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*Conceptualizing, measuring and financing the legacy costs in an NDC reform**

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Abstract

The paper provides a framework for the conceptualization, definition and measurement of the legacy costs that needs to be addressed in a reform that transforms an unfunded (or non-financial) defined benefit (NDB) scheme into an equally unfunded notional (or non-financial) defined contribution (NDC) scheme. During a transition from NDB to NDC a financing gap typically arises due to accrued to date liabilities from the old system in excess of the NDC scheme's sustainable flow of benefits. This gap – or legacy cost – needs to be estimated and best explicitly financed. We illustrate different techniques to gauge the scope of the cost. The paper applies the proposed approach to a hypothetical NDC reform in China.

JEL CODES: H55, H68, J21, J26

Keywords: legacy costs, pension reform, NDC, coverage expansion.

1 Introduction

Pay-as-you go (PAYG) pension systems face serious challenges with respect to their sustainability across the world. In developed countries, three major forces are at work: falling fertility rates, increasing life expectancy and significantly lower labor force participation rates of older workers.[1] Many countries in the developing world face similar challenges: though population structures are overall (still) more favorable making the PAYG systems more sustainable in the short-run, other challenges

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[1] See Wise (2012) for a review of recent demographic and trends in labor force participation for a sample of developed countries.

abound with limited coverage, and overly generous benefits due to more immature systems.

A key objective of pension reforms is to put the reformed system on a financially sustainable basis while adjusting the benefits, the retirement age and their link to contributions in order to render the reformed system more equitable across generations, more affordable fiscally and less distortionary. This applies to parametric reforms to a non-financial defined benefit (NDB) system as well as the move toward a non-financial (or notional defined) contribution (NDC) scheme. In many (or nearly all cases), this implies the move from a more generous toward a less generous benefit structure. For an NDC system, this translates into setting a lower cost-covering contribution rate for the future steady-state with the need to monitor risk to benefit generosity and adequacy as the life expectancy increases.

While raising contribution rates is the third major lever in the hand of political decision-makers, this tool features less prominently in longer-term plans to ensure system sustainability throughout the demographic transition and beyond. The reason is rather simple: faced with the major demographic challenges, raising extra revenues in the magnitudes required is politically and economically unfeasible as it would risk choking off the economy. Even more strongly, many reforms explicitly target a *lower* contribution rate as current contribution levels are often seen as putting an excessive burden on labor, and hence contributing to unemployment of the labor force.

NDC reforms can be positioned in this setting. In an NDC system – while still obeying the logic of a PAYG system – future benefits are strictly linked and adjusted to the contributions that were made during the working life. As compared to the NDB incumbents, NDC systems explicitly focus on benefit adjustments to ensure system sustainability. Contribution levels are fixed at a certain point in time and benefits and/or retirement age endogenously adjusted to meet the budget constraint. While any such change is rather easy to design for new contributions paid into the system, the situation is much more complicated with respect to accrued-to-date (ATD) liabilities.

The legacy of existing commitments to current and future retirees under the old NDB system (due to acquired rights (AR)) may not allow a simple switch from an NDB to an NDC system. While in all generality, these commitments include all liabilities toward current and future beneficiaries related to past and future contributions, we espouse a more restrictive definition by focusing on the concept of implicit pension debt (IPD) based on pension rights that ATD (see Holzmann, 1998; Holzmann *et al.* 2004). This IPD corresponds to the shutdown cost of the system if all AR were honored.

The legacy cost of a system, in turn, relates to the ATD liabilities above and beyond a sustainable level. In fact, the NDB system may have promised levels of benefits to contributors that go well beyond the ones that the reformed NDC system could possibly guarantee – the legacy cost. Such commitments often need to be partly or fully honored for social, political or purely legal reasons. Hence, there is the key issue of how the legacy cost should best be addressed and financed in a transition.

To finance this legacy cost of an NDC reform, different solutions exist. The first alternative consists of using some tools that are often used in the context of parametric NDB reforms. Two prominent examples are annual (gap-filling) transfers from general revenues, as well as the transfer of the proceeds of asset sales to the pension system. While increasing short-run revenues, they clearly weaken the tax-benefit linkages relating to social insurance contributions. Another example is the reduction of benefits below the level that would be sustainable given the current contribution rate. Excess contributions are used to finance the legacy cost associated with the old system. *De facto*, such a policy implicitly taxes current and future generations as they receive lower benefits per unit of contribution. Keeping such a tax element implicit contradicts the very objective of the reform as it further contributes to weaken incentives. Individuals might perceive the overall contribution rate as a pure tax, though only the excess contributions above and beyond the steady-state level truly are pure taxes. Such a tax overhang of social insurance contributions has led to calls for more explicit financing of the legacy cost – and thus to estimate it. The same logic applies to other tools often used in the context of defined benefit (DB) pension plans.

A second alternative is to separate the insurance from the tax element under the form of two separate contributions on wages. First, the contribution to the NDC system would be a true social insurance contribution with a strong tax–benefit linkage, and hence little efficiency loss. Second, a pure tax component would clearly be indicated as such. While resolving the incentive issue regarding the NDC system, such a strategy does not ensure that revenues are raised in the least distortionary way possible by narrowly focusing on labor income as the tax base for this extra tax.

The third approach with more promising features consists in fully separating the financing of the legacy cost and shifting it to general revenue financing, particularly to minimize the social marginal cost of raising revenues by using the most efficient tax instruments. Whether such a separation is practically feasible will heavily depend on the effective availability of sufficient budgetary resources.

While the arguments for an explicit financing of the legacy costs of pension reform seem strong, the actual practice looks bleak and unimpressive. No recent parametric reform has undertaken even a partial explicit financing of the legacy costs; the same applies to the NDC reforms introduced in Italy, Latvia, Poland, and Sweden (see Palmer *et al*. 2012). While many good political economy arguments may explain such a behavior, it may also be the result of a lack of interest in or guidance by the pension reform community on the topic. There is hardly any literature on how to define, how to measure, and how to finance such a legacy cost. To do so is the purpose of the paper and the suggested structure is as follows.

Section 2 explores possibilities to conceptualize and define the legacy costs. Section 3 proposes alternatives on how to estimate legacy costs, while Section 4 reviews approaches and issues of how to finance them. Section 5 illustrates the measurement approach with broad estimates for a hypothetical NDC reform in China. Key conclusions are summarized in Section 6.

2 What are legacy costs made of?

In order to conceptualize legacy costs, we follow a stepwise approach. First, we use the framework of a simple stylized three-generation overlapping generations (OLG) model to define legacy costs under different assumptions regarding system sustainability and reform. In the second step, we then move to a more operational framework that applies these notions to real-world situations and indicators.

2.1 Legacy costs in simple OLG setting with a PAYG DB system

We position the discussion in a simple three-generation OLG model with individuals having a three-period life. We assume that each generation works for two periods and is retired in the third. N is the size of the generation, b the benefit level, c the contribution rate, w the wage level (differentiated between old and young workers), and t is a subscript that denotes the respective periods we consider.[2]

We are particularly interested in the financial situation of the pension scheme in each period. For pure reasons of simplicity, and without loss of generality, we position the discussion in the context of an unfunded (PAYG) NDB scheme. First, the issue of AR or ATD liabilities that a government cannot renege can be most easily isolated in an unfunded NDB scheme.[3] Second, the budgetary impact of various policy options can be easily summarized by the NDB system's balance.

The system we position ourselves in is thus a simple PAYG system where two generations of workers (old – o, young – y) are active and finance the benefits of the generation of retirees that was an old worker 1 period ago, and a young worker 2 periods back. We have

$$b_t N_{t-2} = c w_t^{o} N_{t-1} + c w_t^{y} N_t, \tag{1}$$

$$b_t = c w_t^{o}(N_{t-1}/N_{t-2}) + c w_t^{y}(N_t/N_{t-2}) = c(1+g)(1+n)[(1+g)+(1+n)] w_{t-1}^{y}, \tag{2}$$

$$b\% \approx g + n\{+\delta\}. \tag{3}$$

From the balancing condition (1) we can calculate the benefit level and simplify the expression (2) by inserting constant generational growth rates for wages (g) and size of generations (n). Differentiating by time and simplifying gives us an approximation for the growth rate of benefits (or internal rate of return (IRR)). In expression (3) the well-known result about the IRR of a PAYG system being equal to growth rate of wage (i.e., productivity) plus growth rate of generation size (i.e., labor force) has an additional item – the change in turnover duration.[4] This is the money-weighted average time a contribution unit stays in the system before getting disbursed. In our steady-state model, the turnover ratio is constant and hence the change (δ) zero.

[2] We introduce the model in rather general notation, but will at times simplify without loss of generality.
[3] Conceptually similar issues arise in an NDC context – notably in the presence of a system exposed to shocks.
[4] For a more general presentation and further references see Settergren and Boguslaw (2006) and Robalino and Bodor (2009).

Table 1. *Steady-state – no deficit*

	$t-1$	T	$t+1$	$t+2$
E (expenditure)	$b_{t-1}N_{t-3}$	b_tN_{t-2}	$b_{t+1}N_{t-1}$	$b_{t+2}N_t$
R^o (revenue)	$cw^o_{t-1}N_{t-2}$	$cw^o_tN_{t-1}$	$cw^o_{t+1}N_t$	$cw^o_{t+2}N_{t+1}$
R^y (revenue)	$cw^y_{t-1}N_{t-1}$	$cw^y_tN_t$	$cw^y_{t+1}N_{t+1}$	$cw^y_{t+2}N_{t+2}$
B (balance)	0	0	0	0

Table 2. *Moving from a higher to a lower contribution and benefit level*

	$t-1$	t	$t+1$	$t+2$
E	bN_{t-3}	bN_{t-2}	$b(3/4)N_{t-1}$	$b/2\ N_t$
R^o	cwN_{t-2}	$c/2\ wN_{t-1}$	$c/2\ wN_t$	$c/2\ wN_{t+1}$
R^y	cwN_{t-1}	$c/2\ wN_t$	$c/2\ wN_{t+1}$	$c/2\ wN_{t+1}$
B	0	$-bN/2$	$-bN/4$	0
	or	$-cwN$	$-cwN$	

In reality, and when using multi-generation OLGs, this is not the case and thus has some bearing on measuring and financing the legacy costs.

Table 1 illustrates the characteristics of the steady-state of our NDB system in the benchmark case with no structural deficit – i.e., no implicit debt.

For our next step, we can move without loss of generality to a static model in which g and n are both zero. As wages and derived benefits are constant we can drop the time index of the variables. We only keep it for N to differentiate the cohorts across time.

We assume that the society wants to move toward a lower contribution rate and benefit level (half of the original one), while respecting contribution-based AR – a scenario represented in Table 2. It is easiest to think of this change in the context of a parametric change to the NDB scheme (or change to an NDC scheme). By starting the reform in year t, benefit and expenditure levels are unchanged while contribution revenues are already reduced. The idea behind this assumption of unchanged benefits is that these benefits were promised to the generation $t-2$ in the past based on their contribution level, and for social, political or legal reasons benefit reduction to reflect the new revenue situation of the system is impossible. Reducing the contribution rate immediately for all working generations thus leads to a shortfall of half of the original expenditures or revenues in period t. This shortfall is halved in period $t+1$ as the benefit levels can already be reduced without infringing on AR. In period $t+2$, the new steady-state is reached. A different time profile of the system balance would be achieved only if the generation of labor market entrants were subject to a contribution cut.

The legacy costs of this pension reform are the present values of the balances in the transition period [$-cwN(3/2)$ or $-bN(3/4)$], which correspond to the payments in excess of those that can be afforded under the new steady-state contribution level.

Table 3. *Eliminating a pre-existing deficit of the pension plan*

	$t-1$	t	$t+1$	$t+2$
E	$b_{t-1}N_{t-3}$	b_tN_{t-2}	$b_{t+1}N_{t-1}$	$b_{t+2}N_t$
R^o	$cw^o_{t-1}N_{t-2}$	$cw^o_tN_{t-1}$	$cw^o_{t+1}N_t$	$cw^o_{t+2}N_{t+1}$
R^y	$cw^y_{t-1}N_{t-1}$	$cw^y_tN_t$	$cw^y_{t+1}N_{t+1}$	$cw^y_{t+2}N_{t+1}$
B	$-(b_{t-1}N_{t-3})/2$	$-(b_tN_{t-2})/2$	$-(b_{t+1}N_{t-1})/2$	$-(b_{t+1}N_t)/2$

As the system starts in balance in $t-1$ and ends up again in balance in $t+2$, the legacy cost and the reduction of the IPD (or accrued to date liabilities) of the system are identical ($bN3/4$). The IPD at the beginning of period t consists of the liabilities to the generation of retirees in this period (N_{t-2}) and to the generation of older workers (N_{t-1}) that have accumulated rights in period $t-1$. Similarly, when casting the problem in terms of a transition to a funded (DB or defined contribution (DC)) or an NDC system, the change in contribution levels can be interpreted as a change from a high level of contributions to an unfunded DB scheme to a lower level of contributions to a funded/NDC pillar. The legacy costs are then simply the finite transition costs of the (N)DC reform (see Holzmann 1998, 1999).

As a third step we consider the elimination of an inherited imbalance in period $t-1$ and investigate the policy options and implications in period t or beyond (Table 3). For simplicity, we assume that the imbalance of the system is permanent and constant (say a half of expenditure). Under these assumptions, the actuarial deficit of the pension scheme is infinite if measured across all future generation. The actuarial deficit for all generations that have already contributed to the scheme is finite and amounts to $b_tN_{t-2}/2+b_{t+1}N_{t-1}/4$ at the beginning of period t.

With regard to the size of the legacy costs to be financed, it depends on the commitment the government wants to honor. If the government wants to honor the full benefit level (independently of how much own contributions this reflects) it is equal to the time period actuarial deficit $b_tN_{t-2}/2+b_{t+1}N_{t-1}/4$. If the government wants only to honor the commitment based on own contributions – in our example 50 % – it is lower by the same percentage.

Under such settings the elimination of the deficit for period t and beyond is limited to three key options:

(i) A reform that cuts the benefit levels that are out of sync with the level of contribution rates by 50 %. This can be done by reneging on the excess benefits for individuals of generation N_{t-2} and N_{t-1}. While people retiring in period t have no chance to prepare for the reduction through, e.g., increased personal savings or a modified labor supply, those retiring in period $t+1$ have the opportunity to save in period t to compensate for the lower future benefit level. In this case no legacy costs emerge of this reform and the burden falls on the pensioner generations of period t and $t+1$.

(ii) A reform that cuts the future benefit level by 50 % but shelters the generation of pensioners in period t and $t+1$. Only as of period $t+2$ would the reform

fully take hold. In this case, it is the generation of workers in period t and $t+1$ would already have their benefits aligned with their contribution efforts (inclusive that from employers). In this case, the deficit sequence would be $-(b_t N_{t-2})/2$, $-(b_{t+1} N_{t-1})/4$ and 0 for the periods t, $t+1$ and $t+2$, respectively, and this would be equal to the legacy costs the government would have to finance. The legacy costs are lower than the present value of the deficits for these periods.

(iii) A reform that doubles the contribution rate for the workers as of period t while keeping the benefit level as before. In such an approach there would be no legacy costs; they would be paid by the current generation of workers while all current and future workers would have their future pensions aligned with their contributions.

Most real-world pension reforms are a mixture of addressing both an inherited deficit as well as moving toward a benefit and contribution level that is more sustainable. This can be conceptualized in our model above as a temporary deficit resulting from too high promises and benefits to the generation $t-2$ and $t-1$ with no further future deficits from period $t+2$ onward as the benefit level would be reduced. There are two key sources of the legacy costs: the inherited legacy costs reflecting the structural deficits in the pre-reform system and reform-induced new legacy costs due to the shift toward a lower sustainable contribution rate. The elimination of a temporary deficit (as the result of too much generosity toward prior generations) can be done by reducing the AR (e.g., for expected benefits beyond the present discounted value of contributions), burdening the working generation (with higher contributions) or paying for the deficit with general revenues. Burdening the working generation through higher contributions instead of paying the transitory deficit out of general revenues does not change the overall fiscal requirement but may be more costly for society once labor supply and demand is endogenized.

2.2 Legacy costs in a macroeconomic accounting framework

Pension reforms typically try to address a multitude of issues simultaneously such as handling the financing of high AR of prior generations, bringing different schemes into one system, and reducing the future benefit (and contribution) level of a more harmonized system. Each of them contributes to an overall transitory deficit that differs from the aggregated base-line deficits of the unreformed schemes. The difference between the transitory and base-line deficits is not the overall legacy costs but an amalgam that may or may not lead to a useful interpretation. If the present value of deficits over the next, say, 50 or 75 years are calculated (as proxy of the respective actuarial deficits) and pre-reform and reform values compared, this gives a useful indication about the overall fiscal savings, but not about the legacy costs that should, perhaps, be financed by general revenues.

However, these multiple reforms within an NDC framework are intended to bring the (harmonized) system on a long-term financially sustainable basis and hence making the actuarial deficit finite. Furthermore, as no other revenues are available than contributions, this very actuarial deficit of the reform scheme constitutes the

(aggregate) legacy costs that need to be financed. Analytically, the sources of the legacy costs can be differentiated depending on the scope of reform such as:

- Any acquired and honored rights of current retirees and contributors reflecting leftovers of prior reforms that have not previously been addressed through explicit legacy financing – hence surpassing the steady-state benefit level of the current system. Such old legacy costs exist in any case but were typically contribution and very rarely general revenue financed.
- The acquired and honored rights of current retirees and contributors in excess of the sustainable benefits under the new contribution rate. These are new legacy costs that result from the transition from the old to the new and lower contribution rate equivalent to the (partial) move from an unfunded to a funded system. Hence the scope of these legacy costs depend on a political decision as to how much the contribution rate and future benefits should be downward adjusted.
- The acquired, honored and perhaps, non-contributory rights of additional groups were brought into the NDC scheme (such as civil servants). Such rights are already to be honored by the government and do not reflect new financial engagements of the general government as they would have to be financed in any case. Their inclusion has two effects. First, it makes these extra costs explicit. Second, it likely reduces overall fiscal costs in the long run as their benefit level often is structurally higher, hence transforming a larger implicit debt into a smaller finite legacy cost.[5]

These components of the legacy costs can be estimated separately in the context of an NDC reform and provide useful information for *ex ante* reform design and *ex post* evaluation of the magnitude of gross versus net fiscal costs. We propose an approach based on aggregate indicators to estimate these elements. When an NDC system is in equilibrium, it respects the following budget constraint that applies to any unfunded system.

$$K_t + P_t = L_t \leqslant A_t = FA_t + PA_t + LC_t. \tag{4}$$

The left-hand side of (4) is the liability of the reformed NDC pension system on day one – L_t – and differentiates between the two key components: the liability toward current working generation and that toward the already retired. The latter – P_t – easily calculated as the present value of benefits in disbursement to the retired; while respecting the rights of existing retirees with the reform the value may reflect changes in indexation rules through the reform. The liability toward the current generation – K_t – reflects their accrued rights and in the case of an NDC system the aggregate value of the individual accounts.[6] At the beginning of the reformed system these account values reflect the initial capital that has been recorded and is

[5] The lower future benefits of these new groups of participants may come at a certain cost. If participants are fully or partially compensated by supplementary occupational schemes, additional future outlays will emerge for the plan sponsors and need to be taken into account.

[6] In a NDB system, K is replaced by the value of the AR that the workers have accrued in the unreformed system. AR + P represent the ATD liability of the DB system.

derived from a calculation that transformed acquired future rights of the unreformed system into an 'equivalent' monetary amount in the reformed system.

The right-hand side reflects the assets side of the reformed pension system on day one – A_t – and differentiates between the three key components: the financial asset that the scheme has inherited – FA_t. In most cases this may be small or zero; in some cases (such as in Sweden) amounting to a major share of GDP inherited from the pre-reform scheme. The PAYG asset of the reformed NDC pension scheme – PA_t – defined and estimated as the present value of future contributions minus the present value of the corresponding benefits (see Valdes-Prieto, 2005). If the future schemes were to be perfectly actuarially fair, the PAYG asset would be zero (and all liabilities would need to be covered by the financial assets). Hence, any positive value that results from giving the future beneficiary a lower remuneration on their accounts than derived under a funded system. The assumed underlying positive difference between funded and unfunded rate of return (i.e., $r \geqslant g+n$) is akin to a tax and creates the PAYG assets.[7] The last asset and hence the residual is the legacy cost – LC_t. Without such an asset (and the financing by general revenue), the system would need to adjust the liability side to respect the equilibrium condition (4).

This (residual) definition of legacy costs can be used very handily to compare the changes in the components in equation (4) before and after the reform, at the time of starting the reform:

$$\Delta LC_t \geqslant \Delta K_t + \Delta P_t - \Delta PA_t - \Delta FA_t \tag{5}$$

While each of the four components on the right-hand side of the equation may change, the financial assets are quite likely to remain unchanged as a direct result of the reform (i.e., $\triangle FA_t = 0$). A second component that is likely to exhibit little change is the present value of benefits to existing retirees, albeit the reform may introduce changes such as modified indexation, e.g., moving from mixed wage–price indexation to mere price indexation (i.e., $\triangle P_t \leqslant 0$). The third component is more likely to display some changes. It relates to the present value of accrued rights of the working generation (K_t). While an actuarial translation of the AR should keep them unchanged, their often not fully defined nature and the strategic choice of a discount rate may allow for some reform gains (and hence $\triangle K_t < 0$). Last but not least, the PAYG asset (PA) as the fourth element on the right-hand side has the highest probability of change and exerts most influence on the size of the legacy costs (except, perhaps, the existing legacy costs of the unreformed system – LC_t^u). For the PAYG asset both size and sign need to be assessed. The unreformed scheme may exhibit a low (or even highly negative) PAYG asset if the scheme was fiscally unsustainable (e.g., providing a rate of return in excess of the sustainable IRR) resulting in implicit financial liabilities. Moving it toward an NDC scheme under the prevalent contribution rate makes the scheme financially sound for new contributors, and the PAYG asset and its change positive and large – thus contributing to a reduction of the legacy cost. This change in the PAYG asset eliminates any existing implicit financial liability of the old

[7] There is an ongoing debate and continued analytical work over the properties and similarities of the PAYG asset versus a Swedish-type contribution asset; see Vidal-Melia and Boado-Penas (2010) and Boado-Penas and Vidal-Melia (2012).

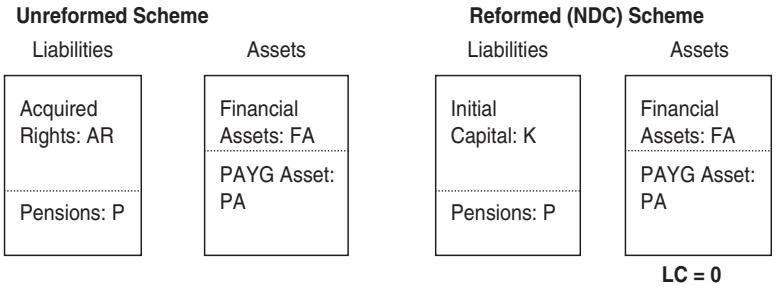

Chart 1. Balance sheet: no legacy costs.

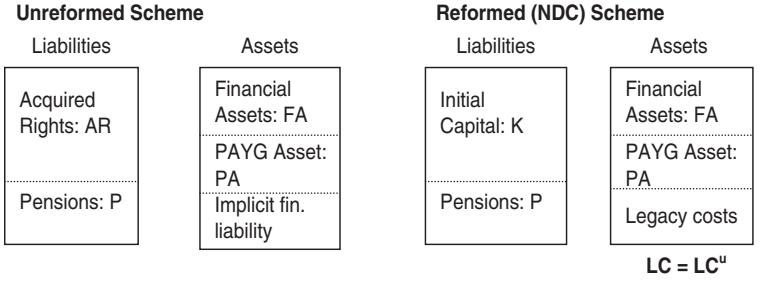

Chart 2. Balance sheet: inherited legacy costs.

scheme for future generations but will still leave old legacy costs. In addition, if the system moves toward a lower contribution and benefit level, the tax base for financing the liabilities are reduced (even if the new system is in fiscal balance) and this increases the legacy costs. The stronger the reduction, the higher in absolute terms is $\triangle PA_t$ if the level of contributors remains unchanged. However, the reduction in the contribution rate and the alignment with future benefit levels are expected to increase coverage, and the overall effect may be very strong in countries where coverage has been low. This may not only compensate for part of the negative change, but may actually create a negative legacy costs (reserve), discussed below. Finally, expression (5) covers only the change in the legacy costs to the unreformed scheme. Hence, for the full costs at the beginning of reform the legacy costs of the unreformed system need to be added $-LC_t^u$. As the permanent elements of unsustainability are addressed by the change in PAYG asset, it includes only the temporary elements of unsustainability, i.e., the inherited legacy costs of prior reforms that were not properly addressed. To illustrate the considerations above, Charts 1–4 present 4 typical examples of the possible changes to the balance sheet of the pension scheme before and after NDC reform. The total costs to be financed are summarized in equation (6)

$$LC_t = LC_t^u + \Delta LC_t. \tag{6}$$

Equations (5) and (6) substantiate the starting definition of legacy cost based on the introspections of the OLG model that highlighted the basic cases that need to be differentiated. With this background we can move toward a measurement of these

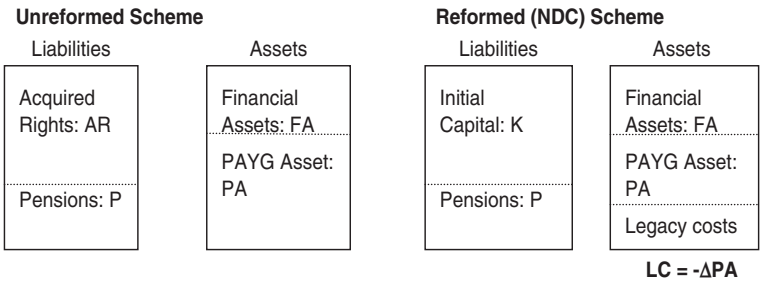

Chart 3. Balance sheet: reform-created legacy costs.

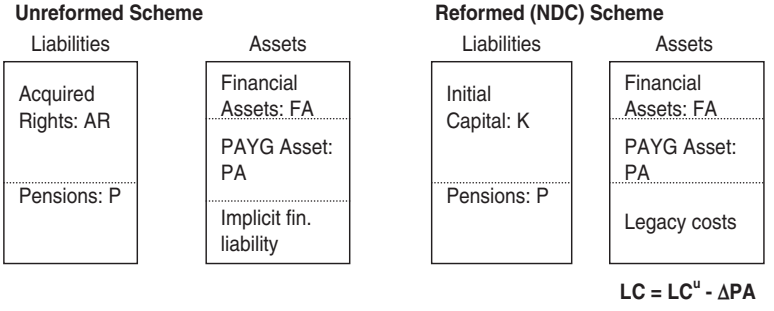

Chart 4. Balance sheet: inherited and reform-created legacy costs.
Sources for chart 1 to 4: Author's presentation.

costs. The discussion also made it clear that the concept and definition of legacy costs for an NDC reform do not differ materially from that of a (parametric) NDB reform, or any other pension reform applied to a funded or unfunded system, DB or DC. What will change are the size and sometimes sign of the different components.

The presentations of Charts 1–4 translate the equations into a graphic balance sheet that is often more easy to read. Chart 1 highlights that an NDC reform that does not include any legacy cost is essentially a renaming of balance sheet items, specifically the AR of an NDB scheme (not yet under disbursement) are translated into initial capital under an NDC scheme. Chart 2 highlights that an inherited legacy cost of an unreformed DB scheme was already there but the implicit financial liability typically not made explicit. Chart 3 highlights that a reduction in the contribution rate under the reformed NDC scheme leads to a lower PAYG asset and the legacy costs is equal to the change in the PYAG asset. Last but not least, Chart 4 combines and highlights both key types of legacy costs – inherited and reform-induced – as they are likely to present in most actual NDC reforms.

3 How to measure legacy costs?

In principle, the best approach is to measure the legacy costs of a pension system by means of actuarial methods. It allows precise estimates of the financing gaps (tax overhang) for the new and reformed system both as overall amount as well as in terms

of the time path. This approach has methodological merits: the adage goes that an actuary can calculate everything given a price and quantity structure. It is, however, often precisely the lack of a meaningful and reliable price and quantity structures that makes estimates difficult. First, not all of the necessary data will be available and will need to be approximated. This is a particularly important limitation in the context of low- and middle-income countries with severe data limitations.

Second, the concept of actuarial studies is more easily applied to company schemes and requires in the case of country-wide schemes, the introduction of macro-economic considerations to render the assumptions consistent. A special challenge for country-wide schemes poses the selection of the appropriate interest to be applied for discounting. While the use of the term-structure of government bonds may be a valid approach, only in the most developed countries with a full-blown financial market are bond interest rate term-structure for 30 years available. And even if they are available their use may not be fully embraced as they do not necessarily reflect all future information but current conditions of fiscal and monetary policy. For this and other reasons, a number of economists propose to use the projected GDP growth rate (with or without a mark-up of, say 100, 150 or 200 bp) as a more appropriate and pragmatic approach – a proposal that is typically not shared by actuaries.

A third issue concerns the existing actuarial capacity in countries that is often weak. Calling in foreign experts to undertake the actuarial work is possible but typically quite expensive and the results may not have the same buy-in, also because the external experts may be considered less able to model the intricacies of the old and reformed system. Also, countries are typically engaging in endogenous adjustments to the reform once they see the price tag, leading to a substantial issue in terms of the of political economy. Social insurance institutions have an interest to maximize the estimated legacy costs as they define the future public transfer to the reformed system, the supplied data and information may be biased without the capacity for direct verification.

For these reasons, the use of simple rule-of-the-thumb methods as a means of validating the orders of magnitude of actuarial results turns out to be a highly useful tool. The ingredients of rule-of-the-thumb methods are threefold: the use of established quantitative relations between pension aggregates (e.g., between stocks and flows), the use of quantitative information about individual aggregates (e.g., cost-covering contribution rate), and the combination of information and cross-validation. As it must have become clear – we are moving from science to art.

As a starting point we can use expression (7) that combines equations (4)–(6) and expresses the legacy costs of the reformed system as that of the unreformed scheme plus the identified elements of change brought about by the reform. Which side of the identity used is determined by the available information and considerations such as the maturity of the unreformed system.

$$\mathrm{LC}_t^r = K_t^r + P_t^r - PA_t^r - FA_t^r = LC_t^u + \Delta LC_t = LC_t^u + \Delta K_t + \Delta P_t - \Delta PA_t - \Delta FA_t. \quad (7)$$

An NDC reform that fully honors AR renders $\triangle P$ and $\triangle K$ equal to zero. If the reform also leaves the financial assets of the system unchanged (i.e., $\triangle FA = 0$), then

equation (7) simplifies to

$$LC = LC^u + \Delta LC = LC^u - \Delta PA \tag{7'}$$

The inherited legacy costs LC^u reflect the current cost-covering contribution rate CR^u in excess of the steady-state contribution rate CR^{su} of the unreformed scheme, and the change in the contribution asset $\triangle PA$ reflects the reduction of the contribution rate from this steady-state level to the new and politically determined steady-state level CR^r. Both old legacy costs and reform-induced legacy costs, as well as their sum, can be presented in terms of the share of the unreformed pension system's IPD. IPD is defined as in Holzmann *et al.* (2004) as the accrued to date liabilities, i.e., the present value of accrued pension rights granted to retirees and contributors. Using these relations, we get easy estimates of the total legacy costs, the inherited legacy costs, and the reform induced legacy costs, respectively:

$$\text{Total legacy costs} = \text{IPD}^u(\text{CR}^u - \text{CR}^r)/\text{CR}^u, \tag{8a}$$

$$\text{Reform-induced legacy costs} = \text{IPD}^u(\text{CR}^{su} - \text{CR}^r)/\text{CR}^u, \tag{8b}$$

$$\text{Reform-induced legacy costs} = \text{IPD}^u(\text{CR}^{su} - \text{CR}^r)/\text{CR}^u. \tag{8c}$$

In the real world, countries often have estimates of the ATD liabilities, perhaps differentiated between that for active population and pensioners (i.e., $K_t^u + P_t^u$). Expressed in percent of GDP even dated estimates can be used as a starting point to estimate the magnitudes for the reformed scheme.

For illustrative purposes, assume that the estimated IPD is 180 % of GDP and that it is currently financed by a contribution rate of 30 %, whereas the long-term sustainable (steady-state) rate is 20 %. Hence, there is an inherited legacy costs of 180*(30–20)/30 or 60 % of GDP and the sustainable IPD is 120 % of GDP. If a reform sets the new (steady-state) contribution rate at 15 % – which is below the long-term sustainable rate – this creates a reform-induced legacy cost. It can be derived in relation to the sustainable IPD, i.e., 120*(20–15)/20 or 30 % of GDP. Hence the total legacy costs – inherited and reform induced amount to 90 % of GDP.

If the reform does not honor all of the AR but changes, say, the indexation from wage to price, the inherited pension debt is reduced (as the value of K_t and P_t is reduced as they have been calculated at full wage indexation). It may or may not increase the PAYG asset depending on whether in the new scheme lower indexation is compensated by higher initial pension. The magnitudes of a change in indexation are important. For example, for an assumed real wage growth of 2 %, a change to pure-priced indexation amounts to about 1/6 of IPD (Holzmann, 1998). If applied to current and future retirees this some 30 % of GDP (for an IPD of 180 %).[8]

[8] If there are no estimates for the ATD liability, a stock–flow relationship can be used to establish a broad estimate. Empirical estimates put the ratio of ATD liability to current (annual) pension expenditure in the range of 20–30 (see Holzmann, 1998) – depending on discount rates. Mere demography-based estimates for mature systems put it into the range of 30–35 (Settegren and Boguslaw 2006 and Holzmann *et al.* 2004).

While useful, these estimates of the stock of legacy costs only give a partial picture of reality as the timing of financing needs might vary wildly between different reform scenarios. The considerations so far have assumed an immediate transfer of all current workers (and retirees) to the new system. Hence, everybody from the new system entrant to the person one day before retirement would have his or her AR transformed into a notional (initial) capital and continue the next day with the recording of contributions (with reduced contribution rates) on his or her individual account. Such a full immediate transition puts the highest cash-flow needs up front and concentrated on the next 40 years or so (unless coverage expansion takes place). It starts out with the difference between the broadly unchanged pension expenditure minus the revenues under the new and fixed contribution rate, with the reduction happening in an S-shaped curvature for many years.

The focus on the timing of transition costs illustrates another set of political economy problem. First, governments might in a rather myopic way be tempted to lower the front-loading of costs by slowing down the transition to the new system. For example, if the conversion to the new scheme concerns only the younger workers, while the older workers continue under the old system, the immediate cash flow need is smaller. The overall legacy costs of such a move would remain unchanged if the reform would merely mean a move from an actuarially sound system with a high to one with a lower contribution rate. If the initial system was financially unsound to start with – which is the most realistic scenario in the real world – then older workers would continue to acquire benefits beyond their contribution efforts and the overall legacy costs would increase. Hence, when deciding on the speed of transition to a new sustainable NDC system, political decision-makers are often facing a clear trade-off between lower short-run financing needs and lower legacy costs.

Second, independently of the level of legacy costs that are recognized by the government, such costs are one off amounts that appear at the time of the reform – and this even if they are effectively disbursed over time. Benefits of the transition toward a reformed system do, however, accrue progressively to all the generations going forward again leading to possible political-economy limitations. The effective burden sharing arrangement across the different generations thus plays an important role in the design of the transition. Holzmann (1998) already recognized several concerns that would justify the temporary buildup of an explicit public debt. These included intergenerational equity, as well as efficiency arguments based on intertemporal tax smoothing. On the other hand, there is no perfect equivalence between explicit and implicit public debt and there might well be crowd-out of private debt instruments. In a different setting, Feldstein *et al*. (2001) identify and isolate the legacy costs of the old system but keep it under the form of implicit public debt rather than converting them into an explicit debt. By positioning their model in the context of uncertain returns and by imposing a constraint that any generation gets benefits that are at least as large as the baseline represented by the current legislation, they show how a social welfare enhancing transition can be orchestrated by a rather modest complementary individual savings component – with the existing PAYG system used as a top-up scheme for the new individual accounts system.

4 Financing of legacy costs

As indicated in the introduction, there are essentially three ways to finance the legacy costs of a (NDC) pension reform: (i) reducing the size of the costs by reneging on some of the existing commitments (i.e., burdening the generations of current retirees and those soon to retire), (ii) reducing the size of the costs by increasing the value of the PAYG asset by coverage expansion (for a given new contribution rate), and (iii) use general government revenues to finance the legacy costs with the understanding that these resources need to be levied in a less-distortionary manner than contribution financing.

The options for reneging on legacy costs under an NDC reform are, perhaps, more limited than under a parametric reform but not zero. In both cases the reneging options for pensions under payment are largely limited to changing the benefit indexation, and for both current and future retirees the move toward a more consistent tax treatment can raise additional revenues. For present workers under an NDC reform the partial reneging seems to be limited to various technical assumptions during the calculation of the initial capital, as well as parametric increases in the retirement age.

Moving from wage or mixed wage–price indexation toward mere price indexation is a powerful instrument to reduce legacy costs. As outlined above, a move from wage to price indexation under an assumed real wage growth of 2% per annum shaves-off some 1/6 of an ATD liability and hence is a sizable contribution to financing of the legacy costs. Furthermore, such a change in indexation is essentially a reduction of existing commitments and may have no material impact on the retirees under the new system. In an NDC system that lives fully within its means, the choice of indexation (price, mixed, or wages) is always done in trading-off to an adjustments in the initially accorded pension. In case of planned full wage instead of mere price indexation, the notional interest rate and in consequence the account values are adjusted downward to accommodate the back-loading of benefit expenditure.

Many countries across the world provide tax advantages for their pension system beyond consumption-type taxation. In numerous countries, individuals escape taxation at every stage (contribution, accumulation, and disbursement) and hence introducing consistent taxation at these three steps would already create sizeable revenues to co-finance any legacy costs of reform. While the desired tax regime depends on country specifics, the two broad options are the Exempt–Exempt–Tax (EET) or as an alternative the Tax–Exempt–Exempt (TEE) system (e.g. Diamond, 2009).

A potentially powerful approach to reduce much of the legacy costs of an NDC reform would consist in first undertaking a parametric reform that increases retirement age and reduces (defined) benefits through lower annual accrual rates, lengthening of assessment periods, etc. before converting the reduced AR into an initial capital under an NDC reform. While conceptually possible, the political economy may speak against such an approach. Parametric reforms have proven difficult to undertake, inter alia as they lack credibility. The attraction of an NDC reform

is, inter alia, the promise to honor AR while putting the scheme on a financially sustainable basis. Yet, this very promise leads to higher legacy costs that need to be addressed.

In an NDC system, the retirement age should become an endogenous variable as individuals are assumed to react to initial reduction in benefits (as a result of the NDC system introduction and the move toward lower contribution rates) and future benefit reductions (as a result of increases in life-expectancy) with delays in retirement under the quasi-actuarial benefit structure. However, fiscal as well as meritocratic considerations speak in favor of a more proactive approach in increasing the retirement age. For fiscal reasons, an increase in the standard retirement age to say 65 years (and above) should be announced and scheduled prior to the NDC reform. Against this new benchmark the acquired benefit rights would be calculated leading to a fall in their present values. For the NDC system itself many experts argue for a minimum retirement age that is indexed to changes in life expectancy and requests a minimum balance able to finance a benefit well in excess of a guaranteed minimum retirement income.

Last but not least, the calculation of the initial capital that converts AR into notional amounts recorded in the individual accounts can be used tacitly to reduce the legacy costs. The two key instruments are the choice of the discount rate in case projected future benefits under the old system are converted into notional capital, and the selection of the lower costs between such a discounting (top–down) approach and an revaluation (bottom–up) approach in which past contributions are revalued with historic and sustainable notional interest rates (Palmer, 2006). The data and calculation demands for the latter approach are challenging but worthwhile to consider.

A second critical way of financing of the legacy costs can be expected from an increase in coverage, in particular in (developing) countries that start out with a low share of labor force in the formal sector and hence contributing to the (unreformed) scheme. The idea is simple: whenever the rate of return that is paid out on the NDC system is systematically lower than the financial discount rate used to estimate the IPD, coverage expansion can contribute to cover aggregate legacy costs. While such an implicit taxation might at first be considered unrealistic and unattractive for new entrants, it is less so in the real world where participation in a formal pension system allows people to pool various forms of risk (longevity, uncertainty of working life, inflation, etc.) and thus makes them willing to accept a lower average return.

The size and timing of a coverage-determined increase in the PAYG asset for the financing of the legacy costs will not only depend on improved incentives to system participation but perhaps equally (or more importantly) on other improvements such as in communication, administration, and contribution collection. While empirically, system coverage of countries remains closely linked to economic development (measured by country GDP/capita), the link is far from perfect and differences across countries for a given per capita income signal a strong influence of the latter. But it also signals that coverage expansion will be the strongest where pension reform, strong economic development, and administrative efforts coincide.

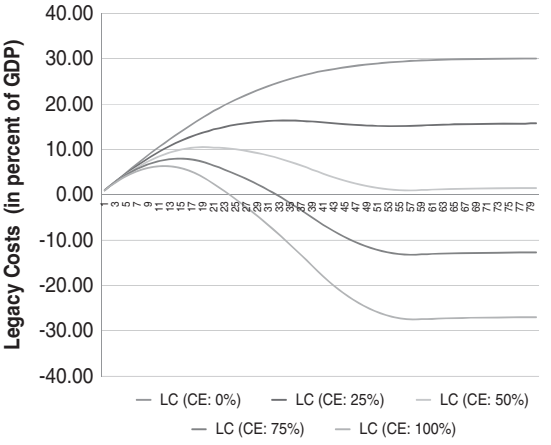

Chart 5. Legacy costs: reform created by contribution rate reduction (under different degrees of coverage expansion, CE). *Note*: In LC(CE: x%) LC stands for Legacy Costs (in percent of GDP) for an assumed Coverage Expansion (CE) of x% compared to the starting position. A value of 200% assumes that all urban workers would become formal and same amount of rural workers would migrant to the cities and become formal.

A simple modeling exercise indicates that coverage increase may, indeed, contribute to the financing of legacy costs in a major way.[9] Let us assume that the unreformed system has an IPD liability of 120% of GDP and related expenditures of 4% of GDP, the reformed NDC scheme steady-state expenditure of 3% (prior to coverage expansion) as the contribution rate is reduced from, say, 20 to 15% and hence imply reform-induced legacy costs of 30% of GDP, and the original coverage rate of labor force was 25%. In a first scenario exercise we assume no old legacy costs, only reform-induced legacy costs due to contribution rate reduction. We investigated various degrees of coverage expansion between 0 (baseline) and 100% in steps of 25%. To this end, we assume that the increase takes place over 40 years and the first benefit pay-outs for new participants start after 20 years. Chart 5 suggests that already modest increases in coverage are able to reduce the deficits and hence the legacy costs importantly. A 25% coverage increase over 40 years (hence from 25% to 31.25% of coverage of labor force) would eliminate the transition deficit after 34 years of the reform and stabilize the overall legacy costs at slightly above half of the baseline value; a 50% coverage increase would eliminate the deficit after 20 years and the surpluses thereafter would reduce the legacy costs to almost nil after another 30 years.

[9] For this exercise, we normalized the flows and stocks by GDP, i.e., we express everything in percent of GDP and thus implicitly assume that the wage growth rate equals the discount rate. Essentially we focus on the pure quantity driven coverage effect in which informal sector worker join the pension system under otherwise stationary conditions. To achieve first orders of magnitudes of the coverage expansion effect, this assumption is justified and the results are qualitatively in line with Oksanen (2012).

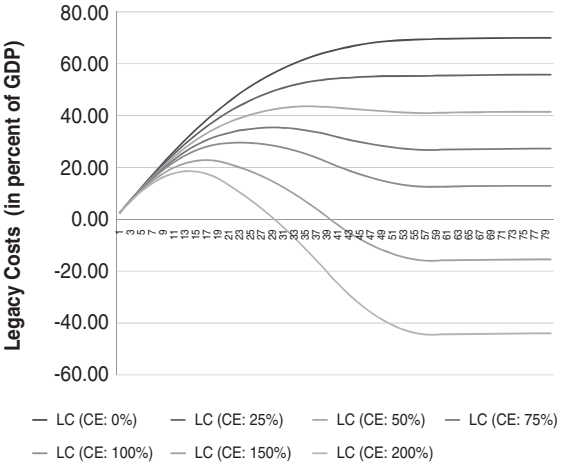

Chart 6. Legacy costs: inherited and reform created (under different degrees of coverage expansion, CE). *Note*: See Chart 5.

Higher increases in coverage (75% and 100%, respectively) would create even stronger surpluses that could give rise to sizable reserve funds after some 50 years. A doubling of the coverage within 40 years from 25% to 50% of labor force seems possible if integrated into a broader and successful reform agenda.

For a second scenario exercise, we add inherited legacy costs (from prior reforms) of 40% of GDP that are assumed to become expenditure over a period of 50 years in a decreasing (death-related) scale starting with an explicit recognition of 1.5% of GDP in expenditures in one year of the reform. Chart 6 suggests that with such high inherited legacy costs the doubling of coverage will not be sufficient to pay for the legacy cost. However, assuming an increase of coverage by 150% (to 67.5% of labor force) would move the aggregated legacy costs well into surplus. A three-fold coverage to 75% would create sizable reserves – quite ambitious but not totally impossible. These, perhaps optimistic, results will need to be substantiated and verified in a real-country setting using a fully-fledged and actuarially based projection model. However, we conjecture that such results will not differ too much from our modeling exercise.

General tax revenue financing as the third alternative has attracted increasing attention in the debate on pension reform. On net, any such shift only makes economic sense insofar as the marginal cost of raising additional public funds is lower when using other general tax instruments rather than the more conventional tool of social insurance contributions. Beyond pure collection costs, this also includes the economic distortion generated by the various tax instruments at the level of economic decision-makers.

In any case, separate financing of legacy costs raises a number of issues of its own that will not be addressed in much detail in this paper. For example, intergenerational aspects are heavily influenced by the way transition costs are evaluated and financed.

Any specific transition option will lead to different burden-sharing across generations – at least when generations are not linked in a way to generate a Barro-type equivalence result. Put differently, the level of explicit and implicit debt shifted forward onto younger generations is heavily dependent on the way the transition is organized and financed. For example, Feldstein *et al.* (2001) provide a concise model that explicitly recognizes the intergenerational burden-sharing of an individual accounts reform in the US context. One interesting implication of their calculations is the heavy dependence of the economic benefits to the various generations (and thus their political support for the reform) on the specifics of the transition.

Similarly, intragenerational distribution will be affected by any reform. Such effects play at least on two levels, in terms of the reforms of the systems themselves as well as in terms of the financing of the transition. At the level of the system change, the shift from the existing system toward an NDC (or other) system will almost inevitably lead to a change in the distributive outcomes. For example, a shift from a Beveridgean system toward NDC will likely benefit higher income earners in relative terms. Similarly, a possible risk-group-specific calculation of annuities would likely run counter to the interests of longer-lived people as compared to the common risk pool in conventional DB systems. At the level of the financing of the transition, various tax instruments are non-neutral with respect to the intra-generational outcomes.

In recent years, the IMF has contributed to the literature on financing the transition costs linked to population aging. It developed a dynamic macro-simulation model that allows for international interdependencies notably at the level of the capital markets. Generally, the results give simple lessons that are *de facto* the direct results of the neoclassical growth model underlying these dynamic systems. They underline the special role of capital taxation in the growth process. Indirect taxation is the most preferable tax instrument to use in the face of aging pressures, while wage taxation (i.e., social insurance contributions) are better than general income taxes or capital income taxes. On net, these – as well as other similar growth models – document that a shift toward consumption-based taxation away from income taxes reduces distortion of savings and labor supply decisions, and hence contributes to a larger 'size of the pie' in the future.[10]

One real-world implication is the increasing role of the value added tax (VAT) as a financing tool for public expenditures of all kinds, notably complementary social insurance financing. The evidence from macro-simulation models is actually further reinforced by observations on the ground showing that VAT has a relatively moderate economic cost relative to the revenues generated because the systems generally have an easier structure than most income tax systems.[11] But these empirical

[10] Atkinson and Stiglitz (1976) pointed to the negative consequences of capital income taxation. The key logic is simple: by taxing capital income the government has an unfavorable influence growth of the economy. Diamond (2009) emphasizes the strong requirements for obtaining such clear preference relations over tax instruments. He emphasizes the role of heterogeneity between individuals, as well as the complicated interactions between year-based tax systems and life-time redistribution in the context of social security programs. Botman and Kumar (2007) and Botman and Tuladhar (2008) are recent examples of the simulation-based approach.

[11] It is generally recognized that a VAT system, in order to achieve its objectives of raising substantial revenues at moderate administrative and compliance cost, should have a simple design. For a discussion of reduced rate and exemptions, see Copenhagen Economics (2007).

observations also point to another important factor: the relative cost of raising public resources with different tax instruments heavily depends on the country specifics.

While these theoretical and simulation-based results are striking, the empirical literature on the effects of taxation on labor supply and savings has been much less unanimous. Well-known individual-level studies from the US as well as from other OECD countries show a few key empirical regularities of the labor market: labor income taxation has little effect on the labor supply of the primary income earner in a household, whereas the effect on secondary earners is mostly one of participation rather than of modified hours of work. Similarly, more recent evidence shows that this effect is much stronger for indigenous workers in their prime-years as compared to either people just out of school, close to retirement, as well as from migration backgrounds.[12] As for capital income taxation, the empirical evidence remains highly inconclusive – the main reason being the difficulty of appropriately measuring the relevant individual-level interest rate and savings parameters.[13]

Regarding developing countries, the empirical evidence is equally mixed. For example, Keen and Mansour (2010*a*, *b*) highlight the increasing role of the VAT as a revenue source for sub-Saharan African countries over the last decades. This increase in VAT has, however, not necessarily generated new budgetary margins, as most countries have faced a sustained and structural fall in customs revenues as well as strong and increasing tax competition at the level of the corporate income tax. Going forward, the picture looks more challenging. In a number of developing countries, simple hikes of VAT rates are an increasingly unlikely policy tool, given the standard rates currently applied – in the developing world in a context of high degree of informality, scarce administrative capacity, and design flaws that limit effective operations and enforcement.

Policy-wise, our discussion has several implications: first, in the context of developed countries with quasi-universal pension systems and sophisticated VAT systems, a general shift of the tax burden away from labor to consumption is likely to have smaller than expected efficiency gains, hence reducing the attractiveness of such a policy.[14] For developing countries, there is an additional aspect: financing the transition of a pension system covering a moderate fraction of the population by a generally applicable (potentially dysfunctional) VAT could involve major inefficiency and undesired redistribution among households in the country. Furthermore, it might necessitate profound reforms of the VAT system itself to restore primary aim as a simple tool for non-distortive revenue generation.

5 Simulation of a hypothetical Chinese NDC pension reform

Despite major and minor reforms of the Chinese pension system over recent decades it remains fragmented within and between the urban and rural areas, does not provide comprehensive basic means-tested benefits for the poor elderly and has no credible

[12] For example Kramarz and Philippon (2001) as well as Chéron *et al*. (2008) study tax and contribution policy in the face of labor market segmentation.
[13] For example Attanasio and Weber (1995).
[14] See the discussions on the desirability of a 'social' VAT in France, as detailed in Besson (2007).

occupational/personal voluntary retirement saving scheme. The reformed urban system collects a high contribution rate (between 28% and 31%) to cover legacy costs, with the cost covering contribution rate estimated at 35% and the steady-state of the reformed scheme estimated at 27% (Sin, 2005). There are separate schemes for public service units (PSU) and state organs (i.e., civil servants), and migrants are only very partially covered by separate schemes. For the rural area, voluntary saving schemes with government-subsidized contributions existed for some time and a new pilot of such a (voluntary) matching DC scheme covering 10% of the counties has started in 2009.

The Chinese government is very much aware of the key shortcomings of the system. In preparation of the next five-year plan (2012–2017) the government has asked an (undisclosed) set of international institutions and academics to prepare their vision piece for a Chinese pension reform in order to fertilize the domestic Chinese reform discussion. The proposal to make an NDC system the core of the future pension scheme has been made by a number of contributions (e.g., Williamson and Shen, 2004; Barr and Diamond, 2009; Oksanen, 2012; Zheng, 2012; World Bank, forthcoming). A key element to make such a proposal credible is, of course, to have broad estimates of the legacy costs and a game-plan for their financing.

We present here the broad estimates that were undertaken in World Bank (forthcoming) based on the rule-of-thumb methodology outlined above. It uses expenditures and a range of multipliers to estimate the IPD for the three schemes to be harmonized (urban scheme, public organ scheme, and PSU scheme). A range of multiplies is needed as the Chinese pension scheme is not yet mature and well above the steady-state multiplier of 30; the multiplier range has drawn on historical national and provincial estimates. For scenario calculations of the (new) and common contribution rate 15%, 20% and 25% are selected. This compares with a cost covering contribution rate of the three unreformed schemes of 35%, 36% and 34%, respectively. Applying the estimator for the legacy costs in equation (8a) provides the range of legacy cost estimates in the shaded area of Table 4. The lower the selected new contribution rate the higher the legacy cost for a given estimated IPD (accrued to date liability).

Given the scenario approach the resulting legacy costs differ widely depending on the IPD estimated and selected new steady-state contribution rate. The highest estimate for total legacy costs (due to the lowest new contribution rate of 15%) range between 89% and 133% of GDP and is distributed between the urban and the government sector schemes in the ratio of 3:1. From these total legacy costs, the main share is inherited and needs to be financed in any case and much or all of the legacy costs for the newly integrated government sector schemes are already tax financed as contributions are not levied from state organs and only for a small share of the public sector unit employees. Altogether (and using an average of the calculated IPD of 150%) this leaves some 75% of GDP to be financed from additional general government or other means, most importantly coverage expansion in the private sector.

During the period of 1998–2008 coverage already increased 39.2% to 54.9%, i.e., 15.4 percentage points in the urban scheme. This has helped increase the reserves of the urban scheme from 0.7% to 3.3% of GDP, i.e., 2.6 percentage points. Achieving

Table 4. *China: broad estimates of the legacy costs under an NDC reform and alternative contribution rates for the new scheme*

Estimates 2008 in % of GDP	Pen Exp	IPD		Cost covering	Legacy costs (low IPD estimate)			Legacy costs (high IPD estimate)		
					New contribution rate			New contribution rate		
		Low est.	High est.	Cont. rate %	15%	20%	25%	15%	20%	25%
Urban system	2.46	118	147	35%	67	50	34	84	63	42
State organs	0.34	12	16	36%	7	5	4	9	7	5
PSU	0.75	26	36	34%	15	11	7	20	15	9
Total	3.54	155	199		89	66	44	113	85	56

Source: World Bank (forthcoming).

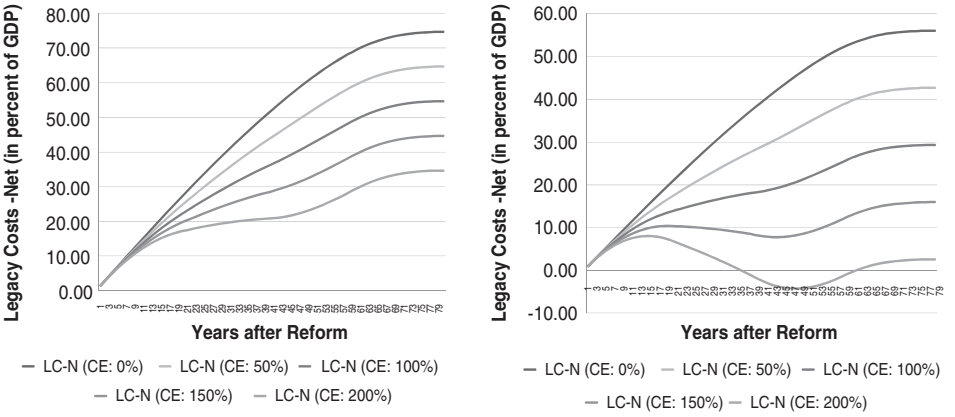

Chart 7. Phasing of net legacy costs under different degrees of coverage expansion (CE) and contribution rates (15 % – left – and 20 % – right panel).
Source: World Bank (forthcoming).

a coverage rate of 90 % by 2050 seems possible and in line with international trends in the relationship between per capita income and coverage (see World Bank, 2006); it is also the goal of the Chinese government. Furthermore, during the period 1998–2008 labor force already increased by almost 40 %. Over the next 40 years labor force could easily double as the result of rural–urban migration (plus an increase in labor force participation). As a result of both effects the overall number of contributors could multifold and create cash flows to help finance the legacy costs.

Chart 7 provides stylized estimates for China of the net legacy costs (i.e., without government sector schemes) for different coverage expansion scenarios and two selected new contribution rates (15 % and 20 %). They are derived from a model that replicates the initial deficit and the estimates for the inherited legacy costs (30 % of GDP) and reform-created legacy costs (45 % of GDP under an assumed new contribution rate of 15 %). It ignores demographic changes by assuming that they are neutralized by higher retirement age and/or lower benefits. The graph indicates that coverage expansion could, indeed, importantly contributed to the financing of the legacy costs to the tune of some 10 % to 13 % of GDP for an expansion of covered labor force of 50 % over 40 years.

6 Concluding remarks

Summing up, several key elements stand out. First, to render an NDC reform credible and fully effective, it is strictly necessary to determine the legacy costs of the reformed system – no matter whether these costs will be financed by contribution increases, coverage expansion or general revenue financing. Second, when considering the shift from an NDB scheme to an NDC scheme with a fixed- and long-term sustainable contribution rate, the definition of legacy costs simply amounts to the actuarial deficit at the time of reform – the latter being finite. Third, different sources of the legacy deficit may be identified and estimated separately. Fourth, distributive effects play

both at the intergenerational and intragenerational level, as benefits and costs of the reform are borne unequally by different subgroups of the current and future population. This also leads to non-trivial political economy consequences, both in terms of the timing of the reform as with respect to the financing mechanisms.

Our discussion and results show that there is no one-size-fits-it-all solution to addressing legacy costs. Our simulations for a hypothetical reform in China do, however, show that coverage expansion to strengthen the contribution asset is a valid and even sometimes preferable alternative to explicit general revenue financing – notably through VAT.

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