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**The Element of Individual Choice in Pension Reform: Cases of  
Argentina and Chile**

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Ďakujem konzultantovi Petrovi Hedbávnému za aktívnu a konštruktívnu asistenciu pri písaní tejto práce. Ďalej ďakujem rodičom ktorí ma vždy ochotne podporovali v činnosti pre ktorú som sa rozhodol, a v neposlednom rade vyučujúcim na IES.

#### Prehlásenie

Prehlasujem, že som bakalársku prácu vypracoval samostatne a použil výhradne uvedené pramene a literatúru.

I hereby declare that I created this bachelor thesis independently, using only the listed literature and resources.

V Prahe 20. mája 2010

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## Abstract

This paper deals with a specific reform of a defined-benefit pay-as-you-go pension system. Namely, it is the one that completely or partially replaces the old system, with a fully funded defined contribution component. Its aim is to examine the element of individual choice embodied in the reform. Pension system participants face a choice of whether to switch to the new system or remain participants of the old one. In theoretical part of the paper, we show how reforms can be classified according to how “right to choice” is granted and denied to various groups of pension system participants. Replacing pay-as-you-go pension system with a fully funded component entails implicit social security debt of the old system turning explicit. Another objective of this paper is thus to match possible distributions of “right to choice” with corresponding kind of social security debt that turns explicit. The last objective is to state the individual decision making problem of a worker facing the reform. There are two major decisions to be made. First, the worker is to select the optimal switching strategy (switch or not to switch). Second, the worker can optimize his/her contribution path throughout productive life. Conclusion of the switching problem analysis is that given the values of all parameters expected by the worker (for example degree of policy risk, market situation, career advancement), the optimal switching strategy can be found for the worker’s time left until retirement. Analysis of the contribution optimization implies risk of moral hazard, namely the incentive to avoid contributing that arises from safety net design features of the reform. To show how these conclusions apply to reality, two empirical studies of such reforms are provided: Chile and Argentina. Each reform is first described and then discussed within the framework established in the theoretical section. Finally, a brief evaluation of both reforms is made in the perspective of recommendations put forward by the World Bank in its 1994’s report *Averting the Old Age Crisis: Policies to Protect the Old and Promote Growth*.

## Abstrakt

Táto práca sa zaoberá konkrétnym typom reformy priebežného, dávkovo určeného penzijného systému (defined benefit pay-as-you-go). Ide o reformu, ktorá spočíva v čiastočnom alebo úplnom nahradení pôvodného systému novým, fondovým systémom s definovanou výškou odvodov (fully funded defined contribution). Naším cieľom je preskúmať prvok voľby jednotlivca ktorý je súčasťou reformy. Účastníci penzijného systému sú postavení pred voľbu medzi pôvodným a novým systémom. V teoretickej časti práce je ukázané ako je možné klasifikovať reformy podľa toho, ako je "právo voľby" priznané a odmietnuté jednotlivým skupinám účastníkov systému. Nahradenie pay-as-you-go systému fondovým (čiastočne alebo úplne) je sprevádzané zmenou implicitného dlhu pôvodného penzijného systému na dlh explicitný. Ďalším cieľom práce je priradiť k možným rozloženiam "práva voľby" príslušný rozsah implicitného dlhu, ktorý sa zmení na explicitný. Posledným cieľom je zostaviť problém rozhodovania sa jednotlivca. Tento problém má dva hlavné komponenty. Po prvé, jednotlivec sa rozhoduje pre optimálnu stratégiu prechodu (prejsť na nový systém alebo ostať v pôvodnom). Po druhé, jednotlivec hľadá optimálnu stratégiu odvádzania príspevkov do systému počas svojho produktívneho života. Záverom problému prechodu je, že pre jednotlivcom očakávané hodnoty parametrov (napr. stupeň politického rizika, situácia na trhu, kariérny rast) je možné určiť optimálnu stratégiu podľa počtu rokov do dôchodku. Analýza problému optimalizácie odvodov poukazuje na riziko morálneho hazardu. Zdrojom tohoto rizika sú prvky systému ktoré predstavujú jeho záchrannú sieť. Následne sú v práci predstavené dve empirické štúdie penzijných reforiem: Čile a Argentína. Obe reformy sú popísané a analyzované pomocou rámca ustanoveného v teoretickej časti. Empirické štúdie sú zakončené stručným hodnotením reformy z pohľadu reformnej stratégie ktorú navrhla Svetová Banka v reporte z roku 1994: *Averting the Old Age Crisis: Policies to Protect the Old and Promote Growth*.

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## 1. Introduction

PAYG systems all over the world have matured, and often failed to adjust to new reality such as rapid population ageing. As the problem becomes increasingly imminent, debates on suitable reform policies intensify. Changes to the pension system of which default is a PAYG system can be divided into parametrical and structural. Parametrical changes mean fine-tuning the original system. This can mean changing eligibility requirements, contribution rates or benefit calculation formulas. In this paper, we will predominately be concerned with the structural reform; complete or partial substitution of PAYG system with a fully funded system based on individual savings. *Partial* means diversification of contributions between PAYG and the fully funded scheme, allowing PAYG to coexist in parallel with the new, fully funded system. *Complete* implies elimination or phasing out the old system.

Whenever structural reform is taking place, there are various alternatives of restricting individual choice. We will particularly focus on the worker's choice of whether to switch or not to switch from the old pension scheme to the one that is brought to existence when the reform is introduced. Should participants be forced to switch to new schemes by reform legislation? Or just enabled to do so? Should the choice be granted to some and restricted for others? "Right to choice", as we shall point out, is granted to different groups depending on the reform design. For those who switch, the government must find the way of recognizing previous contributions. This constitutes the amount of implicit social security debt that is made explicit.

Demonstration follows of how amount of debt made explicit corresponds to distribution of "right to choice". It thus constitutes a crucial design feature of every pension reform. After introduction of "right to choice" concept, we proceed to examine incentives that influence workers' decision making concerning switching and contributing. This completes the theoretical section of the paper. We then describe two reforms from Chile and Argentina, both of which represent different distribution of "right to choice". Both reforms are examined within the framework discussed in theoretical part.

Before we proceed, some important notes need to be made. In many Latin America countries, the reform does not always apply to the entire economically active population. There are countries where the self-employed are not part of any mandatory pension schemes at all. Those of them not having participated in PAYG scheme before are therefore not directly affected. Our discussions in this paper will, if no special remarks are made, not concern them. Similarly, in some countries certain groups of public sector employees were for various reasons excluded from the reform. We will therefore treat them in the same way. Another simplification we will employ to reduce our focus will be considering only the primary function of pension schemes; that is provision of income in retirement. We will not discuss functions such as disability insurance or survivorship insurance which are often incorporated into pension systems. The last significant reduction of our focus will be excluding voluntary components of pension schemes from our discussion, even though these are often regulated by the reform legislation.

## 2. Theory

### 2.1 Definitions

To proceed throughout the paper in a clear-cut manner, let us first provide basic definitions of terms that will be used further in the text.<sup>1</sup>

*Pay-as-you-go (PAYG)*: in its strictest sense, a method of financing whereby current outlays on pension benefits are paid out of current revenues from an earmarked tax, often a payroll tax. Within a single period, the PAYG system is balanced when contributions are exactly sufficient to cover the benefits. In order to state this condition formally, we shall use following notation:

$\bar{w}$  ...the average covered wage

$\bar{p}$  ...the average pension granted by the system

$c$ .....contribution rate

$N^C$ ...number of contributors

$N^B$ ...number of beneficiaries

PAYG is then in balance when the following equality holds; left side being the “revenue side” of the system and right side the “expenditure side”:

$$\bar{w}.c.N^C = \bar{p}.N^B$$

Restatement of the condition in a dynamic perspective is the Aaron-Samuelson condition:

$$\bar{w}_t.(1 + g_n).(1 + g_w).c.N_t^C = \bar{p}_{t+1}.N_{t+1}^B$$

where  $g_n$  stands for growth of number of contributors and  $g_w$  is the wage growth.

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<sup>1</sup> Definitions of terms in italics, if not noted otherwise, are adopted from Averting the Old Age Crisis: Policies to Protect the Old and Promote Growth, World Bank (1994), p. xxi-xxii

PAYG pension schemes are sometimes referred to as *Bismarckian* or *Beveridgean*. Let us enumerate the basic features of these systems<sup>2</sup>.

The *Bismarckian* system is characterized by the following three points:

- the insured persons are employees or gainfully employed,
- the financing is via contributions, graduated according to income,
- the contributions to be paid are based on wages or salaries.

The *Beveridgean* system is marked by the following:

- it includes the entire population,
- it is primarily financed from the state budget,
- it calls for uniform, lump-sum contributions.

*Full funding (FF)*: the accumulation of pension reserves that totals 100 percent of the present value of all pension liabilities owed to current members.

*Defined benefit*: a guarantee by the insurer or pension agency that a benefit based on a prescribed formula will be paid.

*Defined contribution*: a pension plan in which the periodic contribution is prescribed and the benefit depends on the contribution and the investment return.

*Means-tested benefit*: a benefit that is paid only if the recipient's income falls below a certain level. Alternatively, *wealth* can be used as a criterion as opposed to *income*.

*System dependency ratio*: the ratio of persons receiving pensions from a certain pension scheme divided by the number of workers contributing to the same scheme in the same period.

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<sup>2</sup> CESifo DICE Report 4/2008, p.70

*Legal retirement age:* the normal retirement age written into pension statutes.

*Vesting period:* the minimum amount of time required to qualify for full ownership of pension benefits.

*Replacement rate:* the value of a pension as a proportion of a worker's wage during some base period, such as the last year or two before retirement or the entire lifetime average wage. It also denotes the average pension of a group of pensioners as a proportion of the average wage of the group.

*Moral hazard:* a situation in which insured people do not protect themselves from risk as much as they would have if they were not insured.

*Policy Risk:* uncertainty that arises from the possibility of rules being changed via legislation.<sup>3</sup>

*Implicit public pension debt (net):* the value of outstanding pension claims on the public sector minus accumulated pension reserves. Throughout the paper, we will refer to this as SSD (social security debt). Division of SSD will be treated in more detail below.

*Reform of a pension system:* any change of legislation concerning mandatory pension schemes. We will assume that the system before the reform was PAYG, as it always was the case of Latin America.

*Parametric reform:* various modifications of the existing PAYG scheme, such as changing vesting period, legal retirement age, contribution rates, benefit formulas, eligibility requirements or any combination of the previous.

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<sup>3</sup> Own definition.

*Structural reform:* Profound change in the pension system, for example and, as it usually is the case, partial or complete replacement of a PAYG schemes with fully funded schemes.

From this point on, we will refer to FF DC system simply as to fully funded. Similarly, PAYG DB system will be referred to as just pay-as-you-go, since these two characteristics happen to be coupled throughout entire paper.

## 2.2 World Bank 1994 Strategy

We shall briefly summarize the World Bank pension reform strategy put forward in 1994's *Averting the Old Age Crisis: Policies to Protect the Old and Promote Growth*. We will then be able to see up to what extent Argentine and Chilean pension reforms correspond to these recommendations.

The World Bank proposes a *three pillar reform strategy*. First, the mandatory publically managed pillar, financed from general tax revenues. This pillar would provide a minimum guaranteed pension or other level of flat benefit, thus being a strongly redistributive component. Its features fall under the classification of Beveridgean PAYG. The second pillar, recommended to be the major source of income in retirement age, is a mandatory, privately managed, FF scheme. The third pillar is voluntary and in other aspects is identical to the second pillar.

Figure 1: Summary of the World Bank 1994 Strategy

	<b>1st Pillar (mandatory)</b>	<b>2nd Pillar (mandatory)</b>	<b>3rd Pillar (voluntary)</b>
<b>Objectives</b>	Redistributive plus coinsurance	Savings plus coinsurance	Savings plus coinsurance
<b>Form</b>	Means tested, minimum pension guarantee, or flat	Personal savings plan or occupational plan	Personal savings plan or occupational plan
<b>Financing</b>	Tax-financed	Regulated fully funded	Fully funded

Source: World Bank (1994)

## **2.3 Establishing Distribution of “Right to Choice” as a Feature of Pension Reforms**

Participants of the pension system generally are as follows:

- Those already retired who do not contribute into the system anymore and are at the time beneficiaries,
- Present participants of the labor market, making contributions into the system and having contributed differently long time in the past. They vary in period of time ahead of future contributing into pension system before they retire,
- Future entrants into the labor markets who have not yet made any contributions.

Introduction of a mandatory fully funded pension scheme does not indeed directly affect the first group. In case of this group, the contributions have been terminated and benefits are received. This group is only affected when the switch, as it often is the case, is supplemented by a parametric reform of the old PAYG system. The other two groups however, are those who are subject to the reform. Present contributors will be forced or allowed to channel their pension savings (all of them or a part) into a newly established fully funded scheme. So will the new entrants, the difference being that they have no record of previous contributions into the old system.

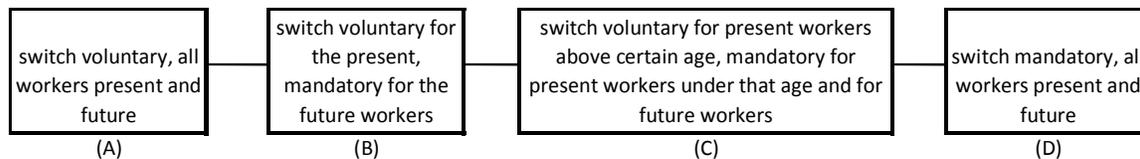
Let us now look at the possible ways of how to provide the groups listed above with choice “to switch or not to switch”. Namely, what are the possible distributions of “right to choice” across all groups of participants. The entire set of possibilities here can be perceived as a line segment, running through possible approaches employed by the government, ordered according to share of total population eligible to “right to choice”.<sup>4</sup> Ends of the line would be represented by two extremes – (A) and (D); (A) the switch being completely voluntary for every participant in labor market present or future, regardless of age and years spent contributing into the old PAYG system. (D) The switch is made mandatory for every present worker as well as future entrants into labor market, again regardless of age and years spent contributing to the old PAYG system. Possibilities in between the extremes represent various modes of division of labor

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<sup>4</sup> This “spectrum” of possibilities draws on Palacios and Whitehouse (1998)

market participants, present and future into two groups –one for which the switch is voluntary and the other one on which the switch is imposed through legislation. Line in between the extremes is continuous, as there are infinite possibilities on how to divide those who are currently in productive age. We will reduce our discussion to their division according to age (no other division has been implemented so far). Furthermore, we will consider future entrants to be a homogenous group, as it has nowhere across the reform countries been case to divide them according to “how soon they will start working and making contributions.”

Figure 2: "Right to Choice" Distribution Possibilities



Source: Palacios and Whitehouse (1998), modified

There are four possibilities in our line segment. (D) means mandatory switch for all. Those who are required to switch under (C) are a subset of those who are required to switch under (D). The same then holds for (C) and (B) as well as for (B) and (A). (A) means that nobody is required to switch. Empty set is a subset of every set, hence *(A) is a subset of (B)* is a trivial statement.

(C) however represents many possibilities, depending of what the “certain age” is. If that age is not an absolute number, but say age of entrance into labour market, then (C) merges with (B) and just three distinct possibilities are left. In that sense, we can understand the age parameter in (C) as a determinant of distribution of “right to choice” across the population. Following this logic, (B) is a special case of (C). In addition, setting moment of entry into labor market as the dividing line is generally less problematic than having to select a certain age. It is perceived as a logical dividing line, whereas picking a certain age, albeit supported by reasonable arguments seems rather arbitrary. Although there are many countries in Latin America where certain age was chosen as a borderline between allowing a worker to choose and making the switch mandatory for

them<sup>5</sup>, we will, for the sake of simplicity, focus on three distinct possibilities. These are represented by boxes (A), (B) and (D):

- i. Switch voluntary, all workers present and future,
- ii. Switch voluntary for the present, mandatory for the future workers,
- iii. Switch mandatory, all workers present and future.

Throughout this paper, pension reforms will be examined with respect to the (i)-(iii) division. We shall refer to it where it suits our considerations. Decision making of labor market participants will be explored in situations (i) and (ii), since the situation (iii) does not provide grounds for any decision making on the side of a worker. Examples of pension reforms corresponding to situations (i) and (ii) will be introduced and explored. (i) will be represented by Argentina and (ii) by Chile. Mexico, which will not be discussed in this paper, would be an example of the situation (iii).

#### **2.4 Division of Social Security Debt (implicit)**

PAYG system at any given moment is burdened with implicit liabilities. When subject to a structural reform, some of these or all of them (partial vs. complete substitution) become explicit. Holtzmann (1998) notes that “*There is surprising confusion about what constitutes the appropriate concept to define and measure the stock of liabilities which potentially become explicit and have to be repaid*” (p. 2-3), and proposes following classification of these liabilities:

- a) Accrued-to-date liabilities: these represent the present value of pensions to be paid in the future on the basis of accrued rights; neither the future contributions, nor the accrual of new rights by them are considered.
- b) Current workers and pensioner’s liabilities: in this case it is assumed that pension schemes continue their existence until the last contributor dies, while no new entrants are allowed; both the future contribution of existing members and their new rights are therefore allowed under current rules.

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<sup>5</sup> Such as El Salvador (1996) and Uruguay (1998)

- c) Open-system liabilities: these also include the present value of contributions and pensions of new workers under current rules; the range of options extends from including only children not yet in the labor force, to an infinite perspective.

It is important to realize the fact, albeit obvious, that in this classification a) is a subset of b), as well as b) is a subset of c). Note that this classification suits well our (i)-(iii) division. We shall therefore adopt it for further considerations. Let us discuss how it *ceteris paribus* applies to situations (i)-(iii).

#### **2.4.1 SSD Turning Explicit**

In case of (i), it is clear that the implicit PAYG debt only turns explicit to the extent determined by the number of workers who switch, more precisely by the liabilities towards those workers that need to be recognized by the government. Remaining liabilities, namely those towards the workers who do not switch and new entrants who decide not to switch (i.e. to contribute to the PAYG component) can then be classified as c) open-system liabilities. If (ii) is the case, then part of the liabilities classified as b) corresponding to present workers who switch are made explicit. The set of implicit liabilities that constitutes the extensions of b) to c) is not allowed to accrue and ceases to exist. Remaining implicit liabilities then fall under b). Under (iii) scenario, accrued-to-date liabilities are made explicit and no more implicit liabilities are allowed to accrue.

Making the debt explicit entails a risk to the credibility of a reform in the eyes of the public, and gives credit to its opponents. If the exposed amount is very high, doubts can arise about the ability of the government to settle this debt. The reformers therefore often choose to reduce the amount of debt made explicit. We will now discuss strategies that allow it. At this point however, let us rest the *ceteris paribus* assumed when linking (a)-(c) liabilities to (i)-(iii) “right to choice” distribution scenarios. We rest that assumption because implicit liabilities cannot be perceived as an absolute. Neither can they be seen as a contractual claim. Their value is set by the defined benefit formula, which can be changed by the legislation. This constitutes the policy risk, and in effect means that the implicit

debt can be reduced by parametric changes made to PAYG system. This kind of strategy is relevant to all the scenarios (i)-(iii); PAYG can be parametrically modified in order to reduce the implicit debt even if it is to be eliminated or phased out in the next step. The entire set of implicit liabilities (c) can be reduced in this way. In turn, part of SSD made explicit is reduced as well. Note that in reality, shift to funded schemes is in itself rarely a sufficient solution to severe actuarial imbalances. Holtzmann (1998) notes that *“A reform of the unfunded scheme in parallel with a partial or full shift to a funded scheme appears required in most countries since the unfunded schemes are essentially financially unsustainable, and a mere shift in the financing mechanism is of little help. So far, all reform countries in Latin America have adjusted eligibility and benefit rules before or in parallel with a shift in the financing mechanism. In order to reduce the amount of SSD made explicit, the reform has to be implemented as early as possible”* (p. 9). Once the amount of debt is made explicit, its settlement follows. How the two discussed countries approached this task, we shall see in later in sections 3 and 4.

Figure 3: SSD Estimates

<b>SSD (implicit) prior to the reform as a (%) of GDP</b>	
<b>Argentina</b>	<b>305</b>
<b>Chile</b>	<b>131</b>

Source: Bravo and Uthoff (1998), Palacios (2003)

## 2.5 Individual Choice

There are many aspects that are relevant to decision making of a worker, many of which are subject to parameters whose future values are uncertain. In the fully funded system, future rates of return are the most important variable. In PAYG schemes, a major uncertainty arises from policy risk. Parametric changes can be legislated for example due to demographic trends or changes of the electorate’s preferences. Furthermore, FF schemes are not immune to this kind of uncertainty either; various legislative restrictions can influence rates of returns to

individual account.<sup>6</sup> An extreme but not impossible legislative change would then be nationalization of pension savings.<sup>7</sup> Even if the values of parameters that the individuals cannot control were predictable, there is still uncertainty related to specifics of individuals themselves, such as their career advancement, fluctuations of earnings over time, health condition etc. All of those have impact on individual decision making. To sum up, we can say that the uncertain parameter values relate to

- Policy risk (legislative changes concerning pension system),
- Market situation (e.g. interest rates...),
- Individual specifics of the worker.

It is important to realize that pension systems often include design features that present grounds for moral hazard. These features are mostly represented by various guarantees, allowing participants to partially evade consequences of their decisions at the expense of other taxpayers. In addition, underreporting of earnings or outright evasion can occur. We will first look at the individual decision making “to switch or not to switch” ignoring the eventuality of evasion and underreporting. Our second look will be on how guarantees within the system can serve as an incentive to evasion and underreporting. Finally, we will briefly discuss other aspects of individual decision-making.

### 2.5.1 Incentives to Switch

For the following considerations, we will adopt a set of assumptions that will allow us to state the decision making problem of a worker in general. We will also adopt notation used by Disney, Palacios and Whitehouse (1999), and modify it for our purposes.

Annual pension paid to the worker by a PAYG scheme is equal to

$$P_{DB\ PAYG} = \alpha \cdot \sum_{t=1}^R (c_t E_t \prod_{j=t}^R (1 + g_w^j)) \quad (1)$$

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<sup>6</sup> An example of such restriction would be regulation of portfolio structure, which as we shall see further bellow was adopted by both Argentina and Chile.

<sup>7</sup> This was actually the case of Argentina in 2008. Introduction of the 1994 reform and first years of its existence will be discussed in section 4.

Where  $c_t$  is a contribution rate in year  $t$ ,  $E_t$  stands for earnings in period  $t$  and  $g_w^j$  represents the average growth of covered earnings in particular year. We thus assume that accrued contributions are indexed by the wage growth.  $\alpha$  represents calculation through which “accrued” contributions are translated into a pension payments.  $\alpha$  is thus subject to policy risk. It is changed when design of the system is changed parametrically. Depending on uniformity of parameters of PAYG scheme across the covered participants and on degree of redistribution within the system,  $\alpha$  can vary substantially for different groups (eg. different income levels). This holds particularly for Latin America countries, for their pre-reform pension systems were often fragmented into numerous different schemes.

To simplify our considerations and enable the comparison of FF and PAYG, we will assume pay-out in the form of annuity for the FF scheme. Annual pension paid to the worker by an FF scheme is equal to

$$P_{DC\ FF} = A \cdot \sum_{t=1}^R (c_t E_t \cdot \prod_t (1 + r_t)) \quad (2)$$

where  $r_t$  is real annual rate of return to contributions in year  $t$ .  $A$  is the annuity factor. Annuity factor represents a formula through which personal savings are translated into an annuity payment. There are three important parameters included in the annuity factor:

- Life expectancy; often set by regulatory bodies,
- Interest rate used in calculation of annuity payment,
- Money Worth Ratio (MWR).

The MWR was introduced into methodology by James and Vittas (2003) to measure efficiency of annuity markets. It is defined as a ratio of present value (PV) of stream from annuity available on the market, to PV of actuarially fair annuity stream which costs equal to the one purchased on the market (interest rate used to calculate the annuity, life expectancy and discount factor used to calculate PV assumed to be same for both annuities). If for example the MWR=0.90, PV of the annuity stream represents 90% of PV of the stream from an actuarially fair annuity. We will not explore efficiency of annuity markets here. For details on that topic, consult James and Vittas (2000) or Antolin (2008).

To illustrate decision-making problem of a worker who is granted an opportunity to opt between various pension schemes, let us run a simple simulation. We shall compare 3 hypothetical pension schemes:

- 1) PAYG DB that provides a certain replacement rate, proportionately to number of years of contributing,
- 2) PAYG DB that provides certain replacement rate, conditional on having contributed for some number of years, and adding some additional bonus for every year of contributing above the minimum vesting period,
- 3) FF DC scheme.

**Simulation Assumptions:**

All variables considered in real terms.

The worker expects no unemployment until his/her retirement.

Contribution rate = 20%

Real wage growth =1%

The worker we consider earns average earnings.

Annuity: interest rate 3%, life expectancy 15 years, MWR 0.90

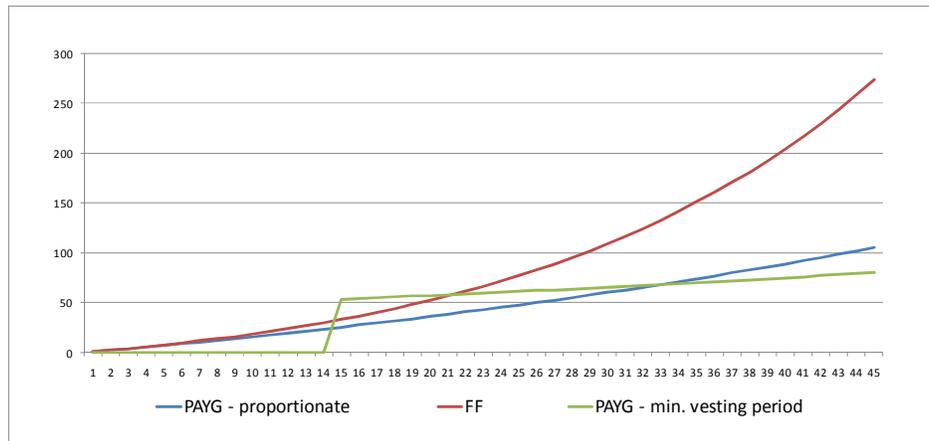
PAYG proportionate: 1.5% of replacement rate per every year of contributing (tied to average covered earnings), reference period last 10 years

PAYG min. vesting period: 50% replacement rate + 0.75% /every extra year (tied to average covered earnings), reference period last 10 years

FF: 5% real returns to contributions.

The resulted pension is expressed in terms of real average covered earnings in year 0; 100=average covered earnings in year 0.

Figure 4: Switching Strategy Simulation



Source: Own calculations

The upper envelope of the three curves constitutes the optimal switching strategy. As we can see on the diagram, for workers with average earnings the optimal strategy is

- “PAYG proportionate” for those with 1 to 6 years until retirement,
- FF scheme for workers with 7 to 14 years until retirement,
- PAYG with min. vesting period for workers with 15 to 21 years until retirement,
- FF scheme for those with at least 22 years until retirement.

Similarly, different optimal strategies would be arrived at for different parameter values.

### 2.5.2 Incentives (not) to Contribute

For those who switch to the fully funded scheme, governments offer different kind of guarantees. The most important one is the minimum pension guarantee whose purpose is to provide a reasonable living standard for those who fail to gather savings that would provide a certain height of pension. We will now examine how this particular kind of guarantee can influence contribution patterns among workers. Furthermore, we shall allow for evasion, underreporting and strategic manipulation of contributions. Palacios (2003) argues that “*the actual reliance on public DB versus private DC depends heavily on the scope of the minimum pension guarantee*” (p. 27). A rational decision-maker compares two

cash-flows; first, the cash flow of complying with the eligibility requirements and subsequently receiving the minimum pension, and two, making contributions in proportion to the actual earnings. Minimum pension guarantee creates a disincentive to contribute especially to that group of workers who expect their life-time contributions at best to cover the minimum wage, but also to groups who expect their benefits exceed the minimum pension by only a narrow margin. The disincentive may lead workers only to contribute for the required number of years, as well as to minimize the contributions by choosing those years when their earnings were lowest, or simply underreport their savings. This is not only possible by outright evasion or entering illegality, but in some countries also by changing one's status to self-employed.<sup>8</sup>

Let us consider a simple example of a worker who is either just about to enter the labor market as a saver in the FF scheme, or is determined to switch. He will work until he reaches his retirement age  $R$ . When the worker measures intertemporal trade-offs, he applies his personal discount factor  $d$ , which we for the sake of simplicity will consider to be constant<sup>9</sup>. He will then purchase a life annuity (remember the assumption made above) that in real terms will pay a constant pension in every period of retirement. If that annuity pays less than minimum guaranteed pension  $M$ , the government steps in and settles the difference for the worker. Let us also ignore the inflation.<sup>10</sup> Let us examine decision making of a worker who is to determine in advance his strategy on how to manage his mandatory pension scheme by comparing present values of cash flows under two relevant situations:

- 1) Contributions made throughout his working life necessary to be entitled to the minimum pension,
- 2) Contributions made throughout his entire working life based on full earnings.

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<sup>8</sup> This would also be the case of Chile, where participation in pension schemes is not mandatory for the self-employed.

<sup>9</sup> This means that we do not allow for hyperbolic discounting, that some authors believe plays an important role when a personal saving strategy is set. For more on this issue consult Brooks (2005)

<sup>10</sup> This assumption is justified by the fact that annuity payments are often kept constant in real terms and minimum wage is often indexed by CPI. In Chile for example minimum wage is inflation adjusted every time the cumulative change of CPI reaches 15%.

The worker thus simply compares:

- 1) Present value of contributions made throughout his working life (full contributions, as required by legislation) less the present value of contributions necessary to be entitled to the minimum pension, i.e.

$$PV(\text{full contributions}) - PV(\text{minimum pension contributions}),$$

- 2) And difference of present values of the annuity inflows he will be able to afford less the guaranteed minimum pension inflows throughout his retirement, i.e.

$$PV(\text{annuity inflow}) - PV(\text{minimum pension inflow}).$$

Following notation will be used to describe the worker's decision making in formal way:

R.....number of years until retirement

P.....worker's life expectancy at retirement (expected by the worker)

M.....minimum pension, annual

$E_t$  .....earnings in year t

d.....personal discount factor  $=1/(1+d_{\text{rate}})$

c.....contribution rate

n.....minimum years of contributing that entitles workers to minimum pension (assumption:  $R > n$ )

$j_1 - j_n$ .....n lowest-earning years in workers career

$r_t$  .....rate of return to contributions in year t

A.....annuity factor specific to a particular annuity product determined by annuity market; it determines payments the worker can obtain for his savings on his individual account at retirement (also depends on the worker's life expectancy estimated by the insurance company or, more importantly, regulatory bodies); when the accumulated savings are multiplied by A, the product yields the annuity payment.

At the point of entering the labor market, the present value of (future) life-time contributions amounts to

$$\sum_{t=1}^R d^{t-1} . E_t . c \quad (3)$$

By an analogy to (3), the path of contributing that minimizes PV of contributions, yet sufficient to provide the worker with the minimum pension entitlement is equal to

$$\sum_{t=j_1}^{j_n} d^{t-1} . E_t . c \quad (4)$$

Accumulated savings translated into annuity are then

$$A . \sum_{t=1}^R E_t . c . \prod_t (1 + r_t) \quad (5)$$

Future annuity benefits amount to

$$\sum_{p=1}^P d^{R+p} . A . \sum_{t=1}^R (E_t . c . \prod_t (1 + r_t)) \quad (6)$$

PV of future benefits in case that the worker only contributes to the extent that entitles him to receive the minimum pension is

$$\sum_{p=1}^P M . d^{R+p} \quad (7)$$

We can now compare the differences in outflows (left side) and inflows (right side) arising from both discussed situations. Thus, we arrive at simple condition which when met, prevents a worker from having a chance to maximize cash flow of his/her pension scheme simply by contributing just the minimum required number of years, and choosing those years when the earnings are lowest.

$$\sum_{t=1}^R d^{t-1} . E_t . c - \sum_{t=j_1}^{j_n} d^{t-1} . E_t . c \leq \sum_{p=1}^P (d^{R+p} . A . \sum_{t=1}^R (E_t . c . \prod_t (1 + r_t))) - \sum_{p=1}^P d^{R+p} . M \quad (8)$$

Let us point out some implications of the stated condition. What really is crucial here is the possibility for  $r$  to be negative in some periods. This leads to discussion of the expected rates of return.<sup>11</sup> Expectations of negative rates of return would (except perhaps for short-term fluctuations) indeed be detrimental for the system of privatized pension savings. Under such expectations, this kind of reform would be politically unfeasible, and also undesirable. Although the most recent history calls for more focus on this issue, we will leave out the discussion of negative rates of return and, as of now, assume positive expected rates of return.<sup>12</sup>

First of all, under the assumptions stated, the left side is always positive and is increasing in  $E$ . Therefore if the right side is negative or equal to zero<sup>13</sup>, the worker has a clear incentive to minimize his contributions. Also, as  $M$  increases, the difference represented by the right hand side decreases and, *ceteris paribus*, creates the incentive to evade contributions for workers with increasingly higher levels of earnings. The right hand side increases in  $r$  for any given year (excluding years of zero earnings, if any). If therefore expected  $r$  increases, more workers will be incentivized to contribute. Furthermore, the *worker's personal life expectancy* (=the one expected by the worker) plays an important role. For any given *life expectancy used in annuity calculation* by the insurance company, PV of future annuity inflows increases with the *worker's personal life expectancy*.

Intricacy of the stated condition lies in the distribution of income over time, and therefore different contributions being invested for various total periods of time, at various cumulative rates of return. One more conclusion can be drawn if we accept another simplification; namely that the  $n$  years with the lowest earnings (and therefore contributions) would represent minimum wage. That means the worker literally minimizes his/her contributions, which in reality is

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<sup>11</sup> Among Latin America countries reforming their pension systems throughout 90's and Chile (80's), Argentina was the only state to legislate a rate of return guaranteed in absolute terms

<sup>12</sup> In first years after reforming the pension systems in countries of Latin America, the fluctuations of rates of return were significant and in some cases negative values were reached, generally however the returns were fairly high entailing positive expectations (example will be provided in case studies bellow)

<sup>13</sup> PV of the inflows of minimum pensions greater than PV of inflows implied by the amount of savings on the worker's individual account.

done by underreporting the earnings, and working the years in excess of  $n$  either as self-employed, in illegality, or not working at all. We then arrive at

$$\sum_{t=1}^R d^{t-1} \cdot E_t \cdot c - \sum_{t=j_1}^{j_n} d^{t-1} \cdot E_m \cdot c \leq \sum_{p=1}^P (d^{R+p} \cdot A \cdot \sum_{t=1}^R (E_t \cdot c \cdot \prod_t (1+r_t))) - \sum_{p=1}^P d^{R+p} \cdot M \quad (9)$$

Where  $E_m$  is the minimum wage. Now we can clearly state that with increase of earnings, incentives to rely on the minimum pension are weakened. So to sum up, we have concluded that the risk of moral hazard arising from the existence of the minimum pension

- Increases with the height of the minimum pension itself,
- Decreases with height of expected real rate of return to contributions,
- Decreases with earnings of a worker.
- Decreases with the *worker's personal life expectancy*

### 2.5.3 Other Aspects of Choice

We have seen that for the given expected parameter values, the optimum strategy can be found for each worker. In practice however, decisions are made in risky environment. For both fully funded and pay-as-you-go schemes, future parameter values are uncertain. Parametric changes can be made to PAYG schemes with either political motivation or as an answer to changing macroeconomic conditions, such as adverse demographic development. To illustrate how individuals perceive their claims after government-run PAYG schemes, Disney, Palacios and Whitehouse (1999) point to “*attitudinal evidence that individuals would trade their public pension promise for a government bond of equal present value. This suggests that the default premium for a PAYG pension promise would be higher than that for government bonds in part because, as has often been pointed out, workers cannot trade or borrow on PAYG pension promises.*”(p. 25-26). In case of FF schemes, portfolio performance constitutes the major uncertainty. Even in case of very conservative portfolio consisting largely of fixed-interest securities, real returns are uncertain due to inflation risks and can turn negative. The inflation risk is also pertinent to PAYG schemes, depending on the indexation rules.

Let us now leave all the outlined uncertainty out of our considerations. In order to determine the optimal strategy of switching and contributing, a worker is required to gather all the information that are needed to make a qualified decision; that is study legislation, evaluate policy risks, seek forecasts of rates of return and other market developments, predict one's career path and personal cash flow and acquire basic level of financial literacy. Intuition suggests that adopting these assumptions would be unrealistic, and so does the empirical evidence, some of which we will provide further bellow. If there is poor level of information across the population of participants as well as low degree of financial literacy, then the design features of the pension reform might not work as intended. System of incentives embodied in the reform by policymakers will in that case likely fail to reach its objectives when confronted with general population. The system brought about by the reform often enables and encourages participants to keep track of their investments' performance and management fees. The possibility for participants to switch between different fund managers, wherever granted, should then render competition, increase efficiency of the system and perhaps compress management fees.

If participants do however make little or no effort to keep track of their fees and investment results and fail to compare these with other managers' performances, then even such well intended design feature does not work. Arenas de Mesa, Bravo, Behrman, Mitchell and Todd (2006) point out that "*if they (participants) systematically misperceive the costs and benefits of the system, their misinformation can shape the system's popularity as well as the perceived effectiveness of specific reforms*"(p.16). We have thus seen that the level of education as well as "goodness of fit" between assumed rational decision-makers and actual participants profoundly influence extent to which objectives of the reform are reached. To provide the indicated empiric evidence that the participants are far from being well informed rational decision makers, we shall briefly turn to results of a survey from Chile presented in Arenas de Mesa, Bravo, Behrman, Mitchell and Todd (2006). In 2002 (the reform had been in place for over 20 years, albeit with some legislative changes throughout the period), 53% of respondents stated they knew what the contribution rate was. Only 28% actually got the rate correct. Only 2% of the respondents knew what the

management fee of their pension fund was (either fixed or variable). 45% knew what their balances were. After Chileans were granted a possibility to choose different funds (multi-fund structure, will be described in section on Chile; suffice it to say that there are funds A-E, ranging from the fund with the most aggressive to the most conservative structure of investment portfolio), only one third of participant knew which fund they held. Furthermore, only 14% could describe how benefits are calculated from their scheme. Results concerning eligibility requirements for minimum pension and other legislative technicalities were poor as well.

#### **2.5.4 Theory: Concluding Remarks**

Before moving on to the case studies of Chile and Argentina, we shall briefly summarize what has been discussed up to this point. We have looked at the pension reform as at a distribution of decision making power over the body of pension system participants. We have termed this *distribution of “right to choice”*. In the process of making the reform, some possibility of distributing “right to choice” is decided upon. This generally divides the body of pension system participants to those who are required to switch, and those who can decide for themselves. Previous contributions into the old pension system constitute implicit social security debt (SSD). The part of SSD that corresponds to those who switch is made explicit. We have shown link between “right to choice” and the amount of SSD that turns explicit.

Once the rules are set, individuals make decisions that the reform allows them to do, as well as decisions that violate the legislation. We have examined two levels of such decision making. First, finding the optimal switching strategy, and second, finding the optimal contribution path. To conclude the considerations about individual choice, some empirical evidence was provided pointing to significance of information and financial education in individual decision making.

### 3. Chile

#### 3.1 Pre-reform Stage<sup>14</sup>

The Chilean pension system dates back to 1920. At first, it was not purely PAYG, for its surpluses (contributions exceeding benefits within a period) were channeled into collective capitalization funds. It was thought that later on when the system matures, these accruals complemented with increased contributions would suffice to cover the pension payments. Poor management of the funds and rapid surge in pension payments (especially to privileged groups) relative to the contributions resulted in the system relying strongly on the government to meet its obligations using sources outside the pension system. By 70's the system was essentially an insolvent PAYG system. Although general concern among workers did not necessarily stem from actuarial imbalances and necessity of subsidies from general budget, huge inequalities and unclear entitlement rules greatly undermined credibility of the system. The situation is best described as follows: There were numerous very different pension schemes (more than 100). The legal retirement age across these regimes varied significantly; some could retire at 42 receiving a very high pension, others had to be 65 to retire. Blue collar workers were considerably discriminated by the system. Their legal retirement age was 65, whereas others could retire at 55 receiving a full pension. There was no uniform indexation of pensions. Senior bureaucrats not only received a 100% replacement rate, but also enjoyed an automatic cost of living indexation. They thus maintained a pension equal in real terms to their wage in the last year of service. The system had naturally begun to be perceived as increasingly unfair. Eligibility requirements were lax for upper and middle-class workers, stiff for the poor, whose pensions, in addition to being low, were not sufficiently protected from inflation. This fact combined with mismanagement of the system led the replacement rate of a blue collar worker to decrease to 41 percent in 1980 (Edwards 1998).

To analyze the incentives of those who were allowed to choose to switch, it is important to note that prior to the reform, workers were part of

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<sup>14</sup> Description provided in this section draws heavily on Edwards (2000)

different schemes that required different contributions and paid various benefits (various replacement rates) subject to various indexation. These differences were not a result of any actuarial principles, nor were there any underlying logics to determine this fragmentation. Links between contributions and benefits were untraceable; often result of discretionary decisions of policymakers giving in to pressures from unions and various interest groups. The frustration of the general public resulting from this reality was per se an important incentive to support a pension reform, which the reformers could and did benefit from. In addition, the contribution rates were rather high, ranging from 16 to 26 percent of wages, adding up to 54.4 percent (employer + employee) combined with health and disability contributions (1973). Demographics had very adverse impact on the system; between 1955 and 1979 the number of active contributors per retiree dropped drastically from 12 to 2.5. By 1971, the subsidy to the system covering its deficit amounted to 4 percent of GDP.

### **3.2 Reform Agenda**

In times of Allende administration, the government control was entrenched very deep in the economy. Many industries were state-owned. Waves of nationalization had taken place. Enterprises were typically subject to variety of directives that substantially influenced their operations. Subsequent Coup d'état resulted in militarist regime led by Augusto Pinochet. To reverse the course of the economy, a team of 25 young Chilean economists trained at the University of Chicago was assembled. An entire set of pro-market reforms was adopted in Chile between mid 70's and early 80's including following:

- Trade liberalization,
- Privatization,
- Fiscal reform,
- Financial reform,
- Social security.

The very last listed addressed the unsustainable state of the PAYG described above. The reform was led by Jose Pinera, the ministry of finance. The opposition to the reform was mostly coming from the public sector workers, who managed to

align their stand with the military officials. General Pinochet himself was rather reluctant, although eventually convinced by Jose Pinera and his team. General Pinochet was however non completely successful in convincing high rank military officials. Since their support was crucial for Augusto Pinochet to remain in power, the military came to be the only sector exempt from the reform. Besides purely political reasons for this exception, there was also a heated debate about private fund managers having access to personal information of military officials. Dangers of such exposure thus served as an excuse. Pensions of military members are managed by two government bodies<sup>15</sup>. These pension funds ran at a deep deficit and were financed almost entirely from general government budget. After military members had been granted immunity from the reform, the reform came into effect in May 1981. Here is the summary of its major features:<sup>16</sup>

- Contributions are capitalized in individual (personal) accounts (the rate of contribution is defined in the law as a proportion of the wage),
- The value of old-age pensions depends on the balance accumulated in the personal account of each worker,
- Disability and survivorship pensions remain “defined benefits” with a value proportional to the taxable wage of the member,
- Workers are free to choose among different registered, single-purpose, pension management institutions (the AFPs),
- AFPs are private and competitive firms whose purpose is to invest the funds in the capital market on behalf of its members,
- At retirement the worker can choose among three different ways in which he can receive the pension (annuity, scheduled withdrawal or a combination of the two),
- State plays mainly a “subsidiary role”, manifested in its responsibility to regulate and supervise the system, finance minimum pensions and provide certain guarantees.

Switch to individual accounts was mandatory for all the future entrants into labor market and voluntary for current workers. The contribution rate was set to 10 percent. In addition to that, workers have to pay insurance charges (disability and

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<sup>15</sup> National Defence Social Security Fund (CAPREDENA) and the General Department of Social Security for the Police Force (DIPRECA)

<sup>16</sup> Rodrigo Acuña R., Augusto Iglesias P.: Chile’s Pension Reform After 20 Years (2001), p.5-6

survivorship) and fees to AFPs. Fees vary across AFPs , but average value of fees and insurance charges combined amounts to 2.3 percent, out of which insurance fees account for 0.8% (Acuña and Iglesias 2001). The retirement age was set at 65 for men, 60 for women. At retirement, a worker can either buy a life-time annuity or receive his/her pension in a form of scheduled withdrawal. It can also be a combination; some withdrawals can be made while the purchase of the annuity is deferred. Annuity payments could not be lower than minimum pension guaranteed by the state (guarantees of the system will be treated below). In addition, every worker can make a one-off withdrawal of funds in excess of those sufficient to *provide a “pensions greater than 70% of the average of their taxable wages for the previous ten years and 120% of the minimum pension”* (Acuña and Iglesias 2001, p.7)

### 3.2.1 Return Guarantees, Investment Restrictions

In order to allow workers to reveal and follow their risk preferences, AFPs were allowed to establish and operate 5 different pension funds. They range from the most conservative Fund E to Fund A which employs the most aggressive investment strategy.

Figure 5: Chile Funds' Portfolio Limits

Instrument	Fund A	Fund B	Fund C	Fund D	Fund E
Government	40	40	50	70	80
Time deposits, bonds etc.	40	40	50	70	80
Letters of credit	40	40	50	60	70
Corporate bonds (all types)	30	30	40	50	60
Shares	60	50	30	15	not eligible
Investment/mutual funds	40	30	20	10	not eligible
Commercial paper	10	10	10	20	30
Foreign securities (overall)			20		
Others authorized by Central Bank	1-5	1-5	1-5	1-5	1-5
Hedging operations	allowed				
Foreign exchange unhedged	37	22	18	13	9
Loans	15	10	5	5	5

Source: Superintendency of Pension Fund Administrators. Adapted from Jimenez and Cuadros (2003), as discussed in Robert Palacios (2003)

Programs were available where investment risk is scheduled to decrease gradually as a worker approaches his/her retirement age by shifting savings in A to E direction. There are however regulations that prevent workers from taking on an excessive investment risk; these prevent older workers from entering aggressive investment schemes. Similar restrictions are imposed on those who opted for scheduled withdrawals; these are aimed at smoothing out their pensions over time and protect retirees' account balances from sudden market fluctuations.

Figure 6: Chile: Restrictions on Entering Aggressive Schemes

	Men	under age 55	aged 56 and above	Pensioners with scheduled withdrawals	Max/Min limits in variable income
	Women	under age 50	aged 51 and above		
Investment	Fund A	✓			80/40
	Fund B	✓	✓		60/25
Options	Fund C	✓	✓	✓	40/15
	Fund D	✓	✓	✓	20/5
	Fund E	✓	✓	✓	0/0

Source: SAFP (2002), as discussed in Palacios (2003)

AFPs are required to keep two types of reserves:

- 1) Mandatory investment reserve,
- 2) Reserve for variations of return.

The first of the two was set to 1% of the total fund assets, regardless of funds' performance or any other external conditions. The second reserve imposes an obligation to keep reserves in times of high returns. Profits that correspond to rates of return higher than

$$\text{Max} \left\{ \frac{1}{36} \sum_{m=1}^{36} r_m + 2\% ; \frac{1}{36} \sum_{m=1}^{36} r_m + 0.5 \times \sum_{m=1}^{36} r_m \right\}$$

must be kept as reserves, where  $r_m$  is rate of return in month  $m$ , and the reference period is the last 36 months.

Reserves of both types must then be used to cover differences of returns, should the rate of return of the fund fall below the minimum required (guaranteed) rate of return. The minimum required return was set to:

$$\text{Min} \left\{ \frac{1}{36} \sum_{m=1}^{36} r_m - 2\% ; \frac{1}{36} \sum_{m=1}^{36} r_m - 0.5 \times \sum_{m=1}^{36} r_m \right\}$$

Whenever an AFP fails to deliver the guaranteed rate of return, it must cover the difference from its reserves. If the reserves are insufficient, the difference is covered from the government budget and AFP is liquidated. Workers then transfer to another AFP of their choice.

### **3.2.2 Recognition of Contributions into the Old System**

As outlined above, the reformers made the switch voluntary for those who already had been contributing into the old PAYG system. For those who decided to switch however, the reformers had to determine the amount of debt made explicit. Determining what the amount payable to individual workers reflects intentions of the reformers. It guides workers' incentives to switch or not to switch. It is logical that years of previous contributions as well as their height are reflected in the amount. The reformers however, are primarily focused on issues concerning financing of the transition. They typically have limited sources to cover the social security debt made explicit. At the same time they know that every worker who switches presents expenses in terms of corresponding debt made explicit and shortfall in financing present pensioners. Cash flow of the pension reform throughout transition period can be fine-tuned by setting the formula determining debt towards individual workers made explicit. The way of calculating the amount guides incentives of workers to switch or not to switch.

In Chile, switching workers were compensated for their previous contributions by receiving a recognition bond. Recognition bond was a fixed amount, capitalized at a fixed annual real interest rate of 4% until retirement. The following formula is the one that Chilean reformers devised:

$$RB = \frac{W \times 0.8}{A \times (1.04)^R} \times \frac{C}{35}$$

where RB is recognition bond (amount), W stands for taxable wages of a worker earned between 30<sup>th</sup> June 1978 and 30<sup>th</sup> June 1979, A is annuity factor and C is a number of years when the worker was actively contributing. R stands for number of years until retirement. In order to state the formula verbally, facilitate comprehension and explain the rationale behind it, we shall rearrange it in following the way.

$$RB \times (1.04)^R \times A = W \times 0.8 \times \frac{C}{35}$$

Amount of the recognition bond is an amount of capital needed to purchase, at the day of retirement, an annuity that provides a replacement rate of 80%<sup>17</sup> times the proportion of years actively contributing. Number 35 in the formula was determined as a “full contribution period” of a worker. Another feature that is somewhat arbitrary is the period of one year before the reform as a reference period for calculation. It assumes seniority in wage rewarding, but can seriously damage workers who for instance had, at the beginning of that period or before it shifted to a lower-paid job or experienced a similar irregularity in earnings. The amount of recognition bond is automatically adjusted for inflation and capitalized at 4% real interest rate until retirement. A very important feature here is the guarantee of real interest rate that applies to the amount; the profitability of individual accounts is only guaranteed in relative terms, which does not necessarily protect workers from the possibility of real interest rates turning negative. Thus those who had contributed into PAYG and then switched, had in effect a unique opportunity to keep a part of their savings as a risk-free instrument with the guarantee of fixed real interest rate. Note however, that they could not decide that amount themselves. The total amount accrued is transferred into an individual account at retirement.

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<sup>17</sup> Again, wages of a worker earned between 30<sup>th</sup> June 1978 and 30<sup>th</sup> June 1979 being the reference period

Selection of recognition bonds as means of determining and disclosing obligations towards previous contributors defers the payment until retirement date. The amount is however no longer a mere promise of the government or a claim after future tax payers, it becomes a regular contractual obligation. The convenience of RB amount calculation and its potential impact on workers' decision making (switch or not to switch) is rather a complicated matter. As said in Acuña and Iglesias (2001) *“the total spending generated by the RB will be different than the expenditure on pensions that would have been paid to these same workers in a scenario without reform, but the direction and magnitude of this difference have not been calculated. Since there are no estimates of the magnitude of this effect, it is not known if the reform did reduce or increase the present value future stream of deficits that were growing at that time.”*( p. 9). This is mostly due to considerable fragmentation of previous pension system. Different worker were affiliated with numerous schemes, requiring various rates of contributions and granting various replacement rates.

As already outlined above, distrust in the old system itself served as a fairly important incentive to switch. What led to that distrust, combined with the overall pro-market approach to reforming the country in fact triggered the reform, but cannot be seen as an incentive created by the reformers. Anticipation of high returns to contributions into individual accounts were combined with efforts to make the new scheme more attractive. Its architects set the contribution rates so as to increase the take-home pay for those who switch. On average, those who transferred to the privately run capitalization system experienced an 11 percent increase in after-tax pay (Iglesias and Vittas (1992), as discussed in Edwards 1998).

### **3.2.3 Minimum Pension Guarantee**

In Chile, to be eligible for the minimum pension 20 years of contributing is required. Then at retirement, if the implied pension does not measure up to the minimum pension, government covers the difference. These transfers are covered from the general government budget. Minimum pension aims to provide a guaranteed level of income to those who met the minimum contribution requirements. As its name suggests, it is a safety net component of the system; its

purpose is to prevent poverty. It is a PAYG component (also called “first pillar”) of the system which leads some<sup>18</sup> authors to the conclusion that Chile in fact relies on a three pillar structure recommended by the World Bank in its report *Averting the Old Age Crisis* (1994).

Let us now look at the dependence of the retired population on the minimum wage, and see if, and to what extent the explored implications hold. As we can see on figure 7, in the first ten years following the reform in Chile, the minimum pension had been fairly stable. Its fluctuations over this period are due to the system of indexation (see footnote 12), which resulted in adjustment in every 2 years on average. The important thing for our considerations is that the minimum pension is consistently and considerably less than the minimum wage, thus not making it an attractive retirement plan. Let us now have a look at the performance of pension funds, namely the rates of return. The rates, especially in first years were very high. This was driven by overall growth of the country, and privileged position the funds, granted to them during the privatization. The auspicious start of the system was marked by high rates of return, attracted trust and triggered more expectations. This, based on our previous conclusions should imply low reliance of the workers on the minimum pension guarantee and increased appetite to invest one’s contributions into individual pension accounts.

Figure 7: Chile: Minimum Pension, Welfare Pension, Net Rate of Returns to Pension Accounts

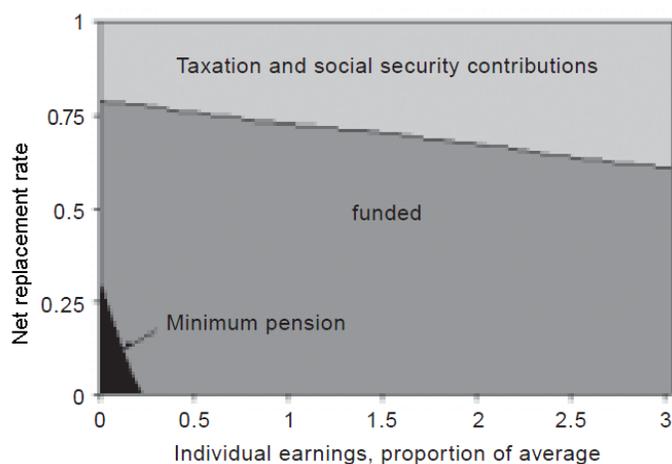
% of minimum wage, real terms			Real net return (%)		
Year	Minimum pension	Welfare pension	Year	Pension accounts	Financial System
1981	59.2	29.4	1981	5.3	13.2
1982	67.8	33.7	1982	25.5	12.1
1983	75.7	37.7	1983	19.4	7.8
1984	104.5	51.9	1984	2.4	8.4
1985	76.1	37.8	1985	11.6	8.2
1986	86.0	39.3	1986	10.9	4.1
1987	89.4	38.2	1987	4.5	4.3
1988	83.3	41.5	1988	6.1	4.6
1989	83.4	36.9	1989	6.7	6.8
1990	80.3	32.6	1990	15.7	9.4
Avg 81-90	80.6	37.9	Avg 81-90	10.4	7.8

<sup>18</sup> For example Edwards (1998)

Source: Multiple Sources<sup>19</sup>

To validate this conclusion, we shall turn to Palacios. He emphasizes structure of the replacement rate as a measure of relative importance of FF scheme and PAYG scheme, which in Chile is reduced to minimum pensions. Palacios has run a simulation to estimate structure of replacement rate.<sup>20</sup>

Figure 8: Chile: Sources of Net Replacement Rate



Source: Palacios 2003

Now that we see results of the simulation that demonstrates importance of the minimum pension as a proportion of replacement rate for various income groups, we must conclude that the risk of moral hazard has not proved to present a major

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<sup>19</sup> Source: Arenas y Marcel (1999), for pension and minimum wage figures. For other figures, the Statistical Bulletin of the Superintendency of AFPs, as discussed in Acuna and Iglesias 2001 for the data on pensions, for the rates of return IMF, adopted from Edwards (1998)

<sup>20</sup>The set of assumption on which the simulation is based can be found in the paper. Palacios argues that “This is superior to comparing the proportion of the contribution going to each type of scheme for several reasons. First, none of the residual DB schemes are in actuarial balance and therefore, the proportion of contribution going to finance them tends to understate their importance in terms of the ultimate benefit. Second, earmarked non-payroll tax revenues are already used to finance several systems as in the case of some countries such as Argentina and Uruguay so the true proportion of financing destined for each part of the system should incorporate these sources. Third, the actual reliance on public DB versus private DC depends heavily on the scope of the minimum pension guarantees” Palacios 2003 (p.26-27)

problem in Chile. Extent of the minimum wage being a component of replacement rate is negligible. Furthermore, the minimum pension, according to Palacios's simulation, is received by low income groups, thus serving the purpose of solidarity for which it was established.

Besides the minimum pension, Chilean pension system also incorporates the welfare pension (figure 7). The welfare pension serves as old age poverty prevention. Every person of 65 years of age and older is eligible, no contribution requirements apply. Recipients of the welfare pension must not be recipients of any other income or transfer.

### **3.2.4 Pay-out Phase**

There are in general three ways of receiving one's benefits throughout retirement. They are as follows as follows:

- 1) Annuity,
- 2) Scheduled withdrawal,
- 3) Combination of 1) and 2), the deferred annuity.

Annuity has proved to be the most common choice. It provides a retiree with fixed annual income in real terms, since it is expressed in Chilean unit of accounting indexed to CPI.<sup>21</sup> It therefore serves as an insurance against longevity risk. Furthermore, once purchased, the annuity makes a retiree's pension independent of market fluctuations. The important concern here, as stated above, is efficiency of the market. That manifests itself in the difference in prices of annuity products and their costs (actuarially fair price). Let us note that annuities comprise numerous products. An interesting example of such could be a "think of her" annuity, which is calculated on life expectancy plus desired time span, throughout which the pension will continue to be paid to spouse of the diseased.

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<sup>21</sup> "...*unidad de fomento (UF)*, whose value changes daily according to (one-month) lagged inflation. Starting in the mid-1980s, virtually every financial contract exceeding ninety days has been expressed in terms of UFs. As a result of this, interest rates on longerterm securities are generally expressed (and negotiated) in real terms in an ex ante fashion. This has added an important component of predictability to Chile's capital market and to the privately managed pensions system." Edwards (1998), p.37

Scheduled withdrawal is another option. It means that an amount the worker is allowed to withdraw every year is determined by a formula. The amount, as we can see is adjusted every year according to life expectancy, account balance, returns of the fund and discount rate reflecting market parameters.

Figure 9: Chile: Scheduled Withdrawal Formula

Each programmed retirement annuity is calculated according to the following formula:

$$P_t = \frac{F_t}{\left( \sum_{x=t}^{110} \frac{q_x}{(1+i_{it})^{(x-t)}} \right)}$$

where,  $F_t$  is the individual account balance in year t.  
 $q_x$  is the probability that the individual will live to year x, given that he or she has lived until year t. Normally,  $q_x=0$ , when  $x>110$ .  
The discount rate used in the calculation is obtained as follows:

$$i_{it} = 0,80x \text{tirv}_{t-1} + 0,20x \sum_{j=t}^{10} r_{i,t-j}$$

where,  $i_{it}$  is the discount rate of AFP i in year t  
 $\text{tirv}_t$  is the average implicit rate applied to life annuities in year t.  
 $r_i$  is the average profitability of AFP i pension funds.

Source: Palacios and Rofman (2001)

By selecting this option, the worker retains the exposure to fund return volatility. The risk of high payment irregularities is partially mitigated by the withdrawal formula. Amount that the worker is eligible to withdraw reflects his/her life expectancy. In spite of such adjustment, scheduled withdrawal does not provide an insurance against the longevity risk. If the account is depleted completely before the death, a worker becomes recipient of either minimum pension or the welfare pension, depending on to which he/she is eligible. If the calculated benefit for the subsequent year is lower than the minimum wage, the worker has the right to withdraw by exactly that difference more funds that year. This guarantee creates a significant element of moral hazard. Especially workers whose annual withdrawals are close to the minimum wage have thus a strong disincentive to insure themselves against the risk of longevity by purchasing annuity. This problem is also outlined in Vittas and Iglesias (1992), and a solution is proposed. *“A solution to the moral hazard problem caused by the offer of*

*a state guarantee would be to require all retired workers who opt for scheduled withdrawals to buy a deferred life annuity for at least the minimum pension*” (p.7). This simple solution completely removes risk of any contingent liabilities of the general government budget arising from potential “bailing out” of workers who had chosen scheduled withdrawal and ran out of funds. Mix of the two, or deferred annuity includes many combinations and differently long deference spans. Since discussion of their features can be reduced to combining the annuity option and scheduled withdrawal, we shall not go into more detail.

### **3.3 Switching and Coverage**

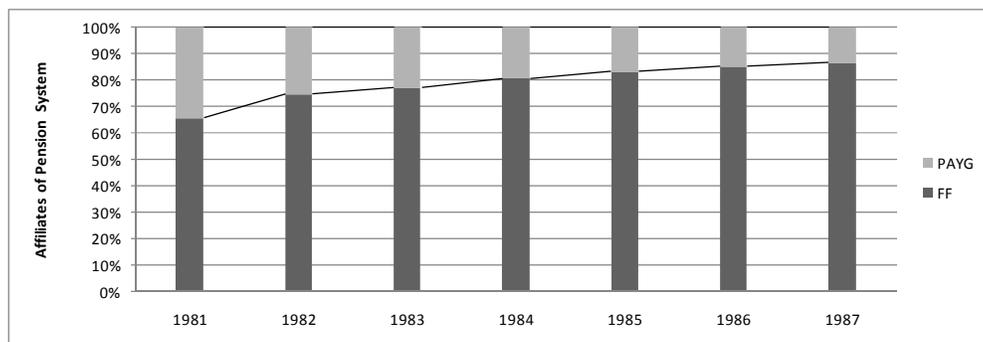
In line with (i)-(iii) possibilities of distribution of choice we have established in the theoretical section, the Chilean reform represents (ii). Workers who already made contributions into the old system were allowed to choose between PAYG (parametrically reformed and unified) and joining any of the new AFPs. New entrants were automatically affiliated with the FF and were to choose their AFP. As already stated in reform description, Chilean pension reform was introduced as a part of overall, enthusiastic pro-market shift in policy. The reform was supported by a strong media campaign led by Jose Pinera himself. He explained that the goal was to create a system based on “*freedom, and solidarity; a fair and yet efficient retirement system; a retirement system for everyone.*” He went on to say that the reform was a “*transcendental step that would benefit every Chilean, within the spirit of freedom, progress and justice*” (Pinera 1988, as quoted in Edwards 1998, p.39). It was emphasized that workers would be the exclusive owners of their account balances and that these can be passed to family members in case of death. Workers were encouraged not to think of their contributions as taxes, but literally as their savings. Workers were to be proud pioneers of the new social security paradigm. This induced enthusiasm combined with distrust in the old system constituted psychological grounds for high switching rates.

Let us also remember the immediate increase in take-home wages for those who switch, perhaps the most powerful incentive. This increase was significant; on average 11% (Iglesias and Vittas 1992). Its effect varied over

participants since pre-reform pension schemes were greatly fragmented and included different contribution rates. Recognition Bond served as another strong incentive. Albeit only payable as of retirement, it was a government-backed certificate to a specific sum. This means that unlike pensions received from the PAYG scheme, once granted it was shielded from the policy risk (we assume that the government would not default on its obligations).

Incentives built into the reform took the intended effect; circa 65% of workers switched in the first year after the reform. Throughout the next 5 years, individual accounts covered 85% of participants. This ratio is indeed bound to increase and approach 100% as the last PAYG affiliate retires. This natural fact was however not the sole explanation. More workers switched, encouraged by high returns earned by pension funds in the first years following the reform. This was due to growth of Chilean economy and increase of asset prices. Timing of the reform aligned with beginning of the boom period significantly improved its popularity.

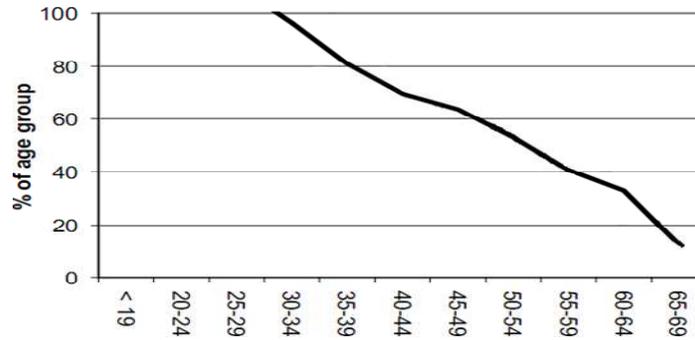
Figure 10: Chile: Relative PAYG and FF Importance



Source: Own, based on Superintendency of AFPs and Chilean Central Bank as discussed in Acuña and Iglesias (2001),

We shall make a brief note on age structure of those who switch. The pattern follows what our simulation implied; the more years until retirement the more it pays off to switch, *ceteris paribus*.

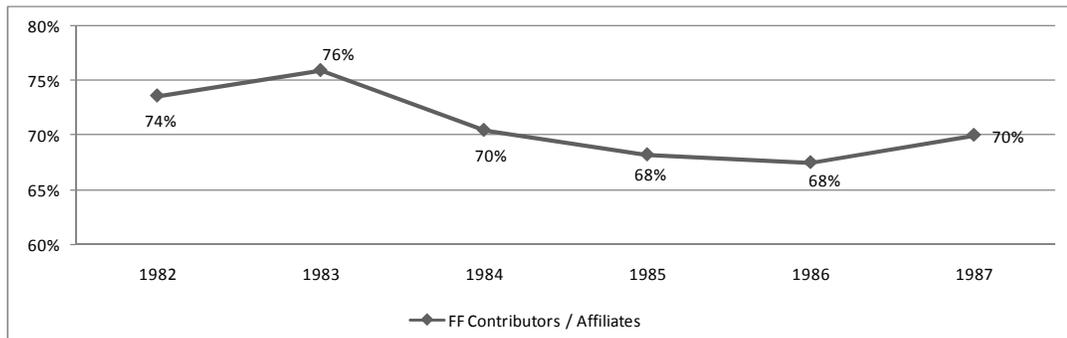
Figure 11: Chile: Switching According to Age



Source: Disney, Palacios and Whitehouse (1999), modified

Contribution patterns of affiliates of AFPs in the first years of reform are summarized on diagram below. Density of contributions, i.e. extent to which affiliates actually contribute to their individual accounts has not been significantly affected by the reform. Meso Lago (2001) concludes that “*Ownership of the individual account and the direct link between contribution and pension levels have not succeeded in solving the problem of evasion and payment delays...*” (p. 19). The problem is greatly linked to the underlying notorious informality and evasion present in Latin America countries.

Figure 12: Chile: Share of Contributors on Total Affiliates of FF Scheme

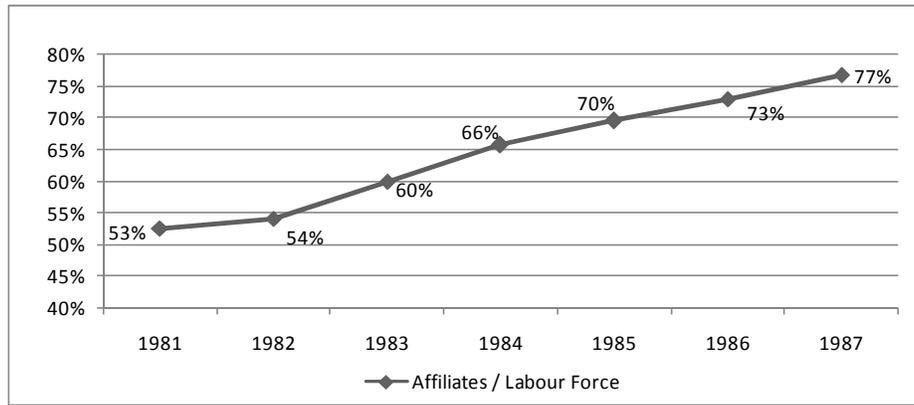


Source: Own, based on Superintendency of AFPs and Chilean Central Bank as discussed in Acuña and Iglesias (2001),

Another aim of the reform was to increase affiliation of labor force to pension system. Major limit to overall coverage of pension system (we will use the measure used in Rofman, Lucchetti and Ourens (2008); the ratio of total affiliates of the system to labor force) is the fact that the system is optional for the self-employed. Yet the years after the reform have seen some increase in affiliation.

Affiliation itself cannot however be considered a notable success, especially when contribution density is low.

Figure 13: Chile: Coverage of Labor Force



Source: Rofman, Lucchetti and Ourens (2008)

### 3.4 Note on Compliance with World Bank 1994 Strategy

In case of Chile, we cannot really talk about compliance, since the Chilean reform had taken place before WB's *Averting the Old Age Crisis* was published. Chile among Latin America countries, as we have seen, was the first to embark on the task of structural reform. The reformers then often acted as advisors in other Latin America countries (for example Argentina and Peru). The question arises to what extent the WB 1994 strategy was influenced by the Chilean reform, since in 1994 the majority opinion deemed the reform successful. Let us now look in what sense the reform can be claimed to match the WB strategy. As we have seen, WB advises reform strategy based on a 3 pillar pension system. The third pillar of the WB strategy consists of voluntary savings. Voluntary components of pension systems, as stated in the introduction, are not discussed in this paper. Suffice it to say that the Chilean reformed pension system does include a voluntary component that corresponds to WB recommendations. Clearly, the AFP system matches the second pillar of the WB strategy. The PAYG component of the Chilean reformed system can be divided into two subcomponents; first, the minimum and welfare pension and second, the old system pension, which provides provisions for those who chose not to switch.

The later was indeed to be phased out, since new labor market participants were allowed to enter. The former, which might be called a safety net component is exactly the kind of Beveridgean, government operated PAYG component providing basic level of solidarity as is the first pillar advocated in the WB 1994 strategy. In conclusion, once the PAYG component corresponding to “non-switchers” has been phased out, the Chilean system can be seen as WB strategy put in practice.

## 4. Argentina

### 4.1 Pre-reform stage<sup>22</sup>

Argentine PAYG system that had prevailed until the reform of 1994 was established in 1969. Within this system the self-employed were subject to mandatory participation (in contrast to Chile). The self-employed did however have a separate pension scheme. Administration of the system was solely the government's responsibility. Benefits were financed from payroll taxes complemented with other sources when needed. Links between contributions and benefits were very weak. Years of active contributions made very little difference in resulting benefits, thus creating strong incentives to evasions and underreporting. The retirement age was 60 for men and 55 for women. The eligibility requirements were both lax and poorly enforced. All above mentioned combined with adverse demographic trends resulted in necessity to raise payroll taxes and massively subsidize the system from other sources. Thus, in the year of the reform the payroll tax rate was 26%. In addition, following sources had to be directed into the system: 10% of VAT collection, 20% of income tax collection, 100% of the personal tax on wealth, 30% of all capital revenues obtained by the federal government from disposal of government owned enterprises and the entire surplus of the family allowance program fund by additional payroll tax. As a result of outlined disincentives as well as traditional distrust in institutions, chronically high rates of evasion were a prevalent problem.

Figure 14: Argentina: Estimated Tax Evasions (% of potential tax revenues)

Year	Employees			Self-Employed	Total
	Public Sector	Private Sector	Total		
1980	58.3	49.5	50.5	44.3	50.1
1985	44.7	37.8	38.5	63.0	39.7
1991	30.5	53.9	53.0	65.5	53.8
1992	35.0	46.9	46.6	74.2	49.1

Source: Cottony and Demarco (1998)

<sup>22</sup> Draws heavily on Cottani and Demarco (1996)

The replacement rate promised by the government varied from 70 to 82% (70% for men retiring at 60 and women retiring at 55, 82% for men retiring at 65 and women retiring at 60) Reference wage on which these replacement rates applied were best worker's 3 years out of the last 10. The short reference period for this calculation was a strong incentive to report or even overstate incomes in just some and underreport in others. Thus the average earnings of workers about to retire were 15% higher than earnings in general.<sup>23</sup> Given the extremely high system dependency ratios, the contribution rate of over 52% would have been needed to deliver the promised replacement rates (Vittas 1997). No attempt to increase the contribution rate was made however. Instead, insolvency of the system forced the government into numerous arbitrary changes. By doing so, the government failed to deliver promised goals of the system. The average replacement rate was down from 65% in 1980 to 50% in 1985 and to 40% in 1990. Many of the citizens came up with legal challenges, many of which succeeded. 1991 and 1992 were the years of costly consolidation of the system's debts. This was partially financed through bond issuance, but more importantly revenues from privatization of oil industry were used. Throughout the consolidation process, the total amount of recognized debt reached \$12.5 billion, or 3.5% of GDP (Cottani and Demarco 1998). Threat of a similar crisis occurring again compelled the legislators into a reform aiming to parametrically change, but most importantly to significantly downsize the imbalanced PAYG system.

#### **4.2 The Reform**

In Argentina, the reform created a second pillar while retaining and parametrically reforming the first pillar (PAYG). Participation in the first pillar was mandatory. The second pillar was mandatory as well. It had two components between which the workers could opt; fully funded (AFJP<sup>24</sup>) component and state-run PAYG component (PAP<sup>25</sup>). Thus two pillars were to coexist. At retirement, a worker's total pension is a combination of money obtained from the

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<sup>23</sup> Dimitri Vittas (1997), original source: Queisser, Larranga and Panadeiros(1993)

<sup>24</sup> AFJP=Administradoras de Fondos de Jubilaciones y Pensiones=Pension Fund Administrators

<sup>25</sup> PAP=Prestacion Adicional de Permanencia=Additional Public Pension

first and the second pillar. To describe the decision making of a worker within the theoretical framework we have established, we will consider contributing into second pillar into PAYG system (first pillar + PAP component of the second pillar ) to be “not switching”, and choosing to channel contributions corresponding to the second pillar into individual accounts (first pillar + AFJP) “switching”. Switching to the newly established funded component of the second pillar was voluntary for both current and future participants. So under the division according to distribution of “right to choice” Argentina’s reform qualifies for option (i). The total contribution rate was set to 27% of the wage bill. Out of this 16% is paid by the employer and channeled into the first pillar, whereas the other 11% is paid by the employee into the second pillar – either funded or PAYG. PAP, the PAYG component of the pillar was originally not a part of the reform. Some authors<sup>26</sup> argue it is a major weakness of the new system. This amendment was done prior to submission of the reform legislation to vote in congress. Moreover, the original proposition of this compromise included a PAP benefit set to 0.5% of the worker’s average wage. Further concession, namely increase to 0.85% represented further dilution of the reform agenda. Unlike in Chile, the Argentine reform extends compulsory coverage to the self-employed. Rofman (2000) explains why situation of this group has been addressed insufficiently; they are divided into ten different groups according to income, seniority and kind of activity. There is even some progressivity imposed on this group. This creates incentives to tax evasion and various other deformations.

#### **4.2.1 First Pillar**

The first pillar provides several types of pensions. First of all, there is the universal basic pension (PBU – first pillar), to which every worker with contribution record of minimum 30 years is eligible (lengthened from previous 15). The normal retirement age was set to 65 for men and 60 for women. PBU is a defined benefit PAYG system, which however incorporates an important feature of notional defined benefit system. Namely, the benefit it grants was linked to

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<sup>26</sup> For example Schulthess and Demarco (1996)

AMPO,<sup>27</sup> which is calculated on semi-annual basis by dividing the total contributions by the number of active contributors. This element constitutes, albeit only partially, a link between expenditures and revenues of the system. The PBU then amounts to 2.5 times the contribution from an average covered wage (AMPO). Since contribution rate paid by a worker was 11%, PBU was equal to 27.5% of the average covered wage. For every recognized year of contributing in excess of 30 years, the PBU is increased by an amount corresponding to 1% of AMPO. 45 years of recognized contributing thus results in PBU equal to 31.65% of an average covered wage ( $31.625\% = 2.5 \times \text{AMPO} + 15 \times 1\% \times 2.5 \times \text{AMPO}$ ). PBU is thus a Beveridgean (flat benefit) pension in a sense, for at the microeconomic level, there is no link between height of contributions of a worker and his/her benefits, given the fixed number of years actively contributing. This is however not true at the aggregate level as we have already observed; lower covered wages and/or underreporting of covered wages lowers the average covered wage as well as AMPO. In turn, PBU benefits would be lowered. The first pillar also assumed responsibility of paying pensions to those who had already been retired at the time of the reform. This was called the Old System Pensions (OSP). The maximum amount of this pension was set to 29% of average wage (35 years of contributions required for the maximum). This component of the pension system is, similarly as the PBU, strongly redistributive since the amount is same for all the workers who have contributed for the same number of years, regardless of differences in income. After the main reform package, in March 1995, the automatic indexation of OSP was removed. The government thus gained a significant discretionary power in changing real levels of OSP pensions. Furthermore, different valorizations for differently high pensions were allowed. The compensatory pension (PC) is paid to those who have previously contributed into the old system (this will be treated below). Furthermore there is an old age poverty prevention pension (PEA)<sup>28</sup> to people over 70 years of age and at least 10 years of contributions, as well as disability and survivorship pension.

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<sup>27</sup> AMPO=Aporte Medio Previsional Obligatorio=Average Compulsory Pension Contribution

<sup>28</sup> PEA=Prestacion por Edad Avanzada=Advanced Age Pension

#### 4.2.2 Second Pillar

As outlined above, contributions corresponding to the second pillar could either be channeled into state run PAYG system (PAP) or a fully funded scheme. Individual accounts then created funds run by investment management companies, the AFJPs. Unlike Chile, Argentina allows management of these funds by both privately and state owned companies. Accumulated capital on individual accounts is, similarly as in Chile, received in a form of annuity or scheduled withdrawal. In case of annuity purchase, a lump sum can be withdrawn at the retirement in excess of funds sufficient to purchase an annuity granting a 70% replacement rate. If the accumulated capital is insufficient to purchase an annuity granting benefit equal to at least  $\frac{1}{2}$  of PBU, then fractional withdrawal in the amount equal to  $\frac{1}{2}$  PBU is allowed. That implies that the account could be exhausted before the death and the retiree then relies completely on pensions received from the first pillar.

The other choice within the second pillar is its PAYG component -PAP. This system has somewhat stronger link between the benefit it pays out and the contributions; both regarding number of years of active contributing and differences in earnings among workers. The benefit is set at 0.85% of a worker's average salary for every year of contributing under the new system. The reference period for average wage calculation is the last 10 years of employment. Some authors argue<sup>29</sup> that introduction of a PAYG pension scheme within the second pillar is a major weakness of the reform. It was not an original intention of the reformers and it was in contradiction to recommendations of the World Bank. Furthermore, the annual accrual factor of PAP had been originally proposed to 0.50%, and then raised to 0.85%. PAP as well as benefit calculations within it were both results of policy concessions.

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<sup>29</sup> Vitas 1998 p. 46, Schulthess and Demarco 1996 p. 15

Figure 15: Argentina: Overview of the New System

	Pension Type	PAYG or Funded	Benefits Linked to Earnings*	Benefits Linked to Years of Contribution*
First Pillar	PBU	PAYG	No	Yes
	PC	PAYG	Yes	Yes
	OSP	PAYG	No	Yes
	PEA	PAYG	No	No
Second Pillar	PAP	PAYG	Yes	Yes
	AFJP	Funded	Yes	Yes

\*once the eligibility requirements have been met

Source: Own

#### 4.2.3 Return Guarantees, Investment Restrictions

Similarly as in Chile, AFJPs are required to keep two types of reserves:

- 1) Investment reserve,
- 2) Profit reserve.

The investment reserve was set to

$$\text{Min } \{ \$3\text{million} ; 2\% \text{ of fund's assets} \}.$$

The profit reserve is equal to all the profits exceeding rate of return equal to

$$\text{Max } \left\{ \frac{1}{36} \sum_{m=1}^{36} r_m + 2\% ; \frac{1}{36} \sum_{m=1}^{36} r_m + 0.3 \times \sum_{m=1}^{36} r_m \right\},$$

where  $\text{avg}(r)$  is the average annual rate of return of all the funds for the ending accounting period. Number 36 means that the reference period is the last 36 months. Reserves of both types must then be used to cover differences of returns, should the rate of return of a fund fall below the minimum required (guaranteed) rate of return. The minimum required return was set to:

$$\text{Min} \left\{ \frac{1}{36} \sum_{m=1}^{36} r_m - 2\% ; \frac{1}{36} \sum_{m=1}^{36} r_m - 0.3 \times \sum_{m=1}^{36} r_m \right\}$$

Whenever an AFJP fails to deliver the guaranteed rate of return, it must cover the difference from its reserves. If the reserves are insufficient, the difference is covered from the government budget and AFJP is liquidated.

Argentina's AFJPs were allowed to keep only one fund with a single investment strategy. Unlike Chile, there is no space to adjust a worker's portfolio to his/her risk preferences. Relative share of different securities in the fund's portfolio was limited by regulations.

Figure 16: Argentina: Funds' Portfolio Restrictions

Type of Assets	Limit % of funds
a. Bonds Issued by the National Government	50,0
a.1. Bonds Issued by the National Government, market value	50,0
a.2. Bonds Issued by the National Government, investment account	30,0
b. Bonds Issued by Provincial and Local Governments	15,0
b.1. Bonds Issued by Provincial and Local Governments, market value	15,0
b.2. Bonds Issued by Provincial and Local Governments, investment account	2,0
c. Commercial Papers, long term	28,0
d. Commercial Papers, short term	14,0
e. Convertible Commercial Papers	28,0
f. Convertible Commercial Papers, issued by Privatized Companies	14,0
g. Certificates of Deposits	28,0
h. Equity	35,0
i. Recently Privatized Companies Equity	14,0
j. Mutual Funds	14,0
k. Foreign Government Bonds	10,0
l. Foreign Commercial Papers	7,0
m. Options and Futures	2,0
n. Securities with Mortgage Warranty	28,0
ñ. Direct Investment Funds	10,0

Source: SAFJP, adopted from Rofman (2000)

#### 4.2.4 SSD made explicit – Compensatory Pensions

Even though the reform in Argentina included existence of the first pillar, it was not really its continuation. The first pillar was rather shut down and restarted. SSD debt of the old first pillar was thus made explicit. Unlike in Chile, it could not be made in form of an increment into individual accounts. Such

solution would constitute a problem of how to settle the debt with those who opted not to switch. The solution devised by reformers was a pension payment in proportion to average earnings over the last ten years before retirement and to number of years of contributing. This was called a compensatory pension, or PC<sup>30</sup>. For every year of contributing, a worker was to receive a pension equal to 1.5% of his or her average wage for the last ten years of contributing. Number of recognized years was capped at 35 years. Recognition of 35 years would thus result in a PC corresponding to 52.5% replacement rate received throughout retirement. Under the division of SSD we have previously established, we can say that the accrued-to-date liabilities were made explicit at the time of the reform, and their settlement was scheduled. New liabilities were to be created under the new system.

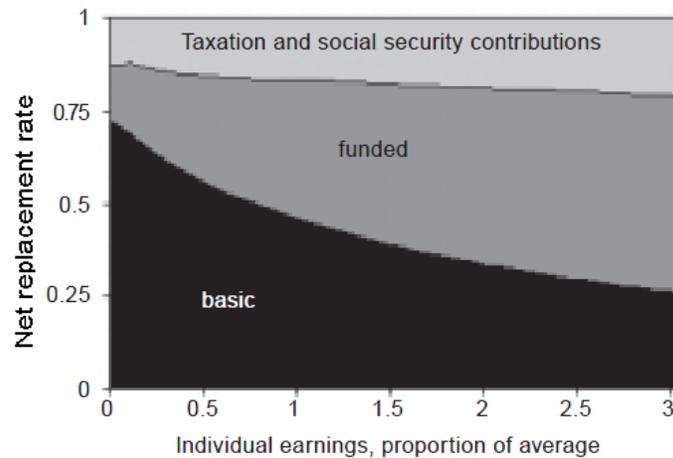
#### **4.2.5 Relative Importance of PAYG and FF**

Besides the Beveridgean old age poverty pension (PEA), PAYG in Argentina also provides compensatory pension (PC) and (PAP) for those who didn't switch. The former component serves to settle the SSD from the previous system made explicit. In contrast with Chile, these design features help to maintain high importance of PAYG. Furthermore, even for those who switch, a significant share of replacement rate is secured through basic pension (PBU). All these features constitute a basis for perpetuation of PAYG as an important source of replacement rate. As simulation run by Palacios (2003) indicates, participants of the FF schemes still rely greatly on the PAYG component. This reliance is fairly significant for low income groups and decreases in income.

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<sup>30</sup> PC = Prescacion Compensatoria = Compensatory Pension

Figure 17: Argentina: Sources of Net Replacement Rate Simulation



Source: Palacios (2003)

### 4.3 Switching and Coverage

Argentine pension reform follows distribution of right to choice (i). All workers present and future face the choice between FF and PAYG. This, at least in theory, implies that either scheme can dominate or even be naturally eliminated, should workers not opt for it at all. This is in direct contrast with Chile and situation (ii) in general, where PAYG scheme is to be gradually phased out.

Modeling the problem of choice in Argentina is a little less complicated than in Chile. In Chile, those who switch receive a recognition bond. Those who don't will receive benefits on basis of their previous contributions as set by the rules of the reformed PAYG system. In Argentina, settlement of previous contribution is same for both groups; those who switch and those who don't (through compensatory pension). Thus, in Chile one needs to calculate:

- a) Value of recognition bond at retirement for the worker,
- b) Increment to the pension as of retirement under the rules of reformed PAYG.

Moreover, one needs to compare them. In Argentina, these considerations are not needed. SSD made explicit is, as already said, settled through a compensatory pension (PC). Same rules apply for those who switch and those who don't. This enables us to run a simple simulation (similar to one we have already run for three hypothetical pension schemes), and determine optimal switching strategy for the

“average worker”. This is based on comparing the PAYG component of the Argentine second pillar (=PAP), and the FF component.

**Simulation Assumptions:**

-rules that apply to benefits of PAYG and contribution rates identical to those of rules in post-reform Argentina

-real wage growth 1% p.a.

-interest rate used in annuity calculation = 4% (the rate actually set by regulatory bodies in Argentina at the time of reform; Palacios and Rofman(2001))

-life expectancy at retirement = 20 years

- MWR=90%

-real rate of return to individual account in FF scheme = 3%

The resulted pension is expressed in terms of real average covered earnings in year 0, 100=average covered earnings in year 0 (note that to reach total effective pension the compensatory pension needs to be added)

Figure 18: Argentina: To Switch or Not To Switch Choice Simulation



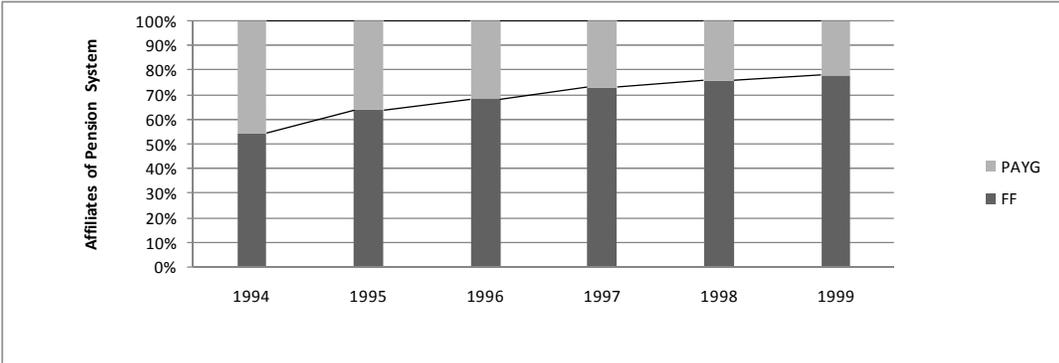
Source: Own

For the employed parameter values, optimal strategy is:

- PAYG (PAP in case of Argentina) for workers with up to 11 years until retirement,
- FF scheme for those with at least 12 years until retirement.

To promote the new pension system, a massive campaign was launched (similarly as in Chile). The political support was not so clear, for as opposed to Chile, the Argentine pension reform was passed through the parliament. It faced opposition and was partially watered down. Thus the campaign was predominately run by the fund management companies. Nearly 30% of the total pension system affiliates at the time the system was created were assigned to an AFJP (Rofman 2000). This figure exceeded 50% by the end of 1994. At this point, let us note that the Argentine reform included a seemingly insignificant, but in fact an important design feature. The workers who did not explicitly report their decision to authorities were automatically assigned to AFJP. However ironically it might sound, the government itself considered indifference of many workers to be an important aspect. Vittas (1997) notes that such design feature “was used as a justification for the government expectation that 70% or more of workers would join the AFJP system, since inaction and inertia would favor the private component of the second pillar” (p. 24). To further encourage affiliation, an amnesty was announced in 1995 that some workers to reveal their earnings to authorities and become participants of the pension system. Another factor that boosted affiliation was incorporation of some local pension schemes into national system.

Figure 19: Relative PAYG and FF Importance

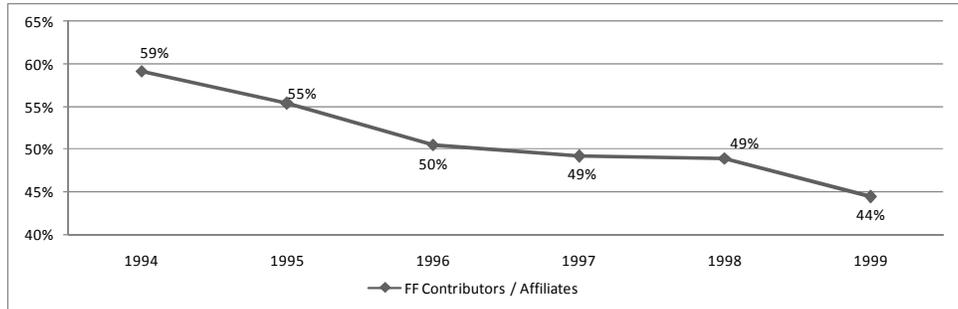


Source: Superintendency of Pension Funds, as discussed in Rofman (2000)

As for the density of contributions, Argentina faced same problems as Chile. The situation, as can be seen on the diagram, was further aggravated by the

financial crisis of 1994-1995, partially arising from the Mexican crisis. This period entailed sharp rise in unemployment and decline in economic activity. Thus the Argentine pension reform did not enjoy continuous high rates of growth seen in Chile in years after the reform.

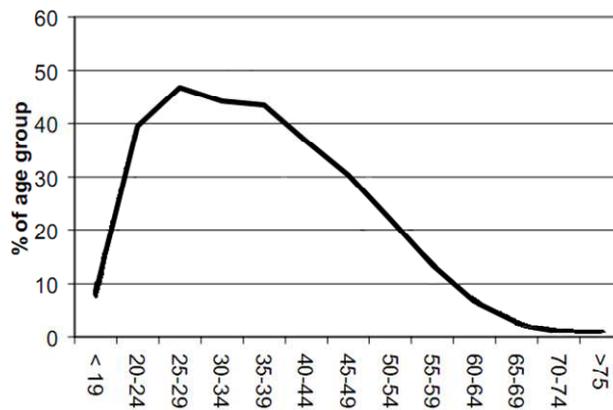
Figure 20: Share of Contributors on Total Affiliates of FF Schemes



Source: Superintendency of Pension Funds, as discussed in Rofman (2000)

Age structure of those who switched held similar patterns as in Chile, exception being some “hesitation” among the group of youngest workers.

Figure 21: Switching According to Age

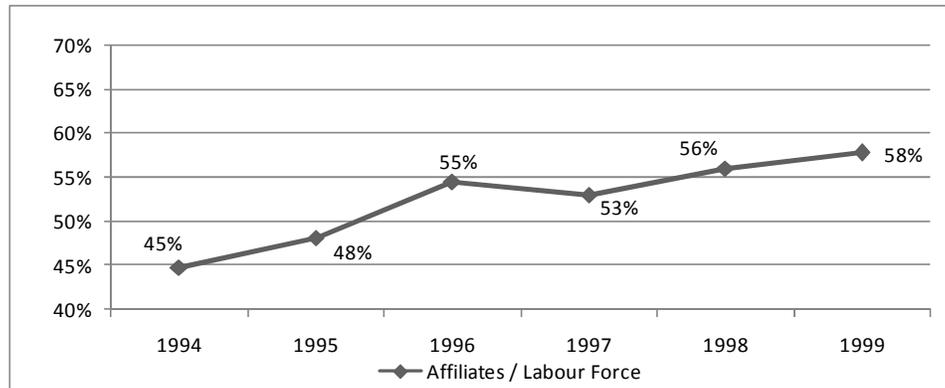


Source: Disney, Palacios and Whitehouse (1999), modified

Unlike in Chile, mandatory affiliation to pension system also applies to the self-employed. The legislation that applies to the self-employed is however rather complicated. As Rofman (2000) points out, there are ten different categories (based on income, seniority and kind of activity) that are subjects to different contribution rates. This creates major incentive for the self-employed to

operate informally. Despite that, the overall affiliation of the pension system rose steadily after the reform. Problem with low and declining contribution density thus prevailed.

Figure 22: Coverage of Labor Force



Rofman, Lucchetti and Ourens (2008)

#### 4.4 Note on Compliance with WB strategy

The AFPJ system is an equivalent to the Chilean AFP, and can clearly be seen as FF second pillar recommended by the WB. The only difference that leaves it short of matching that recommendation completely is maintaining the government management. Thus the funds operated by the government can be a source of various market distortions and moral hazard. Such funds can be expected to provide extraordinary guarantees (even if not stated explicitly), that private sector managers cannot match. Another risk would be skew of investment strategy towards government securities to prop up the government budget, at least within the legislated portfolio restrictions. Thus, a suspicion arises that a state run fund and the general government budget can form a collusion of a type that among other things led to the crisis of old PAYG systems. Just to briefly mention the voluntary third pillar advocated by the WB, let us state that the Argentine reform too included this component.

We have seen that there are several PAYG components in the reformed Argentine pension system; PAP, PBU, PC, PEA and OSP. PC serves as a settlement of the SSD made explicit. Out of the other four, as purely Beveridgean and corresponding to the first pillar advocated by the WB can be seen only PEA

(old age poverty pension). Other PAYG components are based on either number of years of contributing (PBU, OSP), or both height of earnings and years of contributing (PAP). Argentine reform, unlike the Chilean, thus failed to reduce function of the PAYG component to providing basic solidarity, or safety net. PAYG, in contrast to the WB recommendations remains a significant component of the pension system.

## 5. Conclusion

Numerous problems of PAYG led many countries to a pension reform. The reform should be the solution to problems that arise from many sources; demographic development, level of benefits too generous relative to contributions, politically motivated changes with little or no long-term considerations etc. Focus of this paper was the structural reform, namely the switch towards individual, fully funded pension scheme replacing the traditional PAYG schemes (completely or partially). Such a reform requires rules of transition. In its 1994's report *Averting the Old Age Crisis: Policies to Protect the Old and Promote Growth*, the World Bank has proposed a reform strategy. The PAYG component, the first pillar, was to maintain only as a safety net, taking on the task of solidarity. Reliance on this pillar was to be discouraged. WB proposed a fully funded, privately managed second pillar to be the major source of old age income. The third pillar was recommended to consist of voluntary savings.

Throughout the paper, we were discussing structural pension reform with focus on individual choice. We explored the element of individual choice and classified possibilities of restricting this choice legislatively; that is to what extent the choice is granted. We showed that the possibilities of how to distribute the “right to choice” over the pension system participants can be reduced to three distinct cases;

- i. Switch voluntary, all workers present and future,
- ii. Switch voluntary for the present, mandatory for the future workers,
- iii. Switch mandatory, all workers present and future.

In each of the three, the social security debt (SSD) is made explicit. That means that the reformers need to declare a certain amount of liabilities payable to pension system participants, and devise a way to settle these liabilities. The way this problem is solved has an impact on individual choice. Each of the three possible distributions of “right to choice” entails its own type of SSD being made explicit. We show that specification of SSD made explicit under the three possibilities corresponds to division of SSD introduced by Holtzmann (1998). Within a given distribution of “right to choice” and parameters of all available pension schemes, workers need to make their decisions. They can either switch to

a fully funded scheme or remain participants of a PAYG scheme (albeit amended parametrically by the reform). We show that this decision making problems has parameters arising from three different sources:

- Policy risk (legislative changes concerning pension system),
- Market situation (interest rates...),
- Individual specifics of the worker.

Future values of these parameters are uncertain and have to be predicted. For their values expected by the worker we have described the decision making process. In case of parameters arising from legislative design of the reform, this means certain set of rules that constitutes the mandatory pension system. There are usually two components between which the individual is to opt. We illustrated the decision making problem with a simulation. The conclusion followed that for a given time until retirement and for the given set of parameter values (expected by the individual) the optimal switching strategy can be selected (scheme with the highest benefit relative to contributions). In further considerations, we examined design features that constitute grounds for moral hazard. We pointed out incentives that lead to avoiding contributions. The higher is the guaranteed minimum pension amount, the greater is the risk of moral hazard; namely it is becoming attractive to evade one's contributions to the point of just meeting the eligibility requirements. We have seen that as the amount of the safety net pension increases relative to workers' income, it incentivizes further evasion of contributions.

Once the theoretical framework of individual choice is established, it helps us study two cases of reform; Chile (1981) and Argentina (1994). We see that the two differ substantially in many respects. They present different distribution of "right to choice". In turn, different amount of implicit social security debt turned explicit, and different ways of settling that debt were devised in both cases. Evaluation of both reforms in the perspective of the strategy put forward by the World Bank in 1994, we conclude that Chile represents a close adherence to this strategy whereas Argentina conceded significant policy dilutions; namely maintaining extensive reliance on state-managed PAYG schemes. As to factors that influence switching decisions, we have shown that both reforms were made so as to stimulate switching. Visible policies were

introduced to encourage workers to switch. This was particularly notable in Chile (immediate increase in take-home earnings for those who switch recognition bonds etc.). In line with conclusions implied from the simulation we have run, young workers were generally switching at higher rates. Both reforms thus resulted in fairly high rates of switching (5 years after the reform 76% in Argentina and 83% in Chile; see appendix). In both cases, the reform succeeded in extending coverage to greater share of population over the first 5-6 years after introduction. Reforms have however failed to deal with the underlying problem of evasion and underreporting. Under-saving resulting in dependence on the government safety net however remains a problem. This remains subject to further research. Policy makers and researchers face a different task of explaining the importance of well-secured old age income to the public not only in Latin America.

## Literature

Antolin, P. (2008): *Ageing and the payout phase of pensions, annuities and financial markets*, OECD Working Papers on Insurance and Private Pensions

Arenas de Mesa, A. - Bravo, D.- Behrman, J.R. - Mitchell, O.S. - Todd P. (2006): *The Chilean Pension Reform Turns 25: Lessons from the Social Protection Survey*, University of Pennsylvania

Cottani, J. - Demarco, G. (1996): *The Shift to a Funded Social Security System: The Case of Argentina*, A National Bureau of Economic Research Project Report, The University of Chicago Press

Devesa-Carpio J.E. - Vidal-Meliá C. (2002): *The Reformed Pension Systems in Latin America*, Social Protection Discussion Paper No. 0209, The World Bank

Edwards, S. (1998): *The Chilean Pension Reform: A Pioneering Program*, A National Bureau of Economic Research Project Report, Chicago Press

James E.- Vittas D. (2000): *Annuity Markets in Comparative Perspective: Do Consumers Get Their Money's Worth?*, Policy Research Working Paper 2493, Development Research Group , The World Bank

Holzmann, R. (1998): *Financing the Transition to Multi-pillar*, HDNSP

Palacios, R. (2003): *Pension Reform in Latin America: Design and Experiences*, Pension Reform Primer, FIAP

Palacios R. - Rofman R.(2001): *Annuity Markets and Benefit Design in Multipillar Pension Schemes: Experience and Lessons from Four Latin American Countries*, Social Protection Discussion Paper No. 0107, Social Protection Unit, Human Development Network, The World Bank

Palacios, R. - Whitehouse, E. - Disney, R. (1999): *The Individual Choice of Pension Arrangement as a Pension Reform Strategy*, Institute for Fiscal Studies, Working Paper Series No. W99/18

Pinera, J. (1988): *Discurso del ministro del trabajo y previsión social con motivo de la aprobación de la reforma previsional*. In *Sistema privado de pensiones en Chile*, ed. S. Baeza Valdes and R. Manubens, Santiago: Centro de Estudios Públicos

Queisser, M. - Larranaga, O. - Panadeiros, M. (1993): *Adjustment and Social Development in Latin America during the 1980s: Education, Health Care and Social Security*. Munich: Weltforum Verlag

Razin, B (2005): *Social Security Reform*, Cambridge University

Rodrigo Acuña R. - Augusto Iglesias P. (2001): *Chile's Pension Reform After 20 Years*, Social Protection Unit, Human Development Network, The World Bank

Rofman, R. - Lucchetti, L. - Ourens, G. (2008): *Pension Systems in Latin America: Concepts and Measurements of Coverage*, SP Discussion Paper No. 0616, The World Bank

Rofman, R. (2000): *The Pension System in Argentina: Six Years After the Reform*, Social Protection Discussion Paper No. 0015, Social Protection Unit, Human Development Network, The World Bank

Schulthess, W. – Demarco, G. (1996): *El Sistema de Jubilaciones y Pensiones de Argentina a Dos Años de la Reforma*, Buenos Aires: SAFJP.

Vittas, D. - Iglesias, A. (1992): *The Rationale and Performance of Personal Pension Plans in Chile*, Policy Research Working Papers, Country Economics Department, The World Bank

Vittas, D. (1997): *The Argentine Pension Reform and its relevance for Eastern Europe*, Financial Sector Development Department, The World Bank

World Bank (1994): *Averting the Old Age Crisis: Policies to Protect the Old and Promote Growth*, World Bank Policy Research Report, Oxford University Press

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## Appendix – Summary of Data on Switching and Coverage

Chile							
Year	1981	1982	1983	1984	1985	1986	1987
Affiliates Total	2,131,930	1,928,850	2,097,790	2,389,833	2,738,240	3,033,864	3,328,500
FF	1,400,000	1,440,000	1,620,000	1,930,353	2,283,830	2,591,484	2,890,680
PAYG	731,930	488,850	477,790	459,480	454,410	442,380	437,820
Affiliates / Labour Force	53%	54%	60%	66%	70%	73%	77%
FF / Total	66%	75%	77%	81%	83%	85%	87%
PAYG / Total	34%	25%	23%	19%	17%	15%	13%
FF Contributors	N/A	1,060,000	1,230,000	1,360,000	1,558,194	1,749,381	2,023,739
FF Contributors / Affiliates	N/A	74%	76%	70%	68%	68%	70%

Source: Rodrigo Acuña, R. - Augusto Iglesias P. (2001), Superintendency of  
AFPs and Chilean Central Bank

Argentina						
Year	1994	1995	1996	1997	1998	1999
Affiliates Total	6,331,805	7,488,190	8,016,453	8,584,911	9,318,542	10,079,136
FF	3,431,012	4,779,242	5,472,071	6,256,443	7,067,123	7,854,363
PAYG	2,900,793	2,708,948	2,544,382	2,328,468	2,251,419	2,224,773
Affiliates / Labour Force	45%	48%	55%	53%	56%	58%
FF / Total	54%	64%	68%	73%	76%	78%
PAYG / Total	46%	36%	32%	27%	24%	22%
FF Contributors	2,028,653	2,644,099	2,762,250	3,073,537	3,459,176	3,483,265
FF Contributors / Affiliates	59%	55%	50%	49%	49%	44%

Source: Rofman (2000), Superintendency of Pension Funds