 - under 1 year**	**1999 - over 5 years**
T-bills	1776	98025	666586	
Bank deposits	261910	393451	254085	10666
Equities				449
Mutual funds	3061	15000		33
Others	205		10	1178
Total	266952	506476	920681	12326

Source: N.I.S. (2001)

Table B4. Raw data

	BET	BET-C	BET-FI	Mutual Funds Index -MFI	Dow Jones Stoxx TMI (BKXR)	iBoxx euro Overall	NBR discount rate	Discount T-bills	Average deposit interest rate applied by banks	Exchange Rate (Leu/Euro)	Monthly inflation rate
Aug-97	1000.0				248.96		40.0	50.9	38.3	7950.6	3.5
Sep-97	955.9				265.73		40.0	39.0	35.0	8255.7	3.5
Oct-97	941.0				247.26		40.5	45.8	34.7	8612.4	6.5
Nov-97	693.5				255.4		65.6	87.0	40.9	8915.5	4.3
Dec-97	757.9				268.66		52.6		45.7	8858.7	4.5
Jan-98	727.7				284.63		46.0		48.2	9016.9	4.9
Feb-98	811.7				304.52		44.3		50.9	8956.7	7.2
Mar-98	793.1	1000.0			330.78		40.0		50.2	8915.0	3.8
Apr-98	804.7	1056.5			331.02		40.0		45.8	9152.1	2.7
May-98	663.2	885.2			339.59		40.0	47.9	40.1	9412.7	2.3
Jun-98	636.7	856.2		1000.00	343.41		40.0	41.3	36.0	9450.2	1.3
Jul-98	559.0	750.3		1016.00	344.82		40.0	42.5	33.6	9564.1	1.3
Aug-98	359.9	521.8		1032.49	300.54		35.0	47.9	34.1	9687.3	0.6
Sep-98	294.4	429.4		1063.22	273.05		35.0	50.3	39.0	10454.3	2.7
Oct-98	295.8	451.1		1107.49	291.01		35.0	57.3	43.2	11285.6	3.9
Nov-98	376.8	521.1		1164.58	313.3		35.0	65.6	49.4	11592.6	1.9
Dec-98	377.7	488.6		1245.80	321.84	100.00	35.0	72.7	54.6	12383.8	2.2
Jan-99	379.3	506.0		1316.96	332.9	100.94	35.0	70.4	45.0	13185.8	3.0
Feb-99	376.8	499.4		1403.33	335.54	99.10	35.0	89.6	51.3	13752.7	2.9
Mar-99	363.6	471.4		1566.81	345.15	99.25	35.0	78.5	53.2	15301.4	6.4
Apr-99	338.1	434.7		1662.29	362.79	99.90	35.0	111.8	53.3	15835.4	4.8
May-99	422.8	488.6		1730.08	352.25	98.62	35.0	107.0	50.8	16201.5	5.3
Jun-99	524.4	558.4		1801.80	362.07	96.42	35.0	100.4	49.2	16359.0	5.1
Jul-99	486.8	547.6		1877.67	354.06	94.97	35.0	74.4	49.6	16487.2	1.7
Aug-99	561.7	606.7		1942.74	361.92	94.33	35.0	69.0	47.8	17079.7	1.2
Sep-99	559.5	556.7		2004.98	355.36	93.60	35.0	55.9	43.7	17181.9	3.2
Oct-99	574.3	533.8		2087.55	369.88	92.99	35.0	52.1	42.8	17895.9	4.2
Nov-99	510.1	500.0		2180.93	397.28	93.10	35.0	58.9	41.0	18056.0	4.0

Dec-99	448.5	472.8		2256.02	438.25	92.17	35.0	76.0	42.1	18210.3	2.9
Jan-00	605.2	564.3		2344.85	419.84	91.37	35.0	74.4	42.3	18635.7	4.3
Feb-00	616.3	572.9		2431.22	453.9	91.53	35.0	72.0	42.2	18420.8	2.2
Mar-00	535.2	493.9		2547.31	461.75	92.52	35.0	58.0	41.4	18538.2	1.8
Apr-00	505.5	475.5		2642.63	459.34	92.06	35.0	48.5	37.0	18713.3	4.8
May-00	527.1	488.3		2738.75	447.13	91.80	35.0	46.4	33.7	18507.4	1.8
Jun-00	539.4	490.8		2868.52	445.69	91.72	35.0	45.6	30.1	19970.2	2.8
Jul-00	573.8	501.7		2927.60	453.27	91.67	35.0	41.8	29.5	20317.7	4.3
Aug-00	472.3	464.8		2997.81	468.12	91.26	35.0	43.6	27.1	20295.0	1.8
Sep-00	505.9	504.8		3094.91	448.6	91.54	35.0	46.6	26.8	20565.1	2.8
Oct-00	528.9	517.8	1000.0	3178.98	459.76	91.53	35.0	50.2	29.6	21001.3	2.8
Nov-00	506.2	486.7	967.0	3292.30	431.03	92.24	35.0	51.0	28.6	21492.6	2.8
Dec-00	544.7	510.8	1236.8	3381.21	427.36	93.41	35.0	49.7	28.9	23011.8	2.5
Jan-01	603.7	561.2	1357.5	3475.02	431.02	93.76	35.0	50.1	29.3	24645.9	3.7
Feb-01	598.1	570.8	1083.6	3574.55	399.78	93.80	35.0	51.3	27.5	24729.0	2.3
Mar-01	554.2	476.4	1056.1	3701.61	383.89	94.16	35.0	49.9	29.9	24848.5	2.0
Apr-01	562.5	464.0	1044.3	3812.32	409.13	92.59	35.0	48.5	29.4	24879.9	2.7
May-01	583.0	476.8	1069.0	3930.61	410.97	92.45	35.0	47.2	29.3	24909.8	1.7
Jun-01	648.6	516.0	1356.4	4076.63	395.86	92.79	35.0	41.9	27.9	24732.1	1.6
Jul-01	668.7	502.2	1644.3	4196.81	381.14	93.80	35.0	35.9	27.2	25266.1	1.3
Aug-01	776.1	558.9	2295.7	4319.51	359.01	94.34	35.0	36.4	25.5	26853.0	2.2
Sep-01	713.8	471.3	2200.0	4418.58	320.41	94.50	35.0	37.8	24.4	27548.5	1.9
Oct-01	712.3	466.8	2405.8	4532.61	334.41	96.45	35.0	36.4	24.7	27899.1	2.4
Nov-01	757.6	494.5	2823.7	4646.12	349.37	95.57	35.0	35.1	23.6	27806.3	2.7
Dec-01	754.9	486.1	2700.7	4753.34	361.04	94.21	35.0	35.7	23.7	28204.6	2.2
Jan-02	766.7	522.6	2288.3	4848.27	354.11	94.02	35.0	35.4	23.5	28280.8	2.3
Feb-02	797.8	545.1	2304.9	4945.63	351.49	93.79	34.6	34.4	22.9	28053.9	1.2
Mar-02	879.8	608.9	2357.3	5056.90	368.59	92.48	34.2	33.4	23.7	28698.3	0.4
Apr-02	1184.8	794.5	4493.7	5178.53	354.85	93.06	34.1	32.5	21.9	29315.8	2.0
May-02	1260.6	844.2	4447.8	5304.58	342.38	92.80	32.2	30.8	21.9	30774.3	1.9
Jun-02	1241.2	832.4	4292.8	5398.06	312.49	93.84	30.6	27.5	20.5	31912.0	1.2
Jul-02	1254.0	828.5	4377.3	5491.68	280.59	94.75	28.3	25.4	18.5	32721.3	0.5

Aug-02	1393.3	927.9	5424.3	5616.63	280.27	95.63	27.2	24.8	17.9	32365.1	0.8
Sep-02	1638.6	1092.7	7337.3	5739.17	241.05	97.04	25.6	24.0	16.5	32481.2	0.6
Oct-02	1655.3	1105.2	6875.9	5817.41	263.21	96.09	23.8	21.5	15.9	32629.4	1.6
Nov-02	1560.6	1036.9	5877.4	5860.90	275.31	96.35	22.2	19.1	14.6	33592.1	2.6
Dec-02	1659.1	1103.1	6015.2	5929.33	249.95	97.82	20.4	17.3	13.0	34238.7	1.5
Jan-03	1774.6	1171.5	6281.0	6032.88	234.54	98.58	19.6	16.1	12.3	35594.2	1.3
Feb-03	1744.4	1142.5	5466.9	6075.44	226.01	99.33	19.2	16.2	11.7	35442.6	0.8
Mar-03	1677.3	1093.4	5226.3	6128.21	220.31	98.64	18.4	14.4	11.4	35823.1	1.1
Apr-03	1758.4	1139.6	5905.9	6171.22	244.64	98.51	17.4	15.3	10.1	36560.0	1.1
May-03	1784.3	1141.3	5964.9	6260.83	248.21	100.31	17.9	15.2	10.0	37617.2	0.5
Jun-03	1812.4	1205.4	6124.9	6336.44	257.2	99.94	18.2	17.9	10.2	38062.8	0.9
Jul-03	1821.7	1211.6	6184	6392.02	268.16	98.06	18.2	15.2	10.5	37165.7	1.2
Aug-03	1870.8	1249.2	6385.2	6466.92	273.9	97.85	18.2	15.5	10.1	37183.5	0.3
Sep-03	1876	1232.3	6162.5	6531.63	264.4	99.02	19.1	15.7	10.4	37924.3	2.1
Oct-03	1909.9	1245.2	6842.9	6606.49	283.5	97.37	19.3	17.4	11.0	38807.5	1.5
Nov-03	2043.8	1332.2	7602.8	6704.58	286.14	96.74	20.2	17.8	11.1	39912.7	1.4
Dec-03	2171.9	1390.4	8014.2	6806.41	293.66	97.58	20.4	18.0	11.2	40577.0	1.2

Sources: National Bank of Romania (2004); National Union of Organisations for Collective Investments (2004); http://www.iboxx.com and http://www.stoxx.com

Table B5. HR computation (percentages - monthly rates of return)

	Bucharest Stock Exchange	Mutual Funds	Dow Jones Stoxx	iBoxx Overall	T-bills	Bank deposits	Euro	HR (nominal)		Inflation rate	HR (real)
Aug-97	BET										
Sep-97	-4.41		10.83		3.25	2.92	3.84	0.49	HR97	3.5	-3.01
Oct-97	-1.56		-2.93		3.82	2.89	4.32	-0.67		6.5	-7.17
Nov-97	-26.30		6.93		7.25	3.41	3.52	-12.04		4.3	-16.34
Dec-97	9.29		4.52			3.81	-0.64	7.24		4.5	2.74
Average 97	**-5.75**		**4.84**		**4.77**	**3.26**	**2.76**	**-1.25**		**4.7**	**-5.9**
Jan-98	-3.98		7.84			4.02	1.79	-0.02	HR98-1	4.9	-4.92
Feb-98	11.54		6.27			4.24	-0.67	9.03		7.2	1.83
Mar-98	-2.29		8.12			4.18	-0.47	1.09		3.8	-2.71
	BET-C										
Apr-98	5.65		2.73			3.82	2.66	4.70		2.7	2.00
May-98	-16.21		5.51		3.99	3.34	2.85	-0.08		2.3	-2.38
Jun-98	-3.28		1.53		3.44	3.00	0.40	1.46		1.3	0.16
Average 98-1	**-1.43**		**5.33**		**3.72**	**3.77**	**1.09**	**2.70**		**3.7**	**-1.0**
		MFI									
Jul-98	-12.37	1.60	1.62		3.54	2.80	1.20	-0.35	HR98-2	1.3	-1.65
Aug-98	-30.45	1.62	-11.72		3.99	2.84	1.29	-6.47		0.6	-7.07
Sep-98	-17.71	2.98	-1.95		4.19	3.25	7.92	-1.43		2.7	-4.13
Oct-98	5.05	4.16	15.05		4.78	3.60	7.95	6.84		3.9	2.94
Nov-98	15.52	5.15	10.59		5.47	4.12	2.72	8.15		1.9	6.25
Dec-98	-6.24	6.97	9.74		6.06	4.55	6.83	4.19		2.2	1.99
Average 98-2	**-7.70**	**3.75**	**3.89**		**4.67**	**3.53**	**4.65**	**1.82**		**2.1**	**-0.3**
				iBoxx							
Jan-99	3.56	5.71	10.14	7.48	5.86	3.75	6.48	5.53	HR99	3.0	2.53
Feb-99	-1.30	6.56	5.13	2.40	7.46	4.28	4.30	5.24		2.9	2.34
Mar-99	-5.61	11.65	14.45	11.43	6.54	4.43	11.26	6.23		6.4	-0.17

Apr-99	-7.79		6.09	8.78	4.17	9.32	4.44	3.49	5.62		4.8	0.82
May-99	12.40		4.08	-0.66	1.00	8.92	4.23	2.31	6.87		5.3	1.57
Jun-99	14.29		4.15	3.79	-1.28	8.37	4.10	0.97	6.40		5.1	1.30
Jul-99	-1.93		4.21	-1.45	-0.73	6.20	4.13	0.78	3.74		1.7	2.04
Aug-99	10.79		3.47	5.89	2.90	5.75	3.98	3.59	5.37		1.2	4.17
Sep-99	-8.24		3.20	-1.23	-0.18	4.65	3.64	0.60	2.25		3.2	-0.95
Oct-99	-4.11		4.12	8.41	3.48	4.34	3.57	4.16	3.26		4.2	-0.94
Nov-99	-6.33		4.47	8.37	1.01	4.91	3.42	0.89	2.75		4.0	-1.25
Dec-99	-5.44		3.44	11.26	-0.15	6.34	3.51	0.85	3.39		2.9	0.49
Average 99	**0.02**		**5.10**	**6.07**	**2.63**	**6.55**	**3.96**	**3.31**	**4.72**		**3.7**	**1.0**
Jan-00	19.35		3.94	-1.96	1.45	6.20	3.53	2.34	5.91		4.3	1.61
Feb-00	1.52		3.68	6.87	-0.98	6.00	3.52	-1.15	4.58		2.2	2.38
Mar-00	-13.79		4.77	2.38	1.73	4.83	3.45	0.64	3.33		1.8	1.53
Apr-00	-3.73		3.74	0.42	0.44	4.04	3.08	0.94	3.16		4.8	-1.64
May-00	2.69		3.64	-3.73	-1.38	3.87	2.81	-1.10	3.13		1.8	1.33
Jun-00	0.51		4.74	7.56	7.81	3.80	2.51	7.90	3.89		2.8	1.09
Jul-00	2.22		2.06	3.47	1.68	3.48	2.46	1.74	3.02	**HR00**	4.3	-1.28
Aug-00	-7.35		2.40	3.16	-0.56	3.63	2.26	-0.11	2.42		1.8	0.62
Sep-00	8.61		3.24	-2.89	1.64	3.88	2.23	1.33	3.60		2.8	0.80
Oct-00	2.58	BET-FI	2.72	4.66	2.11	4.18	2.47	2.12	3.57		2.8	0.77
Nov-00	-6.01	-3.30	3.56	-4.06	3.13	4.25	2.38	2.34	3.27		2.8	0.47
Dec-00	4.95	27.90	2.70	6.16	8.43	4.14	2.41	7.07	4.21		2.5	1.71
Average 00	**0.96**	**12.30**	**3.43**	**1.84**	**2.13**	**4.36**	**2.76**	**2.00**	**3.67**		**2.7**	**1.1**
Jan-01	9.87	9.76	2.77	8.02	7.50	4.18	2.44	7.10	3.92		3.7	0.22
Feb-01	1.71	-20.18	2.86	-6.94	0.38	4.28	2.29	0.34	3.61		2.3	1.31
Mar-01	-16.54	-2.54	3.55	-3.51	0.87	4.16	2.49	0.48	3.63	**HR01**	2.0	1.63
Apr-01	-2.60	-1.12	2.99	6.71	-1.54	4.04	2.45	0.13	3.39		2.7	0.69
May-01	2.76	2.37	3.10	0.57	-0.03	3.93	2.44	0.12	3.40		1.7	1.70
Jun-01	8.22	26.88	3.71	-4.36	-0.35	3.49	2.33	-0.71	3.08		1.6	1.48

Jul-01	-2.67	21.23	2.95	-1.64	3.27	2.99	2.27	2.16	2.86		1.3	1.56
Aug-01	11.29	39.62	2.92	0.11	6.89	3.03	2.13	6.28	3.04		2.2	0.84
Sep-01	-15.67	-4.17	2.29	-8.44	2.76	3.15	2.03	2.59	2.86		1.9	0.96
Oct-01	-0.95	9.35	2.58	5.70	3.36	3.03	2.06	1.27	2.83		2.4	0.43
Nov-01	5.93	17.37	2.50	4.13	-1.24	2.93	1.97	-0.33	2.50		2.7	-0.20
Dec-01	-1.70	-4.36	2.31	4.82	-0.01	2.98	1.98	1.43	2.59		2.2	0.39
Average 01	**-0.03**	**7.85**	**2.88**	**0.43**	**1.82**	**3.52**	**2.24**	**1.74**	**3.14**		**2.2**	**0.9**
Jan-02	7.51	-15.27	2.00	-1.65	0.07	2.95	1.96	0.27	2.98		2.3	0.68
Feb-02	4.31	0.73	2.01	-1.54	-1.05	2.87	1.90	-0.80	2.49		1.2	1.29
Mar-02	11.70	2.27	2.25	7.27	0.87	2.78	1.98	2.30	3.45		0.4	3.05
Apr-02	30.48	90.63	2.41	-1.66	2.79	2.71	1.82	2.15	5.36		2.0	3.36
May-02	6.26	-1.02	2.43	1.29	4.68	2.57	1.82	4.98	3.08		1.9	1.18
Jun-02	-1.40	-3.48	1.76	-5.36	4.85	2.29	1.71	3.70	2.04	**HR02**	1.2	0.84
Jul-02	-0.47	1.97	1.73	-7.93	3.53	2.12	1.54	2.54	1.87		0.5	1.37
Aug-02	12.00	23.92	2.28	-1.20	-0.17	2.07	1.50	-1.09	2.74		0.8	1.94
Sep-02	17.76	35.27	2.18	-13.69	1.84	2.00	1.37	0.36	3.43		0.6	2.83
Oct-02	1.14	-6.29	1.36	9.69	-0.53	1.79	1.33	0.46	1.48		1.6	-0.12
Nov-02	-6.18	-14.52	0.75	7.68	3.23	1.59	1.22	2.95	0.88		2.6	-1.72
Dec-02	6.38	2.34	1.17	-7.46	3.48	1.44	1.08	1.92	2.01		1.5	0.51
Average 02	**7.46**	**9.71**	**1.86**	**-1.21**	**1.97**	**2.26**	**1.60**	**1.64**	**2.65**		**1.4**	**1.3**
Jan-03	6.20	4.42	1.75	-2.45	4.76	1.34	1.03	3.96	2.70		1.3	1.40
Feb-03	-2.48	-12.96	0.71	-4.05	0.33	1.35	0.98	-0.43	0.52		0.8	-0.28
Mar-03	-4.30	-4.40	0.87	-1.48	0.37	1.20	0.95	1.07	0.23		1.1	-0.87
Apr-03	4.23	13.00	0.70	13.33	1.92	1.28	0.84	2.06	1.83		1.1	0.73
May-03	0.15	1.00	1.45	4.39	4.77	1.27	0.83	2.89	1.68	**HR03**	0.5	1.18
Jun-03	5.62	2.68	1.21	4.85	0.81	1.49	0.85	1.18	1.96		0.9	1.06
Jul-03	0.51	0.96	0.88	1.80	-4.19	1.27	0.87	-2.36	0.13		1.2	-1.07
Aug-03	3.10	3.25	1.17	2.19	-0.17	1.29	0.84	0.05	1.26		0.3	0.96
Sep-03	-1.35	-3.49	1.00	-1.55	3.21	1.31	0.86	1.99	1.21		2.1	-0.89

Oct-03	1.05	11.04	1.15	9.72	0.62	1.45	0.91	2.33	1.28		1.5	-0.22
Nov-03	6.99	11.10	1.48	3.81	2.18	1.48	0.92	2.85	2.45		1.4	1.05
Dec-03	4.37	5.41	1.52	4.34	2.55	1.50	0.93	1.66	2.07		1.2	0.87
Average 03	**2.01**	**2.67**	**1.16**	**2.91**	**1.43**	**1.35**	**0.90**	**1.44**	**1.44**		**1.1**	**0.3**

Table B6. PAYG features

	Net average wage	Gross average wage	Average pension (40% gross wage)	Wage growth rate	Real wage growth rate (WR)
Aug-97	650641	891350	356540		
Sep-97	710242	954606	381842.4	7.10	3.60
Oct-97	797194	1075102	430040.8	12.62	6.12
Nov-97	820842	1113317	445326.8	3.55	-0.75
Dec-97	940495	1294780	517912	16.30	11.80
Jan-98	884424	1121322	448528.8	-13.40	-18.30
Feb-98	878620	1105941	442376.4	-1.37	-8.57
Mar-98	954305	1218672	487468.8	10.19	6.39
Apr-98	1045498	1360552	544220.8	11.64	8.94
May-98	999233	1286536	514614.4	-5.44	-7.74
Jun-98	1040621	1322476	528990.4	2.79	1.49
Jul-98	1098549	1402909	561163.6	6.08	4.78
Aug-98	1122880	1402317	560926.8	-0.04	-0.64
Sep-98	1139952	1433103	573241.2	2.20	-0.50
Oct-98	1170924	1476637	590654.8	3.04	-0.86
Nov-98	1191510	1537715	615086	4.14	2.24
Dec-98	1360261	1756071	702428.4	14.20	12.00
Jan-99	1240941	1569563	627825.2	-10.62	-13.62
Feb-99	1294259	1511917	604766.8	-3.67	-6.57
Mar-99	1411363	1768944	707577.6	17.00	10.60
Apr-99	1479672	1865351	746140.4	5.45	0.65
May-99	1460453	1835505	734202	-1.60	-6.90
Jun-99	1513514	1910834	764333.6	4.10	-1.00
Jul-99	1603869	2019542	807816.8	5.69	3.99
Aug-99	1624183	2035698	814279.2	0.80	-0.40
Sep-99	1629938	2040725	816290	0.25	-2.95
Oct-99	1656981	2080923	832369.2	1.97	-2.23
Nov-99	1751585	2222369	888947.6	6.80	2.80
Dec-99	1990080	2559796	1023918	15.18	12.28
Jan-00	1725994	2263212	905284.8	-11.59	-15.89
Feb-00	1748052	2276621	910648.4	0.59	-1.61
Mar-00	1906989	2488562	995424.8	9.31	7.51
Apr-00	2135867	2838364	1135346	14.06	9.26
May-00	2029662	2676061	1070424	-5.72	-7.52
Jun-00	2103644	2792837	1117135	4.36	1.56
Jul-00	2171977	2848694	1139478	2.00	-2.30
Aug-00	2220361	2908404	1163362	2.10	0.30
Sep-00	2272967	2989839	1195936	2.80	0.00
Oct-00	2357201	3115128	1246051	4.19	1.39
Nov-00	2497493	3349611	1339844	7.53	4.73
Dec-00	2911570	3975929	1590372	18.70	16.20
Jan-01	2738029	3621665	1448666	-8.91	-12.61
Feb-01	2596213	3411998	1364799	-5.79	-8.09
Mar-01	2819240	3716034	1486414	8.91	6.91
Apr-01	3025138	4321748	1728699	16.30	13.60
May-01	2915299	4174679	1669872	-3.40	-5.10
Jun-01	2981495	4280633	1712253	2.54	0.94
Jul-01	3123279	4436326	1774530	3.64	2.34
Aug-01	3135210	4450728	1780291	0.32	-1.88
Sep-01	3124899	4424024	1769610	-0.60	-2.50
Oct-01	3210425	4534130	1813652	2.49	0.09
Nov-01	3314260	4719732	1887893	4.09	1.39

Dec-01	3659686	5298443	2119377	12.26	10.06
Jan-02	3671588	5144789	2057916	-2.90	-5.20
Feb-02	3464365	4778519	1911408	-7.12	-8.32
Mar-02	3666430	5091065	2036426	6.54	6.14
Apr-02	3965851	5585360	2234144	9.71	7.71
May-02	3795431	5329069	2131628	-4.59	-6.49
Jun-02	3806409	5327130	2130852	-0.04	-1.24
Jul-02	3919380	5498528	2199411	3.22	2.72
Aug-02	3898408	5469586	2187834	-0.53	-1.33
Sep-02	3854969	5404070	2161628	-1.20	-1.80
Oct-02	3967454	5570795	2228318	3.09	1.49
Nov-02	4038159	5704674	2281870	2.40	-0.20
Dec-02	4525696	6521579	2608632	14.32	12.82
Jan-03	4730761	6520266	2608106	-0.02	-1.32
Feb-03	4451835	6054129	2421652	-7.15	-7.95
Mar-03	4637693	6338861	2535544	4.70	3.60
Apr-03	4955273	6885534	2754214	8.62	7.52
May-03	4729313	6521441	2608576	-5.29	-5.79
Jun-03	4705891	6476157	2590463	-0.69	-1.59
Jul-03	4863801	6721855	2688742	3.79	2.59
Aug-03	4807983	6647856	2659142	-1.10	-1.40
Sep-03	4881658	6763882	2705553	1.75	-0.35
Oct-03	4957108	6873680	2749472	1.62	0.12
Nov-03	5037861	7021231	2808492	2.15	0.75
Dec-03	5658065	8068932	3227573	14.92	13.72

Note: Monthly average wages. For the months August 1997 to May 1998 figures are based on gross non-agricultural wages, source Laborsta database (http://laborsta.ilo.org/). For the months June 1998 to December 2003 the source for the figures are N.I.S press releases (http://www.insse.ro).

Table B7. Data for the rate of return for the pension funds (HR) and the real wages growth rate (WR) on a four-month basis

	Dec-97	Apr-98	Aug-98	Dec-98	Apr-99	Aug-99	Dec-99	Apr-00	Aug-00	Dec-00	Apr-01	Aug-01	Dec-01	Apr-02	Aug-02	Dec-02	Apr-03	Aug-03	Dec-03
WR	22.00	-13.42	-2.51	12.94	-10.16	-4.53	9.52	-2.79	-7.96	23.38	-2.45	-3.81	8.90	-0.64	-6.39	12.22	1.19	-6.22	14.31
HR	-22.62	-3.93	-10.63	6.94	5.60	9.38	-2.63	3.89	1.75	3.80	3.91	5.69	1.60	8.62	5.44	1.46	0.97	2.14	0.80
Pearson's correlation coefficient r = -0.333; P>0.1, df=17																			

Scenario 1

Scenario 1 - period 1 – period factor: 0.93333 ($\lambda = -0.0667$)

	WY	WM	WO	R	Total
W, R - million	3.60	4.50	4.50	4.50	
w	0.93	0.93	0.93		
Cohort income	3.36	4.20	4.20		11.76
Contributions (30%)	1.01	1.26	1.26		3.53
R-PAYG points				4.50	
Value of pension point				**0.78**	
R-PAYG replacement rate				**0.84**	
NDC funds accumulated	1.01	2.52	3.78	3.78	11.09
Value of NDC pension				**0.84**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.25**

Scenario 1 - period 2 – period factor: 1 ($\lambda = 0$)

	WY	WM	WO	R	Total
W, R - million	4.50	3.60	4.50	4.50	
w	0.93	0.93	0.93		
Cohort income	4.20	3.36	4.20		11.76
Contributions (30%)	1.26	1.01	1.26		3.53
R-PAYG points				4.50	
Value of pension point				**0.78**	
R-PAYG replacement rate				**0.84**	
NDC funds accumulated	1.26	2.02	3.78	3.78	10.84
Value of NDC pension				**0.84**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.25**

Scenario 1 - period 3 – period factor: 1 ($\lambda = 0$)

	WY	WM	WO	R	Total
W, R - million	4.50	4.50	3.60	4.50	
w	0.93	0.93	0.93		
Cohort income	4.20	4.20	3.36		11.76
Contributions (30%)	1.26	1.26	1.01		3.53
R-PAYG points				4.50	
Value of pension point				**0.78**	
R-PAYG replacement rate				**0.84**	
NDC funds accumulated	1.26	2.52	3.02	3.78	10.58
Value of NDC pension				**0.84**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.25**

Scenario 1 - period 4 – period factor: 1.07143 ($\lambda = 0.07143$)

	WY	WM	WO	R	Total
W, R - million	4.50	4.50	4.50	3.60	
w	1.00	1.00	1.00		
Cohort income	4.50	4.50	4.50		13.50
Contributions (30%)	1.35	1.35	1.35		4.05
R-PAYG points				3.60	
Value of pension point				**1.13**	
R-PAYG replacement rate				**1.13**	
NDC funds accumulated	1.35	2.70	4.05	3.24	11.34
Value of NDC pension				**0.90**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**0.81**

Scenario 2

Scenario 2 - period 1 – period factor: 0.93333 (λ = -0.0667)

	WY	WM	WO	R	Total
W, R - million	3.60	4.50	4.50	4.50	
w	0.93	0.93	0.93		
Cohort income	3.36	4.20	4.20		11.76
Contributions (30%)	1.01	1.26	1.26		3.53
R-PAYG points				4.50	
Value of pension point				**0.78**	
R-PAYG replacement rate				**0.84**	
NDC funds accumulated	1.01	2.52	3.78	3.78	11.09
Value of NDC pension				**0.84**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.25**

Scenario 2 - period 2 – period factor: 0.92857 (λ = -0.0714)

	WY	WM	WO	R	Total
W, R - million	3.60	3.60	4.50	4.50	
w	0.87	0.87	0.87		
Cohort income	3.12	3.12	3.90		10.14
Contributions (30%)	0.94	0.94	1.17		3.04
R-PAYG points				4.50	
Value of pension point				**0.68**	
R-PAYG replacement rate				**0.78**	
NDC funds accumulated	0.94	1.87	3.51	3.51	9.83
Value of NDC pension				**0.78**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.47**

Scenario 2 - period 3 – period factor: 0.92308 (λ = -0.0769)

	WY	WM	WO	R	Total
W, R - million	3.60	3.60	3.60	4.50	
w	0.80	0.80	0.80		
Cohort income	2.88	2.88	2.88		8.64
Contributions (30%)	0.86	0.86	0.86		2.59
R-PAYG points				4.50	
Value of pension point				**0.58**	
R-PAYG replacement rate				**0.72**	
NDC funds accumulated	0.86	1.73	2.59	3.24	8.42
Value of NDC pension				**0.72**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.65**

Scenario 2 - period 4 – period factor: 1 (λ = 0)

	WY	WM	WO	R	Total
W, R - million	3.60	3.60	3.60	3.60	
w	0.80	0.80	0.80		
Cohort income	2.88	2.88	2.88		8.64
Contributions (30%)	0.86	0.86	0.86		2.59
R-PAYG points				3.60	
Value of pension point				**0.72**	
R-PAYG replacement rate				**0.90**	
NDC funds accumulated	0.86	1.73	2.59	2.59	7.78
Value of NDC pension				**0.72**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**0.00**

Scenario 3

Scenario 3 - period 1 – period factor: 0.93333 (λ = -0.0667)

	WY	WM	WO	R	Total
W, R - million	3.60	4.50	4.50	4.50	
w	0.93	0.93	0.93		
Cohort income	3.36	4.20	4.20		11.76
Contributions (30%)	1.01	1.26	1.26		3.53
R-PAYG points				4.50	
Value of pension point				**0.78**	
R-PAYG replacement rate				**0.84**	
NDC funds accumulated	1.01	2.52	3.78	3.78	11.09
Value of NDC pension				**0.84**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.25**

Scenario 3 - period 2 – period factor: 1 (λ = 0)

	WY	WM	WO	R	Total
W, R - million	4.50	3.60	4.50	4.50	
w	0.93	0.93	0.93		
Cohort income	4.20	3.36	4.20		11.76
Contributions (30%)	1.26	1.01	1.26		3.53
R-PAYG points				4.50	
Value of pension point				**0.78**	
R-PAYG replacement rate				**0.84**	
NDC funds accumulated	1.26	2.02	3.78	3.78	10.84
Value of NDC pension				**0.84**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.25**

Scenario 3 - period 3 – period factor: 0.92857 (λ = -0.0714)

	WY	WM	WO	R	Total
W, R - million	3.60	4.50	3.60	4.50	
w	0.87	0.87	0.87		
Cohort income	3.12	3.90	3.12		10.14
Contributions (30%)	0.94	1.17	0.94		3.04
R-PAYG points				4.50	
Value of pension point				**0.68**	
R-PAYG replacement rate				**0.78**	
NDC funds accumulated	0.94	2.34	2.81	3.51	9.59
Value of NDC pension				**0.78**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.47**

Scenario 3 - period 4 – period factor: 1.07692 (λ = 0.07692)

	WY	WM	WO	R	Total
W, R - million	4.50	3.60	4.50	3.60	
w	0.93	0.93	0.93		
Cohort income	4.20	3.36	4.20		11.76
Contributions (30%)	1.26	1.01	1.26		3.53
R-PAYG points				3.60	
Value of pension point				**0.98**	
R-PAYG replacement rate				**1.05**	
NDC funds accumulated	1.26	2.02	3.78	3.02	10.08
Value of NDC pension				**0.84**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**0.50**

Scenario 3 - period 5 – period factor: 0.92857 (λ = -0.0714)

	WY	WM	WO	R	Total
W, R - million	3.60	4.50	3.60	4.50	
w	0.87	0.87	0.87		
Cohort income	3.12	3.90	3.12		10.14
Contributions (30%)	0.94	1.17	0.94		3.04
R-PAYG points				4.50	
Value of pension point				**0.68**	
R-PAYG replacement rate				**0.78**	
NDC funds accumulated	0.94	2.34	2.81	3.51	9.59
Value of NDC pension				**0.78**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.47**

Scenario 3 - period 6 – period factor: 1.07692 (λ = 0.07692)

	WY	WM	WO	R	Total
W, R - million	4.50	3.60	4.50	3.60	
w	0.93	0.93	0.93		
Cohort income	4.20	3.36	4.20		11.76
Contributions (30%)	1.26	1.01	1.26		3.53
R-PAYG points				3.60	
Value of pension point				**0.98**	
R-PAYG replacement rate				**1.05**	
NDC funds accumulated	1.26	2.02	3.78	3.02	10.08
Value of NDC pension				**0.84**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**0.50**

Scenario 4

Scenario 4 - period 1 – period factor: 1.06667 (λ = 0.06667)

	WY	WM	WO	R	Total
W, R - million	5.40	4.50	4.50	4.50	
w	1.07	1.07	1.07		
Cohort income	5.76	4.80	4.80		15.36
Contributions (30%)	1.73	1.44	1.44		4.61
R-PAYG points				4.50	
Value of pension point				**1.02**	
R-PAYG replacement rate				**0.96**	
NDC funds accumulated	1.73	2.88	4.32	4.32	13.25
Value of NDC pension				**0.96**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**0.29**

Scenario 4 - period 2 – period factor: 1 (λ = 0)

	WY	WM	WO	R	Total
W, R - million	4.50	5.40	4.50	4.50	
w	1.07	1.07	1.07		
Cohort income	4.80	5.76	4.80		15.36
Contributions (30%)	1.44	1.73	1.44		4.61
R-PAYG points				4.50	
Value of pension point				**1.02**	
R-PAYG replacement rate				**0.96**	
NDC funds accumulated	1.44	3.46	4.32	4.32	13.54
Value of NDC pension				**0.96**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**0.29**

Scenario 4 - period 3 – period factor: 1 (λ = 0)

	WY	WM	WO	R	Total
W, R - million	4.50	4.50	5.40	4.50	
w	1.07	1.07	1.07		
Cohort income	4.80	4.80	5.76		15.36
Contributions (30%)	1.44	1.44	1.73		4.61
R-PAYG points				4.50	
Value of pension point				**1.02**	
R-PAYG replacement rate				**0.96**	
NDC funds accumulated	1.44	2.88	5.18	4.32	13.82
Value of NDC pension				**0.96**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**0.29**

Scenario 4 - period 4 – period factor: 0.9375 (λ = -0.0625)

	WY	WM	WO	R	Total
W, R - million	4.50	4.50	4.50	5.40	
w	1.00	1.00	1.00		
Cohort income	4.50	4.50	4.50		13.50
Contributions (30%)	1.35	1.35	1.35		4.05
R-PAYG points				5.40	
Value of pension point				**0.75**	
R-PAYG replacement rate				**0.75**	
NDC funds accumulated	1.35	2.70	4.05	4.86	12.96
Value of NDC pension				**0.90**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.81**

Scenario 4 - period 5 – period factor: 1 (λ = 0)

	WY	WM	WO	R	Total
W, R - million	4.50	4.50	4.50	4.50	
w	1.00	1.00	1.00		
Cohort income	4.50	4.50	4.50		13.50
Contributions (30%)	1.35	1.35	1.35		4.05
R-PAYG points				4.50	
Value of pension point				**0.90**	
R-PAYG replacement rate				**0.90**	
NDC funds accumulated	1.35	2.70	4.05	4.05	12.15
Value of NDC pension				**0.90**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**0.00**

Scenario 5

Scenario 5 - period 1 – period factor: 0.66667 (λ = -0.33333)

	WY	WM	WO - R	R	Total
W, R - million	4.50	4.50	4.50	4.50	
w	0.67	0.67			
Cohort income	3.00	3.00			6.00
Contributions (30%)	0.90	0.90			1.80
R-PAYG points			4.50	4.50	9.00
Value of pension point			**0.20**	**0.20**	
R-PAYG replacement rate			**0.30**	**0.30**	
NDC funds accumulated	0.90	1.80	1.80	2.70	7.20
Value of NDC pension			**0.20**	**0.60**	
NDC replacement rate			**0.30**	**0.90**	
NDC deficit/surplus					**-1.80**

Scenario 5 - period 2 – period factor: 1 (λ = 0)

	WY	WM	WO - R	R	Total
W, R - million	4.50	4.50	4.50	4.50	
w	0.67	0.67			
Cohort income	3.00	3.00			6.00
Contributions (30%)	0.90	0.90			1.80
R-PAYG points	4.50	4.50	4.50	4.50	18.00
Value of pension point			**0.20**	**0.20**	
R-PAYG replacement rate				**0.30**	
NDC funds accumulated	0.90	1.80	1.80	0.90	5.40
Value of NDC pension			**0.20**	**0.20**	
NDC replacement rate				**0.30**	
NDC deficit/surplus					**0.00**

Scenario 6

Scenario 6 - period 1 – period factor: 1.16667 (λ = 0.16667)

	WY	WM	WO	R	Total
W, R - million	4.50	4.50	4.50	4.50	
w	1.17	1.17	1.17	1.17	
Cohort income	5.25	5.25	5.25	2.63	18.38
Contributions (30%)	1.58	1.58	1.58	1.53	6.26
R-PAYG points	4.50	4.50	4.50	4.50	18.00
Value of pension point				**1.39**	
R-PAYG replacement rate				**1.19**	
NDC funds accumulated	1.58	3.15	4.73	4.73	14.18
value of NDC pension				**1.05**	
additional funds (working pensioners)				1.53	
additional pension (working pensioners)				**0.68**	
Average NDC replacement rate				**1.19**	
NDC deficit/surplus					**0.00**

Scenario 6 - period 2 – period factor: 1 (λ = 0)

	WY	WM	WO	R	Total
W, R - million	4.50	4.50	4.50	4.50	
w	1.17	1.17	1.17	1.17	
Cohort income	5.25	5.25	5.25	2.63	18.38
Contributions (30%)	1.58	1.58	1.58	1.53	6.26
R-PAYG points	4.50	4.50	4.50	4.50	18.00
Value of pension point				**1.39**	
R-PAYG replacement rate				**1.19**	
NDC funds accumulated	1.58	1.58	1.58	4.73	9.45
value of NDC pension				**1.05**	
additional funds (working pensioners)				1.53	
additional pensions (working pensioners)				**0.68**	
Average NDC replacement rate				**1.19**	
NDC deficit/surplus					**0.00**

Scenario 7

Scenario 7 - period 1 – period factor: 0.96667 (λ = -0.0333)

	WY	WM	WO	R	Total
W, R - million	4.05	4.50	4.50	4.50	
w	0.97	0.97	0.97		
Cohort income	3.92	4.35	4.35		12.62
Contributions (30%)	1.17	1.31	1.31		3.78
R-PAYG points				4.50	
Value of pension point				**0.84**	
R-PAYG replacement rate				**0.87**	
NDC funds accumulated	1.17	2.61	3.92	3.92	11.61
Value of NDC pension				**0.87**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.13**

Scenario 7 - period 2 – period factor: 0.93448 (λ = -0.0655)

	WY	WM	WO	R	Total
W, R - million	3.65	4.05	4.50	4.50	
w	0.90	0.90	0.90		
Cohort income	3.29	3.66	4.07		11.02
Contributions (30%)	0.99	1.10	1.22		3.30
R-PAYG points				4.50	
Value of pension point				**0.73**	
R-PAYG replacement rate				**0.81**	
NDC funds accumulated	0.99	2.20	3.66	3.66	10.50
Value of NDC pension				**0.81**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.35**

Scenario 7 - period 3 – period factor: 0.9 (λ = -0.1)

	WY	WM	WO	R	Total
W, R - million	3.28	3.65	4.05	4.50	
w	0.81	0.81	0.81		
Cohort income	2.67	2.96	3.29		8.92
Contributions (30%)	0.80	0.89	0.99		2.68
R-PAYG points				4.50	
Value of pension point				**0.59**	
R-PAYG replacement rate				**0.73**	
NDC funds accumulated	0.80	1.78	2.96	3.29	8.83
Value of NDC pension				**0.73**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.62**

Scenario 7 - period 4 – period factor: 0.9 (λ = -0.1)

	WY	WM	WO	R	Total
W, R - million	2.95	3.28	3.65	4.05	
w	0.73	0.73	0.73		
Cohort income	2.16	2.40	2.67		7.23
Contributions (30%)	0.65	0.72	0.80		2.17
R-PAYG points				4.05	
Value of pension point				**0.54**	
R-PAYG replacement rate				**0.73**	
NDC funds accumulated	0.65	1.44	2.40	2.67	7.16
Value of NDC pension				**0.66**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.50**

Scenario 7 - period 5 – period factor: 0.9 (λ = -0.1)

	WY	WM	WO	R	Total
W, R - million	2.66	2.95	3.28	3.65	
w	0.66	0.66	0.66		
Cohort income	1.75	1.94	2.16		5.85
Contributions (30%)	0.52	0.58	0.65		1.76
R-PAYG points				3.65	
Value of pension point				**0.48**	
R-PAYG replacement rate				**0.73**	
NDC funds accumulated	0.52	1.17	1.94	2.16	5.80
Value of NDC pension				**0.59**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.40**

Scenario 7 - period 6 – period factor: 0.9 (λ = -0.1)

	WY	WM	WO	R	Total
W, R - million	2.39	2.66	2.95	3.28	
w	0.59	0.59	0.59		
Cohort income	1.42	1.57	1.75		4.74
Contributions (30%)	0.43	0.47	0.52		1.42
R-PAYG points				3.28	
Value of pension point				**0.43**	
R-PAYG replacement rate				**0.73**	
NDC funds accumulated	0.43	0.94	1.57	1.75	4.69
Value of NDC pension				**0.53**	
NDC replacement rate				**0.90**	
NDC deficit/surplus					**-0.33**

The Romanian Simulation

Period 0 – year 2000, individuals under 35 years start under the new system (wage = €10,366.7, dependency ratio R/W = 26.5%)

	WY1	WY2	WY3	WM1	WM2	WM3	
Cohort - million	0.800	1.527	1.553	1.092	1.356	1.354	
Cohort income (million €)	8290.2	15826.6	16096.4	11324.7	14053.3	14031.3	
Contributions (million €)	2487.1	4748.0	4828.9	3397.4	4216.0	4209.4	
NDC funds accumulated (mil. €)	2487.1	4748.0	4828.9				
	WO1	**WO2**	**WO3**	**R1**	**R2**	**R3**	**Total**
Cohort - million	0.764	0.613	0.714	1.095	0.892	0.598	
Cohort income (million €)	7924.4	6355.8	7397.3	4052.9	3300.6	2213.2	**110866.6**
Contributions (million €)	2377.3	1906.7	2219.2	1215.9	990.2	664.0	**33260.0**
Value of pension point (€)						12866.7	
R-PAYG replacement rate						**1.241**	
R-PAYG surplus if replacement rate 40%							**22540.9**
NDC funds accumulated (mil. €)							**12064.0**

Period 1 – year 2005 (λ = 0.0278, wage = €10,654.6, dependency ratio R/W = 25.2%)

	WY1	WY2	WY3	WM1	WM2	WM3	
Cohort - million	0.716	1.567	1.525	1.560	1.090	1.350	
Cohort income (million €)	7626.5	16693.1	16251.6	16618.0	11611.3	14385.8	
Contributions (million €)	2288.0	5007.9	4875.5	4985.4	3483.4	4315.7	
NDC funds accumulated (mil. €)	2288.0	7564.0	9755.3	9948.4			
	WO1	**WO2**	**WO3**	**R1**	**R2**	**R3**	**Total**
Cohort - million	0.915	0.758	0.605	0.694	1.048	0.797	
Cohort income (million €)	9746.5	8074.4	6446.7	2639.3	3984.7	3032.7	**117110.6**
Contributions (million €)	2923.9	2422.3	1934.0	791.8	1195.4	909.8	**35133.2**
Value of pension point (€)						13838.8	
R-PAYG replacement rate						**1.299**	
R-PAYG surplus if replacement rate 40%							**24313.4**
NDC funds accumulated (mil. €)							**29555.8**

Period 2 – year 2010 (λ = 0.0223, wage = € 10,892.4, dependency ratio R/W = 20.9%)

	WY1	WY2	WY3	WM1	WM2	WM3	
Cohort - million	0.747	1.402	1.565	1.532	1.556	1.085	
Cohort income (million €)	8135.4	15275.3	17050.3	16689.2	16948.2	11822.9	
Contributions (million €)	2440.6	4582.6	5115.1	5006.8	5084.5	3546.9	
NDC funds accumulated (mil. €)	2440.6	6921.6	12848.0	14979.8	15254.9		
	WO1	**WO2**	**WO3**	**R1**	**R2**	**R3**	**Total**
Cohort - million	0.913	0.907	0.748	0.588	0.664	0.937	
Cohort income (million €)	9939.7	9878.3	8146.5	2287.9	2581.1	3641.8	**122396.5**
Contributions (million €)	2981.9	2963.5	2444.0	686.4	774.3	1092.5	**36719.0**
Value of pension point (€)						**16776.9**	
R-PAYG replacement rate						1.540	
R-PAYG surplus if replacement rate 40%							**27183.0**
NDC funds accumulated (mil. €)							**52444.9**

Period 3 – year 2015 (λ = 0.0007, wage = €10,900.3, dependency ratio R/W = 17.8%)

	WY1	WY2	WY3	WM1	WM2	WM3
Cohort - million	0.524	1.463	1.401	1.572	1.529	1.550
Cohort income (million €)	5714.3	15950.2	15272.5	17139.5	16661.2	16892.6
Contributions (million €)	1714.3	4785.0	4581.8	5141.9	4998.3	5067.8
NDC funds accumulated (mil. €)	1714.3	7227.4	11508.4	17999.1	19989.0	20333.7

	WO1	WO2	WO3	R1	R2	R3	Total
Cohort - million	0.734	0.905	0.895	0.727	0.563	0.593	
Cohort income (million €)	7996.3	9861.3	9756.0	2830.1	2190.2	2309.1	**122573.2**
Contributions (million €)	2398.9	2958.4	2926.8	849.0	657.1	692.7	**36772.0**
Value of pension point (€)						**19523.3**	
R-PAYG replacement rate						**1.791**	
R-PAYG surplus if replacement rate 40%							**28559.7**
NDC funds accumulated (mil. €)							**78771.8**

Period 4 – year 2020 (λ = -0.0320, wage = €10,550.5, dependency ratio R/W = 20.4%)

	WY1	WY2	WY3	WM1	WM2	WM3	
Cohort - million	0.490	1.027	1.462	1.407	1.569	1.522	
Cohort income (million €)	5174.1	10836.1	15424.4	14849.1	16549.7	16062.0	
Contributions (million €)	1552.2	3250.8	4627.3	4454.7	4964.9	4818.6	
NDC funds accumulated (mil. €)	1552.2	4910.1	11622.8	15593.8	22386.4	24166.1	
	WO1	**WO2**	**WO3**	**R1**	**R2**	**R3**	**Total**
Cohort - million	1.047	0.727	0.893	0.870	0.696	0.503	
Cohort income (million €)	11050.5	7673.1	9419.8	3278.1	2620.4	1895.2	**114832.3**
Contributions (million €)	3315.1	2301.9	2825.9	983.4	786.1	568.6	**34449.7**
Value of pension point (€)						**16648.9**	
R-PAYG replacement rate						**1.578**	
R-PAYG surplus if replacement rate 40%							**25717.3**
NDC funds accumulated (mil. €)	22996.3						**103227.6**

Period 5 – year 2025 (λ = -0.0342, wage = €10,189.3, dependency ratio R/W = 24.0%)

	WY1	WY2	WY3	WM1	WM2	WM3	
Cohort - million	0.475	0.961	1.026	1.469	1.404	1.562	
Cohort income (million €)	4843.9	9790.0	10455.7	14963.6	14306.4	15919.3	
Contributions (million €)	1453.2	2937.0	3136.7	4489.1	4291.9	4775.8	
NDC funds accumulated (mil. €)	1453.2	4436.1	7878.7	15714.1	19351.9	26395.9	
	WO1	**WO2**	**WO3**	**R1**	**R2**	**R3**	**Total**
Cohort - million	1.029	1.038	0.718	0.868	0.833	0.622	
Cohort income (million €)	10483.9	10580.5	7313.4	3158.1	3028.5	2262.4	**107105.9**
Contributions (million €)	3145.2	3174.1	2194.0	947.4	908.5	678.7	**32131.8**
Value of pension point (€)						**13833.8**	
R-PAYG replacement rate						**1.358**	
R-PAYG surplus if replacement rate 40%							**22665.1**
NDC funds accumulated (mil. €)	26484.1	25383.3					**127097.4**

Period 6 – year 2030 (λ = -0.0340, wage = €9,843.3, dependency ratio R/W = 24.3%)

	WY1	WY2	WY3	WM1	WM2	WM3	
Cohort - million	0.457	0.931	0.960	1.031	1.465	1.398	
Cohort income (million €)	4497.0	9167.9	9449.0	10146.2	14420.7	13765.2	
Contributions (million €)	1349.1	2750.4	2834.7	3043.9	4326.2	4129.6	
NDC funds accumulated (mil. €)	1349.1	4154.2	7120.2	10655.0	19506.6	22824.3	
	WO1	**WO2**	**WO3**	**R1**	**R2**	**R3**	**Total**
Cohort - million	1.056	1.020	1.025	0.698	0.831	0.744	
Cohort income (million €)	10393.7	10040.8	10087.2	2452.6	2918.5	2615.5	**99954.3**
Contributions (million €)	3118.1	3012.2	3026.2	735.8	875.5	784.6	**29986.3**
Value of pension point (€)						**13193.8**	
R-PAYG replacement rate						**1.340**	
R-PAYG surplus if replacement rate 40%							**21037.8**
NDC funds accumulated (mil. €)	28617.5	28596.9	27547.4				**150371.2**

Period 7 – year 2035, retirement of the first system cohort (λ = -0.0595, wage = €9,257.9, dependency ratio R/W = 27.7%)

	WY1	WY2	WY3	WM1	WM2	WM3	
Cohort - million	0.415	0.895	0.931	0.964	1.028	1.459	
Cohort income (million €)	3846.5	8286.5	8614.9	8927.2	9519.9	13508.9	
Contributions (million €)	1154.0	2486.0	2584.5	2678.2	2856.0	4052.7	
NDC funds accumulated (mil. €)	1154.0	3754.8	6491.6	9374.9	12877.4	22399.2	
	WO1	**WO2**	**WO3**	**R1**	**R2**	**R3**	**Total**
Cohort - million	0.945	1.047	1.007	0.996	0.668	0.742	
Cohort income (million €)	8750.0	9691.5	9320.0	3293.5	2206.6	2453.9	**88419.5**
Contributions (million €)	2625.0	2907.5	2796.0	988.1	662.0	736.2	**26525.8**
Value of pension point (€)						11022.0	
R-PAYG replacement rate						**1.191**	
R-PAYG surplus if replacement rate 40%							**17613.7**
NDC funds accumulated (mil. €)	24091.9	29823.1	29692.3				**139659.2**
NDC retirement funds				25909.2			
Value of NDC pension				**8666.7**			
Additional funds for the working pensioners				988.1			
Additional pension for the working pensioners				**925.8**			
NDC replacement rate				**0.972**			
NDC deficit/surplus							**17560.1**

Period 8 – year 2040 (λ = -0.0671, wage = €8,636.3, dependency ratio R/W = 31.6%)

	WY1	WY2	WY3	WM1	WM2	WM3	
Cohort - million	0.421	0.814	0.894	0.935	0.962	1.024	
Cohort income (million €)	3636.6	7030.1	7723.2	8072.7	8307.8	8845.2	
Contributions (million €)	1091.0	2109.0	2317.0	2421.8	2492.3	2653.6	
NDC funds accumulated (mil. €)	1091.0	3185.5	5819.7	8477.6	11237.8	14666.3	
	WO1	**WO2**	**WO3**	**R1**	**R2**	**R3**	**Total**
Cohort - million	0.986	0.937	1.033	0.979	0.953	0.597	
Cohort income (million €)	8517.0	8092.3	8922.4	3018.2	2939.0	1840.3	**76944.8**
Contributions (million €)	2555.1	2427.7	2676.7	905.4	881.7	552.1	**23083.4**
Value of pension point (€)						**9127.3**	
R-PAYG replacement rate						**1.057**	
R-PAYG surplus if replacement rate 40%							**14346.8**
NDC funds accumulated (mil. €)	23450.4	24902.1	30497.5				**123327.7**
NDC retirement funds				27698.7	16113.1		
Value of NDC pension				**9431.7**	**8451.6**		
Additional funds for the working pensioners				905.4	1496.2		
Additional pension for the working pensioners				**863.6**	**2198.3**		
NDC replacement rate				1.128	1.069		
NDC deficit/surplus							**3396.7**

Period 9 – year 2045, system matures as all the starting cohorts are in retirement (λ = -0.0517, wage = €8,189.3, dependency ratio R/W = 37.5%)

	WY1	WY2	WY3	WM1	WM2	WM3
Cohort - million	0.429	0.825	0.813	0.898	0.932	0.958
Cohort income (million €)	3515.5	6756.1	6660.2	7356.4	7636.5	7846.3
Contributions (million €)	1054.6	2026.8	1998.1	2206.9	2290.9	2353.9
NDC funds accumulated (mil. €)	1054.6	3061.3	5018.7	7725.4	10329.7	13010.0

	WO1	WO2	WO3	R1	R2	R3	Total
Cohort - million	0.692	0.978	0.925	1.005	0.936	0.852	
Cohort income (million €)	5668.6	8006.7	7572.9	2937.0	2737.7	2491.5	69185.4
Contributions (million €)	1700.6	2402.0	2271.9	881.1	821.3	747.4	20755.6
Value of pension point (€)					**7430.7**		
R-PAYG replacement rate					**0.907**		
R-PAYG surplus if replacement rate 40%							**11605.7**
NDC funds accumulated (mil. €)	15607.7	24638.6	25885.0				**106331.0**
NDC retirement funds				28918.9	17510.0	7639.5	
Value of NDC pension				**9595.4**	**9349.3**	**8964.4**	
Additional funds for the working pensioners				881.1	1393.7	747.4	
Additional pension for the working pensioners				**818.9**	**2084.5**	**2456.8**	
NDC replacement rate				1.207	1.233	1.202	
NDC deficit/surplus							**-7016.5**

Period 10 – year 2050 (λ = -0.0516, wage = €7,766.3, dependency ratio R/W = 38.3%)

	WY1	WY2	WY3	WM1	WM2	WM3
Cohort - million	0.443	0.841	0.824	0.817	0.896	0.929
Cohort income (million €)	3441.0	6531.7	6401.3	6344.6	6959.7	7213.0
Contributions (million €)	1032.3	1959.5	1920.4	1903.4	2087.9	2163.9
NDC funds accumulated (mil. €)	1032.3	2959.7	4823.6	6662.8	9414.2	11960.0

	WO1	WO2	WO3	R1	R2	R3	Total
Cohort - million	0.648	0.686	0.965	0.899	0.961	0.837	
Cohort income (million €)	5029.0	5329.5	7493.6	2493.1	2664.4	2321.1	**62222.0**
Contributions (million €)	1508.7	1598.9	2248.1	747.9	799.3	696.3	**18666.6**
Value of pension point (€)					**6920.3**		
R-PAYG replacement rate					**0.891**		
R-PAYG surplus if replacement rate 40%							**10287.2**
NDC funds accumulated (mil. €)	13846.6	16400.3	25613.9				92713.3
NDC retirement funds				24547.8	18283.3	8302.7	
Value of NDC pension				**9099.7**	**9512.6**	**9917.6**	
Additional funds for the working pensioners				747.9	1356.4	696.3	
Additional pension for the working pensioners				**776.6**	**1976.8**	**2329.9**	
NDC replacement rate				1.207	1.316	1.384	
NDC deficit/surplus							**-8584.2**

Period 11 – year 2055 (λ = -0.0521, wage = €7,361.0, dependency ratio R/W = 40.0%)

	WY1	WY2	WY3	WM1	WM2	WM3
Cohort - million	0.454	0.868	0.840	0.828	0.815	0.893
Cohort income (million €)	3343.9	6389.7	6185.3	6094.6	5999.1	6570.1
Contributions (million €)	1003.2	1916.9	1855.6	1828.4	1799.7	1971.0
NDC funds accumulated (mil. €)	1003.2	2895.4	4660.8	6400.3	8114.9	10894.0

	WO1	WO2	WO3	R1	R2	R3	Total
Cohort - million	0.628	0.642	0.677	0.938	0.860	0.859	
Cohort income (million €)	4620.6	4725.6	4985.3	2465.6	2260.5	2257.7	**55898.1**
Contributions (million €)	1386.2	1417.7	1495.6	739.7	678.1	677.3	**16769.4**
Value of pension point (€)					**6310.0**		
R-PAYG replacement rate					**0.857**		
R-PAYG surplus if replacement rate 40%							**8944.4**
NDC funds accumulated (mil. €)	12722.1	14541.8	17040.2				78272.6
NDC retirement funds				24277.4	15511.3	8664.7	
Value of NDC pension				**8624.9**	**9016.2**	**10085.3**	
Additional funds for the working pensioners				739.7	1150.7	677.3	
Additional pension for the working pensioners				**736.1**	**1873.7**	**2208.3**	
NDC replacement rate				1.207	1.316	1.477	
NDC deficit/surplus							**-9242.6**

Period 12 – year 2060 (λ = -0.0289, wage = €7,148.2, dependency ratio R/W = 35.5%)

	WY1	WY2	WY3	WM1	WM2	WM3	
Cohort - million	0.446	0.890	0.867	0.844	0.826	0.812	
Cohort income (million €)	3188.7	6362.0	6199.5	6033.6	5904.3	5802.4	
Contributions (million €)	956.6	1908.6	1859.8	1810.1	1771.3	1740.7	
NDC funds accumulated (mil. €)	956.6	2882.8	4671.5	6336.2	7986.6	9621.0	
	WO1	**WO2**	**WO3**	**R1**	**R2**	**R3**	**Total**
Cohort - million	0.603	0.622	0.634	0.659	0.898	0.769	
Cohort income (million €)	4312.1	4448.4	4528.9	1680.6	2290.5	1962.4	**52713.3**
Contributions (million €)	1293.6	1334.5	1358.7	504.2	687.1	588.7	**15814.0**
Value of pension point (€)					**6801.4**		
R-PAYG replacement rate					**0.951**		
R-PAYG surplus if replacement rate 40%							**9165.8**
NDC funds accumulated (mil. €)	11872.8	13688.9	15480.1				73496.4
NDC retirement funds				16547.6	15717.1	7531.5	
Value of NDC pension				**8375.6**	**8755.6**	**9793.8**	
Additional funds for the working pensioners				504.2	1166.0	588.7	
Additional pension for the working pensioners				**714.8**	**1819.5**	**2144.5**	
NDC replacement rate				1.207	1.316	1.477	
NDC deficit/surplus							**-6431.7**

Period 13 – year 2065 (λ = -0.0203, wage = €7,003.3, dependency ratio R/W = 31.5%)

	WY1	WY2	WY3	WM1	WM2	WM3	
Cohort - million	0.434	0.874	0.889	0.871	0.842	0.823	
Cohort income (million €)	3036.5	6120.6	6227.4	6101.1	5897.0	5761.4	
Contributions (million €)	911.0	1836.2	1868.2	1830.3	1769.1	1728.4	
NDC funds accumulated (mil. €)	911.0	2773.4	4692.5	6407.1	7976.8	9553.0	
	WO1	**WO2**	**WO3**	**R1**	**R2**	**R3**	**Total**
Cohort - million	0.549	0.598	0.614	0.616	0.630	0.802	
Cohort income (million €)	3842.0	4188.3	4301.1	1540.3	1575.1	2006.1	**50597.1**
Contributions (million €)	1152.6	1256.5	1290.3	462.1	472.5	601.8	**15179.1**
Value of pension point (€)					**7410.0**		
R-PAYG replacement rate					**1.058**		
R-PAYG surplus if replacement rate 40%							**9440.7**
NDC funds accumulated (mil. €)	10578.5	12888.5	14701.7				70482.5
NDC retirement funds				15166.2	10808.0	7699.2	
Value of NDC pension				**8205.8**	**8578.1**	**9595.2**	
Additional funds for the working pensioners				462.1	801.8	601.8	
Additional pension for the working pensioners				**700.3**	**1782.6**	**2101.0**	
NDC replacement rate				1.207	1.316	1.477	
NDC deficit/surplus							**-4136.3**

Period 14 – year 2070 (λ = -0.0214, wage = €6,853.5, dependency ratio R/W = 27.1%)

	WY1	WY2	WY3	WM1	WM2	WM3
Cohort - million	0.432	0.849	0.873	0.893	0.869	0.839
Cohort income (million €)	2959.8	5821.9	5984.3	6121.7	5956.3	5747.8
Contributions (million €)	887.9	1746.6	1795.3	1836.5	1786.9	1724.4
NDC funds accumulated (mil. €)	887.9	2638.0	4509.4	6428.7	8057.0	9530.5

	WO1	WO2	WO3	R1	R2	R3	Total
Cohort - million	0.556	0.544	0.590	0.597	0.589	0.563	
Cohort income (million €)	3810.6	3727.5	4045.1	1461.2	1441.9	1378.0	**48456.1**
Contributions (million €)	1143.2	1118.3	1213.5	438.4	432.6	413.4	**14536.8**
Value of pension point (€)					**8308.0**		
R-PAYG replacement rate					**1.212**		
R-PAYG surplus if replacement rate 40%							**9740.1**
NDC funds accumulated (mil. €)	10491.9	11470.6	13826.4				67840.4
NDC retirement funds				14387.3	9894.6	5288.5	
Value of NDC pension				**8030.3**	**8394.6**	**9390.0**	
Additional funds for the working pensioners				438.4	734.1	413.4	
Additional pension for the working pensioners				**685.4**	**1744.5**	**2056.1**	
NDC replacement rate				1.207	1.316	1.477	
NDC deficit/surplus							**-1421.2**

Period 15 – year 2075 (λ = -0.0074, wage = €6,802.7, dependency ratio R/W = 26.0%)

	WY1	WY2	WY3	WM1	WM2	WM3	
Cohort - million	0.437	0.846	0.849	0.877	0.891	0.866	
Cohort income (million €)	2975.9	5755.7	5773.5	5966.7	6061.7	5888.5	
Contributions (million €)	892.8	1726.7	1732.1	1790.0	1818.5	1766.5	
NDC funds accumulated (mil. €)	892.8	2608.1	4350.5	6266.0	8199.5	9763.8	
	WO1	**WO2**	**WO3**	**R1**	**R2**	**R3**	**Total**
Cohort - million	0.567	0.551	0.537	0.574	0.571	0.527	
Cohort income (million €)	3855.9	3749.8	3651.4	1393.8	1387.4	1279.5	**47739.9**
Contributions (million €)	1156.8	1124.9	1095.4	418.1	416.2	383.9	**14322.0**
Value of pension point (€)					**8565.3**		
R-PAYG replacement rate					**1.259**		
R-PAYG surplus if replacement rate 40%							**9772.1**
NDC funds accumulated (mil. €)	10616.6	11539.0	12480.9				66717.1
NDC retirement funds				13723.8	9520.4	4910.6	
Value of NDC pension				**7970.7**	**8332.3**	**9320.3**	
Additional funds for the working pensioners				418.1	416.2	383.9	
Additional pension for the working pensioners				**680.3**	**1020.4**	**2040.8**	
NDC replacement rate				1.207	1.278	1.477	
NDC deficit/surplus							**-654.7**

Period 16 – year 2080 (λ = -0.0002, wage = €6,801.1, dependency ratio R/W = 24.5%)

	WY1	WY2	WY3	WM1	WM2	WM3	
Cohort - million	0.443	0.857	0.845	0.853	0.875	0.888	
Cohort income (million €)	3013.3	5829.0	5749.2	5798.2	5951.0	6036.0	
Contributions (million €)	904.0	1748.7	1724.8	1739.5	1785.3	1810.8	
NDC funds accumulated (mil. €)	904.0	2641.3	4332.2	6089.0	8049.8	10008.4	
	WO1	**WO2**	**WO3**	**R1**	**R2**	**R3**	**Total**
Cohort - million	0.585	0.562	0.544	0.522	0.549	0.511	
Cohort income (million €)	3978.8	3821.8	3699.8	1267.3	1333.0	1240.1	**47717.6**
Contributions (million €)	1193.6	1146.5	1109.9	380.2	399.9	372.0	**14315.3**
Value of pension point (€)					**9050.6**		
R-PAYG replacement rate					**1.331**		
R-PAYG surplus if replacement rate 40%							**10012.4**
NDC funds accumulated (mil. €)	10955.1	11760.7	12646.3				67386.7
NDC retirement funds				12478.0	9147.1	4759.1	
Value of NDC pension				**7968.9**	**8330.4**	**9318.1**	
Additional funds for the working pensioners				380.2	678.6	372.0	
Additional pension for the working pensioners				**680.1**	**1731.1**	**2040.3**	
NDC replacement rate				1.207	1.316	1.477	
NDC deficit/surplus							**-14.7**

Period 17 – year 2085 (λ = -0.000002, wage = €6,801.1, dependency ratio R/W = 23.5%)

	WY1	WY2	WY3	WM1	WM2	WM3	
Cohort - million	0.444	0.868	0.856	0.849	0.850	0.872	
Cohort income (million €)	3019.2	5903.7	5823.8	5775.1	5784.3	5927.2	
Contributions (million €)	905.8	1771.1	1747.1	1732.5	1735.3	1778.2	
NDC funds accumulated (mil. €)	905.8	2675.1	4388.4	6064.7	7824.2	9827.9	
	WO1	**WO2**	**WO3**	**R1**	**R2**	**R3**	**Total**
Cohort - million	0.600	0.580	0.555	0.529	0.499	0.491	
Cohort income (million €)	4079.4	3944.6	3771.7	1284.4	1212.3	1191.7	**47717.4**
Contributions (million €)	1223.8	1183.4	1131.5	385.3	363.7	357.5	**14315.2**
Value of pension point (€)					**9423.5**		
R-PAYG replacement rate					**1.386**		
R-PAYG surplus if replacement rate 40%							**10182.6**
NDC funds accumulated (mil. €)	11232.2	12138.5	12892.2				67949.0
NDC retirement funds				12646.2	8318.6	4573.5	
Value of NDC pension				**7968.8**	**8330.4**	**9318.1**	
Additional funds for the working pensioners				385.3	617.1	357.5	
Additional pension for the working pensioners				**680.1**	**1731.1**	**2040.3**	
NDC replacement rate				1.207	1.316	1.477	
NDC deficit/surplus							**572.4**

Period 18 – year 2090 (wage = €6805.7, dependency ratio R/W = 23.0%)

	WY1	WY2	WY3	WM1	WM2	WM3	
Cohort - million	0.441	0.870	0.867	0.860	0.847	0.847	
Cohort income (million €)	3000.7	5919.2	5902.4	5854.0	5765.1	5765.0	
Contributions (million €)	900.2	1775.8	1770.7	1756.2	1729.5	1729.5	
NDC funds accumulated (mil. €)	900.2	2682.1	4447.6	6147.6	7798.4	9559.0	
	WO1	**WO2**	**WO3**	**R1**	**R2**	**R3**	**Total**
Cohort - million	0.589	0.595	0.572	0.539	0.506	0.446	
Cohort income (million €)	4008.6	4047.1	3895.5	1310.2	1229.5	1084.5	**47781.8**
Contributions (million €)	1202.6	1214.1	1168.7	393.1	368.8	325.4	**14334.5**
Value of pension point (€)					**9609.7**		
R-PAYG replacement rate					**1.412**		
R-PAYG surplus if replacement rate 40%							**17613.7**
NDC funds accumulated (mil. €)	11037.2	12453.9	13315.4				**68341.3**
NDC retirement funds				12900.9	8436.5	4162.1	
Value of NDC pension				**7974.2**	**8336.0**	**9324.4**	
Additional funds for the working pensioners				393.1	625.9	325.4	
Additional pension for the working pensioners				**680.6**	**1732.3**	**2041.7**	
NDC replacement rate				1.207	1.316	1.477	
NDC deficit/surplus							**884.6**

Table C1. Evolution of pensions from period 7 (the retirement of first cohort in the system) including additional benefits for working pensioners (pensions calculated in € as weighted averages of the cohort-respective "pure" NDC pensions and NDC additional pensions, initial wage of €10,366.7, zero productivity change)

	2035	2040	2045	2050	2055	2060	2065	2070	2075	2080	2085	2090
NDC R1	8997.3	9740.1	9887.8	9377.0	8887.7	8630.8	8455.8	8275.0	8213.6	8211.7	8211.6	8217.2
NDC R2		9236.4	10093.5	10218.3	9685.1	9405.2	9214.5	9017.4	8696.6	8948.4	8948.4	8954.4
NDC R3			9841.5	10749.4	10873.6	10559.3	10345.2	10124.0	10048.9	10046.5	10046.5	10053.3
R-PAYG	11022.0	9127.3	7430.7	6920.3	6310.0	6801.4	7410.0	8308.0	8565.3	9050.6	9423.5	9609.7

Table C2. Evolution of replacement rates from period 7 including additional benefits for working pensioners (zero productivity change)

	2035	2040	2045	2050	2055	2060	2065	2070	2075	2080	2085	2090
NDC R1	0.972	1.128	1.207	1.207	1.207	1.207	1.207	1.207	1.207	1.207	1.207	1.207
NDC R2		1.069	1.233	1.316	1.316	1.316	1.316	1.316	1.278	1.316	1.316	1.316
NDC R3			1.202	1.384	1.477	1.477	1.477	1.477	1.477	1.477	1.477	1.477
R-PAYG	1.191	1.057	0.907	0.891	0.857	0.951	1.058	1.212	1.259	1.331	1.386	1.412

Table C3. Evolution of NDC deficits/surpluses (million €, zero productivity change)

	2035	2040	2045	2050	2055	2060	2065	2070	2075	2080	2085	2090
NDC	17560.1	3396.7	-7016.5	-8584.2	-9242.6	-6431.7	-4136.3	-1421.2	-654.7	-14.7	572.4	884.6

Table C4. Evolution of the system dependency rate

	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075	2080	2085	2090
R/W	26.5	25.2	20.9	17.8	20.4	24.0	24.3	27.7	31.6	37.5	38.3	40.0	35.5	31.5	27.1	26.0	24.5	23.5	23.0

Table C5. Evolution of pensions from period 7 (in €, with +1 percent p.a. productivity growth)

	2035	2040	2045	2050	2055	2060	2065	2070	2075	2080	2085	2090
NDC R1	12745.5	14501.6	15472.5	15421.7	15362.6	15679.6	16145.2	16605.9	17323.5	18202.9	19131.4	20120.9
NDC R2		13751.8	15794.4	16805.4	16741.0	17086.4	17593.8	18095.8	18342.3	19836.1	20847.9	21926.1
NDC R3			15400.1	17678.7	18795.4	19183.1	19752.8	20316.4	21194.4	22270.3	23406.2	24616.8
R-PAYG	15613.8	13589.3	11627.6	11381.3	10907.0	12356.1	14148.4	16672.1	18065.4	20062.6	21954.7	23530.7

Table C6. Evolution of NDC deficits/surpluses (million €, +1 percent p.a. productivity growth)

	2035	2040	2045	2050	2055	2060	2065	2070	2075	2080	2085	2090
NDC	24875.7	5057.2	-10979.5	-14117.9	-15976.0	-11684.4	-7897.6	-2852.0	-1380.9	-32.6	1333.7	2166.0

Table C7. Evolution of pensions from period 7 (in €, with -1 percent p.a. productivity growth)

	2035	2040	2045	2050	2055	2060	2065	2070	2075	2080	2085	2090
NDC R1	6329.1	6515.8	6290.5	5673.1	5113.6	4722.4	4399.9	4094.8	3865.2	3674.9	3494.8	3325.8
NDC R2		6178.9	6421.3	6182.1	5572.4	5146.1	4794.7	4462.2	4092.5	4004.6	3808.3	3624.1
NDC R3			6261.0	6503.4	6256.2	5777.6	5383.0	5009.7	4728.9	4496.1	4275.7	4068.9
R-PAYG	7753.4	6105.9	4727.3	4186.8	3630.5	3721.4	3855.7	4111.1	4030.7	4050.3	4010.5	3889.4

Table C8. Evolution of NDC deficits/surpluses (million €, -1 percent p.a. productivity growth)

	2035	2040	2045	2050	2055	2060	2065	2070	2075	2080	2085	2090
NDC	12352.6	2272.3	-4463.8	-5193.5	-5317.8	-3519.1	-2152.3	-703.3	-308.1	-6.6	243.6	358.0

Table C10. Evolution of NDC deficits/surpluses that balances over the period (million €, zero productivity change)

	2035	2040	2045	2050	2055	2060	2065	2070	2075	2080	2085	2090
NDC	18164.8	4724.5	-5143.4	-6746.2	-7488.2	-4931.3	-2833.5	-344.9	355.4	951.8	1499.3	1791.7

Table D1 – HR +/-10.36, WR +/-4.33 – preserving the value of contributions

Pure security investment		Future value payoffs		Contributions		
		S1	S2	First year amount		% of wage
Pure security 1						
Buy FFP	€ 4,862.46	€ 93,753.44	€ 570.82	FFP	€ 187.37	7.85
Short-sell NDC	-€ 1,992.64	-€ 11,848.67	-€ 570.82	NDC	-€ 76.79	3.22
PS1	**€ 2,869.82**	€ 81,904.77	€ 0.00		€ 110.59	**4.63**
Pure security 2						
Buy NDC	€ 15,766.91	€ 93,753.44	€ 4,516.66	NDC	€ 607.57	25.46
Short-sell FFP	-€ 4,862.46	-€ 93,753.44	-€ 570.82	FFP	-€ 187.37	-7.85
PS2	**€ 10,904.45**	€ 0.00	€ 3,945.84		€ 420.20	**17.61**
Total	**€ 13,774.27**	**€ 81,904.77**	**€ 3,945.84**			**22.24**
Average wage at retirement		**€ 10,520.54**	**€ 506.84**			
Ratio of payoff to wage		**7.79**	**7.79**			

Table D2 – HR +/-10.36, WR +/-4.33 – individual optimal portfolio

Pure security investment		Future value payoffs		Contributions		
		S1	S2	First year amount		% of wage
1.41 of Pure security 1						
Buy FFP	€ 8,031.58	€ 154,857.41	€ 942.85	FFP	€ 309.49	12.97
Short-sell NDC	-€ 3,291.35	-€ 19,571.07	-€ 942.85	NDC	-€ 126.83	5.32
	€ 4,740.23	€ 135,286.35	€ 0.00		€ 182.66	7.65
0.46 of Pure security 2						
Buy NDC	€ 6,853.97	€ 40,755.20	€ 1,963.42	NDC	€ 264.11	11.07
Short-sell FFP	-€ 2,113.74	-€ 40,755.20	-€ 248.14	FFP	-€ 81.45	-3.41
	€ 4,740.23	€ 0.00	€ 1,715.28		€ 182.66	7.65
Total	**€ 9,480.46**	**€ 135,286.35**	**€ 1,715.28**			**15.31**
Average wage at retirement		**€ 10,520.54**	**€ 506.84**			
Ratio of payoff to wage		**12.86**	**3.38**			

Table D3 – HR 1 percentage point lower (+/-9.36) – preserving the value of contributions

Pure security investment		Future value payoffs		Contributions		
		S1	S2	First year amount		% of wage
Pure security 1						
Buy FFP	€ 6,348.12	€ 99,482.54	€ 846.83	FFP	€ 244.62	10.25
Short-sell NDC	- € 2,956.13	- € 17,577.78	- € 846.83	NDC	- € 113.91	4.77
PS1	**€ 3,391.99**	€ 81,904.77	€ 0.00		€ 130.71	**5.48**
Pure security 2						
Buy NDC	€ 16,730.40	€ 99,482.54	€ 4,792.66	NDC	€ 644.70	27.01
Short-sell FFP	- € 6,348.12	- € 99,482.54	- € 846.83	FFP	- € 244.62	10.25
PS2	**€ 10,382.28**	€ 0.00	€ 3,945.84		€ 400.08	**16.76**
Total	**€ 13,774.27**	**€ 81,904.77**	**€ 3,945.84**			**22.24**

Average wage at retirement		**€ 10,520.54**	**€ 506.84**			
Ratio of payoff to wage		**7.79**	**7.79**			

Table D4 – HR 1 percentage point lower (+/-9.36) – individual optimal portfolio

Pure security investment		Future value payoffs		Contributions		
		S1	S2	First year amount		% of wage
1.41 of Pure security 1						
Buy FFP	€ 8,953.79	€ 140,316.55	€ 1,194.42	FFP	€ 345.03	14.46
Short-sell NDC	- € 4,169.51	- € 24,792.82	-€ 1,194.42	NDC	- € 160.67	6.73
	€ 4,784.28	€ 115,523.73	€ 0.00		€ 184.36	7.73
0.46 of Pure security 2						
Buy NDC	€ 7,709.56	€ 45,842.72	€ 2,208.51	NDC	€ 297.08	12.45
Short-sell FFP	- € 2,925.29	- € 45,842.72	-€ 390.23	FFP	- € 112.72	4.72
	€ 4,784.28	€ 0.00	€ 1,818.29		€ 184.36	7.73
Total	**€ 9,568.55**	**€ 115,523.73**	**€ 1,818.29**			**15.45**
Average wage at retirement		**€ 10,520.54**	**€ 506.84**			
Ratio of payoff to wage		**10.98**	**3.59**			

Table D5 – HR 1 percentage point higher (+/-11.36) – preserving the value of contributions

Pure security investment		Future value payoffs		Contributions		
		S1	S2	First year amount		% of wage
Pure security 1						
Buy FFP	€ 3,776.67	€ 90,076.96	€ 393.70	FFP	€ 145.53	6.10
Short-sell NDC	- € 1,374.35	- € 8,172.20	- € 393.70	NDC	- € 52.96	2.22
PS1	**€ 2,402.31**	€ 81,904.77	€ 0.00		€ 92.57	**3.88**
Pure security 2						
Buy NDC	€ 15,148.62	€ 90,076.96	€ 4,339.54	NDC	€ 583.75	24.46
Short-sell FFP	- € 3,776.67	- € 90,076.96	- € 393.70	FFP	- € 145.53	6.10
PS2	**€ 11,371.96**	€ 0.00	€ 3,945.84		€ 438.21	**18.36**
Total	**€ 13,774.27**	**€ 81,904.77**	**€ 3,945.84**			**22.24**
Average wage at retirement		**€ 10,520.54**	**€ 506.84**			
Ratio of payoff to wage		**7.79**	**7.79**			

Table D6 – HR 1 percentage point higher (+/-11.36) – individual optimal portfolio

Pure security investment		Future value payoffs		Contributions		
		S1	S2	First year amount		% of wage
1.96 of Pure security 1						
Buy FFP	€ 7,407.66	€ 176,679.60	€ 772.22	FFP	€ 285.45	11.96
Short-sell NDC	-€ 2,695.70	-€ 16,029.19	-€ 772.22	NDC	-€ 103.88	4.35
	€ 4,711.97	€ 160,650.42	€ 0.00		€ 181.57	**7.61**
0.41 of Pure security 2						
Buy NDC	€ 6,276.83	€ 37,323.36	€ 1,798.09	NDC	€ 241.87	10.14

Short-sell FFP	-€ 1,564.86	-€ 37,323.36	-€ 163.13	FFP	-€ 60.30	2.53
	€ 4,711.97	€ 0.00	€ 1,634.96		€ 181.57	**7.61**
Total	**€ 9,423.93**	**€ 160,650.42**	**€ 1,634.96**			**15.22**
Average wage at retirement		**€ 10,520.54**	**€ 506.84**			
Ratio of payoff to wage		**15.27**	**3.23**			

Table D7 – WR 1 percentage point lower (+/-3.33) – preserving the value of contributions (discount rate for S_2 changes to –0.67%, cost of investment without pure securities changes to € 15,962.86)

Pure security investment		**Future value payoffs**		**Contributions**		
		S1	**S2**	**First year amount**		**% of wage**
Pure security 1						
Buy FFP	€ 2,746.13	€ 55,216.38	€ 483.44	FFP	€ 123.15	5.16
Short-sell NDC	-€ 1,007.71	-€ 4,977.99	-€ 483.44	NDC	-€ 45.19	1.89
PS1	**€ 1,738.42**	€ 50,238.40	€ 0.00		€ 77.96	**3.27**
Pure security 2						
Buy NDC	€ 11,177.60	€ 55,216.38	€ 5,362.32	NDC	€ 501.27	21.01
Short-sell FFP	-€ 2,746.13	€ 55,216.38	-€ 483.44	FFP	-€ 123.15	5.16
PS2	**€ 8,431.47**	€ 0.00	€ 4,878.89		€ 378.12	**15.85**
Total	**€ 10,169.89**	**€ 50,238.40**	**€ 4,878.89**			**19.11**
Average wage at retirement		**€ 7,510.02**	**€ 729.33**			
Ratio of payoff to wage		**6.69**	**6.69**			

Table D8 – WR 1 percentage point lower (+/-3.33) – individual optimal portfolio

Pure security investment		**Future value payoffs**		**Contributions**		
		S1	**S2**	**First year amount**		**% of wage**
2.24 of Pure security 1						
Buy FFP	€ 6,159.51	€ 123,849.39	€ 1,084.34	FFP	€ 276.23	11.58
Short-sell NDC	-€ 2,260.27	-€ 11,165.54	-€ 1,084.34	NDC	-€ 101.36	4.25
	€ 3,899.24	€ 112,683.85	€ 0.00		€ 174.87	**7.33**
0.46 of Pure security 2						
Buy NDC	€ 5,169.22	€ 25,535.53	€ 2,479.88	NDC	€ 231.82	9.71
Short-sell FFP	-€ 1,269.98	-€ 25,535.53	-€ 223.57	FFP	-€ 56.95	2.39
	€ 3,899.24	€ 0.00	€ 2,256.31		€ 174.87	**7.33**
Total	**€ 7,798.49**	**€ 112,683.85**	**€ 2,256.31**			**14.66**
Average wage at retirement		**€ 7,510.02**	**€ 729.33**			
Ratio of payoff to wage		**15.00**	**3.09**			

Table D9 – Both HR and WR 1 percentage point lower (+/-9.36 and +/-3.33) – preserving the value of contributions (discount rate for S_2 changes to –0.67%, cost of investment without pure securities changes to € 15,962.86)

Pure security investment		**Future value payoffs**		**Contributions**	
		S1	**S2**	**First year amount**	**% of wage**

Pure security 1						
Buy FFP	€ 3,543.96	€ 57,468.20	€ 702.12	FFP	€ 158.93	6.66
Short-sell NDC	-€ 1,463.55	-€ 7,229.81	-€ 702.12	NDC	-€ 65.63	-2.75
PS1	**€ 2,080.41**	€ 50,238.40	€ 0.00		€ 93.30	**3.91**
Pure security 2						
Buy NDC	€ 11,633.44	€ 57,468.20	€ 5,581.01	NDC	€ 521.72	21.86
Short-sell FFP	-€ 3,543.96	€ 57,468.20	-€ 702.12	FFP	-€ 158.93	-6.66
PS2	**€ 8,089.48**	€ 0.00	€ 4,878.89		€ 362.78	**15.20**
Total	**€ 10,169.89**	**€ 50,238.40**	**€ 4,878.89**			**19.11**
Average wage at retirement		**€ 7,510.02**	**€ 729.33**			
Ratio of payoff to wage		**6.69**	**6.69**			

Table D10 – Both HR and WR 1 percentage point lower (+/-9.36 and +/-3.33) – individual optimal portfolio

Pure security investment		Future value payoffs		Contributions		
		S1	S2	First year amount		% of wage
2.24 of Pure security 1						
Buy FFP	€ 6,671.81	€ 108,188.82	€ 1,321.80	FFP	€ 299.21	12.54
Short-sell NDC	-€ 2,755.26	-€ 13,610.73	-€ 1,321.80	NDC	-€ 123.56	-5.18
	€ 3,916.56	€ 94,578.09	€ 0.00		€ 175.64	**7.36**
0.46 of Pure security 2						
Buy NDC	€ 5,632.38	€ 27,823.48	€ 2,702.07	NDC	€ 252.59	10.59
Short-sell FFP	-€ 1,715.82	-€ 27,823.48	-€ 339.93	FFP	-€ 76.95	-3.22
	€ 3,916.56	€ 0.00	€ 2,362.14		€ 175.64	**7.36**
Total	**€ 7,833.11**	**€ 94,578.09**	**€ 2,362.14**			**14.72**
Average wage at retirement		**€ 7,510.02**	**€ 729.33**			
Ratio of payoff to wage		**12.59**	**3.24**			

Table D11 – HR 1 percentage point higher and WR 1 percentage point lower (+/-11.36 and +/-3.33) – preserving the value of contributions (discount rate for S_2 changes to –0.67%, cost of investment without pure securities changes to € 15,962.86)

Pure security investment		Future value payoffs		Contributions		
		S1	S2	First year amount		% of wage
Pure security 1						
Buy FFP	€ 2,144.26	€ 53,721.21	€ 338.23	FFP	€ 96.16	4.03
Short-sell NDC	-€ 705.03	-€ 3,482.81	-€ 338.23	NDC	-€ 31.62	-1.33
PS1	**€ 1,439.22**	€ 50,238.40	€ 0.00		€ 64.54	**2.70**
Pure security 2						
Buy NDC	€ 10,874.92	€ 53,721.21	€ 5,217.12	NDC	€ 487.70	20.44
Short-sell FFP	-€ 2,144.26	€ 53,721.21	-€ 338.23	FFP	-€ 96.16	-4.03
PS2	**€ 8,730.67**	€ 0.00	€ 4,878.89		€ 391.54	**16.41**
Total	**€ 10,169.89**	**€ 50,238.40**	**€ 4,878.89**			**19.11**

Average wage at retirement		**€ 7,510.02**	**€ 729.33**		
Ratio of payoff to wage		**6.69**	**6.69**		

Table D12 – HR 1 percentage point higher and WR 1 percentage point lower (+/-11.36 and +/-3.33) – individual optimal portfolio

Pure security investment		**Future value payoffs**		**Contributions**		
		S1	**S2**	**First year amount**		**% of wage**
2.24 of Pure security 1						
Buy FFP	€ 5,792.24	€ 145,116.03	€ 913.66	FFP	€ 259.76	10.89
Short-sell NDC	-€ 1,904.49	-€ 9,408.04	-€ 913.66	NDC	-€ 85.41	-3.58
	€ 3,887.75	€ 135,707.98	€ 0.00		€ 174.35	**7.31**
0.46 of Pure security 2						
Buy NDC	€ 4,842.58	€ 23,921.95	€ 2,323.17	NDC	€ 217.17	9.10
Short-sell FFP	-€ 954.83	-€ 23,921.95	-€ 150.61	FFP	-€ 42.82	-1.79
	€ 3,887.75	€ 0.00	€ 2,172.56		€ 174.35	**7.31**
Total	**€ 7,775.50**	**€ 135,707.98**	**€ 2,172.56**			**14.61**
Average wage at retirement		**€ 7,510.02**	**€ 729.33**			
Ratio of payoff to wage		**18.07**	**2.98**			

Table D13 – WR 1 percentage point higher (+/-5.33) – preserving the value of contributions (discount rate for S_2 changes to -4.58%, cost of investment without pure securities changes to €21,787.46)

Pure security investment		**Future value payoffs**		**Contributions**		
		S1	**S2**	**First year amount**		**% of wage**
Pure security 1						
Buy FFP	€ 8,822.17	€ 163,012.92	€ 689.82	FFP	€ 289.87	12.15
Short-sell NDC	-€ 4,079.46	-€ 28,881.78	-€ 689.82	NDC	-€ 134.04	5.62
PS1	**€ 4,742.71**	€ 134,131.14	€ 0.00		€ 155.83	**6.53**
Pure security 2						
Buy NDC	€ 23,025.05	€ 163,012.92	€ 3,893.43	NDC	€ 756.54	31.70
Short-sell FFP	-€ 8,822.17	€ 163,012.92	-€ 689.82	FFP	-€ 289.87	12.15
PS2	**€ 14,202.88**	€ 0.00	€ 3,203.61		€ 466.67	**19.56**
Total	**€ 18,945.59**	**€ 134,131.14**	**€ 3,203.61**			**26.09**
Average wage at retirement		**€ 14,690.58**	**€ 350.87**			
Ratio of payoff to wage		**9.13**	**9.13**			

Table D14 – WR 1 percentage point higher (+/-5.33) – individual optimal portfolio

Pure security investment		**Future value payoffs**		**Contributions**		
		S1	**S2**	**First year amount**		**% of wage**
1.25 of Pure security 1						
Buy FFP	€ 11,052.00	€ 204,215.01	€ 864.17	FFP	€ 363.14	15.22
Short-sell NDC	-€ 5,110.56	-€ 36,181.75	-€ 864.17	NDC	-€ 167.92	7.04
	€ 5,941.45	€ 168,033.25	€ 0.00		€ 195.22	**8.18**

0.42 of Pure security 2						
Buy NDC	€ 9,632.00	€ 68,192.71	€ 1,628.73	NDC	€ 316.48	13.26
Short-sell FFP	-€ 3,690.55	-€ 68,192.71	-€ 288.57	FFP	-€ 121.26	5.08
	€ 5,941.45	€ 0.00	€ 1,340.16		€ 195.22	**8.18**
Total	**€ 11,882.89**	**€ 168,033.25**	**€ 1,340.16**			**16.36**
Average wage at retirement		**€ 14,690.58**	**€ 350.87**			
Ratio of payoff to wage		**11.44**	**3.82**			

Table D15 – HR 1 percentage point lower and WR 1 percentage point higher (+/-9.36 and +/-5.33) – preserving the value of contributions (discount rate for S_2 changes to -4.58%, cost of investment without pure securities changes to €21,787.46)

Pure security investment		**Future value payoffs**		**Contributions**		
		S1	**S2**	**First year amount**		**% of wage**
Pure security 1						
Buy FFP	€ 11,784.45	€ 178,432.72	€ 1,058.11	FFP	€ 387.20	16.23
Short-sell NDC	-€ 6,257.46	-€ 44,301.59	-€ 1,058.11	NDC	-€ 205.60	-8.62
PS1	**€ 5,526.99**	€ 134,131.14	€ 0.00		€ 181.60	**7.61**
Pure security 2						
Buy NDC	€ 25,203.04	€ 178,432.72	€ 4,261.72	NDC	€ 828.10	34.70
Short-sell FFP	-€ 11,784.45	€ 178,432.72	-€ 1,058.11	FFP	-€ 387.20	-16.23
PS2	**€ 13,418.60**	€ 0.00	€ 3,203.61		€ 440.90	**18.48**
Total	**€ 18,945.59**	**€ 134,131.14**	**€ 3,203.61**			**26.09**
Average wage at retirement		**€ 14,690.58**	**€ 350.87**			
Ratio of payoff to wage		**9.13**	**9.13**			

Table D16 – HR 1 percentage point lower and WR 1 percentage point higher (+/-9.36 and +/-5.33) – individual optimal portfolio

Pure security investment		**Future value payoffs**		**Contributions**		
		S1	**S2**	**First year amount**		**% of wage**
1.25 of Pure security 1						
Buy FFP	€ 12,920.90	€ 195,640.17	€ 1,160.15	FFP	€ 424.54	17.79
Short-sell NDC	-€ 6,860.90	-€ 48,573.88	-€ 1,160.15	NDC	-€ 225.43	-9.45
	€ 6,060.00	€ 147,066.29	€ 0.00		€ 199.11	**8.34**
0.42 of Pure security 2						
Buy NDC	€ 11,381.99	€ 80,582.31	€ 1,924.64	NDC	€ 373.98	15.67
Short-sell FFP	-€ 5,321.99	-€ 80,582.31	-€ 477.85	FFP	-€ 174.87	-7.33
	€ 6,060.00	€ 0.00	€ 1,446.79		€ 199.11	**8.34**
Total	**€ 12,119.99**	**€ 147,066.29**	**€ 1,446.79**			**16.69**
Average wage at retirement		**€ 14,690.58**	**€ 350.87**			
Ratio of payoff to wage		**10.01**	**4.12**			

Table D17 – Both HR and WR 1 percentage point higher (+/-11.36 and +/-5.33) – preserving the value of contributions (discount rate for S_2 changes to -4.58%, cost of investment without pure securities changes to €21,787.46)

Pure security investment		Future value payoffs		Contributions		
		S1	S2	First year amount		% of wage
Pure security 1						
Buy FFP	€ 6,772.97	€ 153,628.40	€ 465.68	FFP	€ 222.54	9.33
Short-sell NDC	-€ 2,753.93	-€ 19,497.26	-€ 465.68	NDC	-€ 90.49	-3.79
PS1	**€ 4,019.05**	€ 134,131.14	€ 0.00		€ 132.05	**5.53**
Pure security 2						
Buy NDC	€ 21,699.51	€ 153,628.40	€ 3,669.29	NDC	€ 712.99	29.88
Short-sell FFP	-€ 6,772.97	€ 153,628.40	-€ 465.68	FFP	-€ 222.54	-9.33
PS2	**€ 14,926.54**	€ 0.00	€ 3,203.61		€ 490.44	**20.55**
Total	**€ 18,945.59**	**€ 134,131.14**	**€ 3,203.61**			**26.09**
Average wage at retirement		**€ 14,690.58**	**€ 350.87**			
Ratio of payoff to wage		**9.13**	**9.13**			

Table D18 – Both HR and WR 1 percentage point higher (+/-11.36 and +/-5.33) – individual optimal portfolio

Pure security investment		Future value payoffs		Contributions		
		S1	S2	First year amount		% of wage
1.25 of Pure security 1						
Buy FFP	€ 9,891.05	€ 224,354.37	€ 680.06	FFP	€ 324.99	13.62
Short-sell NDC	-€ 4,021.75	-€ 28,473.23	-€ 680.06	NDC	-€ 132.14	-5.54
	€ 5,869.30	€ 195,881.14	€ 0.00		€ 192.85	**8.08**
0.42 of Pure security 2						
Buy NDC	€ 8,532.52	€ 60,408.58	€ 1,442.81	NDC	€ 280.35	11.75
Short-sell FFP	-€ 2,663.22	-€ 60,408.58	-€ 183.11	FFP	-€ 87.51	-3.67
	€ 5,869.30	€ 0.00	€ 1,259.70		€ 192.85	**8.08**
Total	**€ 11,738.60**	**€ 195,881.14**	**€ 1,259.70**			**16.16**
Average wage at retirement		**€ 14,690.58**	**€ 350.87**			
Ratio of payoff to wage		**13.33**	**3.59**			