PBSS
CANCUN MEXICO
COLLOQUIUM 2017
DEFINING AMBITION

National Framework Law and equivalence model for Individual Accounts and Defined Benefit

Francisco Miguel Aguirre Villarreal
Valuaciones Actuariales del Norte
faguirre@actuariales.com.mx

IACA PBSS

VALUACIONES ACTUARIALES DEL NORTE

Defined Benefit vs Defined Contribution

At international level there comes the same question: Which is the best approach? Defined Benefit or Defined Contribution?

Generally speaking from a technical point of view, it is true that the retirement cost of a pension system for a new entry worker is the same in a Defined Contribution Model than in a Defined Benefit approach as long as the following assumptions are held:

- Same replacement rate
- Same retirement age
- Same contribution time
- Same salary increase rate
- Same return rate
- Same mortality table, disability, rotation, etc.
- Biometric and financial hypothesis are not modified through out time
- No commisions of management costs
- In case of separation without the right for a pension, both schemes give back worker's and employer's contributions, as well as all returns that were generated along time

This work demonstrates that the financial cost of the pure Defined Benefit scheme is equal to the cost of a pure Defined Contribution model as long as both provide equal benefits on amounts and conditions to obtain them, by doing the same calculations based on the same financial and biometric hypotesis.

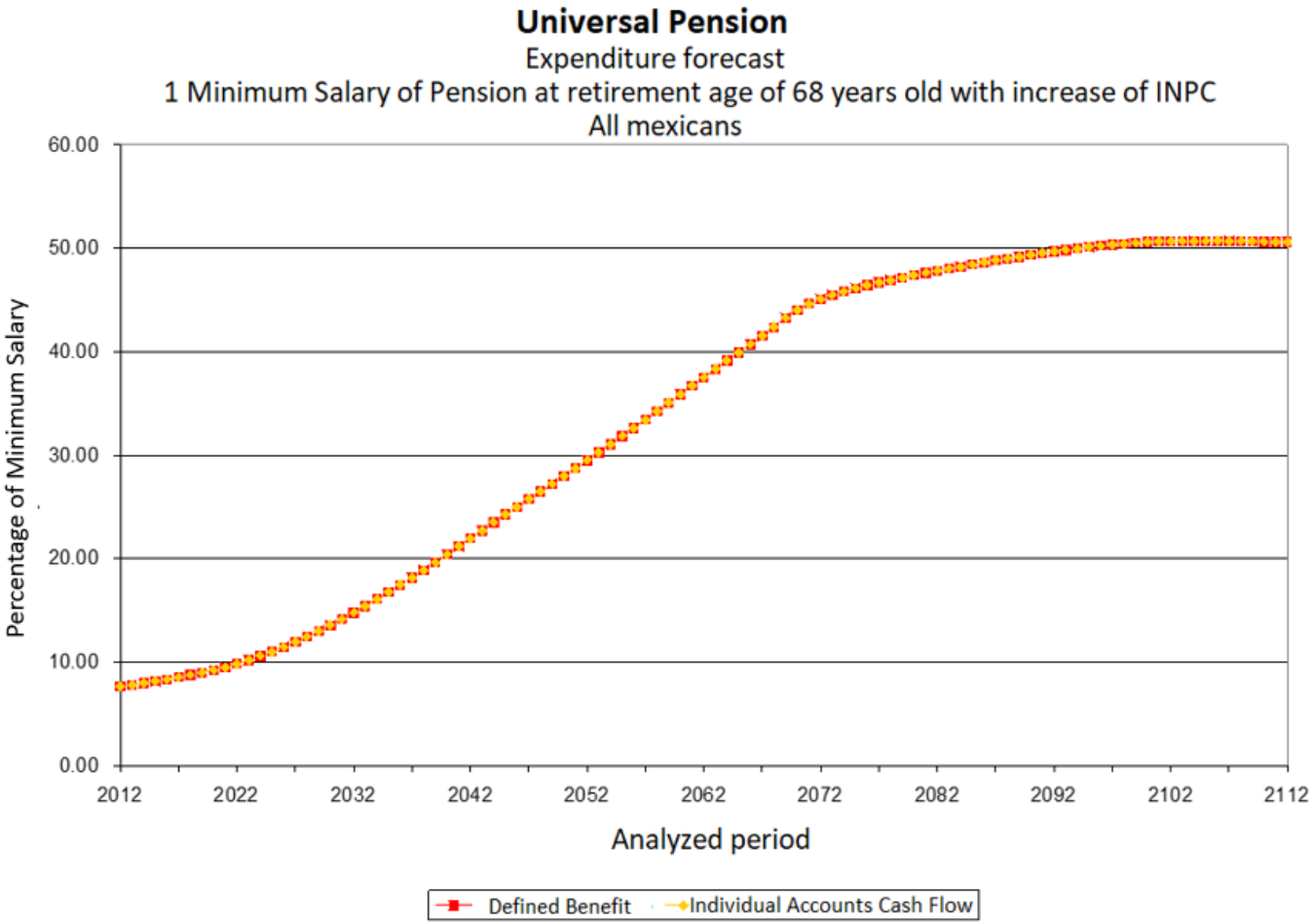
Our Office was requested to evaluate the actuarial cost of setting up a Universal Pension System in Mexico, which was financed by the Defined Benefit scheme as well as by Defined Contribution approach. In both cases, the objective Benefit would be of 1 mínimum salary with a retirement age of 68 years old.

The graphic results of both forecasts are shown as follows:

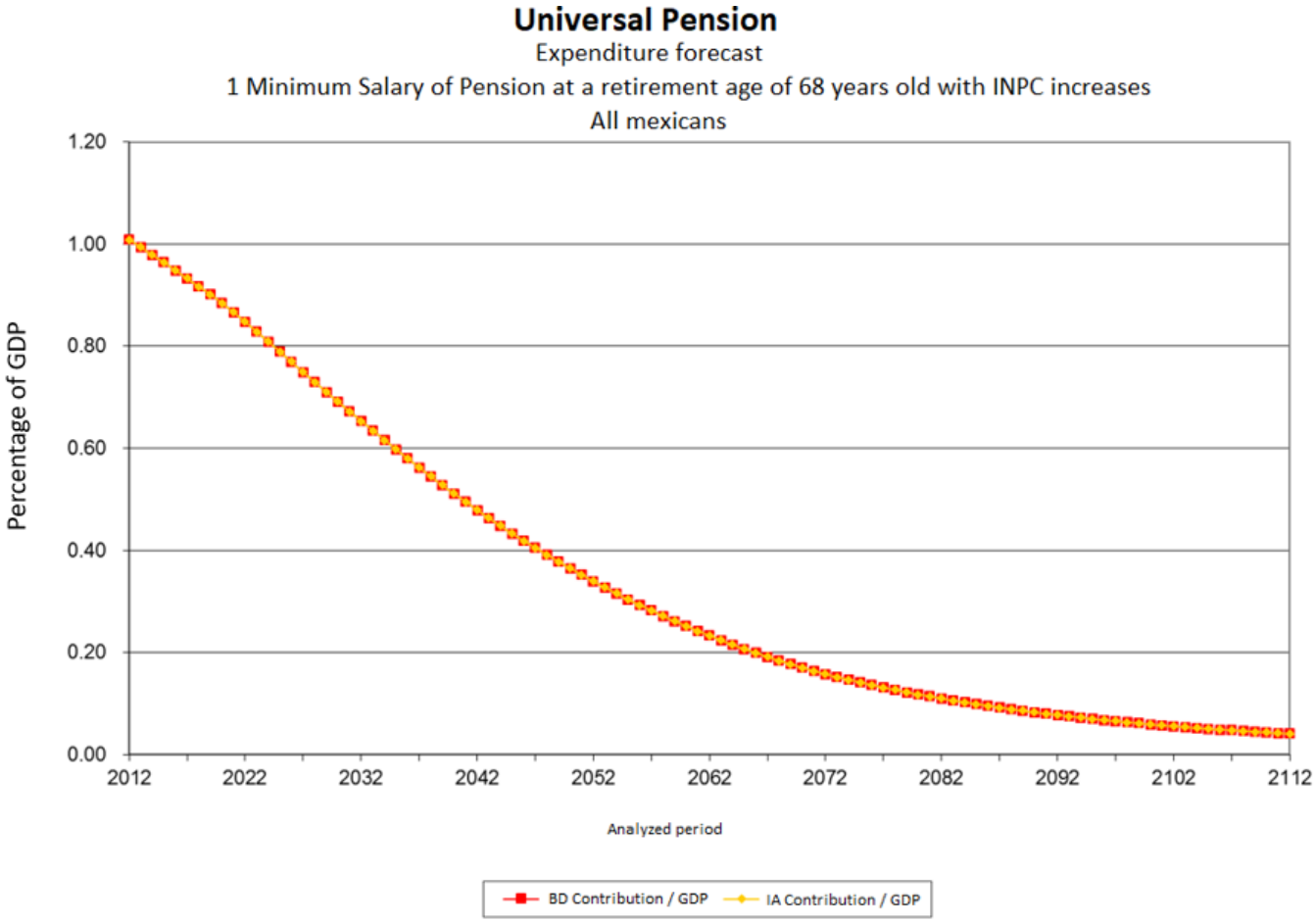
- Graph 1 : Payed benefits as cash flows at the moment when they are demanded as a percentage of the payroll of 1 mínimum salary for each participant.

- Graph 2 : Contributions to the system that are calculated as a percentage of the GDP (Gross Domestic Product).

Graph1


Universal Pension
Expenditure forecast
1 Minimum Salary of Pension at retirement age of 68 years old with increase of INPC
All mexicans
Percentage of Minimum Salary
60.00
50.00
40.00
30.00
20.00
10.00
0.00
2012
2022
2032
2042
2052
2062
2072
2082
2092
2102
2112
Analyzed period
Defined Benefit
Individual Accounts Cash Flow

Graph2


Universal Pension
Expenditure forecast
1 Minimum Salary of Pension at a retirement age of 68 years old with INPC increases
All mexicans
Percentage of GDP
1.20
1.00
0.80
0.60
0.40
0.20
0.00
2012
2022
2032
2042
2052
2062
2072
2082
2092
2102
2112
Analyzed period
BD Contribution / GDP
IA Contribution / GDP

In the previous graphs it is shown how the cost of one scheme is equal to the other one, whenever claims are received as well as at the moment of funding

To demonstrate this actuarial equivalence, it will be necessary to consider two possible cases:

- Case 1: The insured worker completes his contributions and survives to retirement age

- Case 2: The insured worker does not complete his contributions (by leaving the scheme before attaining the retirment age), so either him or his beneficiaries received the amount that has been given plus all generated interests.

We start from the fact that in actuarial terms, the following equation must be held true for Defined Benefit and Defined Contribution models:

Actuarial Present Value of Contributions (VPAC)	=	Actuarial Present Value of Benefits (VPAB)	+	Actuarial Present Value of Contributions' reimbursements (VPAD)

Defined Contribution Scheme (without withdrawals prior to retirment age)

Let's consider an individual account **where there are no withdrawals due to death, disability, rotation or voluntary retreat** where it is desired to offer a pension $P_{ss}(S_y)$ in mexican pesos at age "x". The present value of contributions at age "x" would be calculated in the following way:

$$
{}^{CD}VPAC_{SS}^{x} = \left[{}^{CD}C_{SS} \cdot S_x \left[(1+r)^{y-x}(1+s)^{0} + (1+r)^{y-x-1}(1+s)^{1} + \ldots + (1+r)^{1}(1+s)^{y-x-1} \right] \right] (1+r)^{-(y-x)}
$$

In all of cases that are analyzed by this work, we will asume that the pension grows in the same rate as salary does for simplification purposes. Therefore, the Actuarial Present Value of Benefits for the worker in mexican pesos at age "x" would be given by:

$$ {}^{CD}VPAB_{SS}^{x} = {}^{CD}P_{SS} \cdot S_x \frac{(1+r)^{y}(1+s)^{-x}}{l_y^m} \left[\sum_{i=0}^{\infty} l_{y+i}^m \left(\frac{1+s}{1+r} \right)^{y+i} \right] (1+r)^{-(y-x)} $$

If we equalize the actuarial present value of contributions and the actuarial present value of contributions we can obtain the value of ${}^{CD}P_{SS}$ (replacement rate) and the value of ${}^{CD}C_{SS}$ (percentage of salary that is paid annualy):

$$ {}^{CD}P_{SS} = \frac{{}^{CD}C_{SS}\,(1+s)^{y-x}\left[\dfrac{1-\left(\dfrac{1+s}{1+r}\right)^{-(y-x-1)}}{\dfrac{1+s}{1+r}-1}\right]}{\dfrac{(1+r)^{y}(1+s)^{-x}}{l_y^m}\left[\displaystyle\sum_{i=0}^{\infty} l_{y+i}^m\left(\frac{1+s}{1+r}\right)^{y+i}\right]} $$

$$ {}^{CD}C_{SS} = \frac{{}^{CD}P_{SS}\,\dfrac{(1+r)^{y}(1+s)^{-x}}{l_y^m}\left[\displaystyle\sum_{i=0}^{\infty} l_{y+i}^m\left(\frac{1+s}{1+r}\right)^{y+i}\right]}{(1+s)^{y-x}\left[\dfrac{1-\left(\dfrac{1+s}{1+r}\right)^{-(y-x-1)}}{\dfrac{1+s}{1+r}-1}\right]} $$

Defined Benefit (without withdrawals prior to retirement)

In the same way as we worked in the defined contribution scheme, let's consider a Defined Benefit scheme where **there are no withdrawals du to death, disability, rotation or voluntary retreat** where it is desired to offer a pension (just as it was done in the defined contribution model) in pesos at age "x".

$$ {}^{BD}VPAB_{SS}^{x} = (1+r)^{-(y-x)}\ {}^{CD}P_{SS} \cdot S_x \frac{(1+r)^{y}(1+s)^{-x}}{l_x^m}\left[\sum_{i=0}^{\infty} l_{y+i}^{m}\left(\frac{1+s}{1+r}\right)^{y+i}\right] $$

$$ {}^{BD}VPAC_{SS}^{x} = (1+r)^{-(y-x)}\ {}^{BD}C_{SS} S_x (1+s)^{y-x}\left[\frac{1-\left(\frac{1+s}{1+r}\right)^{-(y-x-1)}}{\frac{1+s}{1+r}-1}\right] $$

As we already know, in order to have actuarial equilibrium in a Defined Benefit system, the present value of contributions must be equal to the present value of benefits, which implies the following formulas:

$$ {}^{BD}VPAB_{SS}^{x} = {}^{BD}VPAC_{SS}^{x} \quad \Rightarrow \quad {}^{BD}C_{SS} = \frac{{}^{CD}P_{SS}\dfrac{(1+r)^{y}(1+s)^{-x}}{l_{y}^{m}}\left[\displaystyle\sum_{i=0}^{\infty} l_{y+i}^{m}\left(\frac{1+s}{1+r}\right)^{y+i}\right]}{(1+s)^{y-x}\left[\dfrac{1-\left(\dfrac{1+s}{1+r}\right)^{-(y-x-1)}}{\dfrac{1+s}{1+r}-1}\right]} $$

This demonstrates that ${}^{BD}C_{SS}$ is equal to ${}^{CD}C_{SS}$. In other words, if there are no withdrawals prior to retirement, the pension's financial cost that is equivalent to the percentage of the last salary ${}^{CD}P_{SS}$ is the same for both models of Defined Benefit and Defined Contribution.

$$ {}^{BD}VPAB_{SS}^{x} = {}^{BD}VPAC_{SS}^{x} \quad \Rightarrow \quad {}^{BD}C_{SS} = \frac{{}^{CD}P_{SS}\dfrac{(1+r)^{y}(1+s)^{-x}}{l_{y}^{m}}\left[\sum_{i=0}^{\infty} l_{y+i}^{m}\left(\dfrac{1+s}{1+r}\right)^{y+i}\right]}{(1+s)^{y-x}\left[\dfrac{1-\left(\dfrac{1+s}{1+r}\right)^{-(y-x-1)}}{\dfrac{1+s}{1+r}-1}\right]} $$

$$ {}^{CD}VPAC_{SS}^{x} = {}^{CD}VPAB_{SS}^{x} \quad \Rightarrow \quad {}^{CD}C_{SS} = \frac{{}^{CD}P_{SS}\dfrac{(1+r)^{y}(1+s)^{-x}}{l_{y}^{m}}\left[\sum_{i=0}^{\infty} l_{y+i}^{m}\left(\dfrac{1+s}{1+r}\right)^{y+i}\right]}{(1+s)^{y-x}\left[\dfrac{1-\left(\dfrac{1+s}{1+r}\right)^{-(y-x-1)}}{\dfrac{1+s}{1+r}-1}\right]} $$

On the other hand, if contribution ${}^{CD}C_{SS}$ is known in the Defined Contribution scheme, we can calculate the corresponding pension in terms of the percentage of the last salary ${}^{BD}P_{SS}$ in the following way:

$$ {}^{BD}VPAB_{SS}^{x} = (1+r)^{-(y-x)}\ {}^{BD}P_{SS} \cdot S_x \frac{(1+r)^{y}(1+s)^{-x}}{l_y^m}\left[\sum_{i=0}^{\infty} l_{y+i}^m \left(\frac{1+s}{1+r}\right)^{y+i}\right] $$

$$ {}^{BD}VPAC_{SS}^{x} = (1+r)^{-(y-x)}\ {}^{CD}C_{SS} S_x (1+s)^{y-x}\left[\frac{1-\left(\frac{1+s}{1+r}\right)^{-(y-x-1)}}{\frac{1+s}{1+r}-1}\right] $$

In order to have equilibrium between the actuarial present value of benefits and the actuarial present value of contributions, it is required that:

$$ {}^{BD}VPAB^{x}_{SS} = {}^{BD}VPAC^{x}_{SS} $$

so we can have the following equation:

$$ {}^{BD}P_{SS} = \frac{{}^{CD}C_{SS}\left(1+s\right)^{y-x}\left[\dfrac{1-\left(\dfrac{1+s}{1+r}\right)^{-(y-x-1)}}{\dfrac{1+s}{1+r}-1}\right]}{\dfrac{\left(1+r\right)^{y}\left(1+s\right)^{-x}}{l_{y}^{m}}\left[\sum_{i=0}^{\infty} l_{y+i}^{m}\left(\dfrac{1+s}{1+r}\right)^{y+i}\right]} $$

In that way we demonstrate that contribution ${}^{CD}C_{SS}$ is the same in both models of Defined Contribution and Defined Benefit.

Therefore, the pension in terms of a percentage of the last salary is the same in both models, which implies:

$$ {}^{BD}P_{SS} = {}^{CD}P_{SS} $$

$$ {}^{BD}P_{SS} = \frac{{}^{CD}C_{SS}(1+s)^{y-x}\left[\dfrac{1-\left(\dfrac{1+s}{1+r}\right)^{-(y-x-1)}}{\dfrac{1+s}{1+r}-1}\right]}{\dfrac{(1+r)^{y}(1+s)^{-x}}{l_y^m}\left[\sum_{i=0}^{\infty} l_{y+i}^m\left(\dfrac{1+s}{1+r}\right)^{y+i}\right]} \qquad {}^{CD}P_{SS} = \frac{{}^{CD}C_{SS}(1+s)^{y-x}\left[\dfrac{1-\left(\dfrac{1+s}{1+r}\right)^{-(y-x-1)}}{\dfrac{1+s}{1+r}-1}\right]}{\dfrac{(1+r)^{y}(1+s)^{-x}}{l_y^m}\left[\sum_{i=0}^{\infty} l_{y+i}^m\left(\dfrac{1+s}{1+r}\right)^{y+i}\right]} $$

Defined Contribution (with withdrawals prior to retirement)

However, in practice it is common to have withdrawals prior to retirement age "y", which would require the payment of cumulative amounts in the individual account. Therefore, the actuarial present value in pesos at age "x" of the retirement pension ${}^{CD}P_{SS}S_y$ considering withdrawals prior to the age of retirment, would require to calculate the following:

$$ {}^{CD}VPAB_{CS}^{x} = \frac{l_y^T}{l_x^T}\,{}^{CD}P_{SS}\cdot S_x\,\frac{(1+r)^y(1+s)^{-x}}{l_y^m}\left[\sum_{i=0}^{\infty} l_{y+i}^m\left(\frac{1+s}{1+r}\right)^{y+i}\right](1+r)^{-(y-x)} + {}^{CD}VPAD_{CS}^{x} $$

$$ {}^{CD}VPAB_{CS}^{x} = \frac{l_y^T}{l_x^T}\,{}^{CD}P_{SS}\cdot S_x\,\frac{(1+r)^y(1+s)^{-x}}{l_y^m}\left[\sum_{i=0}^{\infty} l_{y+i}^m\left(\frac{1+s}{1+r}\right)^{y+i}\right](1+r)^{-(y-x)} $$

$$ +{}^{CD}C_{SS}(S_x)\sum_{k=0}^{y-x-1} {}_{k|}q_x^T\left[\sum_{j=0}^{k}(1+r)^{-j}(1+s)^{j}\right] $$

Additionally, the present value of contributions at age "x" for a Defined Contribution scheme, considering withdrawals prior to retirement and the value of ${}^{CD}C_{SS}$, would require to calculate the following:

$$ {}^{CD}VPAC_{CS}^{x} = \frac{{}^{CD}C_{SS}(S_x)}{l_x^T}\left[\sum_{k=0}^{y-x-1} l_{x+k}^T (1+r)^{-k}(1+s)^k\right] $$

Y dado que se debe cumplir: $ {}^{CD}VPAB_{CS}^{x} = {}^{CD}VPAC_{CS}^{x} $

$$ S_x\,{}^{CD}P_{SS}\cdot\frac{(1+r)^y(1+s)^{-x}}{l_y^m}\left[\sum_{i=0}^{\infty} l_{y+i}^m\left(\frac{1+s}{1+r}\right)^{y+i}\right]\left[\frac{l_y}{l_x}(1+r)^{-(y-x)}\right]+\frac{{}^{CD}C_{SS}(S_x)}{l_x^T}\sum_{k=0}^{y-x-1}\left(d_{x+k}^T\right)\left[\sum_{j=0}^{k}(1+r)^{-j}(1+s)^j\right. $$

$$ =\frac{{}^{CD}C_{SS}(S_x)}{l_x^T}\left[\sum_{k=0}^{y-x-1}(1+r)^{-k}\,l_{x+k}^T(1+s)^k\right] $$

Defined Benefit (with withdrawals prior to retirement)

If we know the percentage of the last salary ${}^{BD}P_{SS}$ in the Defined Contribution scheme and we assume that there are no reimbursements of contributions associated to withdrawals without pension rights, we may calculate the contribution as a percentage of salary C' in the Defined Benefit model, with withdrawals prior to retirement, according to the following procedure:

$$ {}^{BD}_{SJ}VPAB^{x}_{CS} = \frac{l^{T}_{y}}{l^{T}_{x}}(1+r)^{-(y-x)}\ {}^{CD}P_{SS}\cdot S_{x}\frac{(1+r)^{y}(1+s)^{-x}}{l^{m}_{y}}\left[\sum_{i=0}^{\infty} l^{m}_{y+i}\left(\frac{1+s}{1+r}\right)^{y+i}\right] $$

$$ {}^{BD}_{SJ}VPAC^{x}_{CS} = \frac{C'(S_{x})}{l^{T}_{x}}\left[\sum_{k=0}^{y-x-1}(1+r)^{-k}\, l^{T}_{x+k}(1+s)^{k}\right] $$

Once again, in order to assure equilibrium between income and expenditure in the Defined Benefit system it must be held that:

$$ {}^{BD}_{SJ}VPAB^{x}_{CS} = {}^{BD}_{SJ}VPAC^{x}_{CS} $$

If we need to find the appropriate contribution as a percentage of salary C' that the Defined Benefit system requires to provide a retirement pension of ${}^{CD}P_{SS}(S_y)$ with no reimbursement of contributions, the following equation should be satisfied:

$$ C' = \frac{\frac{l_y^T}{l_x^T}(1+r)^{-(y-x)}\,{}^{CD}P_{SS}\,\frac{(1+r)^{y}(1+s)^{-x}}{l_y^m}\left[\sum_{i=0}^{\infty} l_{y+i}^{m}\left(\frac{1+s}{1+r}\right)^{y+i}\right]}{\frac{S_x}{l_x^T}\left[\sum_{k=0}^{y-x-1}(1+r)^{-k}\,l_{x+k}^{T}(1+s)^{k}\right]} $$

In order to obtain the value of ${}^{CD}C_{CS}$, which is equivalent to the percentage of salary that is needed to pay a retirement pension of ${}^{CD}P_{SS}(S_y)$ in an individual account system, considering withdrawals prior to retirement, we need to calculate as follows:

$$
{}^{CD}C_{CS} = \frac{\dfrac{{}^{CD}P_{SS} S_x (1+r)^y (1+s)^{-x}}{l_y^m} \left[\sum_{i=0}^{\infty} l_{y+i}^m \left(\dfrac{1+s}{1+r} \right)^{y+i} \right] \left[\dfrac{l_y^T}{l_x^T} (1+r)^{-(y-x)} \right]}{\dfrac{S_x}{l_x^T} \left[\sum_{k=0}^{y-x-1} (1+r)^{-k} l_{x+k}^T (1+s)^k - \sum_{k=0}^{y-x-1} d_{x+k}^T \left[\sum_{j=0}^{k} (1+r)^{-j} (1+s)^j \right] \right]}
$$

In other words, if contributions are reimbursed in a Defined Contribution scheme, as well as all generated interest due to withdrawal prior to retirement, the following inequality holds:

$$
C' \leq {}^{CD}C_{CS}
$$

The required calculation of ${}^{BD}C_{CS}$ in a Defined Benefit model with a retirement pension of ${}^{CD}P_{SS}S_Y$ with the benefit of contributions reimbursement plus interest when there are withdrawals prior to retirement, is the following:

$$
{}^{BD}C_{CS} = \frac{\dfrac{{}^{CD}P_{SS}S_x(1+r)^y(1+s)^{-x}}{l_y^m}\left[\sum_{i=0}^{\infty} l_{y+i}^m \left(\dfrac{1+s}{1+r}\right)^{y+i}\right]\left[\dfrac{l_y^T}{l_x^T}(1+r)^{-(y-x)}\right]}{\dfrac{S_x}{l_x^T}\left[\sum_{k=0}^{y-x-1}(1+r)^{-k} l_{x+k}^T (1+s)^k - \sum_{k=0}^{y-x-1} d_{x+k}^T \left[\sum_{j=0}^{k}(1+r)^{-j}(1+s)^j\right]\right]}
$$

Therefore, ${}^{BD}C_{CS}$ = ${}^{CD}C_{CS}$ when benefits are the same in both models, which implies to have a retirement pension of ${}^{CD}P_{SS}S_y$ and contrribution reimbursement plus interest in case of withdrawals prior to retirement.

$$
{}^{BD}C_{CS} = \frac{\dfrac{{}^{CD}P_{SS}S_x(1+r)^y(1+s)^{-x}}{l_y^m}\left[\sum_{i=0}^{\infty} l_{y+i}^m\left(\dfrac{1+s}{1+r}\right)^{y+i}\right]\left[\dfrac{l_y^T}{l_x^T}(1+r)^{-(y-x)}\right]}{\dfrac{S_x}{l_x^T}\left[\sum_{k=0}^{y-x-1}(1+r)^{-k}l_{x+k}^T(1+s)^k - \sum_{k=0}^{y-x-1} d_{x+k}^T\left[\sum_{j=0}^{k}(1+r)^{-j}(1+s)^j\right]\right]}
$$

$$
{}^{CD}C_{CS} = \frac{\dfrac{{}^{CD}P_{SS}S_x(1+r)^y(1+s)^{-x}}{l_y^m}\left[\sum_{i=0}^{\infty} l_{y+i}^m\left(\dfrac{1+s}{1+r}\right)^{y+i}\right]\left[\dfrac{l_y^T}{l_x^T}(1+r)^{-(y-x)}\right]}{\dfrac{S_x}{l_x^T}\left[\sum_{k=0}^{y-x-1}(1+r)^{-k}l_{x+k}^T(1+s)^k - \sum_{k=0}^{y-x-1} d_{x+k}^T\left[\sum_{j=0}^{k}(1+r)^{-j}(1+s)^j\right]\right]}
$$

Group model

So far we have demonstrated that the actuarial present value of a pension ${}^{CD}P_{SS}(Sy)$ is individually the same in the Defined Contribution scheme as in the Defined Contribution model:

$$ {}^{CD}VPAB_{SS}^{x} = {}^{BD}VPAB_{SS}^{x} = {}^{CD}VPAC_{SS}^{x} = {}^{BD}VPAC_{SS}^{x} $$

$$ {}^{CD}VPAB_{CS}^{x} = {}^{BD}VPAB_{CS}^{x} = {}^{CD}VPAC_{CS}^{x} = {}^{BD}VPAC_{CS}^{x} $$

It was also proved that the contribution as a percetange of the salary that is individually required is the same for both models:

$$ {}^{CD}C_{SS} = {}^{BD}C_{SS} \quad \text{y} \quad {}^{CD}C_{CS} = {}^{BD}C_{CS} $$

If we change from indidual to group modelling, the **total** actuarial present value of benefits for a Defined Contribution scheme with withdrawals would be calcuated as follows:

$$ {}^{CD}VPABT_{CS}^{x} = \sum_{j=1}^{m} \frac{{}^{CD}C_{SS}^{j} S_{x_j}}{l_x^T} \left[\sum_{k=0}^{y-x-1} (1+r)^{-k} \, l_{x+k}^{T} \, (1+s)^{k} \right] $$

where "m" represents the number of workers and "S_{xj}" represents the salary of the "jth worker at age x.

Besides the previous equation, it is also true that:

$$ {}^{CD}VPABT_{CS}^{x} = \sum_{j=1}^{m} {}^{CD}VPAC_{Cs}^{x_j} = \sum_{j=1}^{m} {}^{CD}VPAB_{Cs}^{x_j} $$

$$ {}^{BD}VPABT_{CS}^{x} = \sum_{j=1}^{m} {}^{BD}VPAB_{CS}^{x_j} = \sum_{j=1}^{m} {}^{BD}VPAC_{CS}^{x_j} $$

$$ \Rightarrow \quad {}^{BD}VPABT_{CS}^{x} = {}^{CD}VPABT_{CS}^{x} $$

For a value of ${}^{BD}C^{g}_{CS}$ (which es equivalent to ${}^{CD}C^{g}_{SS}$) of all workers in both models (Defined Contribution and Defined Benefit), we will have a replacement rate of ${}^{CD}P_{SS}$ that is different for each worker.

If we already have a value of the replacement rate${}^{CD}P_{SS}$ for each worker in the Defined Contribution scheme as well as the Benefit of contribution reimbursement, then the cost is the same in cash flow and present value terms for both cases.

If ${}^{CD}C_{SS}$ (which is equal to ${}^{CD}C_{CS}$) is different for each worker in the Defined Contribution scheme, then it holds that the actuarial present value cost is the same for both models. However, cash Flow would change as the Defined Benefit scheme calculates an average contribution ${}^{BD}C^{g}_{SS}$ (average contribution of the Defined Benefit scheme) as a percentage of salaries.

In the latter case, the annual global cash flow of contributions can be different for both pension models (Defined Benefit or Defined Contribution). However, in big groups of workers Defined Benefit cash flows are calculated by multiplying ${}^{BD}C^{g}_{CS}$ by the sum of workers' salaries. If we compare this result with the sum of contributions (${}^{CD}C^{T}_{SS}(S_{xt})$) for each worker in the Defined Contribution scheme, the result is very similar as the contributions cash flow barely varies in both models.

$$ {}^{BD}C^{g}_{CS}\left(\sum_{j=1}^{m} S_{x_j}\right) \approx \sum_{j=1}^{m} {}^{CD}C^{j}_{SS} S_{x_j} $$

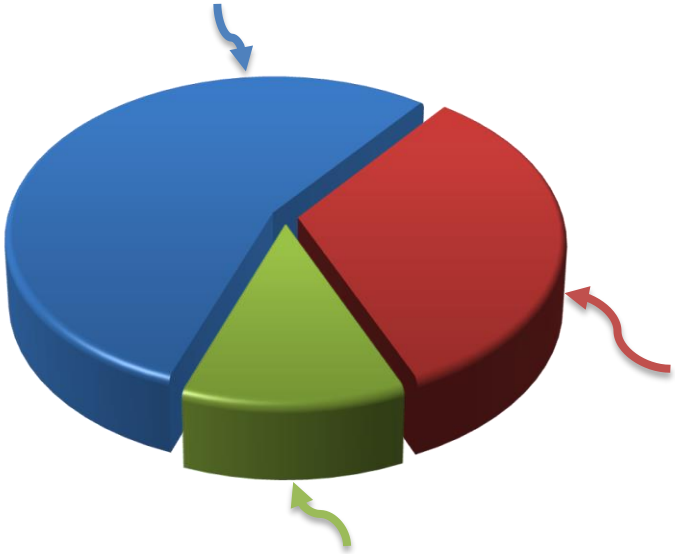
- The Defined Benefit model works as long as quantities, requirements and conditions are designed according to current and future social and demographic reality.

- Parametric reforms of individual and combined accounts can either have or not have inter-generational solidarity. However, they should calculate the timing of future demands for defined benefits or individual accounts in order to guaranteee liquidity (**the break-up of inter-generational solidarity generates reserves**).

- When the reserves of federal pension public systems are invested in government bonds, the funding method is of share.

Three types of mexicans

1. The ones that are not affiliated to contributory pension systems (55% de Economic Active Population - EAP). **Serious social issue.**



2. The ones that are affiliated to IMSS (33% de EAP), which are divided in two:

   a. The ones that joined before 1997 (Defined Benefit - DB) . **Financial issue.**

   b. The ones that joined since 1997 (Defined Contribution - DC). **Social issue**

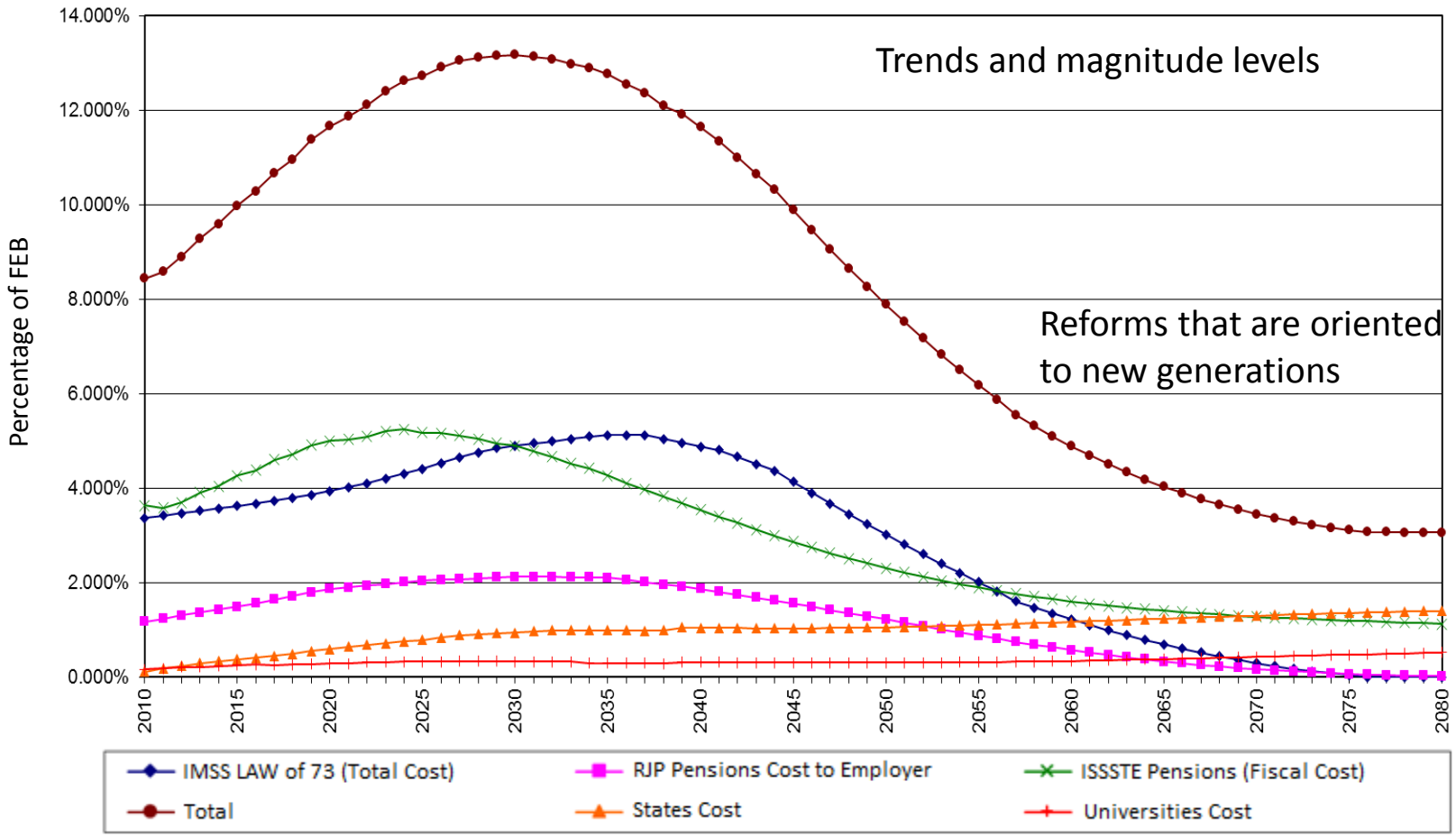
2. The ones that are covered by pension systems for public servers and college workers (12% de EAP) **DB Serious financial issue, DC Social Issue**

Heterogeneidad de los sistemas de pensiones

There are over **1000** public pension systems in Mexico. All of them are **different** and the majority are **undercapitalized**:

1. IMSS insurer (only reformed for new generations in DC), **GF transition.**
2. IMSS RJP Employer (only reformed for new generations in DC).
3. ISSSTE (Reformed Transition DB and New Generations DC), **GF transition.**
4. Productive companies of the state (Reformed Transition DB and New Generations DC).
5. ISSFAM.
6. State schema (25 Reforms DB y DC).
7. Municipal institutions of pensions.
8. College Shema of pensions (27 Reforms DB y DC).
9. Judicial branches (Federal y State).
10. Bank of México (Reformed).
11. Police
12. Development banking (Reformed).
13. Water comissions.
14. Others

Subsidy expenditure on Federal Expenditure Budget (FEB)



* It does not consider fiscal costs for supplementary mínimum guaranteed pension, ISSFAM, health expenses to pensioned workers and others.

Source : Own estimations (2008) which could vary depending on specific hypothesis and methodology.

Some contingent liabilities as a percentage of GDP

Institution	Past services %	Future Services %	Totals %
IMSS	28*	33*	61 *
IMSS RJP	9	2	11
ISSSTE	25	15	40
Federal Entitites	8	5	13
Organizations and companies	9	7	16
Universities	1.5	.5	2
Totals	80.5	62.5	143

Magnitude levels

It does not consider fiscal costs for supplementary mínimum guaranteed pension, ISSFAM, health expenses to pensioned workers and others.

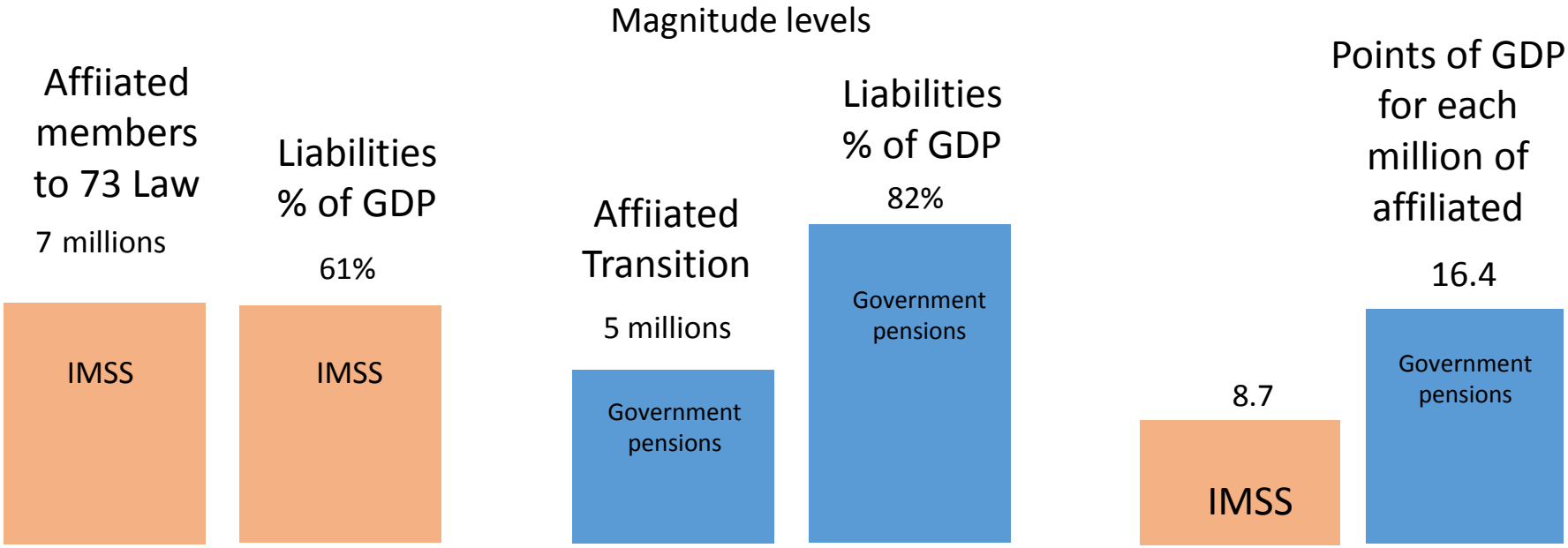
*Estimated distribution

Source : Own estimations and authorities data which could vary depending on specific hypothesis and methodology

Contingent liabilities, % of GDP and people under care

Economic paradises over social cemeteries and viceversa.

Magnitude levels



Ratio Pensioned/Total afilliated: IMSS 20% - ISSSTE 40%

PENSIONS : Two different issues

Social problem

1-	**No access to pensions.**
2.-	Protected by non contributory systems
3.-	Affiliated to IMSS 97.
4.-	Other systems of individual accounts with low contributions

Financial problem

1-	**Main financial problem**	**"Privilege" systems that support public and college servers (82% of GDP)**

To take care of the overall problem:

Three specific proposals

Three specific proposals

Proposal 1

- Designate a **cross-discipline group** of pension experts that:
  - Analyze the topics: economic, political, social and legal of all pension systems that currenty opérate within the country.
  - Rescue the wise choices of each one of them and correct their deficiencies.
  - Propose different solutions for each one the three types of mexicans and correct the financial and social problem.

Three specific proposals

Proposal 2

- Create a **State ministry** responsible of the social security systems in Mexico, with political and financial authority. It would take care of all related issues to **pensions, health and housing ,** among others.

In our country there is no public position with political and financial authority with the responsibility of designing, managing and guarding pension systems. One of the most serious social and financial problems is being barely atended in such an unorganized way by different public ministries and servants.

Three specific proposals

Proposal 3

- **Modify the constitution** to créate a National Framework Law for Pensions, after a previous political and social agreeement (floors and caps for each one of the three types of mexicans).

To create a Framework Law

- It is required to have a **national agreement**, political and soial, with the involvement of unions, the executive and legal powers at all different government levels, business owners and academic people, among others.
- **To elaborate or modify secondary laws** that specify a regulatory framework to which all pension systems should comply with the appropriate fiscal treatment of private schema.

Features of the Framework Law

Features of the framework law

1. It must treat in a different way ...
   - People who don't have contributory pension systems
   - Affiliated people to IMSS with DB and DC.
   - Public serves and college workers.

   Note: The three previous schemas should be inter-connected

2. It should establish for each one of the previous groups:
   - The benefits, conditions, mínimum and máximum requirements to have Access to them by making a distinction between:
     - ✓ Generation in transition (gradual)
     - ✓ New generations of workers.

3. It must preserve the main institutions of the country and take adavantage of the financial infrastructure and norms given by the CI.

Features of the framework law

4. In order to obey sovereignties and autonomies, the systems that protect public servers and university workers could choose between:
   - ✓ Affiliating to IMSS or ISSSTE.
   - ✓ Establishing of modifiying their regulations either on an individual account system or in a Defined Benefit scheme, but always **ruled by the same law.**

5. It would also establish general rules of investment, management and portability, as well as the use of the national record and database of pension systems, among others.

The exercise of writing a framework law would define the actions to take for each group of mexicans.

PROPOSAL: CONSTITUTIONAL REFORM

Some rules, floors and caps that should regulate the Framework Law:

1. Fees and máximum and mínimum contributions (DC).
2. Voluntary contribution with the employer's accompaniment (DC).
3. Social fee (DC).
4. Guaranteed pension (DC).
5. Self or third party administration (DC).
6. Optional to migrate to a new scheme (DC).
7. Regulating salary
8. Minimum age and seniority to retire
9. Pension Increase equivalent to inflation
10. Maximum and mínimum pensions
11. Portability
12. Changes gradualness for current generation.
13. National system of information
14. Others

THANK YOU FOR YOUR ATTENTION!

Francisco Miguel Aguirre Villarreal
faguirre@actuariales.com.mx

VALUACIONES ACTUARIALES DEL NORTE