Implicit Pension Debt in the Middle-East and North Africa Magnitude and Fiscal Implications

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ABSTRACT

This paper breaks down the contingent liability of a mandatory pension system into two components: the implicit pension debt and the pay-as-you-go asset. It then estimates these two components for 12 pension schemes across six MENA countries and presents international comparisons. The results show that implicit pension debts are large (in the order of 50% to 100% of GDP), often higher than the explicit public debt. At the same time, the large majority of pension schemes have negative pay-as-you-go assets. Under these circumstances, it is misleading to consider the implicit pension debt a contingency, as the government will have to finance it with almost certainty. In the absence of a default the fiscal impacts are expected to be large. The paper recommends including in the assessment of public debt sustainability the implicit liabilities of the mandatory pension system and the pay-as-you-go asset.

مُلخّص

تقسم هذه الدراسة الالتزامات المحتملة لأنظمة المعاشات التقاعدية الإلزامية إلى قسمين: المديونية الضمنية لخطط المعاشات التقاعدية، والأصول من الاقتطاعات بالتقسيط عند المنبع. ثم تقوم بوضع تقديرات هذين القسمين بشأن 12 خطة معاشات تقاعدية في ستة من بلدان منطقة الشرق الأوسط وشمال أفريقيا، مع عرض مقارنات دولية. وتُبيّن النتائج أن المديونيات الضمنية كبيرة (بنسبة تصل ما بين 50 في المائة و 100 في المائة من إجمالي الناتج المحلي)، وهي غالباً ما تكون أكبر من مقدار الدّيْن العام الصريح. وفي الوقت نفسه، نجد أن غالبية خطط المعاشات التقاعدية معدلاتُ أصولها من الاقتطاعات بالتقسيط عند المنبع سلبية. وفي ظلّ هذه الأوضاع، يكون من المُضلّل اعتبار المديونية الضمنية لخطط المعاشات التقاعدية نوعاً من الاحتمالات الطارئة لأنه ينبغي بالتأكيد تقريباً على الحكومات تمويل تلك المديونية. وإذا لم يحصل العجز عن السداد، فإن من المتوقع أن يكون الأثر على المالية العامة كبيراً. وتوصي هذه الدراسة بتضمين تقديرات القدرة على تحمّل الدّيْن العام الالتزامات المحتملة لأنظمة المعاشات التقاعدية الإلزامية وللأصول من الاقتطاعات بالتقسيط عند المنبع.

RÉSUMÉ

Le document présente une ventilation du passif éventuel d'un régime de retraite obligatoire selon deux composantes : l'endettement implicite du régime de retraite et les actifs du régime fondé sur la répartition (« *pay-as-you-go* »). Il estime ensuite ces deux

composantes pour 12 régimes de retraite de six pays de la région MENA et présente des comparaisons internationales. Les résultats indiquent que l'endettement implicite des régimes de retraite est important (de l'ordre de 50 pour cent à 100 pour cent du PIB), et qu'il est souvent supérieur à l'endettement public explicite. Parallèlement, la vaste majorité des régimes de retraite font montre d'actifs négatifs pour le régime fondé sur la répartition. Dans ces circonstances, il est erroné de considérer l'endettement implicite des régimes de retraite comme un passif, étant pratiquement certain que le gouvernement devra le financer. En l'absence de défaut, les impacts budgétaires sont anticipés importants. Le document recommande d'inclure dans l'évaluation de la viabilité de la dette publique, les passifs implicites du régime de retraite obligatoire et les actifs du régime fondé sur la répartition.

1. Introduction

The proper measurement and monitoring of the public debt and the total external debt of a country are essential for the efficient design of fiscal policy and the prevention of financial crisis. There is an ongoing debate in terms of the most appropriate methodology to measure the level of these debts and assess their sustainability (see IMF, 2004 for a discussion in the case of low-income countries, and a more general discussion on debt tolerance by Reinhart, Rogoff and Savastano, 2003). In all cases, however, the implicit liabilities of the mandatory pension funds are excluded from the analysis. At best, the implicit pension debt is treated as a contingent liability of the government and is not reported as part of the public debt. Unfortunately, it can be shown that when the pension system is not solvent, a large component of the implicit pension debt is actually not "contingent." The probability that the government will have to repay – or default on this debt – is very close to one. Excluding this non-contingent component from the assessment of public debt sustainability can therefore seriously bias the design and implementation of fiscal policy.

The objectives of this paper are to describe the true nature of the contingent liability of the pension systems in selected MENA countries and asses its fiscal implications. We start by breaking down the contingent pension liability into two components: the implicit pension debt (IPD) and the so called pay-as-you-go asset (PA). We then estimate the value of these two components for 12 schemes across 6 MENA countries1 and benchmark the results against those observed in other countries.2 To assess potential fiscal implications, we compute the change in the fiscal balance necessary to reduce the debt/GDP ratio by a given fraction over some period of time, resulting from the inclusion of the IPD in the debt sustainability analysis.

The core of the paper is organized in 4 sections. Section 2 sets the analytical framework by presenting the traditional definition of public debt and characterizing the contingent liability of the mandatory pension system. Section 3 describes the methods and the data used to estimate IPDs and pay-as-you-go assets. Section 4 presents the results of the analysis and assesses fiscal impacts. Section 5 concludes and discusses policy implications.

2. Public Debt and Contingent Pension Liabilities

The public debt, as defined in Government Financial Statistics of the International Monetary Fund (IMF), incorporates public and publicly guaranteed obligations of the central, municipal, and local governments -- as well as other public entities -- with non-government institutions. Although not included directly in the calculation of the public debt, the definition recognizes the existence of contingent liabilities of various public institutions (e.g., state owned enterprises, banks) as well as the pension funds. In this

[1] Countries have been selected on the basis of available information.

[2] The calculation of the IPD is based on the methodology developed in Holzmann et al. (2004), which normalizes assumptions to make results comparable across countries.

section we show why treating the implicit debt of the pension funds as a contingency can be misleading.

In an earnings related pension system that is not fully funded, current promises to pay pensions (pension rights accrued to date) are backed by available reserves as well as future contributions net of future pension payments ensuing from these contributions – the so called pay-as-you-go asset. The contingent liability of the pension funds, on the other hand, is often interpreted as the part of future obligations that, with some probability, cannot be covered by future revenues. Formally, the contingent liability can be defined as:

$$CPL_t = E\left[L_c\left(\mathbf{N_c}, \mathbf{w}, \mathbf{s}; \theta\right) + L_p\left(\mathbf{N_p}, \mathbf{p}, \mathbf{s}; \theta\right) - A\left(\mathbf{N_c}, \mathbf{N_n}, \mathbf{w}, \mathbf{s}; \theta\right)\right] - R_t, \qquad (1)$$

where E is the expectations operator, $L_c(.)$ gives the liabilities of the pension system with current contributors ($\mathbf{N}_c$), which depend on current and future average wages by age ($\mathbf{w}$), a vector of current and future survival probabilities by age ($\mathbf{s}$), and the parameters of the system ($\boldsymbol{\theta}$); L_p gives the liabilities with current beneficiaries ($\mathbf{N}_p$), which depend on the current distribution of pensions ($\mathbf{p}$), survival probabilities, and system parameters (e.g., pension indexation mechanisms); and A(.) is the pay-as-you-go asset, which depends on current *and* new contributors ($\mathbf{N}_n$), as well as wages, survival probabilities, and system parameters; and R_t represents current reserves. The implicit pension liability (IPD) of the system, the accrued to date liability, is given by $L_c(.) + L_p(.)$.

In a solvent pension system one would expect the contingent liability to be equal to or less than zero. In other words, the expected implicit pension liability net of reserves would be at least equal to the expected pay-as-you-go asset. Any deviation from equilibrium would not be systematic, but rather the result of unexpected shocks. Under some designs, automatic rules that adjust $\boldsymbol{\theta}$ to changes in the demographic and economic environment could even eliminate the contingent pension liability. In this case, the IPD net of reserves would be equal to the pay-as-you-go asset in all states of nature.

When the pension system is insolvent, however, the expected contingent liability is positive. That is, under average conditions, the IPD net of reserves would be above the pay-as-you-go asset. At the extreme, it is possible to observe an expected pay-as-you-go asset which is negative. Indeed, it can be shown that the pay-as-you-go asset is equal to the accrued to date pension liabilities (IPD) plus the present value of future cash-balances (which is the negative of the so called financing gap, FG, of the system). Formally, over the infinite horizon, we have:

$$
\begin{aligned}
&A(.) = \sum_t c_t \rho^t - \sum_t p_t^e \rho^t - \sum_t p_t^n \rho^t \\
&IPD = L_c(.) + L_p(.) = \sum_t p_t^c \rho^t + \sum_t p_t^p \rho^t \\
&FG = \sum_t p_t^n \rho^t \sum_t p_t^e \rho^t + \sum_t p_t^c \rho^t + \sum_t p_t^p \rho^t - \sum_t c_t \rho^t \\
&\Leftrightarrow A(.) = IPD - FG
\end{aligned}
\quad , \qquad (2)
$$

where c are contributions at time t, p^e are pension payments accrued by the new contributions of current plan members; p^n are pension payments accrued by the contributions of new entrants to the system, p^p are pension payments to current beneficiaries, and p^c are pension payments to current contributors for the pension rights that they have accrued to date. Hence, if the financing gap of the system is large enough (higher than the IPD), the pay-as-you-go asset of the pension system becomes negative. Basically, future contributions do not generate a surplus in present value that can be used to finance the IPD. On the contrary, the new contributions bring new liabilities that themselves cannot be financed by the system. In other words, keeping the system open to new contributions worsens its long-term financial position.

Having a negative pay-as-you-go asset has important fiscal implications because it implies that only general revenues can be used to finance the IPD.[3] Governments can delay the use of general revenues by continuing to "borrow" contributions to pay pensions, but because these new contributions also bring new pension liabilities, the situation eventually becomes explosive. Under these circumstances, the liabilities of the pension funds do not represent a contingency for the government but rather a real debt that, in the absence of default, sooner or later will need to be financed. When this is the case, excluding the IPD from the analysis of fiscal sustainability of the public debt can lead to severely biased policy recommendations.

The next two sections of this paper are concerned with the estimation of the IPD and the pay-as-you-go asset of pension systems in various MENA countries.

3. Methods and Data

The implicit pension debt is defined here as the accrued-to-date liabilities, or the PBO (projected benefit obligation). It is equal to the present value of the benefits the pension system will have to pay to its current participants (and their survivors) on the basis of their pension rights accrued prior to the year for which the IPD is calculated. The calculation of benefits is made on the basis of future wages (i.e., wages at the time of retirement). Neither future contributions nor new pension rights are included in the calculation. Thus, the IPD shows how much it would cost to discontinue the pension scheme and pay out all obligations (see Holzmann et al., 2004 for a review of various measures of pension liabilities).

[3] Here we abstract from the existence of reserves. As shown later these are usually very low relative to the level of the IPD.

Our estimates of the IPD are based on the World Bank PROST (Pension Reform Options Simulation Toolkit) model. Given limited information in most middle and low-income countries about the vesting period of current contributors and their turnover rates, when computing pension payments for new retirees PROST uses little information about "their past." Thus, it is not possible to differentiate between those future new retirees who are contributors today and those future new retirees who enrolled in the system at a latter date. Similarly, in the case of future new retirees who are contributors today, it is not possible to distinguish between the part of the pension that is associated with rights accumulated to date, and pension rights accumulated through new contributions. In essence, for all new retirees of age a at time t, PROST computes the pension on the basis of an estimate of the average length of service at retirement. However, because the pension payments in year t are related to both pension rights accrued to the date of computing the IPD and pension rights resulting from new contributions (of current and new plan members), a mechanism is necessary to separate the two. For simplicity, PROST increases the share of pension rights accrued from new contributions in direct proportion to time. As an illustration, assume that the calculation of the IPD is made at time t=0, that the average retirement age is 55, and that the youngest age at which individuals join the system is 20. PROST in this case infers that the pension payments to new retirees in year t=1 are all the result of contributions made during the last 35 (55-20) years (i.e., are related to the pension rights accrued to date by current contributors). As t increases, however, the role of past years of contributions has to diminish. Hence, for year t=2, PROST reduces the share of past years by 1/35 -- since pension payments to new retirees now can reflect on year of *new* contributions. Similarly, in year t=3 the share of past years of contributions is reduced by 2/35 and by 3/35 in year t=4. At some point in time, past years of contributions are no longer associated with the pension payments to new retirees, as these result entirely from pension rights accrued through new contributions.

Formally, the accrued to date liability with current contributors is given by:

$$IPD\_C\_P_{t,g} = \sum_{y=t+1}^{T} \left(\frac{PV\_NP_{y,g}}{\prod_{j=t+1}^{y}(1+\rho_j)} NP_{y,g} \left(1 - \frac{y-t-1}{RA\_NP_{t,g} - EA} \right) \right); \quad T < RA\_NP_{t,g} - EA + t + 1, \tag{3}$$

where $NP_{y,g}$ is the number of new retirees of sex g in year y, $RA\_NP_{t,g}$ is the average retirement age of all new retirees of sex g in year t, EA is the age of the youngest contributor, ρ is the discount rate, and $PV\_NP_{y,g}$ is the average present value at time y of the stream of pension payments made to new retirees of sex g between times y and T. For each of these new retirees the present value of the future pension payments is itself given by:

$$PV\_NP_{a,i,t,g} = NB_{a,i,t,g} + \sum_{y=t+1}[B_{a,i,y,g} \cdot \frac{\prod_{j=t+1}^{y}(1-m_{a+j-t,j,g})}{\prod_{j=t+1}^{y}(1+\rho_j)}], \quad (4)$$

where a indexes the age of the individual, i indexes the income category, NB is the first pension payment to the new retiree, B represents the indexed pension at time y, and m_a the mortality rate at age a. A similar approach is used to allocate disability pensions.

The method described above for the calculation of the implicit pension debt with current contributors has proven to provide a reasonable approximation of the "true" IPD in the case systems that have been in operation for over 20 to 30 years. Thus, it is suitable for all pension schemes analyzed in this paper. For younger systems, or systems that start from scratch, the methodology just described tends to overestimate the IPD, as too much weight is given the accrued rights of current contributors.

The liabilities to current beneficiaries comprise liabilities to old age pensioners, disabled, survivors and orphans. The IPD to current old age pensioners is calculated in a more precise way than to current contributors, by following the current age-sex cohorts of beneficiaries over time. Formally, the IPD is defined by:

$$IPD\_OAP_t = \sum_{a,i,g} PV\_OAP_{a,i,t,g} \cdot OAP_{a,i,t,g}, \quad (5)$$

where $PV\_OAP_{a,i,t,g}$ is the present value of the stream of pension payments to a pensioner of age a and sex g, in income category i (see equation 4); and $OAP_{a,i,t,g}$ is the number of these individuals. A similar approach is used to compute the implicit liabilities of current disabled. Obligations to survivors (widows/widowers and orphans) are estimated with a lesser precision. PROST assumes that the share of obligations to survivors in the total IPD to existing old age pensioners and disabled is the same as the share of survivor pension expenditures on total expenditures.

Data and Assumptions

We estimate the implicit pension debt and the pay-as-you-go asset for 12 pension systems across 6 countries in the region. These countries have been selected on the basis of data availability. In the context of a cross country analysis, it is essential to find the right balance between taking into account the idiosyncrasy of a country's pension system, on the one hand, and the comparability of the results, on the other. To this end, we follow the methodology and assumptions developed by Holzmann et al. (2004), which allows for international comparisons. Below we describe the key data and assumptions

regarding demographic dynamics, coverage, retirement patterns, benefit formulas, the finances of the system, and the macroeconomy.

Demography. Population projections are important to compute the *pay-as-you-go asset* because they determine the number of scheme participants by sex and age. The projections are based on information provided by the World Bank's Population Unit regarding the initial population by age and gender, and projections of age-specific fertility and mortality rates for each country. In line with international trends, mortality rates are assumed to decrease over time resulting in growing life expectancy, while fertility rates gradually converge to reproduction level (see Table 1). Decreasing mortality and fertility rates result in population aging and growing system dependency rates.

To follow the different cohorts of contributors and beneficiaries over time, nationwide mortality rates are applied to the members of all schemes. This is because of the lack of mortality rates which are specific to plan members. The use of nationwide mortality rates adds some bias to the projections as coverage rates are relatively low and those who participate in the system are generally middle and high income individuals (particularly in the case of civil servants) who are expected to have longer life expectancies. This would underestimate the implicit pension debt.

Contributors. The initial number of contributors and beneficiaries and their distribution by age and sex are based on actual data provided by the respective pension funds. The initial age distributions of contributors for all considered schemes are compared on Figure 1. Private sector schemes are shown on the left-hand side chart, public sector schemes on the right-hand side. In general, schemes for civil servants have a more mature population because often they were created first.

Table 1: Expected Dynamics of Life Expectancy and Fertility Rates

	Base Year	2020	2040	2060	2075
Life Expectancy at Birth					
Djibouti	42.5	49.8	59.3	67.6	71.7
Iran	69.5	74.5	77.5	81.7	84.5
Jordan	71.3	75.3	77.4	79.9	81.5
Lebanon	70.3	74.0	76.8	79.9	82.8
Morocco	68.1	71.9	74.5	77.3	79.6
West Bank&Gaza	72.3	75.4	77.3	79.3	80.8
Total Fertility Rates					
Djibouti	493%	314%	241%	221%	213%
Iran	250%	211%	210%	208%	207%
Jordan	350%	209%	208%	207%	207%
Lebanon	225%	210%	209%	208%	207%
Morocco	273%	213%	210%	209%	207%
West Bank&Gaza	485%	309%	214%	210%	206%

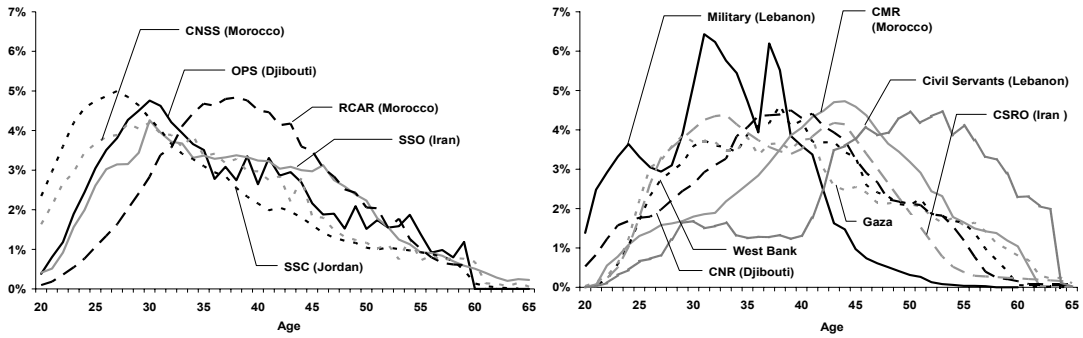
Source: WB Population Unit.

To project the stock of future contributors by age and sex it is assumed, for all schemes and all countries, that current population coverage rates by age and gender remain constant (see Figure 2). This normalization is introduced to facilitate cross-

country comparisons. However, it is important to note that in the presence of growing labor force participation rates, the assumption of constant population coverage implies declining labor force coverage. This is particularly relevant for women in MENA countries for whom participation in the labor market is increasing rapidly. In the case of insolvent systems, and with reasonable estimates for the discount rate, this assumption would overestimate the value of the pay-as-you-go asset.

Beneficiaries. Projections of the future number of disabled and survivors are done, similarly, by holding constant over time the beneficiary to population ratio in each age and gender cohort. The old age pensioners are modeled in a more complicated way. The initial age distribution of the stock of old age pensioners in each pension scheme is given (see Figure 3). For the future, the underlying assumption is that retirement rates,[4] for all ages for which there are retirees today, eventually converge to the current (base year) maximum participation rate across plan members of all ages. For instance, if the maximum ratio between the population of contributors, disabled, and retirees and the total population is 50 percent (observed say at age 40), then the assumption is that over the medium term retirement rates for all ages will converge to 50%. Basically, if 50% is the maximum observed share of individuals of a given age and sex who are in the system today, then 50% becomes a ceiling for the share of individuals across ages and gender who can be retired when the system matures.

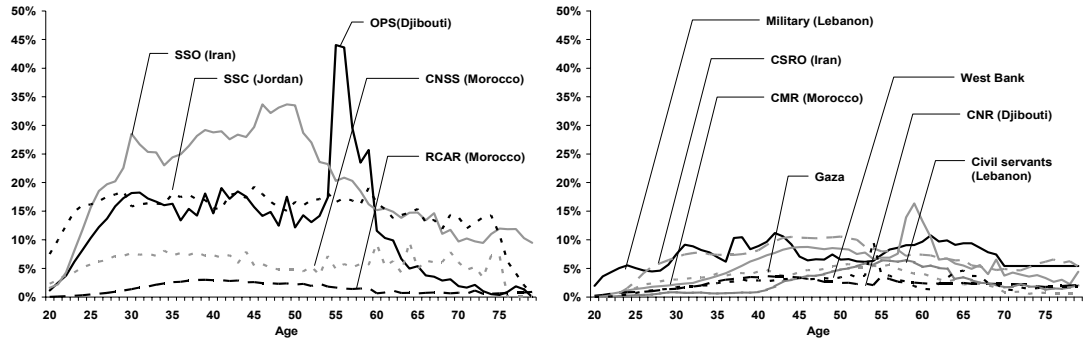
Figure 1: Age Distribution of Current Contributors



Source: Various pension funds

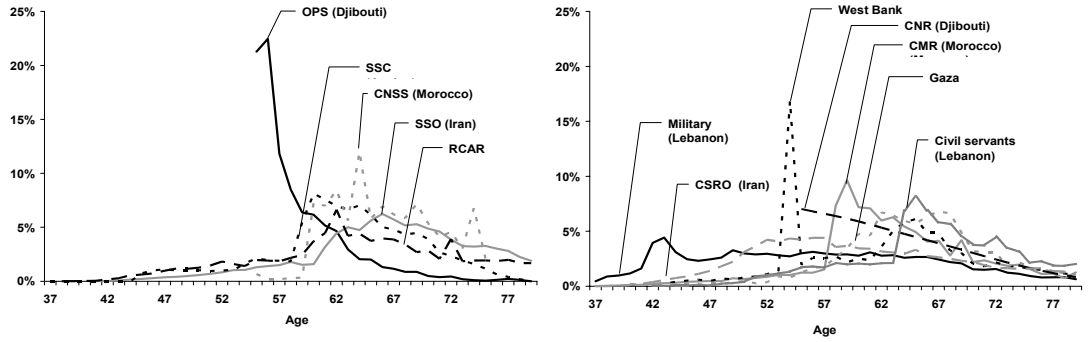
[4] Here by retirement rates we understand the share of old age pensioners and disabled in the population of a given gender at a given age.

Figure 2: Current Coverage Rates of the Population of Contributors



Source: Authors' calculations

Figure 3: Age Distribution of Current Old-Age Pensioners



Source: Various pension funds

Benefit formulas and eligibility conditions. Key system parameters such as the contribution rate, the ceiling on the covered wage, the retirement age and the vesting periods, penalties for early retirement, the income measure, the accrual rate, and rules for revalorizing wages and indexing pensions are based on the latest legislations.[5] Unfortunately, most countries use ad-hoc or discretionary mechanisms to index pensions and revalorize wages. Hence, in the simulations we follow the approach presented in Holzmann et al. (2004) and consider two scenarios: one in which the growth rate of the average covered wage is used to revalorized wages and index pensions, and a second where prices are used (the indexation to prices is implicit since all the projections are made in real terms). The revalorization mechanism can have an important impact in the level of the IPD in schemes with "long" averaging periods that do not revalorize wages, such as the OPS in Djibouti (10 years) and the CNSS in Morocco (8 years).

Revenues and expenditures in the pension systems. In the projections, only pension related revenues and expenditures are considered in all schemes. Payments under social assistance programs and other non-pension expenditures, e.g. health care or

[5] Any reforms that are being introduced after the beginning of the simulation period are taken into account if they were enacted prior to the base year.

unemployment benefits, – if they are covered by the pension or social security fund – are excluded. Contributions or transfers to cover these expenditures are also excluded.[6]

Any negative pension balance or explicit accumulated debt of the pension system at the beginning of the simulation period is ignored – which is the case for CSRO (Iran). This assumes that the initial system deficit has been covered by the government's budget. The current reserves of the system are also not taken into account in the projections. Basically, for transparency purposes, investment income is ignored.

Wages. Actual data on the current average wage of the covered population in each of the modeled schemes are used in the simulations. However, gender differences in wages are uniformly ignored even in cases where information about gender distribution of wages is available. In addition, the age profile of wages is normalized across countries. This is important to compare schemes with different income measures, particularly when past wages are not revalorized as a function of the growth rate of the average covered wage or inflation. We assume that a one year increase in the age is accompanied, on average, by a 1 percentage point increase in wages. This pattern reflects the overall trend observed around the world (see Holzmann et al., 2004).

Macroeconomy. To look at the different systems in a comparable economic environment, normalized macroeconomic projections are used based on the following assumptions: (i) real GDP growth rate is 4%; (ii) productivity growth is 2%; and (iii) the inflation rate is zero (i.e., projections are conducted in real terms). As IPD estimates are highly sensitive to the discount rate used in present value calculations, simulations were done with a range of discount rates varying from a low 2% to a relatively high 5%. Higher discount rates not only reduce the level of the IPDs for all schemes but in some cases they also change their relative position, depending on whether their future unfunded liabilities are more front- or back-loaded. Hence, schemes that have larger expected payments further down the road are favored by high discount rates.

4. Results from the Analysis

The results of the calculations for the various schemes in the six MENA countries are presented in Table 2 . The first six columns provide estimates of the implicit pension debt, while the last six columns present estimates of the pay-as-you-go asset. Each column refers to a combination of the indexation factor for pensions and the discount rate.

A first observation is that in all cases the IPDs are sizable, in general higher for the schemes for private sector workers than for the scheme for civil servants (the exception is Morocco). This is not explained by more generosity in the schemes for

[6] The following "pension related" contribution rates are assumed: CNR (Djibouti) – 20% (pensioners – 10.2%); OPS (Djibouti) – 8% (pensioners – 10.9%); CSRO (Iran) – 22.5%; SSO (Iran) – 18%; SSC (Jordan) – 16.5%; civil servants and military (Lebanon) – 6%; CMR (Morocco) – 17%; CNSS (Morocco) – 9.1%; RCAR (Morocco) – 18%; West Bank – 2%; Gaza – 22.5% (however, currently nobody actually pays contributions). The assumed collection rate is based on the actual data on the current status for each scheme

private sector workers, the opposite tends to be true (see Robalino et al. 2005), but simply by a larger contributory base.

Among the four schemes for private sector workers reviewed (Djibouti OPS, Iran SSO, Jordan SSC, and Morocco CNSS) the largest IPDs across scenarios are observed in Jordan (between 84% and 240% of GDP), followed by Djibouti (67% - 151%), Iran (32% - 82%) and Morocco (22%-50%). Among the schemes for civil servants the highest IPDs are observed in the West Bank and Gaza (between 45% and 121% of GDP), followed closely by Morocco (between 45% and 111% of GDP) and then Iran (21% - 52%), Djibouti (12% - 23%) and Lebanon (11% - 25%). In the only military scheme analyzed (Lebanon) the IPD ranges between 29% and 78% of GDP. The lowest IPDs (between 4% and 11% of GDP) are observed in the scheme for public sector contractual workers in Morocco (the RCAR), which is both smaller and better designed than the other schemes (see Robalino et al., 2005).

Regarding pay-as-you-go assets an important finding of this paper is that in most systems there are none.[7] With the exception of the CNR in Djibouti (recently reformed) and the RCAR in Morocco, all schemes have large pay-as-you-go liabilities (i.e., the pay-as-you-go assets are negative). In Jordan, estimates of pay-as-you-go liabilities for the next 75 years range between 2 and 14 times GDP. With a discount rate of 4% and price indexation of pensions, future liabilities could represent 3 times today GDP. Under the same scenario future liabilities in WBG, Iran and Lebanon would represent 3, 2 and 1.7 times current GDPs respectively. Only in Morocco and Djibouti would future pay-as-you-go liabilities be below current GDP (50% and 10% respectively).

Negative pay-as-you-go assets imply that having the pension systems open to new entrants (and new contributions) worsens their financial position. This is because future generations will not generate a "surplus" to cover the pensions of current plan members. Thus, in the absence of a default, the IPD can only be financed through general revenues. It is therefore important to take into account these liabilities when assessing the fiscal sustainability of the public debt.

[7] It is important to note that the estimates of the pay-as-you-go asset presented in Table 2 overestimate the "true" pay-as-you-go asset. This is because the calculations do not take into account the implicit pension liability of the system in year 2075.

Table 2: Implicit Pension Debt and Pay-as-you-go Assets for Pension Scheme in MENA Countries

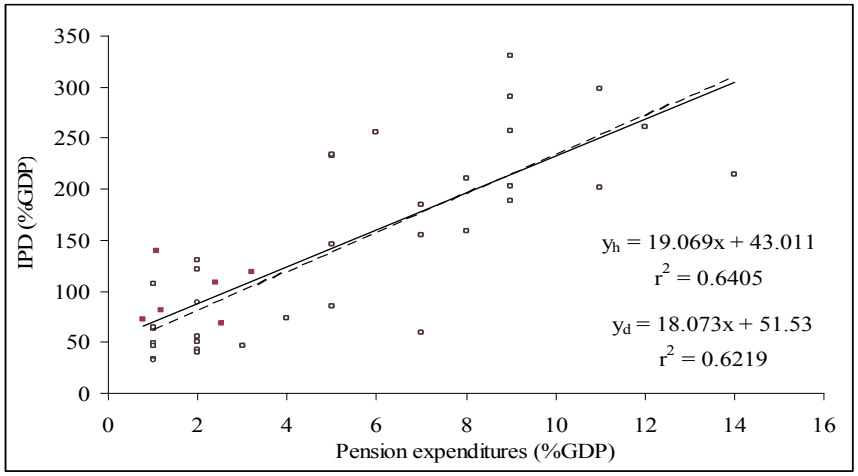
Country Scheme	IPD wage 2%	IPD price 2%	IPD wage 4%	IPD price 4%	IPD wage 5%	IPD price 5%	PA wage 2%	PA price 2%	PA wage 4%	PA price 4%	PA wage 5%	PA price 5%
Djibouti												
CNR	23	19	17	14	14	12	23	36	21	25	18	21
OPS	151	113	102	79	86	67	-309	-172	-262	-35	-38	-10
Total	**174**	**132**	**119**	**93**	**100**	**79**	-286	-136	119	-10	-20	11
Iran												
CSRO	52	38	33	25	27	21	-197	-136	-61	-41	-33	-21
SSO	82	64	48	39	38	32	-536	-420	-171	-133	-97	-74
Total	**134**	**102**	**81**	**64**	**65**	**53**	-733	-556	-232	-174	-130	-95
Jordan												
SSC	240	173	140	105	110	84	-1402	-996	-444	-307	-251	-169
Total	**240**	**173**	**140**	**105**	**110**	**84**	**-1402**	**-996**	**-444**	**-307**	**-206**	**-169**
Lebanon												
CS	25	20	16	13	13	11	-99	-82	-36	-31	-23	-19
Milit. 1	58	43	41	32	35	29	-205	-176	-91	-80	-65	-56
Milit. 2	78	57	53	41	45	36	-323	-265	-139	-116	-96	-81
Total 1	**83**	**63**	**57**	**45**	**48**	**40**	-304	-258	-127	-111	-88	-75
Total 2	**103**	**77**	**69**	**54**	**58**	**47**	-422	-347	-175	-147	-119	-100
Morocco												
CNSS	50	40	32	26	26	22	-154	-117	-47	-34	-26	-18
CMR	111	84	70	55	57	45	-241	-121	-70	-28	-35	-10
RCAR	11	7	7	5	6	4	-15	3	0	7	3	7
Total	**172**	**131**	**109**	**86**	**89**	**71**	**-410**	**-235**	**-117**	**-55**	**-58**	**-21**
WBG												
WB	68	50	42	32	34	26	-318	-239	-112	-85	-68	-53
Gaza	53	40	30	24	23	19	-473	-353	-163	-124	-100	-76
Total	**121**	**90**	**72**	**56**	**57**	**45**	**-791**	**-592**	**-275**	**-209**	**-168**	**-129**

Note: The pay-as-you-go asset presented in this table excludes the implicit pension liability of the system at the end of the simulation horizon. Therefore, it overestimates the "true" pay-as-you-go asset.
Source: Authors' calculations.

International comparisons show that, despite still favorable demographic conditions in most MENA countries, the estimated IPDs are not among the lowest in the world (see Table 3). In fact, only Eastern European countries, which have older populations and much higher coverage rates, tend to have larger IPDs than Jordan, Djibouti and Morocco. The IPD for Lebanon is among the lowest in the world, while the IPD for Iran and WBG are in the middle of the distribution for non-European countries.

Several factors can explain the international variation of observed IPD/GDP ratios, including the generosity of the system, the level of coverage, its demographic structure, and the level of wages. Holzmann et al. (2004) showed that the current level of pension expenditures can in fact explain up to 60 percent of the international variation of the IPD/GDP ratio. Adding our countries to the original model changes little the results (see Figure 4).

Figure 4: IPDs and Pension Expenditures at the International Level



The doted line refers to the equation estimated in this paper. The continuous line is from Holzmann et al. 2004.
Source: Holzmann et al. 2004 and authors' calculations.

When this simple model is applied to Algeria, Egypt, Libya, Tunisia, and Yemen, for which no data are currently available to directly estimate the IPD, we obtain estimates of 109%, 108%, 91%, 129% and 67% of GDP respectively. Clearly, these estimates incorporate a large error, but one can be confident that IPDs in these countries are above 50 percent of GDP.

Table 3: International Comparison of IPDs in Selected MENA Countries

Country	IPD (Wages/2%)	IPD (Prices/2%)	IPD (Wages/4%)	IPD (Prices/4%)	IPD (Wages/5%)	IPD (Prices/5%)
Brazil	500	362	330	248	275	211
Macedonia	441	356	291	241	244	204
Poland	379	304	261	212	220	181
Ukraine	365	292	257	211	220	183
Romania	386	292	256	199	214	169
Uruguay	295	246	214	182	187	160
Portugal	358	271	233	181	193	151
Hungary	300	212	203	150	171	128
Turkey	217	154	146	109	123	93
Jordan	**240**	**173**	**140**	**105**	**110**	**84**
Costa Rica	203	163	121	100	97	80
Djibouti	**174**	**132**	**119**	**93**	**100**	**79**
Morocco	**172**	**131**	**109**	**86**	**89**	**71**
Philippines	185	146	107	85	81	66
Argentina	106	91	85	75	78	70
Iran	146	110	89	70	72	57
Bolivia	111	92	73	65	62	55
Iran	**134**	**102**	**81**	**64**	**65**	**53**
WBG	**121**	**90**	**72**	**56**	**57**	**45**
México	101	84	65	54	54	45
Chile	77	64	60	50	53	45
Ecuador	103	78	63	49	51	40
Colombia	88	73	56	48	46	39
Lebanon	**83**	**63**	**57**	**45**	**48**	**40**
Mauritius	63	46	47	37	42	33
Senegal	73	51	51	37	44	32
Peru	57	51	40	35	34	30
El Salvador	60	46	43	34	37	29
Korea	57	35	33	21	26	17
Average	**193**	**149**	**128**	**101**	**107**	**86**

Countries sorted by the IPD valued at a 4% discount rate using price indexation.
Source: For MENA countries authors' calculations. For other countries Holzmann et al. 2004.

It is informative to compare the IPD with the explicit public debt. Assuming that pensions are indexed by prices and that the discount rate is 4% per year, the estimated IPDs in five of the six countries are equal or above the explicit public debt (Table 4). In Iran, for instance, the IPD represents 3.2 times the explicit public debt. Only in Lebanon is the IPD relatively low compared to the public debt (25%). This is because the explicit pubic debt is considerably high (over 170% of GDP) but also because there is no pension scheme for private sector workers.

To assess the fiscal impact that the implicit pension debt can have we look at the fiscal balance necessary to achieve a given reduction of the debt/GDP ratio over a given period of time. Formally, this fiscal balance as a percentage of GDP in each year is given by:

$$b^* = \frac{\beta\left[(1+r)^n - (1-x)(1+g)^n\right](1-\theta)}{(1+r)^n\left(1-\theta^{n+1}\right)}, \qquad (6)$$

where β is the debt/GDP ratio, x is the targeted fractional reduction, n is the period of time (measured in number of years), r is the interest rate on the debt, g the growth rate of GDP, and θ = (1+g)/(1+r). Clearly, as β and x increase, so does the required fiscal balance b*.

Figure 5 graphs b* as a function of n for three values of β (0.20; 1; and 2) under the assumption that x=0.5 (50% reduction), g=0.04, and r=0.05. We observe that a doubling of the debt to GDP ratio also implies a doubling of the fiscal balance necessary to achieve a given reduction in this ratio.

Figure 5: Public Debt and the Fiscal Balance

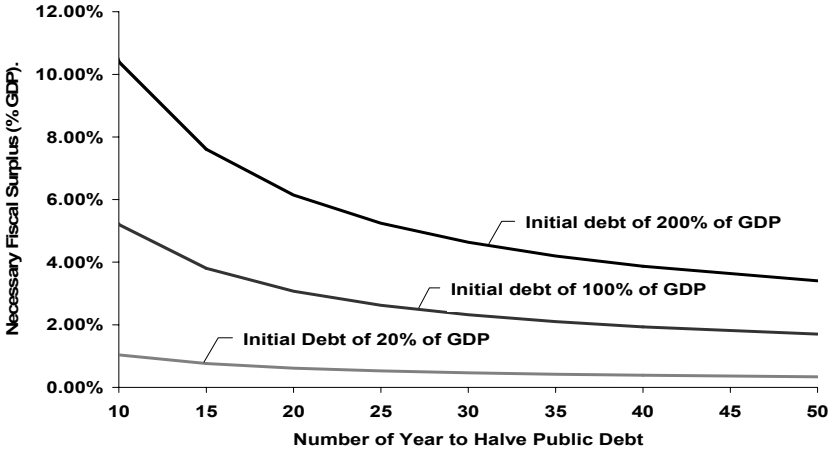


Figure is based on equation (6). The values of the relevant parameters are x=0.5; g=0.04; and r=0.05.
Source: Authors' calculations

We calculate b* for our six countries with and without including the implicit pension debt. The results of the calculations are presented in Table 4. We work under

the conservative assumption that pensions are indexed with prices and that the discount rate is 4% per year. The first two columns provide information about the fiscal balance necessary to reduce the public debt by 50% over a period of 10 years. The next two columns refer to the case where the 50% reduction is achieved over a period of 20 years, while the last two columns consider a period of 30 years.

Table 4: Fiscal Balance Necessary to Reduce the Public Debt With and Without IPD (% GDP)

			Reduce debt by half in 10 years		**Reduce debt by half in 20 years**		**Reduce debt by half in 30 years**	
	Explicit Public Debt	Implicit Pension Debt (IPD)	Explicit Public Debt Only	With IPD	Explicit Public Debt Only	With IPD	Explicit Public Debt Only	With IPD
Djibouti	65%	93%	3.38%	8.22%	2.00%	4.85%	1.51%	3.66%
Iran	20%	64%	1.04%	4.37%	0.61%	2.58%	0.46%	1.95%
Jordan	110%	105%	5.72%	11.18%	3.38%	6.60%	2.55%	4.98%
Lebanon	175%	45%	9.10%	11.44%	5.37%	6.76%	4.06%	5.10%
Morocco	70%	86%	3.64%	8.11%	2.15%	4.79%	1.62%	3.62%

Calculations assume that the GDP grows at 4% per year and that the interest on the debt is 4% per year.
Source: Authors' calculations.

The results of the calculations confirm that current pension liabilities have important implications for fiscal policy. Looking at the case of a 50% reduction over a 10 year period, the inclusion of the IPD implies increases in the fiscal balances necessary to achieve the targets, between 2.34 percentage points in the case of Lebanon to up to 5.46 percentage points in the case of Jordan. With a longer period (30 years) the increases in the fiscal balances would be less traumatic, but still substantial: between 1 percentage point in the case of Lebanon to 2.4 percentage points in the case of Jordan.

5. Discussion and Policy Implications

This paper has shown that the contingent liabilities of the government can be decomposed into the implicit pension debt (IPD) and the pay-as-you-go asset (PA). Estimates for 12 pension schemes across 6 countries in the Middle East and North Africa show that IPDs are considerably high (in the order of 50 to over 100 percent of GDP) and always above the explicit public debt. At the same time, the large majority of the schemes analyzed have negative pay-as-you-go assets.

The implication is that, in the absence of default, current IPDs can only be financed out of current reserves – in general small relative to the IPD – and general

revenues. Governments can continue to "roll-over" the pension debt by "borrowing" new contributions, but this will only delay and aggravate the problem. It follows that considering the implicit pension liabilities as contingencies, as opposed to regular debt, can severely bias the design of fiscal policy and the assessment of debt sustainability. The paper has shown that the fiscal balance targets necessary to reduce debt/GDP ratios can change dramatically depending on whether the calculations include or not the IPD.

The natural recommendation is to formally require countries to report the value of the IPD and the pay-as-you-go asset as part of the portfolio of public sector obligations and to devise appropriate financing mechanisms. There are, however, questions that will need to be addressed before countries start to move in this direction.

One question is what should be the standards to compute and report the IPD, in order to ensure comparability across countries? An initial attempt to develop a standard methodology, which has also been applied in this paper, is presented in Holzmann et al. (2004), but there are still questions and limitations. Setting standards, on the other hand, is likely to be a continuous process. Indeed, problems of standardization still pervade most components of the national accounts in developing countries. Thus, reporting requirements would not need to wait until the perfect methodology is in place.

A second and, arguably, more fundamental question relates to the effects that official reports of the IPD would have on the markets for public debt. Are current investors in government debt already discounting the value of the IPD, or will new reporting criteria open a Pandora box? The evidence from the literature is limited and refers largely to occupational plans. For these plans there is some convincing evidence supporting the idea that markets do pay attention to and discount unfunded pension liabilities. Bulow, Mϕrck, and Summers (1985) report, for instance, that an increase in the implicit pension debt of a company is associated with a fall in the value of its equity. These results confirm previous findings by Feldstein and Mϕrck (1983) and Feldstein and Seligman (1981). Little is known, however, about the relationship between the spreads on government debt and the IPD of the mandatory pension systems. The literature on the cross-country determinants of spreads is also limited (see Eichengreen and Mody, 2000 for a review and recent empirical evidence) and has not looked at the impact of the IPD. A recent study uses the institutional investors rating (IIR)[8] to investigate countries "debt tolerance." (See Reinhart, Rogoff, and Savastano, 2003). The authors show that countries with stories of default and high inflation are penalized by the IIR measure, even with relatively low levels of debt.[9] The implicit pension debt, however, is not taken into account in the analysis.[10] To our knowledge, the question of how the IPD of mandatory systems influences investors' attitudes towards government debt remains more or less open.

[8] The IRR is computed twice a year and is based on information provided by economists and sovereign risks analysts at leading global banks and security firms. The ratings grade each country on a scale from 0 to 100, with a rating of 100 given to those countries perceived as a having the lowest chance of defaulting on their government debt obligations.

[9] The analysis on the paper is actually based on the external debt of the country.

[10] Our own preliminary analysis suggests no correlation between the IPD and the IRR.

Three cases could be considered. In the first case investors would already discount the value of the IPDs when pricing the government debt. In this case, formally reporting the IPD -- and even making explicit this IPD through the issuance of bonds -- would not affect the spreads of government debt. In the second case, while taking into account the IPD when assessing the risk of default of the government, investors would have biased expectations about its level. In fact, often governments and the pension funds themselves are not aware of the value of the IPD. In this case, revealing new information about the IPD and the PA would realign expectations and affect spreads.

The third case, which can co-exist with the second one, would occur when investors do not consider current IPDs an important predictor of the risk of default and do not take it into account in the calculations of spreads on government debt. This could be because investors expect that governments will default on the IPD rather than on the explicit debt or because they expect that governments will continue to roll-over the IPD for still a long time. Since pension crisis tend to be associated with the aging of the population, observations of high young dependency ratios and low old dependency ratios would sustain these expectations. In this case, revealing information about the value of the IPD would not affect spreads. However, making the IPD explicit and adding property rights – for instance by issuing bonds – could change expectations about the likelihood of default and could affect spreads.

We argue that even in case two, where current spreads are not reflecting the level of the implicit pension debt due to investors myopia, countries would be better off by being transparent and reporting the IPD and the pay-as-you-go asset. This is because state two is not stable – investors cannot be fooled forever. Expectations are constantly being updated and investor would eventually learn the true financial position of the pension funds. Governments attempt to hide information would then result in over borrowing and eventually a financial crisis when investors finally learn the facts and refuse to roll-over public debt. This situation can be avoided if the government discloses the value of the IPD along with a credible plan to finance it – in cases where the pay-as-you-go asset is negative. In fact, countries adopting this strategy would be more credible than countries that do not. This is simply because the new information on a given country would force investors to also update their expectations about the value of the IPD in other countries.

At the same time, rating agencies should give higher scores to countries that unveil their pension debt than to countries where an IPD of potential similar magnitude is not disclosed. Finally, international organizations should be more forgiving in terms of targeted fiscal balances in countries where efforts are being undertaken to disclose, control and finance the accumulation of implicit pension debt. This could imply lower surpluses or higher deficits over the short term, but an overall reduction in the present value of the public debt.

As a final comment, we emphasize that Governments can make pension liabilities "explicit" in different ways. Jordan, which recently closed to new entrants the schemes for civil servants and the military and assumed the payment of the current and new

implicit pension debt of the system, simply "added a line" in the budget. Basically, the value of the IPD was disclosed along with a projection of future expenditures to cover the deficits of the two pension funds. These expenditures are treated as current expenditures, similar to wages. As far as we can tell, there were no visible changes in spreads of government debt when the closure of the schemes was announced and the IPD disclosed. If anything, the policy intervention should have been taken with relieve by investors who saw the government committing to put a halt to the irresponsible accumulation of implicit pension debt. On the other hand, it is difficult to imagine that investors' reactions would have been different if the government had issued recognition bonds for individuals' accrued rights. There is no strong reason to believe that the likelihood of default on government bonds (which give property rights to plan members) is higher than the likelihood of default on future pension payments through the general budget.

We argue that more transparent and explicit instruments could also be considered for new pension liabilities in countries preserving earnings related schemes with pay-as-you-go financing, if these are made solvent. In this case, the new IPD, which could take the form of government bonds (tradable or not) would be backed by the pay-as-you-go asset. Mechanisms would need to be in place, however, to introduce corrections – ideally automatic -- when unexpected shocks start to generate systematic divergences between the pay-as-you-go asset and the IPD.

In conclusion, more research is necessary to better understand how investors treat the IPD of a country and how they react to changes in its level under different economic and demographic environments. At the same time, efforts to systematically estimate IPDs across countries should continue. This information should be made available to policymakers and the general public. What should be the appropriate reporting mechanism is a question still open to debate. We argue, however, that there could be important advantages in terms of increased transparency and better fiscal discipline to making, at least the new IPD of reformed earnings related schemes with pay-as-you-go financing, fully explicit, by investing new contributions in appropriately indexed government bonds. In this case, tolerance levels for the public debt would need to be reviewed, in part by looking at the pay-as-you-go asset. The fiscal implications of this approach are explored in a companion paper.

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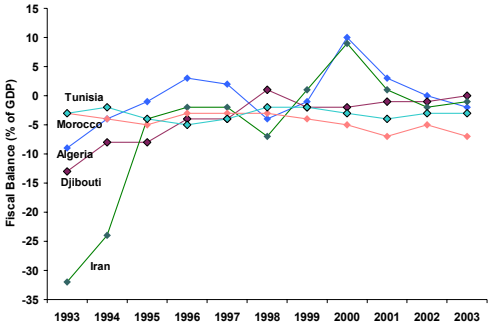
Appendix I: Dynamics of the Public Debt in Selected MENA Countries

Figure A1: Fiscal Balance



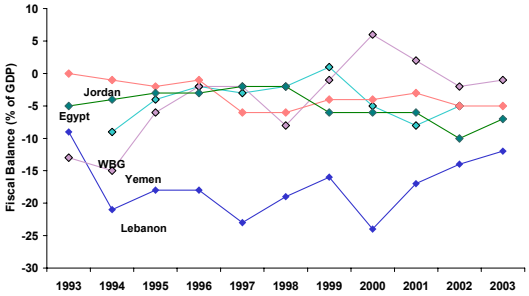
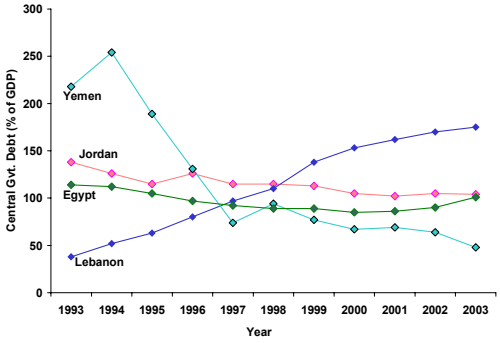
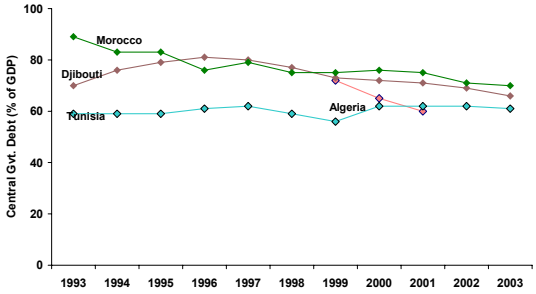


Figure A2: Central Government Debt





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Implicit Pension Debt in the Middle East and North Africa: Magnitude and Fiscal Implications

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ABSTRACT

This paper breaks down the contingent liability of a mandatory pension system into two components: the implicit pension debt and the pay-as-you-go asset. It then estimates these two components for 12 pension schemes across six MENA countries and presents international comparisons. The results show that implicit pension debts are large (in the order of 50% to 100% of GDP), often higher than the explicit public debt. At the same time, the large majority of pension schemes have negative pay-as-you-go assets. Under these circumstances, it is misleading to consider the implicit pension debt a contingency, as the government will have to finance it with almost certainty. In the absence of a default the fiscal impacts are expected to be large. The paper recommends including in the assessment of public debt sustainability the implicit liabilities of the mandatory pension system and the pay-as-you-go asset.

مُلخّص

تقسم هذه الدراسة الالتزامات المحتملة لأنظمة المعاشات التقاعدية الإلزامية إلى قسمين: المديونية الضمنية لخطط المعاشات التقاعدية، والأصول من الاقتطاعات بالتقسيط عند المنبع. ثم تقوم بوضع تقديرات هذين القسمين بشأن 12 خطة معاشات تقاعدية في ستة من بلدان منطقة الشرق الأوسط وشمال أفريقيا، مع عرض مقارنات دولية. وتُبيّن النتائج أن المديونيات الضمنية كبيرة (بنسبة تصل ما بين 50 في المائة و 100 في المائة من إجمالي الناتج المحلي)، وهي غالباً ما تكون أكبر من مقدار الدّيْن العام الصريح. وفي الوقت نفسه، نجد أن غالبية خطط المعاشات التقاعدية معدلاتُ أصولها من الاقتطاعات بالتقسيط عند المنبع سلبية. وفي ظلّ هذه الأوضاع، يكون من المُضلّل اعتبار المديونية الضمنية لخطط المعاشات التقاعدية نوعاً من الاحتمالات الطارئة لأنه ينبغي بالتأكيد تقريباً على الحكومات تمويل تلك المديونية. وإذا لم يحصل العجز عن السداد، فإن من المتوقع أن يكون الأثر على المالية العامة كبيراً. وتوصي هذه الدراسة بتضمين تقديرات القدرة على تحمّل الدّيْن العام الالتزامات المحتملة لأنظمة المعاشات التقاعدية الإلزامية وللأصول من الاقتطاعات بالتقسيط عند المنبع.

RÉSUMÉ

Le document présente une ventilation du passif éventuel d'un régime de retraite obligatoire selon deux composantes : l'endettement implicite du régime de retraite et les actifs du régime fondé sur la répartition (« *pay-as-you-go* »). Il estime ensuite ces deux

composantes pour 12 régimes de retraite de six pays de la région MENA et présente des comparaisons internationales. Les résultats indiquent que l'endettement implicite des régimes de retraite est important (de l'ordre de 50 pour cent à 100 pour cent du PIB), et qu'il est souvent supérieur à l'endettement public explicite. Parallèlement, la vaste majorité des régimes de retraite font montre d'actifs négatifs pour le régime fondé sur la répartition. Dans ces circonstances, il est erroné de considérer l'endettement implicite des régimes de retraite comme un passif, étant pratiquement certain que le gouvernement devra le financer. En l'absence de défaut, les impacts budgétaires sont anticipés importants. Le document recommande d'inclure dans l'évaluation de la viabilité de la dette publique, les passifs implicites du régime de retraite obligatoire et les actifs du régime fondé sur la répartition.

1. Introduction

The proper measurement and monitoring of the public debt and the total external debt of a country are essential for the efficient design of fiscal policy and the prevention of financial crisis. There is an ongoing debate in terms of the most appropriate methodology to measure the level of these debts and assess their sustainability (see IMF, 2004 for a discussion in the case of low-income countries, and a more general discussion on debt tolerance by Reinhart, Rogoff and Savastano, 2003). In all cases, however, the implicit liabilities of the mandatory pension funds are excluded from the analysis. At best, the implicit pension debt is treated as a contingent liability of the government and is not reported as part of the public debt. Unfortunately, it can be shown that when the pension system is not solvent, a large component of the implicit pension debt is actually not "contingent." The probability that the government will have to repay – or default on this debt – is very close to one. Excluding this non-contingent component from the assessment of public debt sustainability can therefore seriously bias the design and implementation of fiscal policy.

The objectives of this paper are to describe the true nature of the contingent liability of the pension systems in selected MENA countries and asses its fiscal implications. We start by breaking down the contingent pension liability into two components: the implicit pension debt (IPD) and the so called pay-as-you-go asset (PA). We then estimate the value of these two components for 12 schemes across 6 MENA countries1 and benchmark the results against those observed in other countries.2 To assess potential fiscal implications, we compute the change in the fiscal balance necessary to reduce the debt/GDP ratio by a given fraction over some period of time, resulting from the inclusion of the IPD in the debt sustainability analysis.

The core of the paper is organized in 4 sections. Section 2 sets the analytical framework by presenting the traditional definition of public debt and characterizing the contingent liability of the mandatory pension system. Section 3 describes the methods and the data used to estimate IPDs and pay-as-you-go assets. Section 4 presents the results of the analysis and assesses fiscal impacts. Section 5 concludes and discusses policy implications.

2. Public Debt and Contingent Pension Liabilities

The public debt, as defined in Government Financial Statistics of the International Monetary Fund (IMF), incorporates public and publicly guaranteed obligations of the central, municipal, and local governments -- as well as other public entities -- with non-government institutions. Although not included directly in the calculation of the public debt, the definition recognizes the existence of contingent liabilities of various public institutions (e.g., state owned enterprises, banks) as well as the pension funds. In this

[1] Countries have been selected on the basis of available information.

[2] The calculation of the IPD is based on the methodology developed in Holzmann et al. (2004), which normalizes assumptions to make results comparable across countries.

section we show why treating the implicit debt of the pension funds as a contingency can be misleading.

In an earnings related pension system that is not fully funded, current promises to pay pensions (pension rights accrued to date) are backed by available reserves as well as future contributions net of future pension payments ensuing from these contributions – the so called pay-as-you-go asset. The contingent liability of the pension funds, on the other hand, is often interpreted as the part of future obligations that, with some probability, cannot be covered by future revenues. Formally, the contingent liability can be defined as:

$$CPL_t = E\left[L_c\left(\mathbf{N_c}, \mathbf{w}, \mathbf{s}; \theta\right) + L_p\left(\mathbf{N_p}, \mathbf{p}, \mathbf{s}; \theta\right) - A\left(\mathbf{N_c}, \mathbf{N_n}, \mathbf{w}, \mathbf{s}; \theta\right)\right] - R_t, \qquad (1)$$

where E is the expectations operator, $L_c(.)$ gives the liabilities of the pension system with current contributors ($\mathbf{N}_c$), which depend on current and future average wages by age ($\mathbf{w}$), a vector of current and future survival probabilities by age ($\mathbf{s}$), and the parameters of the system ($\boldsymbol{\theta}$); L_p gives the liabilities with current beneficiaries ($\mathbf{N}_p$), which depend on the current distribution of pensions ($\mathbf{p}$), survival probabilities, and system parameters (e.g., pension indexation mechanisms); and A(.) is the pay-as-you-go asset, which depends on current *and* new contributors ($\mathbf{N}_n$), as well as wages, survival probabilities, and system parameters; and R_t represents current reserves. The implicit pension liability (IPD) of the system, the accrued to date liability, is given by $L_c(.) + L_p(.)$.

In a solvent pension system one would expect the contingent liability to be equal to or less than zero. In other words, the expected implicit pension liability net of reserves would be at least equal to the expected pay-as-you-go asset. Any deviation from equilibrium would not be systematic, but rather the result of unexpected shocks. Under some designs, automatic rules that adjust $\boldsymbol{\theta}$ to changes in the demographic and economic environment could even eliminate the contingent pension liability. In this case, the IPD net of reserves would be equal to the pay-as-you-go asset in all states of nature.

When the pension system is insolvent, however, the expected contingent liability is positive. That is, under average conditions, the IPD net of reserves would be above the pay-as-you-go asset. At the extreme, it is possible to observe an expected pay-as-you-go asset which is negative. Indeed, it can be shown that the pay-as-you-go asset is equal to the accrued to date pension liabilities (IPD) plus the present value of future cash-balances (which is the negative of the so called financing gap, FG, of the system). Formally, over the infinite horizon, we have:

$$
\begin{aligned}
&A(.) = \sum_t c_t \rho^t - \sum_t p_t^e \rho^t - \sum_t p_t^n \rho^t \\
&IPD = L_c(.) + L_p(.) = \sum_t p_t^c \rho^t + \sum_t p_t^p \rho^t \\
&FG = \sum_t p_t^n \rho^t \sum_t p_t^e \rho^t + \sum_t p_t^c \rho^t + \sum_t p_t^p \rho^t - \sum_t c_t \rho^t \\
&\Leftrightarrow A(.) = IPD - FG
\end{aligned}
\quad , \qquad (2)
$$

where c are contributions at time t, p^e are pension payments accrued by the new contributions of current plan members; p^n are pension payments accrued by the contributions of new entrants to the system, p^p are pension payments to current beneficiaries, and p^c are pension payments to current contributors for the pension rights that they have accrued to date. Hence, if the financing gap of the system is large enough (higher than the IPD), the pay-as-you-go asset of the pension system becomes negative. Basically, future contributions do not generate a surplus in present value that can be used to finance the IPD. On the contrary, the new contributions bring new liabilities that themselves cannot be financed by the system. In other words, keeping the system open to new contributions worsens its long-term financial position.

Having a negative pay-as-you-go asset has important fiscal implications because it implies that only general revenues can be used to finance the IPD.[3] Governments can delay the use of general revenues by continuing to "borrow" contributions to pay pensions, but because these new contributions also bring new pension liabilities, the situation eventually becomes explosive. Under these circumstances, the liabilities of the pension funds do not represent a contingency for the government but rather a real debt that, in the absence of default, sooner or later will need to be financed. When this is the case, excluding the IPD from the analysis of fiscal sustainability of the public debt can lead to severely biased policy recommendations.

The next two sections of this paper are concerned with the estimation of the IPD and the pay-as-you-go asset of pension systems in various MENA countries.

3. Methods and Data

The implicit pension debt is defined here as the accrued-to-date liabilities, or the PBO (projected benefit obligation). It is equal to the present value of the benefits the pension system will have to pay to its current participants (and their survivors) on the basis of their pension rights accrued prior to the year for which the IPD is calculated. The calculation of benefits is made on the basis of future wages (i.e., wages at the time of retirement). Neither future contributions nor new pension rights are included in the calculation. Thus, the IPD shows how much it would cost to discontinue the pension scheme and pay out all obligations (see Holzmann et al., 2004 for a review of various measures of pension liabilities).

[3] Here we abstract from the existence of reserves. As shown later these are usually very low relative to the level of the IPD.

Our estimates of the IPD are based on the World Bank PROST (Pension Reform Options Simulation Toolkit) model. Given limited information in most middle and low-income countries about the vesting period of current contributors and their turnover rates, when computing pension payments for new retirees PROST uses little information about "their past." Thus, it is not possible to differentiate between those future new retirees who are contributors today and those future new retirees who enrolled in the system at a latter date. Similarly, in the case of future new retirees who are contributors today, it is not possible to distinguish between the part of the pension that is associated with rights accumulated to date, and pension rights accumulated through new contributions. In essence, for all new retirees of age a at time t, PROST computes the pension on the basis of an estimate of the average length of service at retirement. However, because the pension payments in year t are related to both pension rights accrued to the date of computing the IPD and pension rights resulting from new contributions (of current and new plan members), a mechanism is necessary to separate the two. For simplicity, PROST increases the share of pension rights accrued from new contributions in direct proportion to time. As an illustration, assume that the calculation of the IPD is made at time t=0, that the average retirement age is 55, and that the youngest age at which individuals join the system is 20. PROST in this case infers that the pension payments to new retirees in year t=1 are all the result of contributions made during the last 35 (55-20) years (i.e., are related to the pension rights accrued to date by current contributors). As t increases, however, the role of past years of contributions has to diminish. Hence, for year t=2, PROST reduces the share of past years by 1/35 -- since pension payments to new retirees now can reflect on year of *new* contributions. Similarly, in year t=3 the share of past years of contributions is reduced by 2/35 and by 3/35 in year t=4. At some point in time, past years of contributions are no longer associated with the pension payments to new retirees, as these result entirely from pension rights accrued through new contributions.

Formally, the accrued to date liability with current contributors is given by:

$$IPD\_C\_P_{t,g} = \sum_{y=t+1}^{T} \left(\frac{PV\_NP_{y,g}}{\prod_{j=t+1}^{y}(1+\rho_j)} NP_{y,g} \left(1 - \frac{y-t-1}{RA\_NP_{t,g} - EA} \right) \right); \quad T < RA\_NP_{t,g} - EA + t + 1, \tag{3}$$

where $NP_{y,g}$ is the number of new retirees of sex g in year y, $RA\_NP_{t,g}$ is the average retirement age of all new retirees of sex g in year t, EA is the age of the youngest contributor, ρ is the discount rate, and $PV\_NP_{y,g}$ is the average present value at time y of the stream of pension payments made to new retirees of sex g between times y and T. For each of these new retirees the present value of the future pension payments is itself given by:

$$PV\_NP_{a,i,t,g} = NB_{a,i,t,g} + \sum_{y=t+1}[B_{a,i,y,g} \cdot \frac{\prod_{j=t+1}^{y}(1-m_{a+j-t,j,g})}{\prod_{j=t+1}^{y}(1+\rho_j)}], \quad (4)$$

where a indexes the age of the individual, i indexes the income category, NB is the first pension payment to the new retiree, B represents the indexed pension at time y, and m_a the mortality rate at age a. A similar approach is used to allocate disability pensions.

The method described above for the calculation of the implicit pension debt with current contributors has proven to provide a reasonable approximation of the "true" IPD in the case systems that have been in operation for over 20 to 30 years. Thus, it is suitable for all pension schemes analyzed in this paper. For younger systems, or systems that start from scratch, the methodology just described tends to overestimate the IPD, as too much weight is given the accrued rights of current contributors.

The liabilities to current beneficiaries comprise liabilities to old age pensioners, disabled, survivors and orphans. The IPD to current old age pensioners is calculated in a more precise way than to current contributors, by following the current age-sex cohorts of beneficiaries over time. Formally, the IPD is defined by:

$$IPD\_OAP_t = \sum_{a,i,g} PV\_OAP_{a,i,t,g} \cdot OAP_{a,i,t,g}, \quad (5)$$

where $PV\_OAP_{a,i,t,g}$ is the present value of the stream of pension payments to a pensioner of age a and sex g, in income category i (see equation 4); and $OAP_{a,i,t,g}$ is the number of these individuals. A similar approach is used to compute the implicit liabilities of current disabled. Obligations to survivors (widows/widowers and orphans) are estimated with a lesser precision. PROST assumes that the share of obligations to survivors in the total IPD to existing old age pensioners and disabled is the same as the share of survivor pension expenditures on total expenditures.

Data and Assumptions

We estimate the implicit pension debt and the pay-as-you-go asset for 12 pension systems across 6 countries in the region. These countries have been selected on the basis of data availability. In the context of a cross country analysis, it is essential to find the right balance between taking into account the idiosyncrasy of a country's pension system, on the one hand, and the comparability of the results, on the other. To this end, we follow the methodology and assumptions developed by Holzmann et al. (2004), which allows for international comparisons. Below we describe the key data and assumptions

regarding demographic dynamics, coverage, retirement patterns, benefit formulas, the finances of the system, and the macroeconomy.

Demography. Population projections are important to compute the *pay-as-you-go asset* because they determine the number of scheme participants by sex and age. The projections are based on information provided by the World Bank's Population Unit regarding the initial population by age and gender, and projections of age-specific fertility and mortality rates for each country. In line with international trends, mortality rates are assumed to decrease over time resulting in growing life expectancy, while fertility rates gradually converge to reproduction level (see Table 1). Decreasing mortality and fertility rates result in population aging and growing system dependency rates.

To follow the different cohorts of contributors and beneficiaries over time, nationwide mortality rates are applied to the members of all schemes. This is because of the lack of mortality rates which are specific to plan members. The use of nationwide mortality rates adds some bias to the projections as coverage rates are relatively low and those who participate in the system are generally middle and high income individuals (particularly in the case of civil servants) who are expected to have longer life expectancies. This would underestimate the implicit pension debt.

Contributors. The initial number of contributors and beneficiaries and their distribution by age and sex are based on actual data provided by the respective pension funds. The initial age distributions of contributors for all considered schemes are compared on Figure 1. Private sector schemes are shown on the left-hand side chart, public sector schemes on the right-hand side. In general, schemes for civil servants have a more mature population because often they were created first.

Table 1: Expected Dynamics of Life Expectancy and Fertility Rates

	Base Year	2020	2040	2060	2075
Life Expectancy at Birth					
Djibouti	42.5	49.8	59.3	67.6	71.7
Iran	69.5	74.5	77.5	81.7	84.5
Jordan	71.3	75.3	77.4	79.9	81.5
Lebanon	70.3	74.0	76.8	79.9	82.8
Morocco	68.1	71.9	74.5	77.3	79.6
West Bank&Gaza	72.3	75.4	77.3	79.3	80.8
Total Fertility Rates					
Djibouti	493%	314%	241%	221%	213%
Iran	250%	211%	210%	208%	207%
Jordan	350%	209%	208%	207%	207%
Lebanon	225%	210%	209%	208%	207%
Morocco	273%	213%	210%	209%	207%
West Bank&Gaza	485%	309%	214%	210%	206%

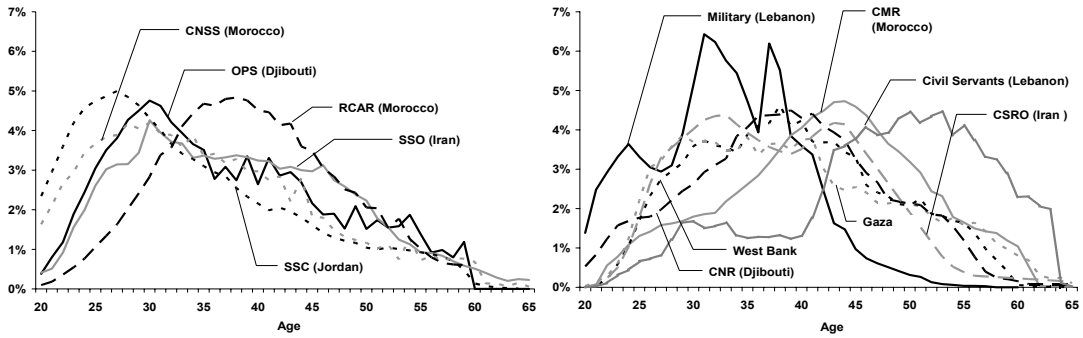
Source: WB Population Unit.

To project the stock of future contributors by age and sex it is assumed, for all schemes and all countries, that current population coverage rates by age and gender remain constant (see Figure 2). This normalization is introduced to facilitate cross-

country comparisons. However, it is important to note that in the presence of growing labor force participation rates, the assumption of constant population coverage implies declining labor force coverage. This is particularly relevant for women in MENA countries for whom participation in the labor market is increasing rapidly. In the case of insolvent systems, and with reasonable estimates for the discount rate, this assumption would overestimate the value of the pay-as-you-go asset.

Beneficiaries. Projections of the future number of disabled and survivors are done, similarly, by holding constant over time the beneficiary to population ratio in each age and gender cohort. The old age pensioners are modeled in a more complicated way. The initial age distribution of the stock of old age pensioners in each pension scheme is given (see Figure 3). For the future, the underlying assumption is that retirement rates,[4] for all ages for which there are retirees today, eventually converge to the current (base year) maximum participation rate across plan members of all ages. For instance, if the maximum ratio between the population of contributors, disabled, and retirees and the total population is 50 percent (observed say at age 40), then the assumption is that over the medium term retirement rates for all ages will converge to 50%. Basically, if 50% is the maximum observed share of individuals of a given age and sex who are in the system today, then 50% becomes a ceiling for the share of individuals across ages and gender who can be retired when the system matures.

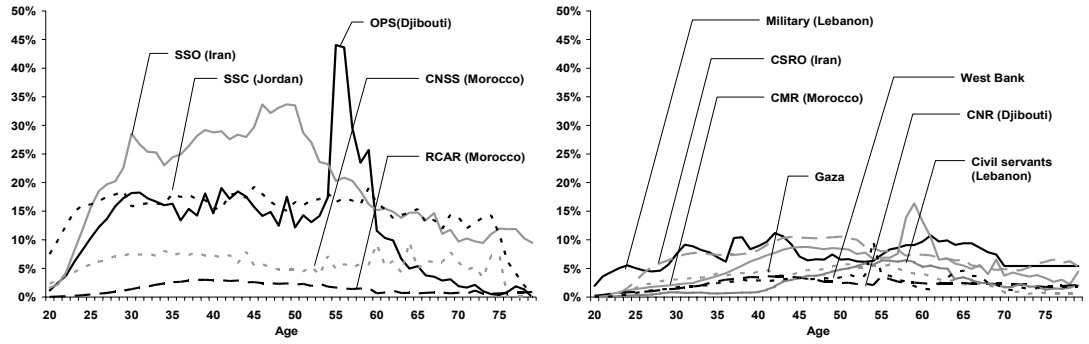
Figure 1: Age Distribution of Current Contributors



Source: Various pension funds

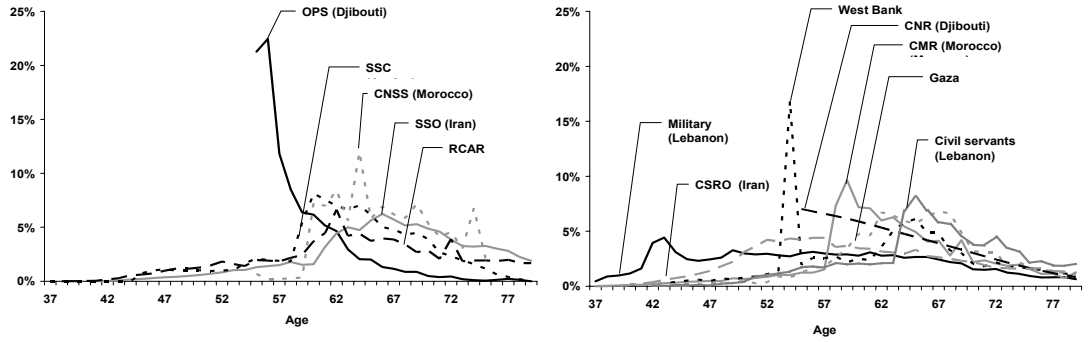
[4] Here by retirement rates we understand the share of old age pensioners and disabled in the population of a given gender at a given age.

Figure 2: Current Coverage Rates of the Population of Contributors



Source: Authors' calculations

Figure 3: Age Distribution of Current Old-Age Pensioners



Source: Various pension funds

Benefit formulas and eligibility conditions. Key system parameters such as the contribution rate, the ceiling on the covered wage, the retirement age and the vesting periods, penalties for early retirement, the income measure, the accrual rate, and rules for revalorizing wages and indexing pensions are based on the latest legislations.[5] Unfortunately, most countries use ad-hoc or discretionary mechanisms to index pensions and revalorize wages. Hence, in the simulations we follow the approach presented in Holzmann et al. (2004) and consider two scenarios: one in which the growth rate of the average covered wage is used to revalorized wages and index pensions, and a second where prices are used (the indexation to prices is implicit since all the projections are made in real terms). The revalorization mechanism can have an important impact in the level of the IPD in schemes with "long" averaging periods that do not revalorize wages, such as the OPS in Djibouti (10 years) and the CNSS in Morocco (8 years).

Revenues and expenditures in the pension systems. In the projections, only pension related revenues and expenditures are considered in all schemes. Payments under social assistance programs and other non-pension expenditures, e.g. health care or

[5] Any reforms that are being introduced after the beginning of the simulation period are taken into account if they were enacted prior to the base year.

unemployment benefits, – if they are covered by the pension or social security fund – are excluded. Contributions or transfers to cover these expenditures are also excluded.[6]

Any negative pension balance or explicit accumulated debt of the pension system at the beginning of the simulation period is ignored – which is the case for CSRO (Iran). This assumes that the initial system deficit has been covered by the government's budget. The current reserves of the system are also not taken into account in the projections. Basically, for transparency purposes, investment income is ignored.

Wages. Actual data on the current average wage of the covered population in each of the modeled schemes are used in the simulations. However, gender differences in wages are uniformly ignored even in cases where information about gender distribution of wages is available. In addition, the age profile of wages is normalized across countries. This is important to compare schemes with different income measures, particularly when past wages are not revalorized as a function of the growth rate of the average covered wage or inflation. We assume that a one year increase in the age is accompanied, on average, by a 1 percentage point increase in wages. This pattern reflects the overall trend observed around the world (see Holzmann et al., 2004).

Macroeconomy. To look at the different systems in a comparable economic environment, normalized macroeconomic projections are used based on the following assumptions: (i) real GDP growth rate is 4%; (ii) productivity growth is 2%; and (iii) the inflation rate is zero (i.e., projections are conducted in real terms). As IPD estimates are highly sensitive to the discount rate used in present value calculations, simulations were done with a range of discount rates varying from a low 2% to a relatively high 5%. Higher discount rates not only reduce the level of the IPDs for all schemes but in some cases they also change their relative position, depending on whether their future unfunded liabilities are more front- or back-loaded. Hence, schemes that have larger expected payments further down the road are favored by high discount rates.

4. Results from the Analysis

The results of the calculations for the various schemes in the six MENA countries are presented in Table 2 . The first six columns provide estimates of the implicit pension debt, while the last six columns present estimates of the pay-as-you-go asset. Each column refers to a combination of the indexation factor for pensions and the discount rate.

A first observation is that in all cases the IPDs are sizable, in general higher for the schemes for private sector workers than for the scheme for civil servants (the exception is Morocco). This is not explained by more generosity in the schemes for

[6] The following "pension related" contribution rates are assumed: CNR (Djibouti) – 20% (pensioners – 10.2%); OPS (Djibouti) – 8% (pensioners – 10.9%); CSRO (Iran) – 22.5%; SSO (Iran) – 18%; SSC (Jordan) – 16.5%; civil servants and military (Lebanon) – 6%; CMR (Morocco) – 17%; CNSS (Morocco) – 9.1%; RCAR (Morocco) – 18%; West Bank – 2%; Gaza – 22.5% (however, currently nobody actually pays contributions). The assumed collection rate is based on the actual data on the current status for each scheme

private sector workers, the opposite tends to be true (see Robalino et al. 2005), but simply by a larger contributory base.

Among the four schemes for private sector workers reviewed (Djibouti OPS, Iran SSO, Jordan SSC, and Morocco CNSS) the largest IPDs across scenarios are observed in Jordan (between 84% and 240% of GDP), followed by Djibouti (67% - 151%), Iran (32% - 82%) and Morocco (22%-50%). Among the schemes for civil servants the highest IPDs are observed in the West Bank and Gaza (between 45% and 121% of GDP), followed closely by Morocco (between 45% and 111% of GDP) and then Iran (21% - 52%), Djibouti (12% - 23%) and Lebanon (11% - 25%). In the only military scheme analyzed (Lebanon) the IPD ranges between 29% and 78% of GDP. The lowest IPDs (between 4% and 11% of GDP) are observed in the scheme for public sector contractual workers in Morocco (the RCAR), which is both smaller and better designed than the other schemes (see Robalino et al., 2005).

Regarding pay-as-you-go assets an important finding of this paper is that in most systems there are none.[7] With the exception of the CNR in Djibouti (recently reformed) and the RCAR in Morocco, all schemes have large pay-as-you-go liabilities (i.e., the pay-as-you-go assets are negative). In Jordan, estimates of pay-as-you-go liabilities for the next 75 years range between 2 and 14 times GDP. With a discount rate of 4% and price indexation of pensions, future liabilities could represent 3 times today GDP. Under the same scenario future liabilities in WBG, Iran and Lebanon would represent 3, 2 and 1.7 times current GDPs respectively. Only in Morocco and Djibouti would future pay-as-you-go liabilities be below current GDP (50% and 10% respectively).

Negative pay-as-you-go assets imply that having the pension systems open to new entrants (and new contributions) worsens their financial position. This is because future generations will not generate a "surplus" to cover the pensions of current plan members. Thus, in the absence of a default, the IPD can only be financed through general revenues. It is therefore important to take into account these liabilities when assessing the fiscal sustainability of the public debt.

[7] It is important to note that the estimates of the pay-as-you-go asset presented in Table 2 overestimate the "true" pay-as-you-go asset. This is because the calculations do not take into account the implicit pension liability of the system in year 2075.

Table 2: Implicit Pension Debt and Pay-as-you-go Assets for Pension Scheme in MENA Countries

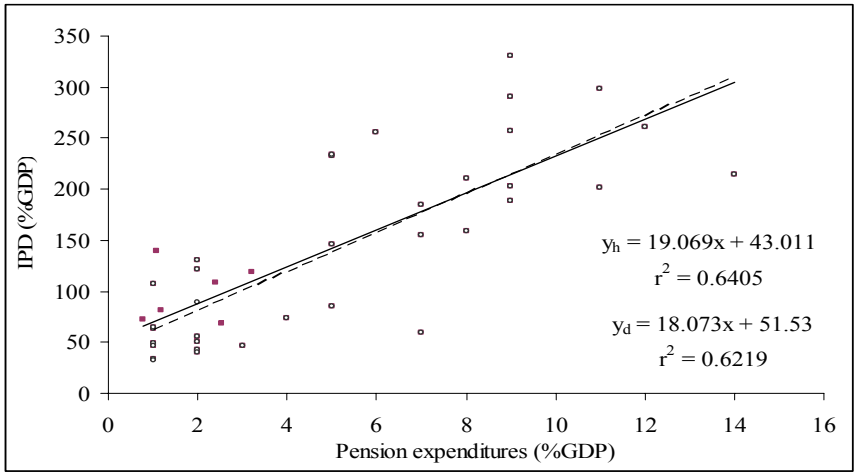
Country Scheme	IPD wage 2%	IPD price 2%	IPD wage 4%	IPD price 4%	IPD wage 5%	IPD price 5%	PA wage 2%	PA price 2%	PA wage 4%	PA price 4%	PA wage 5%	PA price 5%
Djibouti												
CNR	23	19	17	14	14	12	23	36	21	25	18	21
OPS	151	113	102	79	86	67	-309	-172	-262	-35	-38	-10
Total	**174**	**132**	**119**	**93**	**100**	**79**	-286	-136	119	-10	-20	11
Iran												
CSRO	52	38	33	25	27	21	-197	-136	-61	-41	-33	-21
SSO	82	64	48	39	38	32	-536	-420	-171	-133	-97	-74
Total	**134**	**102**	**81**	**64**	**65**	**53**	-733	-556	-232	-174	-130	-95
Jordan												
SSC	240	173	140	105	110	84	-1402	-996	-444	-307	-251	-169
Total	**240**	**173**	**140**	**105**	**110**	**84**	**-1402**	**-996**	**-444**	**-307**	**-206**	**-169**
Lebanon												
CS	25	20	16	13	13	11	-99	-82	-36	-31	-23	-19
Milit. 1	58	43	41	32	35	29	-205	-176	-91	-80	-65	-56
Milit. 2	78	57	53	41	45	36	-323	-265	-139	-116	-96	-81
Total 1	**83**	**63**	**57**	**45**	**48**	**40**	-304	-258	-127	-111	-88	-75
Total 2	**103**	**77**	**69**	**54**	**58**	**47**	-422	-347	-175	-147	-119	-100
Morocco												
CNSS	50	40	32	26	26	22	-154	-117	-47	-34	-26	-18
CMR	111	84	70	55	57	45	-241	-121	-70	-28	-35	-10
RCAR	11	7	7	5	6	4	-15	3	0	7	3	7
Total	**172**	**131**	**109**	**86**	**89**	**71**	**-410**	**-235**	**-117**	**-55**	**-58**	**-21**
WBG												
WB	68	50	42	32	34	26	-318	-239	-112	-85	-68	-53
Gaza	53	40	30	24	23	19	-473	-353	-163	-124	-100	-76
Total	**121**	**90**	**72**	**56**	**57**	**45**	**-791**	**-592**	**-275**	**-209**	**-168**	**-129**

Note: The pay-as-you-go asset presented in this table excludes the implicit pension liability of the system at the end of the simulation horizon. Therefore, it overestimates the "true" pay-as-you-go asset.
Source: Authors' calculations.

International comparisons show that, despite still favorable demographic conditions in most MENA countries, the estimated IPDs are not among the lowest in the world (see Table 3). In fact, only Eastern European countries, which have older populations and much higher coverage rates, tend to have larger IPDs than Jordan, Djibouti and Morocco. The IPD for Lebanon is among the lowest in the world, while the IPD for Iran and WBG are in the middle of the distribution for non-European countries.

Several factors can explain the international variation of observed IPD/GDP ratios, including the generosity of the system, the level of coverage, its demographic structure, and the level of wages. Holzmann et al. (2004) showed that the current level of pension expenditures can in fact explain up to 60 percent of the international variation of the IPD/GDP ratio. Adding our countries to the original model changes little the results (see Figure 4).

Figure 4: IPDs and Pension Expenditures at the International Level



The doted line refers to the equation estimated in this paper. The continuous line is from Holzmann et al. 2004.
Source: Holzmann et al. 2004 and authors' calculations.

When this simple model is applied to Algeria, Egypt, Libya, Tunisia, and Yemen, for which no data are currently available to directly estimate the IPD, we obtain estimates of 109%, 108%, 91%, 129% and 67% of GDP respectively. Clearly, these estimates incorporate a large error, but one can be confident that IPDs in these countries are above 50 percent of GDP.

Table 3: International Comparison of IPDs in Selected MENA Countries

Country	IPD (Wages/2%)	IPD (Prices/2%)	IPD (Wages/4%)	IPD (Prices/4%)	IPD (Wages/5%)	IPD (Prices/5%)
Brazil	500	362	330	248	275	211
Macedonia	441	356	291	241	244	204
Poland	379	304	261	212	220	181
Ukraine	365	292	257	211	220	183
Romania	386	292	256	199	214	169
Uruguay	295	246	214	182	187	160
Portugal	358	271	233	181	193	151
Hungary	300	212	203	150	171	128
Turkey	217	154	146	109	123	93
Jordan	**240**	**173**	**140**	**105**	**110**	**84**
Costa Rica	203	163	121	100	97	80
Djibouti	**174**	**132**	**119**	**93**	**100**	**79**
Morocco	**172**	**131**	**109**	**86**	**89**	**71**
Philippines	185	146	107	85	81	66
Argentina	106	91	85	75	78	70
Iran	146	110	89	70	72	57
Bolivia	111	92	73	65	62	55
Iran	**134**	**102**	**81**	**64**	**65**	**53**
WBG	**121**	**90**	**72**	**56**	**57**	**45**
México	101	84	65	54	54	45
Chile	77	64	60	50	53	45
Ecuador	103	78	63	49	51	40
Colombia	88	73	56	48	46	39
Lebanon	**83**	**63**	**57**	**45**	**48**	**40**
Mauritius	63	46	47	37	42	33
Senegal	73	51	51	37	44	32
Peru	57	51	40	35	34	30
El Salvador	60	46	43	34	37	29
Korea	57	35	33	21	26	17
Average	**193**	**149**	**128**	**101**	**107**	**86**

Countries sorted by the IPD valued at a 4% discount rate using price indexation.
Source: For MENA countries authors' calculations. For other countries Holzmann et al. 2004.

It is informative to compare the IPD with the explicit public debt. Assuming that pensions are indexed by prices and that the discount rate is 4% per year, the estimated IPDs in five of the six countries are equal or above the explicit public debt (Table 4). In Iran, for instance, the IPD represents 3.2 times the explicit public debt. Only in Lebanon is the IPD relatively low compared to the public debt (25%). This is because the explicit pubic debt is considerably high (over 170% of GDP) but also because there is no pension scheme for private sector workers.

To assess the fiscal impact that the implicit pension debt can have we look at the fiscal balance necessary to achieve a given reduction of the debt/GDP ratio over a given period of time. Formally, this fiscal balance as a percentage of GDP in each year is given by:

$$b^* = \frac{\beta\left[(1+r)^n - (1-x)(1+g)^n\right](1-\theta)}{(1+r)^n\left(1-\theta^{n+1}\right)}, \qquad (6)$$

where β is the debt/GDP ratio, x is the targeted fractional reduction, n is the period of time (measured in number of years), r is the interest rate on the debt, g the growth rate of GDP, and θ = (1+g)/(1+r). Clearly, as β and x increase, so does the required fiscal balance b*.

Figure 5 graphs b* as a function of n for three values of β (0.20; 1; and 2) under the assumption that x=0.5 (50% reduction), g=0.04, and r=0.05. We observe that a doubling of the debt to GDP ratio also implies a doubling of the fiscal balance necessary to achieve a given reduction in this ratio.

Figure 5: Public Debt and the Fiscal Balance

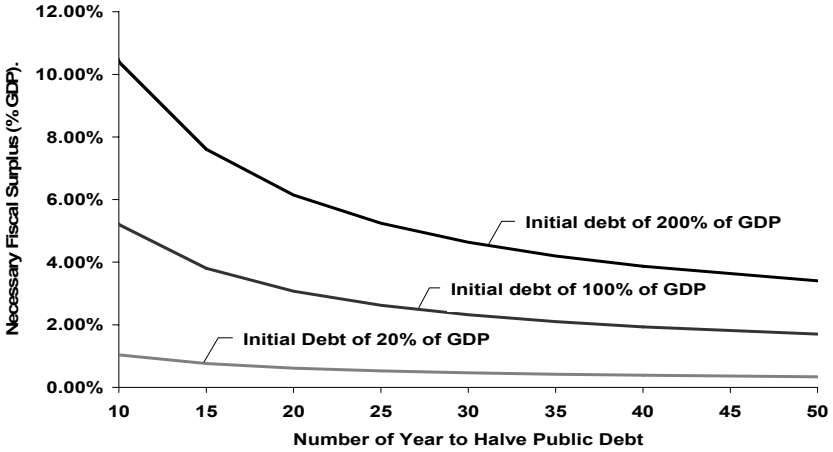


Figure is based on equation (6). The values of the relevant parameters are x=0.5; g=0.04; and r=0.05.
Source: Authors' calculations

We calculate b* for our six countries with and without including the implicit pension debt. The results of the calculations are presented in Table 4. We work under

the conservative assumption that pensions are indexed with prices and that the discount rate is 4% per year. The first two columns provide information about the fiscal balance necessary to reduce the public debt by 50% over a period of 10 years. The next two columns refer to the case where the 50% reduction is achieved over a period of 20 years, while the last two columns consider a period of 30 years.

Table 4: Fiscal Balance Necessary to Reduce the Public Debt With and Without IPD (% GDP)

			Reduce debt by half in 10 years		**Reduce debt by half in 20 years**		**Reduce debt by half in 30 years**	
	Explicit Public Debt	Implicit Pension Debt (IPD)	Explicit Public Debt Only	With IPD	Explicit Public Debt Only	With IPD	Explicit Public Debt Only	With IPD
Djibouti	65%	93%	3.38%	8.22%	2.00%	4.85%	1.51%	3.66%
Iran	20%	64%	1.04%	4.37%	0.61%	2.58%	0.46%	1.95%
Jordan	110%	105%	5.72%	11.18%	3.38%	6.60%	2.55%	4.98%
Lebanon	175%	45%	9.10%	11.44%	5.37%	6.76%	4.06%	5.10%
Morocco	70%	86%	3.64%	8.11%	2.15%	4.79%	1.62%	3.62%

Calculations assume that the GDP grows at 4% per year and that the interest on the debt is 4% per year.
Source: Authors' calculations.

The results of the calculations confirm that current pension liabilities have important implications for fiscal policy. Looking at the case of a 50% reduction over a 10 year period, the inclusion of the IPD implies increases in the fiscal balances necessary to achieve the targets, between 2.34 percentage points in the case of Lebanon to up to 5.46 percentage points in the case of Jordan. With a longer period (30 years) the increases in the fiscal balances would be less traumatic, but still substantial: between 1 percentage point in the case of Lebanon to 2.4 percentage points in the case of Jordan.

5. Discussion and Policy Implications

This paper has shown that the contingent liabilities of the government can be decomposed into the implicit pension debt (IPD) and the pay-as-you-go asset (PA). Estimates for 12 pension schemes across 6 countries in the Middle East and North Africa show that IPDs are considerably high (in the order of 50 to over 100 percent of GDP) and always above the explicit public debt. At the same time, the large majority of the schemes analyzed have negative pay-as-you-go assets.

The implication is that, in the absence of default, current IPDs can only be financed out of current reserves – in general small relative to the IPD – and general

revenues. Governments can continue to "roll-over" the pension debt by "borrowing" new contributions, but this will only delay and aggravate the problem. It follows that considering the implicit pension liabilities as contingencies, as opposed to regular debt, can severely bias the design of fiscal policy and the assessment of debt sustainability. The paper has shown that the fiscal balance targets necessary to reduce debt/GDP ratios can change dramatically depending on whether the calculations include or not the IPD.

The natural recommendation is to formally require countries to report the value of the IPD and the pay-as-you-go asset as part of the portfolio of public sector obligations and to devise appropriate financing mechanisms. There are, however, questions that will need to be addressed before countries start to move in this direction.

One question is what should be the standards to compute and report the IPD, in order to ensure comparability across countries? An initial attempt to develop a standard methodology, which has also been applied in this paper, is presented in Holzmann et al. (2004), but there are still questions and limitations. Setting standards, on the other hand, is likely to be a continuous process. Indeed, problems of standardization still pervade most components of the national accounts in developing countries. Thus, reporting requirements would not need to wait until the perfect methodology is in place.

A second and, arguably, more fundamental question relates to the effects that official reports of the IPD would have on the markets for public debt. Are current investors in government debt already discounting the value of the IPD, or will new reporting criteria open a Pandora box? The evidence from the literature is limited and refers largely to occupational plans. For these plans there is some convincing evidence supporting the idea that markets do pay attention to and discount unfunded pension liabilities. Bulow, Mϕrck, and Summers (1985) report, for instance, that an increase in the implicit pension debt of a company is associated with a fall in the value of its equity. These results confirm previous findings by Feldstein and Mϕrck (1983) and Feldstein and Seligman (1981). Little is known, however, about the relationship between the spreads on government debt and the IPD of the mandatory pension systems. The literature on the cross-country determinants of spreads is also limited (see Eichengreen and Mody, 2000 for a review and recent empirical evidence) and has not looked at the impact of the IPD. A recent study uses the institutional investors rating (IIR)[8] to investigate countries "debt tolerance." (See Reinhart, Rogoff, and Savastano, 2003). The authors show that countries with stories of default and high inflation are penalized by the IIR measure, even with relatively low levels of debt.[9] The implicit pension debt, however, is not taken into account in the analysis.[10] To our knowledge, the question of how the IPD of mandatory systems influences investors' attitudes towards government debt remains more or less open.

[8] The IRR is computed twice a year and is based on information provided by economists and sovereign risks analysts at leading global banks and security firms. The ratings grade each country on a scale from 0 to 100, with a rating of 100 given to those countries perceived as a having the lowest chance of defaulting on their government debt obligations.

[9] The analysis on the paper is actually based on the external debt of the country.

[10] Our own preliminary analysis suggests no correlation between the IPD and the IRR.

Three cases could be considered. In the first case investors would already discount the value of the IPDs when pricing the government debt. In this case, formally reporting the IPD -- and even making explicit this IPD through the issuance of bonds -- would not affect the spreads of government debt. In the second case, while taking into account the IPD when assessing the risk of default of the government, investors would have biased expectations about its level. In fact, often governments and the pension funds themselves are not aware of the value of the IPD. In this case, revealing new information about the IPD and the PA would realign expectations and affect spreads.

The third case, which can co-exist with the second one, would occur when investors do not consider current IPDs an important predictor of the risk of default and do not take it into account in the calculations of spreads on government debt. This could be because investors expect that governments will default on the IPD rather than on the explicit debt or because they expect that governments will continue to roll-over the IPD for still a long time. Since pension crisis tend to be associated with the aging of the population, observations of high young dependency ratios and low old dependency ratios would sustain these expectations. In this case, revealing information about the value of the IPD would not affect spreads. However, making the IPD explicit and adding property rights – for instance by issuing bonds – could change expectations about the likelihood of default and could affect spreads.

We argue that even in case two, where current spreads are not reflecting the level of the implicit pension debt due to investors myopia, countries would be better off by being transparent and reporting the IPD and the pay-as-you-go asset. This is because state two is not stable – investors cannot be fooled forever. Expectations are constantly being updated and investor would eventually learn the true financial position of the pension funds. Governments attempt to hide information would then result in over borrowing and eventually a financial crisis when investors finally learn the facts and refuse to roll-over public debt. This situation can be avoided if the government discloses the value of the IPD along with a credible plan to finance it – in cases where the pay-as-you-go asset is negative. In fact, countries adopting this strategy would be more credible than countries that do not. This is simply because the new information on a given country would force investors to also update their expectations about the value of the IPD in other countries.

At the same time, rating agencies should give higher scores to countries that unveil their pension debt than to countries where an IPD of potential similar magnitude is not disclosed. Finally, international organizations should be more forgiving in terms of targeted fiscal balances in countries where efforts are being undertaken to disclose, control and finance the accumulation of implicit pension debt. This could imply lower surpluses or higher deficits over the short term, but an overall reduction in the present value of the public debt.

As a final comment, we emphasize that Governments can make pension liabilities "explicit" in different ways. Jordan, which recently closed to new entrants the schemes for civil servants and the military and assumed the payment of the current and new

implicit pension debt of the system, simply "added a line" in the budget. Basically, the value of the IPD was disclosed along with a projection of future expenditures to cover the deficits of the two pension funds. These expenditures are treated as current expenditures, similar to wages. As far as we can tell, there were no visible changes in spreads of government debt when the closure of the schemes was announced and the IPD disclosed. If anything, the policy intervention should have been taken with relieve by investors who saw the government committing to put a halt to the irresponsible accumulation of implicit pension debt. On the other hand, it is difficult to imagine that investors' reactions would have been different if the government had issued recognition bonds for individuals' accrued rights. There is no strong reason to believe that the likelihood of default on government bonds (which give property rights to plan members) is higher than the likelihood of default on future pension payments through the general budget.

We argue that more transparent and explicit instruments could also be considered for new pension liabilities in countries preserving earnings related schemes with pay-as-you-go financing, if these are made solvent. In this case, the new IPD, which could take the form of government bonds (tradable or not) would be backed by the pay-as-you-go asset. Mechanisms would need to be in place, however, to introduce corrections – ideally automatic -- when unexpected shocks start to generate systematic divergences between the pay-as-you-go asset and the IPD.

In conclusion, more research is necessary to better understand how investors treat the IPD of a country and how they react to changes in its level under different economic and demographic environments. At the same time, efforts to systematically estimate IPDs across countries should continue. This information should be made available to policymakers and the general public. What should be the appropriate reporting mechanism is a question still open to debate. We argue, however, that there could be important advantages in terms of increased transparency and better fiscal discipline to making, at least the new IPD of reformed earnings related schemes with pay-as-you-go financing, fully explicit, by investing new contributions in appropriately indexed government bonds. In this case, tolerance levels for the public debt would need to be reviewed, in part by looking at the pay-as-you-go asset. The fiscal implications of this approach are explored in a companion paper.

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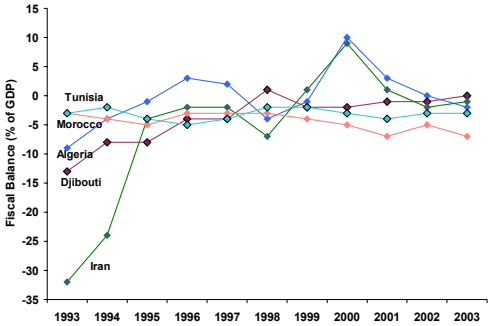
Appendix I: Dynamics of the Public Debt in Selected MENA Countries

Figure A1: Fiscal Balance



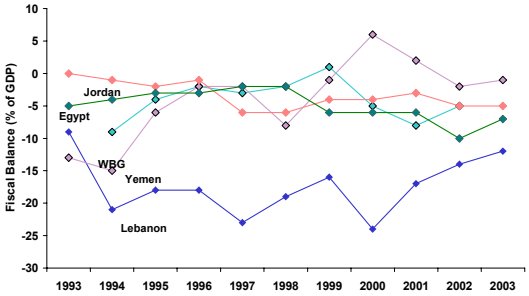
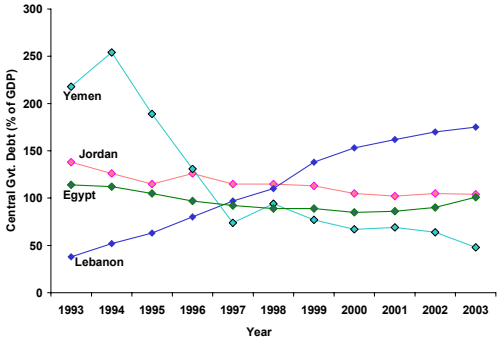
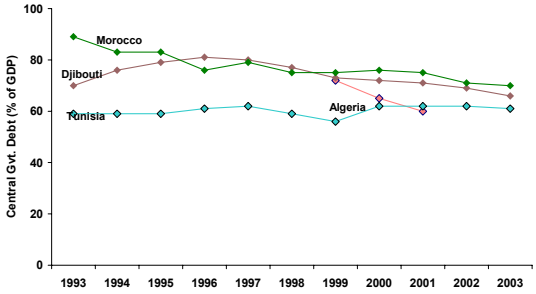


Figure A2: Central Government Debt





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Implicit Pension Debt in the Middle East and North Africa: Magnitude and Fiscal Implications

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ABSTRACT

This paper breaks down the contingent liability of a mandatory pension system into two components: the implicit pension debt and the pay-as-you-go asset. It then estimates these two components for 12 pension schemes across six MENA countries and presents international comparisons. The results show that implicit pension debts are large (in the order of 50% to 100% of GDP), often higher than the explicit public debt. At the same time, the large majority of pension schemes have negative pay-as-you-go assets. Under these circumstances, it is misleading to consider the implicit pension debt a contingency, as the government will have to finance it with almost certainty. In the absence of a default the fiscal impacts are expected to be large. The paper recommends including in the assessment of public debt sustainability the implicit liabilities of the mandatory pension system and the pay-as-you-go asset.

مُلخّص

تقسم هذه الدراسة الالتزامات المحتملة لأنظمة المعاشات التقاعدية الإلزامية إلى قسمين: المديونية الضمنية لخطط المعاشات التقاعدية، والأصول من الاقتطاعات بالتقسيط عند المنبع. ثم تقوم بوضع تقديرات هذين القسمين بشأن 12 خطة معاشات تقاعدية في ستة من بلدان منطقة الشرق الأوسط وشمال أفريقيا، مع عرض مقارنات دولية. وتُبيّن النتائج أن المديونيات الضمنية كبيرة (بنسبة تصل ما بين 50 في المائة و 100 في المائة من إجمالي الناتج المحلي)، وهي غالباً ما تكون أكبر من مقدار الدّيْن العام الصريح. وفي الوقت نفسه، نجد أن غالبية خطط المعاشات التقاعدية معدلاتُ أصولها من الاقتطاعات بالتقسيط عند المنبع سلبية. وفي ظلّ هذه الأوضاع، يكون من المُضلّل اعتبار المديونية الضمنية لخطط المعاشات التقاعدية نوعاً من الاحتمالات الطارئة لأنه ينبغي بالتأكيد تقريباً على الحكومات تمويل تلك المديونية. وإذا لم يحصل العجز عن السداد، فإن من المتوقع أن يكون الأثر على المالية العامة كبيراً. وتوصي هذه الدراسة بتضمين تقديرات القدرة على تحمّل الدّيْن العام الالتزامات المحتملة لأنظمة المعاشات التقاعدية الإلزامية وللأصول من الاقتطاعات بالتقسيط عند المنبع.

RÉSUMÉ

Le document présente une ventilation du passif éventuel d'un régime de retraite obligatoire selon deux composantes : l'endettement implicite du régime de retraite et les actifs du régime fondé sur la répartition (« *pay-as-you-go* »). Il estime ensuite ces deux

composantes pour 12 régimes de retraite de six pays de la région MENA et présente des comparaisons internationales. Les résultats indiquent que l'endettement implicite des régimes de retraite est important (de l'ordre de 50 pour cent à 100 pour cent du PIB), et qu'il est souvent supérieur à l'endettement public explicite. Parallèlement, la vaste majorité des régimes de retraite font montre d'actifs négatifs pour le régime fondé sur la répartition. Dans ces circonstances, il est erroné de considérer l'endettement implicite des régimes de retraite comme un passif, étant pratiquement certain que le gouvernement devra le financer. En l'absence de défaut, les impacts budgétaires sont anticipés importants. Le document recommande d'inclure dans l'évaluation de la viabilité de la dette publique, les passifs implicites du régime de retraite obligatoire et les actifs du régime fondé sur la répartition.

1. Introduction

The proper measurement and monitoring of the public debt and the total external debt of a country are essential for the efficient design of fiscal policy and the prevention of financial crisis. There is an ongoing debate in terms of the most appropriate methodology to measure the level of these debts and assess their sustainability (see IMF, 2004 for a discussion in the case of low-income countries, and a more general discussion on debt tolerance by Reinhart, Rogoff and Savastano, 2003). In all cases, however, the implicit liabilities of the mandatory pension funds are excluded from the analysis. At best, the implicit pension debt is treated as a contingent liability of the government and is not reported as part of the public debt. Unfortunately, it can be shown that when the pension system is not solvent, a large component of the implicit pension debt is actually not "contingent." The probability that the government will have to repay – or default on this debt – is very close to one. Excluding this non-contingent component from the assessment of public debt sustainability can therefore seriously bias the design and implementation of fiscal policy.

The objectives of this paper are to describe the true nature of the contingent liability of the pension systems in selected MENA countries and asses its fiscal implications. We start by breaking down the contingent pension liability into two components: the implicit pension debt (IPD) and the so called pay-as-you-go asset (PA). We then estimate the value of these two components for 12 schemes across 6 MENA countries1 and benchmark the results against those observed in other countries.2 To assess potential fiscal implications, we compute the change in the fiscal balance necessary to reduce the debt/GDP ratio by a given fraction over some period of time, resulting from the inclusion of the IPD in the debt sustainability analysis.

The core of the paper is organized in 4 sections. Section 2 sets the analytical framework by presenting the traditional definition of public debt and characterizing the contingent liability of the mandatory pension system. Section 3 describes the methods and the data used to estimate IPDs and pay-as-you-go assets. Section 4 presents the results of the analysis and assesses fiscal impacts. Section 5 concludes and discusses policy implications.

2. Public Debt and Contingent Pension Liabilities

The public debt, as defined in Government Financial Statistics of the International Monetary Fund (IMF), incorporates public and publicly guaranteed obligations of the central, municipal, and local governments -- as well as other public entities -- with non-government institutions. Although not included directly in the calculation of the public debt, the definition recognizes the existence of contingent liabilities of various public institutions (e.g., state owned enterprises, banks) as well as the pension funds. In this

[1] Countries have been selected on the basis of available information.

[2] The calculation of the IPD is based on the methodology developed in Holzmann et al. (2004), which normalizes assumptions to make results comparable across countries.

section we show why treating the implicit debt of the pension funds as a contingency can be misleading.

In an earnings related pension system that is not fully funded, current promises to pay pensions (pension rights accrued to date) are backed by available reserves as well as future contributions net of future pension payments ensuing from these contributions – the so called pay-as-you-go asset. The contingent liability of the pension funds, on the other hand, is often interpreted as the part of future obligations that, with some probability, cannot be covered by future revenues. Formally, the contingent liability can be defined as:

$$CPL_t = E\left[L_c\left(\mathbf{N_c}, \mathbf{w}, \mathbf{s}; \theta\right) + L_p\left(\mathbf{N_p}, \mathbf{p}, \mathbf{s}; \theta\right) - A\left(\mathbf{N_c}, \mathbf{N_n}, \mathbf{w}, \mathbf{s}; \theta\right)\right] - R_t, \qquad (1)$$

where E is the expectations operator, $L_c(.)$ gives the liabilities of the pension system with current contributors ($\mathbf{N}_c$), which depend on current and future average wages by age ($\mathbf{w}$), a vector of current and future survival probabilities by age ($\mathbf{s}$), and the parameters of the system ($\boldsymbol{\theta}$); L_p gives the liabilities with current beneficiaries ($\mathbf{N}_p$), which depend on the current distribution of pensions ($\mathbf{p}$), survival probabilities, and system parameters (e.g., pension indexation mechanisms); and A(.) is the pay-as-you-go asset, which depends on current *and* new contributors ($\mathbf{N}_n$), as well as wages, survival probabilities, and system parameters; and R_t represents current reserves. The implicit pension liability (IPD) of the system, the accrued to date liability, is given by $L_c(.) + L_p(.)$.

In a solvent pension system one would expect the contingent liability to be equal to or less than zero. In other words, the expected implicit pension liability net of reserves would be at least equal to the expected pay-as-you-go asset. Any deviation from equilibrium would not be systematic, but rather the result of unexpected shocks. Under some designs, automatic rules that adjust $\boldsymbol{\theta}$ to changes in the demographic and economic environment could even eliminate the contingent pension liability. In this case, the IPD net of reserves would be equal to the pay-as-you-go asset in all states of nature.

When the pension system is insolvent, however, the expected contingent liability is positive. That is, under average conditions, the IPD net of reserves would be above the pay-as-you-go asset. At the extreme, it is possible to observe an expected pay-as-you-go asset which is negative. Indeed, it can be shown that the pay-as-you-go asset is equal to the accrued to date pension liabilities (IPD) plus the present value of future cash-balances (which is the negative of the so called financing gap, FG, of the system). Formally, over the infinite horizon, we have:

$$
\begin{aligned}
&A(.) = \sum_t c_t \rho^t - \sum_t p_t^e \rho^t - \sum_t p_t^n \rho^t \\
&IPD = L_c(.) + L_p(.) = \sum_t p_t^c \rho^t + \sum_t p_t^p \rho^t \\
&FG = \sum_t p_t^n \rho^t \sum_t p_t^e \rho^t + \sum_t p_t^c \rho^t + \sum_t p_t^p \rho^t - \sum_t c_t \rho^t \\
&\Leftrightarrow A(.) = IPD - FG
\end{aligned}
\quad , \qquad (2)
$$

where c are contributions at time t, p^e are pension payments accrued by the new contributions of current plan members; p^n are pension payments accrued by the contributions of new entrants to the system, p^p are pension payments to current beneficiaries, and p^c are pension payments to current contributors for the pension rights that they have accrued to date. Hence, if the financing gap of the system is large enough (higher than the IPD), the pay-as-you-go asset of the pension system becomes negative. Basically, future contributions do not generate a surplus in present value that can be used to finance the IPD. On the contrary, the new contributions bring new liabilities that themselves cannot be financed by the system. In other words, keeping the system open to new contributions worsens its long-term financial position.

Having a negative pay-as-you-go asset has important fiscal implications because it implies that only general revenues can be used to finance the IPD.[3] Governments can delay the use of general revenues by continuing to "borrow" contributions to pay pensions, but because these new contributions also bring new pension liabilities, the situation eventually becomes explosive. Under these circumstances, the liabilities of the pension funds do not represent a contingency for the government but rather a real debt that, in the absence of default, sooner or later will need to be financed. When this is the case, excluding the IPD from the analysis of fiscal sustainability of the public debt can lead to severely biased policy recommendations.

The next two sections of this paper are concerned with the estimation of the IPD and the pay-as-you-go asset of pension systems in various MENA countries.

3. Methods and Data

The implicit pension debt is defined here as the accrued-to-date liabilities, or the PBO (projected benefit obligation). It is equal to the present value of the benefits the pension system will have to pay to its current participants (and their survivors) on the basis of their pension rights accrued prior to the year for which the IPD is calculated. The calculation of benefits is made on the basis of future wages (i.e., wages at the time of retirement). Neither future contributions nor new pension rights are included in the calculation. Thus, the IPD shows how much it would cost to discontinue the pension scheme and pay out all obligations (see Holzmann et al., 2004 for a review of various measures of pension liabilities).

[3] Here we abstract from the existence of reserves. As shown later these are usually very low relative to the level of the IPD.

Our estimates of the IPD are based on the World Bank PROST (Pension Reform Options Simulation Toolkit) model. Given limited information in most middle and low-income countries about the vesting period of current contributors and their turnover rates, when computing pension payments for new retirees PROST uses little information about "their past." Thus, it is not possible to differentiate between those future new retirees who are contributors today and those future new retirees who enrolled in the system at a latter date. Similarly, in the case of future new retirees who are contributors today, it is not possible to distinguish between the part of the pension that is associated with rights accumulated to date, and pension rights accumulated through new contributions. In essence, for all new retirees of age a at time t, PROST computes the pension on the basis of an estimate of the average length of service at retirement. However, because the pension payments in year t are related to both pension rights accrued to the date of computing the IPD and pension rights resulting from new contributions (of current and new plan members), a mechanism is necessary to separate the two. For simplicity, PROST increases the share of pension rights accrued from new contributions in direct proportion to time. As an illustration, assume that the calculation of the IPD is made at time t=0, that the average retirement age is 55, and that the youngest age at which individuals join the system is 20. PROST in this case infers that the pension payments to new retirees in year t=1 are all the result of contributions made during the last 35 (55-20) years (i.e., are related to the pension rights accrued to date by current contributors). As t increases, however, the role of past years of contributions has to diminish. Hence, for year t=2, PROST reduces the share of past years by 1/35 -- since pension payments to new retirees now can reflect on year of *new* contributions. Similarly, in year t=3 the share of past years of contributions is reduced by 2/35 and by 3/35 in year t=4. At some point in time, past years of contributions are no longer associated with the pension payments to new retirees, as these result entirely from pension rights accrued through new contributions.

Formally, the accrued to date liability with current contributors is given by:

$$IPD\_C\_P_{t,g} = \sum_{y=t+1}^{T} \left(\frac{PV\_NP_{y,g}}{\prod_{j=t+1}^{y}(1+\rho_j)} NP_{y,g} \left(1 - \frac{y-t-1}{RA\_NP_{t,g} - EA} \right) \right); \quad T < RA\_NP_{t,g} - EA + t + 1, \tag{3}$$

where $NP_{y,g}$ is the number of new retirees of sex g in year y, $RA\_NP_{t,g}$ is the average retirement age of all new retirees of sex g in year t, EA is the age of the youngest contributor, ρ is the discount rate, and $PV\_NP_{y,g}$ is the average present value at time y of the stream of pension payments made to new retirees of sex g between times y and T. For each of these new retirees the present value of the future pension payments is itself given by:

$$PV\_NP_{a,i,t,g} = NB_{a,i,t,g} + \sum_{y=t+1}[B_{a,i,y,g} \cdot \frac{\prod_{j=t+1}^{y}(1-m_{a+j-t,j,g})}{\prod_{j=t+1}^{y}(1+\rho_j)}], \quad (4)$$

where a indexes the age of the individual, i indexes the income category, NB is the first pension payment to the new retiree, B represents the indexed pension at time y, and m_a the mortality rate at age a. A similar approach is used to allocate disability pensions.

The method described above for the calculation of the implicit pension debt with current contributors has proven to provide a reasonable approximation of the "true" IPD in the case systems that have been in operation for over 20 to 30 years. Thus, it is suitable for all pension schemes analyzed in this paper. For younger systems, or systems that start from scratch, the methodology just described tends to overestimate the IPD, as too much weight is given the accrued rights of current contributors.

The liabilities to current beneficiaries comprise liabilities to old age pensioners, disabled, survivors and orphans. The IPD to current old age pensioners is calculated in a more precise way than to current contributors, by following the current age-sex cohorts of beneficiaries over time. Formally, the IPD is defined by:

$$IPD\_OAP_t = \sum_{a,i,g} PV\_OAP_{a,i,t,g} \cdot OAP_{a,i,t,g}, \quad (5)$$

where $PV\_OAP_{a,i,t,g}$ is the present value of the stream of pension payments to a pensioner of age a and sex g, in income category i (see equation 4); and $OAP_{a,i,t,g}$ is the number of these individuals. A similar approach is used to compute the implicit liabilities of current disabled. Obligations to survivors (widows/widowers and orphans) are estimated with a lesser precision. PROST assumes that the share of obligations to survivors in the total IPD to existing old age pensioners and disabled is the same as the share of survivor pension expenditures on total expenditures.

Data and Assumptions

We estimate the implicit pension debt and the pay-as-you-go asset for 12 pension systems across 6 countries in the region. These countries have been selected on the basis of data availability. In the context of a cross country analysis, it is essential to find the right balance between taking into account the idiosyncrasy of a country's pension system, on the one hand, and the comparability of the results, on the other. To this end, we follow the methodology and assumptions developed by Holzmann et al. (2004), which allows for international comparisons. Below we describe the key data and assumptions

regarding demographic dynamics, coverage, retirement patterns, benefit formulas, the finances of the system, and the macroeconomy.

Demography. Population projections are important to compute the *pay-as-you-go asset* because they determine the number of scheme participants by sex and age. The projections are based on information provided by the World Bank's Population Unit regarding the initial population by age and gender, and projections of age-specific fertility and mortality rates for each country. In line with international trends, mortality rates are assumed to decrease over time resulting in growing life expectancy, while fertility rates gradually converge to reproduction level (see Table 1). Decreasing mortality and fertility rates result in population aging and growing system dependency rates.

To follow the different cohorts of contributors and beneficiaries over time, nationwide mortality rates are applied to the members of all schemes. This is because of the lack of mortality rates which are specific to plan members. The use of nationwide mortality rates adds some bias to the projections as coverage rates are relatively low and those who participate in the system are generally middle and high income individuals (particularly in the case of civil servants) who are expected to have longer life expectancies. This would underestimate the implicit pension debt.

Contributors. The initial number of contributors and beneficiaries and their distribution by age and sex are based on actual data provided by the respective pension funds. The initial age distributions of contributors for all considered schemes are compared on Figure 1. Private sector schemes are shown on the left-hand side chart, public sector schemes on the right-hand side. In general, schemes for civil servants have a more mature population because often they were created first.

Table 1: Expected Dynamics of Life Expectancy and Fertility Rates

	Base Year	2020	2040	2060	2075
Life Expectancy at Birth					
Djibouti	42.5	49.8	59.3	67.6	71.7
Iran	69.5	74.5	77.5	81.7	84.5
Jordan	71.3	75.3	77.4	79.9	81.5
Lebanon	70.3	74.0	76.8	79.9	82.8
Morocco	68.1	71.9	74.5	77.3	79.6
West Bank&Gaza	72.3	75.4	77.3	79.3	80.8
Total Fertility Rates					
Djibouti	493%	314%	241%	221%	213%
Iran	250%	211%	210%	208%	207%
Jordan	350%	209%	208%	207%	207%
Lebanon	225%	210%	209%	208%	207%
Morocco	273%	213%	210%	209%	207%
West Bank&Gaza	485%	309%	214%	210%	206%

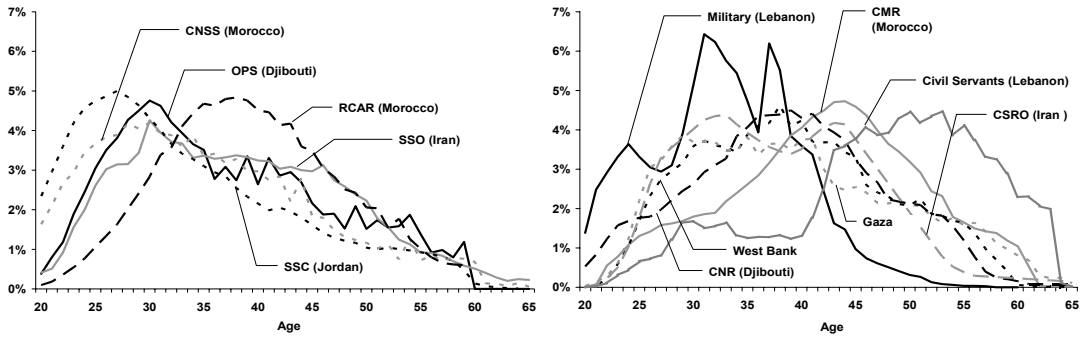
Source: WB Population Unit.

To project the stock of future contributors by age and sex it is assumed, for all schemes and all countries, that current population coverage rates by age and gender remain constant (see Figure 2). This normalization is introduced to facilitate cross-

country comparisons. However, it is important to note that in the presence of growing labor force participation rates, the assumption of constant population coverage implies declining labor force coverage. This is particularly relevant for women in MENA countries for whom participation in the labor market is increasing rapidly. In the case of insolvent systems, and with reasonable estimates for the discount rate, this assumption would overestimate the value of the pay-as-you-go asset.

Beneficiaries. Projections of the future number of disabled and survivors are done, similarly, by holding constant over time the beneficiary to population ratio in each age and gender cohort. The old age pensioners are modeled in a more complicated way. The initial age distribution of the stock of old age pensioners in each pension scheme is given (see Figure 3). For the future, the underlying assumption is that retirement rates,[4] for all ages for which there are retirees today, eventually converge to the current (base year) maximum participation rate across plan members of all ages. For instance, if the maximum ratio between the population of contributors, disabled, and retirees and the total population is 50 percent (observed say at age 40), then the assumption is that over the medium term retirement rates for all ages will converge to 50%. Basically, if 50% is the maximum observed share of individuals of a given age and sex who are in the system today, then 50% becomes a ceiling for the share of individuals across ages and gender who can be retired when the system matures.

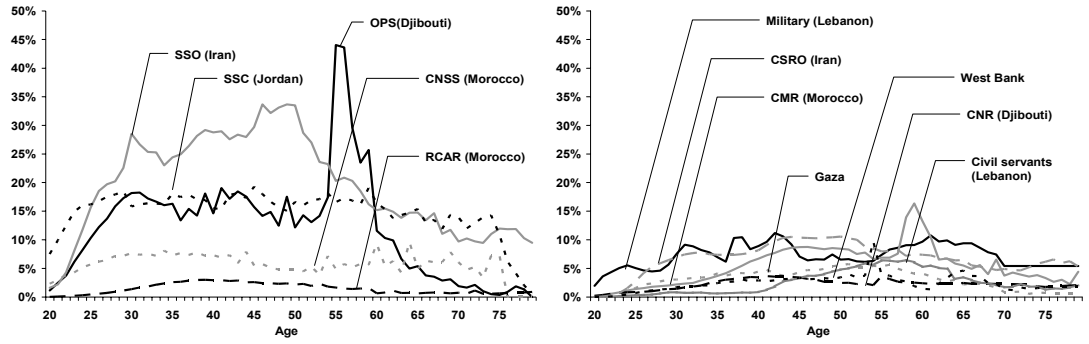
Figure 1: Age Distribution of Current Contributors



Source: Various pension funds

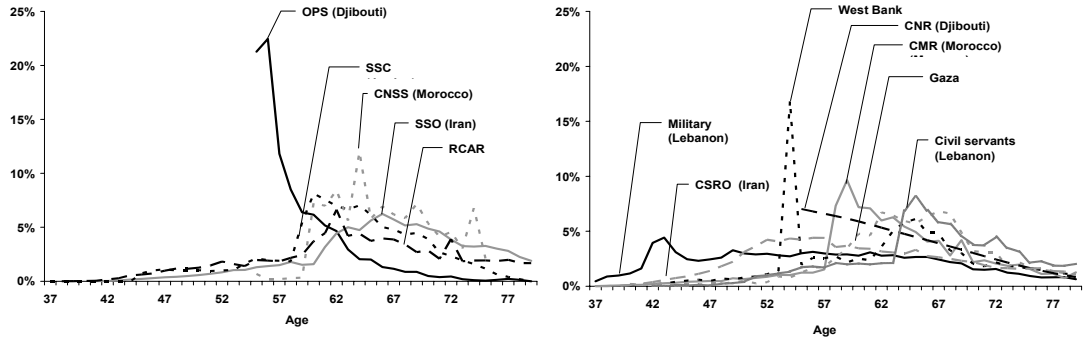
[4] Here by retirement rates we understand the share of old age pensioners and disabled in the population of a given gender at a given age.

Figure 2: Current Coverage Rates of the Population of Contributors



Source: Authors' calculations

Figure 3: Age Distribution of Current Old-Age Pensioners



Source: Various pension funds

Benefit formulas and eligibility conditions. Key system parameters such as the contribution rate, the ceiling on the covered wage, the retirement age and the vesting periods, penalties for early retirement, the income measure, the accrual rate, and rules for revalorizing wages and indexing pensions are based on the latest legislations.[5] Unfortunately, most countries use ad-hoc or discretionary mechanisms to index pensions and revalorize wages. Hence, in the simulations we follow the approach presented in Holzmann et al. (2004) and consider two scenarios: one in which the growth rate of the average covered wage is used to revalorized wages and index pensions, and a second where prices are used (the indexation to prices is implicit since all the projections are made in real terms). The revalorization mechanism can have an important impact in the level of the IPD in schemes with "long" averaging periods that do not revalorize wages, such as the OPS in Djibouti (10 years) and the CNSS in Morocco (8 years).

Revenues and expenditures in the pension systems. In the projections, only pension related revenues and expenditures are considered in all schemes. Payments under social assistance programs and other non-pension expenditures, e.g. health care or

[5] Any reforms that are being introduced after the beginning of the simulation period are taken into account if they were enacted prior to the base year.

unemployment benefits, – if they are covered by the pension or social security fund – are excluded. Contributions or transfers to cover these expenditures are also excluded.[6]

Any negative pension balance or explicit accumulated debt of the pension system at the beginning of the simulation period is ignored – which is the case for CSRO (Iran). This assumes that the initial system deficit has been covered by the government's budget. The current reserves of the system are also not taken into account in the projections. Basically, for transparency purposes, investment income is ignored.

Wages. Actual data on the current average wage of the covered population in each of the modeled schemes are used in the simulations. However, gender differences in wages are uniformly ignored even in cases where information about gender distribution of wages is available. In addition, the age profile of wages is normalized across countries. This is important to compare schemes with different income measures, particularly when past wages are not revalorized as a function of the growth rate of the average covered wage or inflation. We assume that a one year increase in the age is accompanied, on average, by a 1 percentage point increase in wages. This pattern reflects the overall trend observed around the world (see Holzmann et al., 2004).

Macroeconomy. To look at the different systems in a comparable economic environment, normalized macroeconomic projections are used based on the following assumptions: (i) real GDP growth rate is 4%; (ii) productivity growth is 2%; and (iii) the inflation rate is zero (i.e., projections are conducted in real terms). As IPD estimates are highly sensitive to the discount rate used in present value calculations, simulations were done with a range of discount rates varying from a low 2% to a relatively high 5%. Higher discount rates not only reduce the level of the IPDs for all schemes but in some cases they also change their relative position, depending on whether their future unfunded liabilities are more front- or back-loaded. Hence, schemes that have larger expected payments further down the road are favored by high discount rates.

4. Results from the Analysis

The results of the calculations for the various schemes in the six MENA countries are presented in Table 2 . The first six columns provide estimates of the implicit pension debt, while the last six columns present estimates of the pay-as-you-go asset. Each column refers to a combination of the indexation factor for pensions and the discount rate.

A first observation is that in all cases the IPDs are sizable, in general higher for the schemes for private sector workers than for the scheme for civil servants (the exception is Morocco). This is not explained by more generosity in the schemes for

[6] The following "pension related" contribution rates are assumed: CNR (Djibouti) – 20% (pensioners – 10.2%); OPS (Djibouti) – 8% (pensioners – 10.9%); CSRO (Iran) – 22.5%; SSO (Iran) – 18%; SSC (Jordan) – 16.5%; civil servants and military (Lebanon) – 6%; CMR (Morocco) – 17%; CNSS (Morocco) – 9.1%; RCAR (Morocco) – 18%; West Bank – 2%; Gaza – 22.5% (however, currently nobody actually pays contributions). The assumed collection rate is based on the actual data on the current status for each scheme

private sector workers, the opposite tends to be true (see Robalino et al. 2005), but simply by a larger contributory base.

Among the four schemes for private sector workers reviewed (Djibouti OPS, Iran SSO, Jordan SSC, and Morocco CNSS) the largest IPDs across scenarios are observed in Jordan (between 84% and 240% of GDP), followed by Djibouti (67% - 151%), Iran (32% - 82%) and Morocco (22%-50%). Among the schemes for civil servants the highest IPDs are observed in the West Bank and Gaza (between 45% and 121% of GDP), followed closely by Morocco (between 45% and 111% of GDP) and then Iran (21% - 52%), Djibouti (12% - 23%) and Lebanon (11% - 25%). In the only military scheme analyzed (Lebanon) the IPD ranges between 29% and 78% of GDP. The lowest IPDs (between 4% and 11% of GDP) are observed in the scheme for public sector contractual workers in Morocco (the RCAR), which is both smaller and better designed than the other schemes (see Robalino et al., 2005).

Regarding pay-as-you-go assets an important finding of this paper is that in most systems there are none.[7] With the exception of the CNR in Djibouti (recently reformed) and the RCAR in Morocco, all schemes have large pay-as-you-go liabilities (i.e., the pay-as-you-go assets are negative). In Jordan, estimates of pay-as-you-go liabilities for the next 75 years range between 2 and 14 times GDP. With a discount rate of 4% and price indexation of pensions, future liabilities could represent 3 times today GDP. Under the same scenario future liabilities in WBG, Iran and Lebanon would represent 3, 2 and 1.7 times current GDPs respectively. Only in Morocco and Djibouti would future pay-as-you-go liabilities be below current GDP (50% and 10% respectively).

Negative pay-as-you-go assets imply that having the pension systems open to new entrants (and new contributions) worsens their financial position. This is because future generations will not generate a "surplus" to cover the pensions of current plan members. Thus, in the absence of a default, the IPD can only be financed through general revenues. It is therefore important to take into account these liabilities when assessing the fiscal sustainability of the public debt.

[7] It is important to note that the estimates of the pay-as-you-go asset presented in Table 2 overestimate the "true" pay-as-you-go asset. This is because the calculations do not take into account the implicit pension liability of the system in year 2075.

Table 2: Implicit Pension Debt and Pay-as-you-go Assets for Pension Scheme in MENA Countries

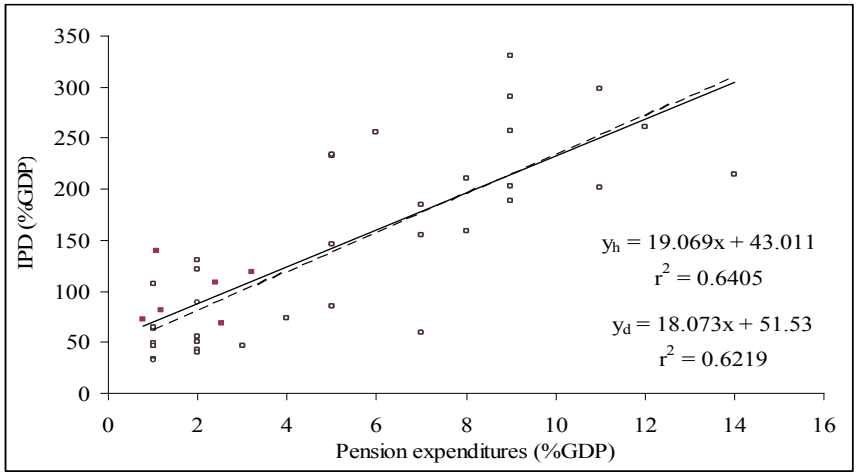
Country Scheme	IPD wage 2%	IPD price 2%	IPD wage 4%	IPD price 4%	IPD wage 5%	IPD price 5%	PA wage 2%	PA price 2%	PA wage 4%	PA price 4%	PA wage 5%	PA price 5%
Djibouti												
CNR	23	19	17	14	14	12	23	36	21	25	18	21
OPS	151	113	102	79	86	67	-309	-172	-262	-35	-38	-10
Total	**174**	**132**	**119**	**93**	**100**	**79**	-286	-136	119	-10	-20	11
Iran												
CSRO	52	38	33	25	27	21	-197	-136	-61	-41	-33	-21
SSO	82	64	48	39	38	32	-536	-420	-171	-133	-97	-74
Total	**134**	**102**	**81**	**64**	**65**	**53**	-733	-556	-232	-174	-130	-95
Jordan												
SSC	240	173	140	105	110	84	-1402	-996	-444	-307	-251	-169
Total	**240**	**173**	**140**	**105**	**110**	**84**	**-1402**	**-996**	**-444**	**-307**	**-206**	**-169**
Lebanon												
CS	25	20	16	13	13	11	-99	-82	-36	-31	-23	-19
Milit. 1	58	43	41	32	35	29	-205	-176	-91	-80	-65	-56
Milit. 2	78	57	53	41	45	36	-323	-265	-139	-116	-96	-81
Total 1	**83**	**63**	**57**	**45**	**48**	**40**	-304	-258	-127	-111	-88	-75
Total 2	**103**	**77**	**69**	**54**	**58**	**47**	-422	-347	-175	-147	-119	-100
Morocco												
CNSS	50	40	32	26	26	22	-154	-117	-47	-34	-26	-18
CMR	111	84	70	55	57	45	-241	-121	-70	-28	-35	-10
RCAR	11	7	7	5	6	4	-15	3	0	7	3	7
Total	**172**	**131**	**109**	**86**	**89**	**71**	**-410**	**-235**	**-117**	**-55**	**-58**	**-21**
WBG												
WB	68	50	42	32	34	26	-318	-239	-112	-85	-68	-53
Gaza	53	40	30	24	23	19	-473	-353	-163	-124	-100	-76
Total	**121**	**90**	**72**	**56**	**57**	**45**	**-791**	**-592**	**-275**	**-209**	**-168**	**-129**

Note: The pay-as-you-go asset presented in this table excludes the implicit pension liability of the system at the end of the simulation horizon. Therefore, it overestimates the "true" pay-as-you-go asset.
Source: Authors' calculations.

International comparisons show that, despite still favorable demographic conditions in most MENA countries, the estimated IPDs are not among the lowest in the world (see Table 3). In fact, only Eastern European countries, which have older populations and much higher coverage rates, tend to have larger IPDs than Jordan, Djibouti and Morocco. The IPD for Lebanon is among the lowest in the world, while the IPD for Iran and WBG are in the middle of the distribution for non-European countries.

Several factors can explain the international variation of observed IPD/GDP ratios, including the generosity of the system, the level of coverage, its demographic structure, and the level of wages. Holzmann et al. (2004) showed that the current level of pension expenditures can in fact explain up to 60 percent of the international variation of the IPD/GDP ratio. Adding our countries to the original model changes little the results (see Figure 4).

Figure 4: IPDs and Pension Expenditures at the International Level



The doted line refers to the equation estimated in this paper. The continuous line is from Holzmann et al. 2004.
Source: Holzmann et al. 2004 and authors' calculations.

When this simple model is applied to Algeria, Egypt, Libya, Tunisia, and Yemen, for which no data are currently available to directly estimate the IPD, we obtain estimates of 109%, 108%, 91%, 129% and 67% of GDP respectively. Clearly, these estimates incorporate a large error, but one can be confident that IPDs in these countries are above 50 percent of GDP.

Table 3: International Comparison of IPDs in Selected MENA Countries

Country	IPD (Wages/2%)	IPD (Prices/2%)	IPD (Wages/4%)	IPD (Prices/4%)	IPD (Wages/5%)	IPD (Prices/5%)
Brazil	500	362	330	248	275	211
Macedonia	441	356	291	241	244	204
Poland	379	304	261	212	220	181
Ukraine	365	292	257	211	220	183
Romania	386	292	256	199	214	169
Uruguay	295	246	214	182	187	160
Portugal	358	271	233	181	193	151
Hungary	300	212	203	150	171	128
Turkey	217	154	146	109	123	93
Jordan	**240**	**173**	**140**	**105**	**110**	**84**
Costa Rica	203	163	121	100	97	80
Djibouti	**174**	**132**	**119**	**93**	**100**	**79**
Morocco	**172**	**131**	**109**	**86**	**89**	**71**
Philippines	185	146	107	85	81	66
Argentina	106	91	85	75	78	70
Iran	146	110	89	70	72	57
Bolivia	111	92	73	65	62	55
Iran	**134**	**102**	**81**	**64**	**65**	**53**
WBG	**121**	**90**	**72**	**56**	**57**	**45**
México	101	84	65	54	54	45
Chile	77	64	60	50	53	45
Ecuador	103	78	63	49	51	40
Colombia	88	73	56	48	46	39
Lebanon	**83**	**63**	**57**	**45**	**48**	**40**
Mauritius	63	46	47	37	42	33
Senegal	73	51	51	37	44	32
Peru	57	51	40	35	34	30
El Salvador	60	46	43	34	37	29
Korea	57	35	33	21	26	17
Average	**193**	**149**	**128**	**101**	**107**	**86**

Countries sorted by the IPD valued at a 4% discount rate using price indexation.
Source: For MENA countries authors' calculations. For other countries Holzmann et al. 2004.

It is informative to compare the IPD with the explicit public debt. Assuming that pensions are indexed by prices and that the discount rate is 4% per year, the estimated IPDs in five of the six countries are equal or above the explicit public debt (Table 4). In Iran, for instance, the IPD represents 3.2 times the explicit public debt. Only in Lebanon is the IPD relatively low compared to the public debt (25%). This is because the explicit pubic debt is considerably high (over 170% of GDP) but also because there is no pension scheme for private sector workers.

To assess the fiscal impact that the implicit pension debt can have we look at the fiscal balance necessary to achieve a given reduction of the debt/GDP ratio over a given period of time. Formally, this fiscal balance as a percentage of GDP in each year is given by:

$$b^* = \frac{\beta\left[(1+r)^n - (1-x)(1+g)^n\right](1-\theta)}{(1+r)^n\left(1-\theta^{n+1}\right)}, \qquad (6)$$

where β is the debt/GDP ratio, x is the targeted fractional reduction, n is the period of time (measured in number of years), r is the interest rate on the debt, g the growth rate of GDP, and θ = (1+g)/(1+r). Clearly, as β and x increase, so does the required fiscal balance b*.

Figure 5 graphs b* as a function of n for three values of β (0.20; 1; and 2) under the assumption that x=0.5 (50% reduction), g=0.04, and r=0.05. We observe that a doubling of the debt to GDP ratio also implies a doubling of the fiscal balance necessary to achieve a given reduction in this ratio.

Figure 5: Public Debt and the Fiscal Balance

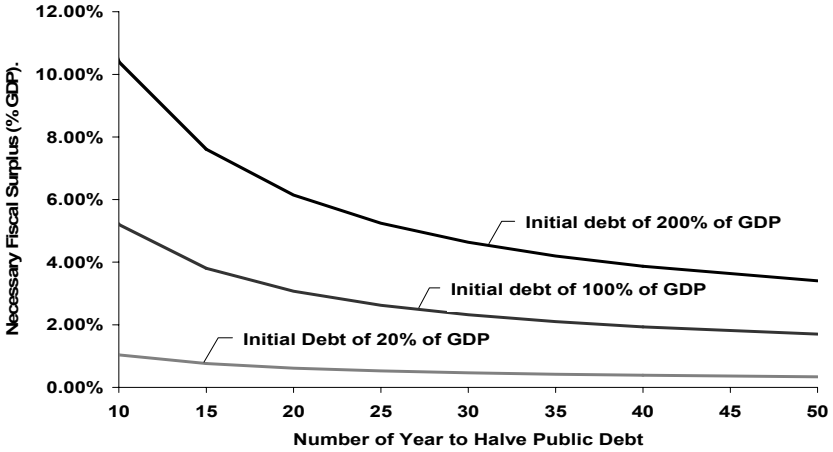


Figure is based on equation (6). The values of the relevant parameters are x=0.5; g=0.04; and r=0.05.
Source: Authors' calculations

We calculate b* for our six countries with and without including the implicit pension debt. The results of the calculations are presented in Table 4. We work under

the conservative assumption that pensions are indexed with prices and that the discount rate is 4% per year. The first two columns provide information about the fiscal balance necessary to reduce the public debt by 50% over a period of 10 years. The next two columns refer to the case where the 50% reduction is achieved over a period of 20 years, while the last two columns consider a period of 30 years.

Table 4: Fiscal Balance Necessary to Reduce the Public Debt With and Without IPD (% GDP)

			Reduce debt by half in 10 years		**Reduce debt by half in 20 years**		**Reduce debt by half in 30 years**	
	Explicit Public Debt	Implicit Pension Debt (IPD)	Explicit Public Debt Only	With IPD	Explicit Public Debt Only	With IPD	Explicit Public Debt Only	With IPD
Djibouti	65%	93%	3.38%	8.22%	2.00%	4.85%	1.51%	3.66%
Iran	20%	64%	1.04%	4.37%	0.61%	2.58%	0.46%	1.95%
Jordan	110%	105%	5.72%	11.18%	3.38%	6.60%	2.55%	4.98%
Lebanon	175%	45%	9.10%	11.44%	5.37%	6.76%	4.06%	5.10%
Morocco	70%	86%	3.64%	8.11%	2.15%	4.79%	1.62%	3.62%

Calculations assume that the GDP grows at 4% per year and that the interest on the debt is 4% per year.
Source: Authors' calculations.

The results of the calculations confirm that current pension liabilities have important implications for fiscal policy. Looking at the case of a 50% reduction over a 10 year period, the inclusion of the IPD implies increases in the fiscal balances necessary to achieve the targets, between 2.34 percentage points in the case of Lebanon to up to 5.46 percentage points in the case of Jordan. With a longer period (30 years) the increases in the fiscal balances would be less traumatic, but still substantial: between 1 percentage point in the case of Lebanon to 2.4 percentage points in the case of Jordan.

5. Discussion and Policy Implications

This paper has shown that the contingent liabilities of the government can be decomposed into the implicit pension debt (IPD) and the pay-as-you-go asset (PA). Estimates for 12 pension schemes across 6 countries in the Middle East and North Africa show that IPDs are considerably high (in the order of 50 to over 100 percent of GDP) and always above the explicit public debt. At the same time, the large majority of the schemes analyzed have negative pay-as-you-go assets.

The implication is that, in the absence of default, current IPDs can only be financed out of current reserves – in general small relative to the IPD – and general

revenues. Governments can continue to "roll-over" the pension debt by "borrowing" new contributions, but this will only delay and aggravate the problem. It follows that considering the implicit pension liabilities as contingencies, as opposed to regular debt, can severely bias the design of fiscal policy and the assessment of debt sustainability. The paper has shown that the fiscal balance targets necessary to reduce debt/GDP ratios can change dramatically depending on whether the calculations include or not the IPD.

The natural recommendation is to formally require countries to report the value of the IPD and the pay-as-you-go asset as part of the portfolio of public sector obligations and to devise appropriate financing mechanisms. There are, however, questions that will need to be addressed before countries start to move in this direction.

One question is what should be the standards to compute and report the IPD, in order to ensure comparability across countries? An initial attempt to develop a standard methodology, which has also been applied in this paper, is presented in Holzmann et al. (2004), but there are still questions and limitations. Setting standards, on the other hand, is likely to be a continuous process. Indeed, problems of standardization still pervade most components of the national accounts in developing countries. Thus, reporting requirements would not need to wait until the perfect methodology is in place.

A second and, arguably, more fundamental question relates to the effects that official reports of the IPD would have on the markets for public debt. Are current investors in government debt already discounting the value of the IPD, or will new reporting criteria open a Pandora box? The evidence from the literature is limited and refers largely to occupational plans. For these plans there is some convincing evidence supporting the idea that markets do pay attention to and discount unfunded pension liabilities. Bulow, Mϕrck, and Summers (1985) report, for instance, that an increase in the implicit pension debt of a company is associated with a fall in the value of its equity. These results confirm previous findings by Feldstein and Mϕrck (1983) and Feldstein and Seligman (1981). Little is known, however, about the relationship between the spreads on government debt and the IPD of the mandatory pension systems. The literature on the cross-country determinants of spreads is also limited (see Eichengreen and Mody, 2000 for a review and recent empirical evidence) and has not looked at the impact of the IPD. A recent study uses the institutional investors rating (IIR)[8] to investigate countries "debt tolerance." (See Reinhart, Rogoff, and Savastano, 2003). The authors show that countries with stories of default and high inflation are penalized by the IIR measure, even with relatively low levels of debt.[9] The implicit pension debt, however, is not taken into account in the analysis.[10] To our knowledge, the question of how the IPD of mandatory systems influences investors' attitudes towards government debt remains more or less open.

[8] The IRR is computed twice a year and is based on information provided by economists and sovereign risks analysts at leading global banks and security firms. The ratings grade each country on a scale from 0 to 100, with a rating of 100 given to those countries perceived as a having the lowest chance of defaulting on their government debt obligations.

[9] The analysis on the paper is actually based on the external debt of the country.

[10] Our own preliminary analysis suggests no correlation between the IPD and the IRR.

Three cases could be considered. In the first case investors would already discount the value of the IPDs when pricing the government debt. In this case, formally reporting the IPD -- and even making explicit this IPD through the issuance of bonds -- would not affect the spreads of government debt. In the second case, while taking into account the IPD when assessing the risk of default of the government, investors would have biased expectations about its level. In fact, often governments and the pension funds themselves are not aware of the value of the IPD. In this case, revealing new information about the IPD and the PA would realign expectations and affect spreads.

The third case, which can co-exist with the second one, would occur when investors do not consider current IPDs an important predictor of the risk of default and do not take it into account in the calculations of spreads on government debt. This could be because investors expect that governments will default on the IPD rather than on the explicit debt or because they expect that governments will continue to roll-over the IPD for still a long time. Since pension crisis tend to be associated with the aging of the population, observations of high young dependency ratios and low old dependency ratios would sustain these expectations. In this case, revealing information about the value of the IPD would not affect spreads. However, making the IPD explicit and adding property rights – for instance by issuing bonds – could change expectations about the likelihood of default and could affect spreads.

We argue that even in case two, where current spreads are not reflecting the level of the implicit pension debt due to investors myopia, countries would be better off by being transparent and reporting the IPD and the pay-as-you-go asset. This is because state two is not stable – investors cannot be fooled forever. Expectations are constantly being updated and investor would eventually learn the true financial position of the pension funds. Governments attempt to hide information would then result in over borrowing and eventually a financial crisis when investors finally learn the facts and refuse to roll-over public debt. This situation can be avoided if the government discloses the value of the IPD along with a credible plan to finance it – in cases where the pay-as-you-go asset is negative. In fact, countries adopting this strategy would be more credible than countries that do not. This is simply because the new information on a given country would force investors to also update their expectations about the value of the IPD in other countries.

At the same time, rating agencies should give higher scores to countries that unveil their pension debt than to countries where an IPD of potential similar magnitude is not disclosed. Finally, international organizations should be more forgiving in terms of targeted fiscal balances in countries where efforts are being undertaken to disclose, control and finance the accumulation of implicit pension debt. This could imply lower surpluses or higher deficits over the short term, but an overall reduction in the present value of the public debt.

As a final comment, we emphasize that Governments can make pension liabilities "explicit" in different ways. Jordan, which recently closed to new entrants the schemes for civil servants and the military and assumed the payment of the current and new

implicit pension debt of the system, simply "added a line" in the budget. Basically, the value of the IPD was disclosed along with a projection of future expenditures to cover the deficits of the two pension funds. These expenditures are treated as current expenditures, similar to wages. As far as we can tell, there were no visible changes in spreads of government debt when the closure of the schemes was announced and the IPD disclosed. If anything, the policy intervention should have been taken with relieve by investors who saw the government committing to put a halt to the irresponsible accumulation of implicit pension debt. On the other hand, it is difficult to imagine that investors' reactions would have been different if the government had issued recognition bonds for individuals' accrued rights. There is no strong reason to believe that the likelihood of default on government bonds (which give property rights to plan members) is higher than the likelihood of default on future pension payments through the general budget.

We argue that more transparent and explicit instruments could also be considered for new pension liabilities in countries preserving earnings related schemes with pay-as-you-go financing, if these are made solvent. In this case, the new IPD, which could take the form of government bonds (tradable or not) would be backed by the pay-as-you-go asset. Mechanisms would need to be in place, however, to introduce corrections – ideally automatic -- when unexpected shocks start to generate systematic divergences between the pay-as-you-go asset and the IPD.

In conclusion, more research is necessary to better understand how investors treat the IPD of a country and how they react to changes in its level under different economic and demographic environments. At the same time, efforts to systematically estimate IPDs across countries should continue. This information should be made available to policymakers and the general public. What should be the appropriate reporting mechanism is a question still open to debate. We argue, however, that there could be important advantages in terms of increased transparency and better fiscal discipline to making, at least the new IPD of reformed earnings related schemes with pay-as-you-go financing, fully explicit, by investing new contributions in appropriately indexed government bonds. In this case, tolerance levels for the public debt would need to be reviewed, in part by looking at the pay-as-you-go asset. The fiscal implications of this approach are explored in a companion paper.

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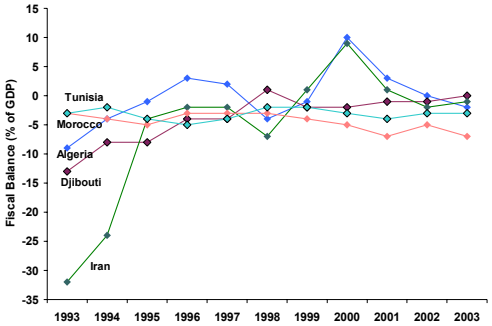
Appendix I: Dynamics of the Public Debt in Selected MENA Countries

Figure A1: Fiscal Balance



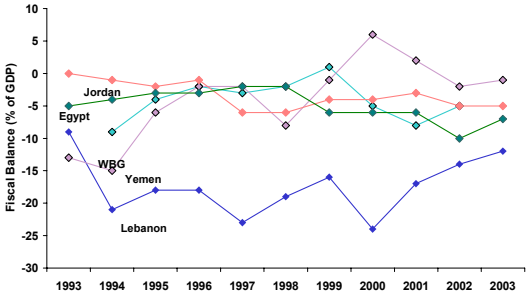
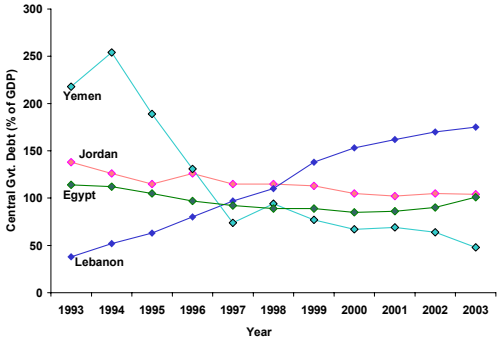
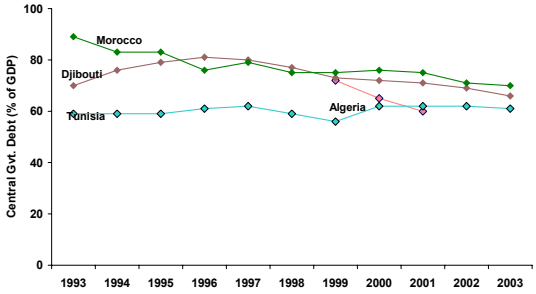


Figure A2: Central Government Debt





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