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Indexing Pensions

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Abstract: Pension indexation should anchor the parameters of the pension system to one or more economic and demographic variables to ensure that the system is implemented in a sustainable way, while minimizing distortions affecting important economic choices. Arguing that financial sustainability, incentive compatibility and consistency across multiple government programs are critical, we examine the many linkages between the various parameters of pension schemes. Finally, we turn to the cost of the insurance dimension of indexation, and suggest that option pricing techniques could be used to price indexation guarantees, and that this approach may suggest refinements to indexation practice not thus far implemented.

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Introduction

Pension system design and operation have been important areas of academic research and policy reform for several decades now. Much attention has centred on the parametric and structural reform of pensions in response to changing demographics and resultant fiscal burdens. Effort has also gone into evaluating and comparing various pension arrangements for their effectiveness in providing old-age income security.[1] One area where there seems to be a consensus is that pensions in payment should be indexed to prices or average wages, to insure pension recipients against an erosion of purchasing power in old age. The World Bank, responding to the 2008 financial crisis, has recommended that governments in emerging economies maximize protection to low income workers by offering flat-rate minimum pensions and full indexation of benefits (Dorfman et al. 2009).

Public pensions in most OECD countries already do provide for some form of pension indexation. But these are often the result of historical accident, rather than deliberative policy design. Governments have manipulated what were initially systematic indexation arrangements to reduce social security liabilities in the face of demographic transition, and have revisited the indexation design issue less often than they might. While the importance of indexation has broad agreement, no detailed analysis examines indexation design. This paper aims to fill this gap.

Retirement policy, however delivered, has several objectives. Among these is the appropriate insurance of participants against unanticipated changes in their economic environment. As well, its design should be robust and flexible enough to appropriately maintain its broad contours as the economy within which it operates changes. Indexation is an important mechanism for delivering both these: We label them the insurance and the anchoring functions. While insurance is a term that is meaningful to most, "anchoring" may need some explanation.

Anchoring means that if an indicator shifts, the value of the pension is appropriately adjusted. Perhaps the most obvious indexation target is inflation, but other dimensions are equally important. For example, increasing life expectancy has altered the proportionality around work life and retirement, and good indexation practice should involve indexing the access age of the pension to increasing longevity. Most countries, especially those now facing unprecedented increases in later-life longevity, have found

[1] See Whitehouse (2006) for one such example.

that failure to index access age has led to fiscal burdens requiring other adjustments in policy arrangements to manage the increased liability. An appropriately anchored retirement policy will generate pension programs that are responsive to changing economic circumstances and are mutually consistent. In this sense, the idea of anchoring suggests that adjustment rules be transparent and that payouts do adjust to dramatic and unanticipated changes.[2] Appropriate anchoring essentially involves recognizing that there are important linkages between the various parameters of a system that get indexed as well as parameters that often get neglected.

In this paper, we list the various aspects of a pension system that need to be indexed, and examine the possible benchmarks that might be used. For example, exactly what metric should be used to gauge increasing longevity? We then focus on three underlying considerations, or principles, that indexation design should take into account. First, the costs of any guarantee associated with an indexation regime should be made explicit, and should not be so large as to outweigh participant value. Second, indexation should not lead to unintended redistribution and set up perverse incentives towards saving and labor force participation. Third, indexation across multiple government programs and across regulation of private programs needs to be mutually consistent. Treating different components of a system differently can lead to unintended disparities between programs over time, setting up inappropriate incentives for individuals to substitute programs to maximize their income.

These three ideas, while normative, are widely accepted in principle. In practice however, none are consistently applied. The fiscal impacts of alternative indexing arrangements are frequently not considered (Summers 1982). Implications of indexation for incentives and redistribution are often ignored, and different indexation benchmarks are used, apparently arbitrarily, for different components of retirement provision policy. A more systematic approach to indexing pensions would allow policies to be formulated which align more closely with these principles.

The paper is organized as follows. In Section 1 we present a typology of the various kinds of pension schemes that exist and their current indexation practices. We discuss issues relevant to the practice of indexation focusing especially on parameters that need to be anchored and the associated indexation benchmarks in Section 2. In Section 3 we elaborate on the principles of indexation policy. We abstract away from issues related to design of the underlying pension system and focus only on indexation design given the structure of the pension system. Section 4 presents an illustrative model that allows us

[2] For convenience, we ignore price and wage deflation in this paper.

to explore the impact of various indexation arrangements on expenditure outflows of governments as well as consistency across multiple programs: aspects that we think are critical to well-functioning indexation provisions. Section 5 focuses on the cost of the insurance dimension of indexation, an area that has received scant attention in the literature. This crystallizes the issue of risk diversification, and the efficient allocation of risk. As the value of retirement provision burgeons with demographic shift, mechanisms to more efficiently allocate risk between stakeholders may become more valuable. Here, by way of example, we introduce the idea of deductibles for inflation insurance. Finally, Section 6 concludes.

I. Overview of Pension Systems and Indexation

There is a range of taxonomies for framing pension analysis. The World Bank has a five-pillar approach whereas the OECD has an approach that is based on the role and objectives of each part of the pension system.[3] Our approach, for this paper, is closer to that of the OECD, in which pension systems are categorized into three tiers (Queisser et al. 2007). The first tier aims to ensure a minimum standard of living while the second targets income replacement. The third tier consists of voluntary retirement savings. This three-tier structure, along with some alternative policy approaches, is laid out schematically in Figure 1. In the following section, we expand on this framework.

1.1 The Structure of Pension Systems

The first tier comprises basic, flat-rate pensions, either resource-tested or universal. They are usually financed out of general tax revenue. First tier schemes are found in most OECD countries, although they are less often legislated in poorer countries. For example, only a third of the countries in the Asia-Pacific region have well-developed first tiers.[4] Australia provides an example of a resource-tested pension: retirees below certain income and assets thresholds are eligible for a flat-rate, tax-financed pension. The pension payment in resource-tested schemes is completely divorced from contribution history or participation in a second tier scheme. By contrast, Japan has developed a non-means-tested basic pension that is paid with a vesting period of at least 25 years of contributions. The payouts depend on the number of years of contributions and not earnings. The basic pension in China pays a fixed percentage of average, citywide earnings for each year of coverage.

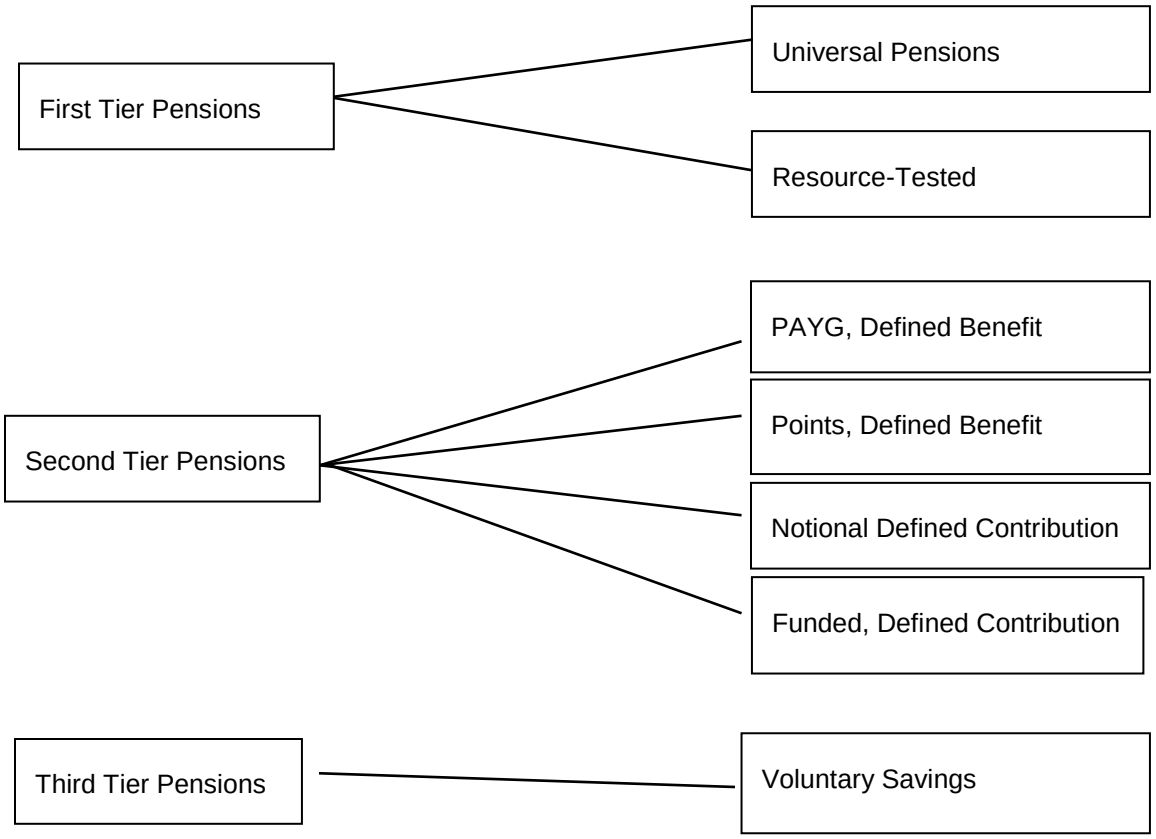
The second tier aims at income replacement. Many countries have a public, pay-as-you-go (PAYG) defined-benefit earnings-related system where the value of the pension depends on past earnings and contributions. For example, U.S. Social Security pays a retirement benefit that is a non-linear function of average lifetime earnings and contributions. Some countries (France and Germany) have a points system where workers earn points for each year of their contributions. At retirement, the accumulated points

[3] The World Bank approach consists of a non-contributory pillar provided by the government to deal with poverty alleviation, a mandatory first pillar which consists of a contributory pension linked to pre–retirement income financed from government revenue, a mandatory second pillar which consists of a fully funded savings account. Discretionary savings that provide greater flexibility than exists in mandatory pillars are part of the voluntary third pillar. Access to informal support (such as family support), social programs (health care and housing) and other individual financial and non–financial assets (such as home ownership and reverse mortgages) form part of the fourth pillar.

[4] Pensions at a Glance Asia/Pacific (2009) and OECD countries (2007), OECD.

are multiplied by a pension-point value to convert them to an annuity. Sometimes, the redistributive part of a PAYG scheme is explicitly recognized in a "minimum pension".

Figure 1:Components of Retirement Provision



If the pension from the earnings-related scheme is below a particular minimum amount, it is topped up. These are a part of the first tier in the sense of their objective of ensuring a minimum standard of living, but institutionally, are a part of the second tier system. Spain is one example of a country that provides a minimum pension.

In recent years, a few countries such as Sweden, Italy, and Poland have transitioned to a notional defined contribution system where individual contributions are recorded and credited with a notional interest rate. At retirement, the notional capital is converted to a pension payment according to a pre-determined formula mostly dependent on the life expectancy at that time. Such schemes, labeled "notional defined contribution" (NDC) are also managed by the state.

A few countries have a mandatory pre-funded system where employee and/or employer contributions are required to be invested in pension funds run by the private sector. The payout is market-determined (as in Australia) or is paid at a mandated rate set by the government (as in Switzerland). Many developing economies have DC-type schemes called “Provident Funds”, of which the best known is Singapore’s Central Provident Fund. While these are DC, they often credit a guaranteed rate of interest to member accounts and allow for early withdrawals.

The third tier covers voluntary savings in schemes offered by pension funds and/or insurance companies that pay out a lump sum or annuity at retirement. Governments often provide tax advantages to such schemes in order to encourage investment in them. We do not discuss the third tier in this paper. Table 1 maps the combinations of the first and second tier structures across a range of economies. Across the world, the structure of system design varies widely. Some countries means-test general tax-financed benefits to those in need while others aim at universal coverage. Poorer countries in Asia have no provisions for social assistance, whereas most OECD countries have more than one instrument to deliver poverty reduction.

Table 1: Pension Systems: OECD and Asia

2nd Tier	1st Tier							
	Basic	***Minimum***	***Resource-Tested***	***Basic Plus Resource-Tested***	***Basic Plus Minimum***	***Minimum Plus Resource-Tested***	***All Three***	***None***
DB	Japan Korea Netherlands	Finland Portugal Spain Turkey Pakistan	Austria U.S.	Canada Iceland	Switzer-Land Philipp-Ines	Belgium Greece	Czech Republic Luxemburg U.K.	Thailand Vietnam
Points		Slovak Rep.	Germany					
DB + Points				France				
NDC		Poland	Italy					
DC			Australia Hong-Kong	Denmark	Mexico			Indonesia Malaysia Singapore Sri Lanka
DC + Points					Norway			Chinese-Taipei
DB + DC								Hungary India
DB + DC + NDC		Sweden						
None	New Zealand China			Ireland				

Source: Pensions at a Glance (2007) and Asia/Pacific (2009), OECD.

1.2 Indexation Practice

Indexation practices are a function of the underlying scheme design and objectives in each country. In Table 2, we present the indexation arrangements of first tier schemes, while tier 2 indexation is described in Table 3. For minimum or basic pensions, indexing to prices seems to be the norm followed by indexing to wages. Very few countries have no systematic policy of indexation and uprate benefits in an ad-hoc manner. In the case of resource-tested schemes, information on indexation of thresholds that determine eligibility is scant. Belgium and France index both the thresholds and actual pension payment to the same index (i.e. prices and wages respectively), while Australia indexes the thresholds to prices, but the pension payment to a combination of wages and prices. The United States, on the other hand, does not index the thresholds at all.

Table 2: Indexation Arrangements of First Tier Pensions

Minimum/Basic Pensions

	None/Ad-Hoc	*Prices*	*Wages*	*GDP*	*Hybrid*
Pensions in Payment	Greece[A] Norway Pakistan Philippines	Belgium Canada France Japan Mexico Poland Spain U.K.	Luxembourg Netherlands[B] Norway Iceland[C] Ireland		Hungary[D] New Zealand[E]

Resource-Tested Pensions

	None/Ad-Hoc	*Prices*	*Wages*	*GDP*	*Hybrid*
Thresholds	U.S.	Australia Canada Finland	France		
Pensions	Austria Portugal	Belgium Canada[F] Finland Sweden U.S.	Denmark[G] France Mexico U.K. Iceland Ireland		Australia Switzerland[H] Germany[I]

Notes: [A] Value adjusted annually as part of the income policy. [B] Value of the basic pension is uprated biannually in line with the net minimum wage. [C] Public sector wages. [D] 50 percent changes in price and wage indexes. The minimum pension will be abolished in 2009. [E] Uprating follows CPI until either a ceiling of 72.5 percent of average earnings or a 65 percent floor is triggered. In the first case, with CPI rising more than wages, indexation follows wages when the ceiling is reached. In the opposite case of wages growing faster than prices, indexation follows wages if the 65 percent floor is triggered. [F] The basic pension has a threshold that is price-indexed. In addition, a targeted pension includes the basic pension. [G] If nominal earnings growth exceeds 2 percent per year, up to 0.3 percentage points of the excess is put in a reserve [H] Average of wage and price index. [I] Annual adjustments to living standard on the basis of an index based on consumer prices, net incomes and consumer behavior.

Source: Cantillon et al. (nd); Pensions at a Glance (2007) and Asia/Pacific (2009), OECD.

In the case of second tier pensions, countries resort to wage indexation for valorization of contributions, and to price indexation for the pensions-in-payment. Countries have recently started moving towards hybrid indexation and are using some combination of a price and wage index and sometimes longevity.

At retirement, a worker may receive payments from both tiers: she may be eligible for a social assistance or a means-tested benefit and may draw a pension from the second tier scheme. Pension schemes in both the tiers often have their own indexation provisions, sometimes without regard to the indexation mechanism in the other tier. Disney and Whitehouse (1991) point out that in the United Kingdom, the method of indexing the basic state pension also determines the value of earnings limits between which National Insurance contributions are paid. These values in turn have an impact on the level of entitlement from the second pillar scheme. In addition, minimum and resource-tested pensions coexist as part of the first tier in several OECD countries. Different indexation rules for these schemes may lead to overlaps or omissions. For example, in the United States, the thresholds that determine eligibility to the resource-tested benefit are not indexed, leading to a very tight assets test over time.

Uprating of thresholds, taxes and benefits can have large implications on the treatment of different people.

Most social security schemes, even if they are not means-tested, have some sort of an earnings test, reducing the availability of social security payments to those who continue to work beyond the social security eligibility age. But in recent times these rules have been relaxed in a number of countries to encourage elderly labor force participation. This allows the elderly to receive social security payments while continuing to be in the labor force and earning labor income below certain thresholds. Indexation of the earnings-test thresholds, pension access age and earnings-test access age can also influence the value of the final pension received. This has not received adequate attention in the literature.

Table 3: Indexation Arrangements of Earnings-Related Pensions

	None/Ad-Hoc	Prices	Wages	GDP	Hybrid
Ceilings on Contributions	Finland	Canada[A]	United States		
Valorization	Chinese-Taipei Netherlands Pakistan Philippines Thailand	Belgium Denmark[B] France Spain (benefit base) Korea	Austria Canada Greece[C] Hungary Iceland Japan Korea[D] Luxemburg Norway Poland[E] Slovakia Switzerland United Kingdom United States Vietnam	Italy Turkey (?)	Finland[F] Germany[G] Sweden Portugal[H]
Pensions in Payment	Austria Chinese-Taipei Greece Ireland Denmark Netherlands Pakistan Philippines Thailand	Belgium[I] Canada France Italy[J] Japan Korea Norway Poland[K] Portugal Spain Turkey United Kingdom United States	Norway Iceland[L] Germany Vietnam		Finland[M] Czech[N] Denmark[O] Hungary[P] Japan[Q] Luxemburg[R] Slovak[S] Portugal [T] Sweden[U] Switzerland[V]

Notes: [A] There exists a contribution floor that is frozen in nominal terms. [B] If financial conditions allow. [C] The pay of earlier years is valorized in line with the increase in the pensions for public sector workers. [D] Average of individual lifetime earnings-average earnings and economy-wide average pay measured over the previous three years). [E] Real wage bill growth, but at least price inflation (Whitehouse 2006). [F] Change in earnings has an 80 percent weighting and change in prices has a 20 percent weighting. [G] Used to be gross wages subject to an adjustment for increases in the total contribution rate to the public scheme. From 2004, a sustainability factor which is linked to the system-dependency ratio. [H] 25 percent wages, 75 percent prices. [I] Based on a "health" index that is like the CPI but does not take into account the price of products that are deemed to be damaging to people's health or that are strongly affected by foreign factors (e.g., oil). [J] Full price indexation for benefits up to three times the minimum pension, 90 percent of price inflation for benefits between three and five times the minimum pension, 75 percent of price inflation above five times the minimum pension.

Source: Pensions at a Glance (2007) and Asia/Pacific (2009), OECD; Knuuti (2005).

Box 1: Inconsistencies in Indexation of First Tier Schemes in U.K.

The United Kingdom has two first tier schemes: Basic State Pension (BSP) and Pension Credit (PC).

The BSP is paid to all pensioners once they have accumulated sufficient National Insurance Contributions over their working life. Adjustments to the BSP have been made in line with the increase in prices by using the Retail Price Index (RPI) since 1981. Had the BSP been rising with average wages, it would have been more than half as high as its actual value in 2007. Whitehouse (2009) points out that in 1981 the BSP was 24 percent of average earnings and is only 15 percent of average earnings in 2008. People above the age of 80 in the United Kingdom are entitled to an addition of 25 pence per week to the BSP. This addition has been 25 pence since the time it was introduced in 1971. Had its value been increased each year in line with the growth of average earnings, it would have been worth nearly £5 per week in April 2007.

The PC is an income-tested payment given to pensioners to achieve a minimum monthly income. The PC is uprated using average earnings. With earnings rising faster than prices, there is an ongoing compression between the value of the BSP and the PC.

Source: Sutherland et al. (2008).

II. What Should Be Indexed and How?

In this section, we focus on the question of which parameters of the scheme to index and the benchmarks to anchor the promises to. As we conceive it, indexation should not necessarily be confined to publicly provided schemes, or to pension payouts. The whole of the retirement system is vulnerable to imbalance from economic or demographic change, and indexation policy should therefore be considered holistically.

2.1 What to Index?

We list below some critical features of a pension system that have an impact on the value of the pensions in payment and system. We divide parameters into those that matter during the accumulation phase and those that have a bearing on the benefits.

2.1.1 *Contribution Phase*

Social security contributions are typically legislated up to some limit of earnings. If ceilings on pensionable salaries are not indexed, then workers will be contributing lower amounts towards their pensions. If the ceilings are price-indexed and wages grow faster than prices, there may be a significant erosion of their value relative to average earnings. Whitehouse (2009) notes that in 2006 in Canada, where price indexation prevailed, the ceiling was only 96 percent of average earnings. Recently indexation of the ceilings to average earnings has been introduced.

Social security contribution ceilings have their analogues in private occupational pensions, where some form of contribution limit is typically legislated. In Australia, non-concessional and concessional contributions (those which might be claimed as tax deduction) are subject to caps. The concessional contribution cap (AU$25,000) is indexed in line with the average weekly ordinary time earnings (AWOTE), in increments of $5,000. For those over the age of 50, the annual cap is set at AU$50,000 and this cap is not indexed.[5] As of July 2009 the non-concessional contribution cap was six times the concessional contribution cap.[6] In the United Kingdom, since 2006 there have been no limits on contributions that can be made towards different schemes every year. Tax relief on contributions can be

[5] http://www.ato.gov.au/super/content.asp?doc=/Content/60489.htm&page=3&H3.

[6] http://www.ato.gov.au/super/content.asp?doc=/Content/60489.htm&page=4&H4.

obtained up to the full value of labor income, up to a cap. Contributions above this limit are taxed. The annual limit is set by the HM Revenue and Customs and as of 2009 the limits till 2016 have already been set.[7] Policy needs to consider indexing these limits in a consistent manner, in view of other thresholds that might be a part of the pension system.

2.1.2 *Pension Access Age*

Pension systems have previously been designed under the assumption of constant life expectancy. Increasing life expectancy has not been adequately accommodated in these structures. This has become critical in recent decades because of the increasing longevity of the middle-aged. Many schemes have found it difficult to maintain benefit levels without increasing contributions. Diamond (1996) discusses access age indexation as one of the proposals to restructure social security. Age limits for retirement in most countries have been increased, but while these adjustments can in principle take account of increasing longevity, they cannot deal with declining fertility.[8] In practice, these changes have been ad-hoc and need to be continuously evaluated in light of improvements in longevity. A further issue arises when the first and second tier schemes have different access ages. In Australia for example, accumulations from superannuation funds (second tier scheme) can be accessed from the age of 55, whereas the age-pension (first tier resource-tested scheme) is payable from the age of 65. This allows individuals to draw down private savings and qualify for the public program.

A standard age limit for all members may not be adequate as the poor often enter the labor force at younger years and a "proportional" work-retiree life may mean different access ages for the rich and the poor. Haverstick et al. (2007) introduce the notion of using quarters of covered earnings in the context of determining the earliest eligibility age for social security benefits, a suggestion that deserves further attention in the access age determination debate.

[7] http://www.pensionsadvisoryservice.org.uk/Occupational_Pensions/Contributions/.

[8] Denmark is one of few countries to have made eligibility age explicitly dependent on longevity.

Box 2: Trends in Pension Ages around the World

Declining mortality rates and the related increase in life expectancy is a common pattern around the world. As a result, many governments have considered or undertaken significant pension reforms during recent years.

The majority of OECD countries have a standard pension age of 65 for men (OECD 2007). Traditionally most OECD countries have permitted women to receive social security benefits at younger ages than men although many are now increasing them to the same age as males. Indeed, European countries are required to do so by a 2004 European Union Directive.

However increases in the pension age are now going beyond the equalization issue. Some current changes that have already been announced include:

1. The United States is gradually increasing its normal retirement age for social security from 65 to 66 between 2002 and 2009 and then increasing it again from 66 to 67 between 2020 and 2027.
2. The United Kingdom announced in a 2006 White Paper discussing their new pensions system that they will gradually increase their state pension age from 65 in 2024 to 68 in 2046.
3. Germany is gradually increasing its pension age from 65 in 2012 to 66 in 2024 and then to 67 in 2029.
4. Denmark is increasing the age threshold for the public old-age pension from 65 in 2024 to 67 in 2027. Furthermore from 2025, the eligibility age will be directly linked to changes in life expectancy at age 60.
5. Japan is increasing its age for access to the earnings-related component of its pension from 60 to 65 by 2025 for males and by 2030 for females.
6. Increases in pension age that affect both men and women are being implemented in the Czech Republic, Greece, Hungary, Italy and Korea (OECD 2007).

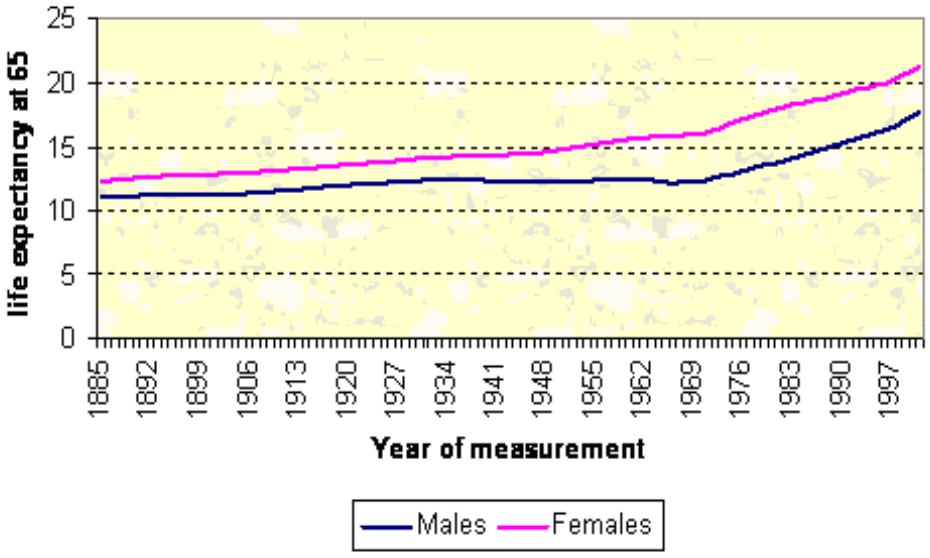
Source: Knox (2008).

Box 3: Australian Age Pension: A Case for Longevity Indexing

Some of the first age pensions were paid by states in Australia: New South Wales (1900), Victoria (1900) and Queensland (1908). So they have been around a long time. A national age pension system replaced these schemes from 1 July 1909. The first age pension was a modest means-tested payment, which was worth around 12 percent of male total average weekly earnings.

Access age was set at 65, although for women it was reduced to 60 shortly afterwards. Life expectancy for those born in 1901-1910 was 55.2 for men and 58.8 for women. It is now 78.5 for men and 83.3 for women. This is relevant because it indicates how the probability of receiving an age pension payout at all has increased. But a second trend has also emerged, as Figure 2 shows. Life expectancy at age 65, after remaining relatively stable for the first seven decades of the 20th century, has increased substantially in the period since. This is relevant because now those who receive an age pension are expected to receive payouts for up to 50 percent longer. Further, the rate of full pension has doubled, to 25 percent of average male earnings.

Figure 2: Life Expectancies for Australians at Age 65 from 1885-2001



Source: Authors' calculations.

2.1.3 *Benefits Indexation*

First Pension Payment

In earnings-related schemes, pensions are calculated based on lifetime earnings, or some related metric – the best 10 years, for example, or final salary. In these calculations, past contributions are typically revalued to wage growth, to ensure that older cohorts are not worse off in a growing economy. There are several proxies for this: A standard measure that has been used is the growth rate in average covered wage. U.S. Social Security provides for a wage-indexing procedure where the nominal earnings of workers in each calendar year are multiplied by its Average Wage Index (AWI). This procedure expresses past earnings in terms of earnings at the time the beneficiary reaches age 60.

The formula for determining the first pension payment has ramifications for the pensions that will be paid throughout retirement. In the social security scheme in the United States, the first payment, also called the Primary Insurance Amount (PIA) is a non-linear function of earnings revalued using the AWI. Indexing the bend-points of the non-linear function is also critical to keep the formula relevant. Several countries such as Sweden, Italy and Poland have made benefit determination depend on cohort life expectancy.

Similar issues arise with occupational pension plans, whether in the public or private sector. Typically, occupational plans operate with tax concessions that are linked to tax laws with limits, or ceilings. These may apply to annual contributions or lifetime accumulations. Again, these tax thresholds will become misaligned with other components of the retirement system if they are not indexed.

Ultimately, the calculation of the first pension amount should take account of the proposed indexation of the pensions in payment. The higher the expected growth rate of the pension payment, the lower the pension would have to be for the same expected present value of payout. In the case of phased withdrawals, percentage draw downs should be similarly calibrated.

Pensions in Payment

In most countries, pensions are indexed to prices, wages, or some combination. Indexing pensions in payment to prices may protect against loss of purchasing power, but beneficiaries may still

not be protected against a fall in standards of living relative to the working age population. Indexing to average earnings on the other hand may lead to unaffordable increases in costs of providing pensions.[9]

The choice between wage and price indexation is frequently determined in practice by the perceived role of the payout – is the primary role of the pension in question poverty alleviation, or income replacement? We treat the indexation of means-tested pensions in more detail below, but it is worth noting here that a relativist view of poverty speaks to indexation of tier 1 pensions based on some proportion of average wages, since wages provide some guide to community living standards.

In most countries, there is limited legal direction as to the pattern of occupational pension payout, and in many cases a flat payout is offered, generating a higher initial payout than would be possible with an indexed flow. From a policy perspective, the negative consequence of this is that in later life, a person with substantial lifetime resources may become eligible to receive public support, while a more moderate and indexed income flow would have avoided this outcome.

Most pension schemes provide for survivor benefits at a reduced rate. Indexation of survivor benefits to the same extent will lead to increased outflows for considerably longer but will provide better replacement rates to the spouse.

Poverty Alleviation and Means-Tested Pensions

Poverty alleviation begs the question of what constitutes poverty. Leaving aside for the moment levels of poverty, a more in-principle question is whether poverty is measured according to some absolute standard, or whether it is perceived as relative to community standards. Resolution of this question is critical in designing indexation for first tier pensions.

An absolute living standard measure is typically calibrated to the ability to buy a particular basket of goods and services. But changes in community standards may imply changes in the appropriate composition of the basket, in which case a price-indexed pension will gradually fall short of the required income. One implication is that retirees of different ages who are mainly reliant on a pension designed around poverty alleviation may receive different amounts, because the first payment has been wage-indexed, but subsequent payouts increase with prices. There is no normative rationale for this result, since poverty is usually defined in relative terms, as a proportion of mean or median income. It is

[9] Wage indexation may also have an adverse impact on contributions or benefits when the age distribution of the economy changes. Alho et al. (2005) suggest a move to wage-bill indexation from average-wage indexation as the former may lower the sensitivity of pension contributions to demographic uncertainty.

therefore necessary to determine what ratio is appropriate and then to recalibrate that living standard to community living standards as these change.

In the case of means-tested pensions, it is important to index thresholds that determine eligibility for the pension. If the thresholds do not keep pace with inflation or the growth rate of the economy, then they may become irrelevant in determining eligibility. In Australia, the thresholds are indexed to prices. Means-test thresholds need to be linked to an indicator of average standards of living in the economy. Two possible indicators are GDP per capita and economy-wide average earnings.

The value of the pension must be determined as a proportion of some economic variable. Most frequently, average wages are chosen. In Australia the means-tested pension for a single person has been set at 25 percent of male total average weekly earnings (MTAWE) although in light of the financial crisis, this amount has recently been increased.[10]

Box 4: Notional Defined Contribution Plans: An Indexer's Paradise?

Indexation of pension plans reaches what is perhaps its purest form in the canonical design of the Notional Defined Contribution Plan. The classical NDC plan is essentially a non-pre-funded defined contribution system where notional individual accounts accumulate at a notional interest rate linked to system return. Individual accounts are maintained as a book-keeping system, and benefits are annuitized at retirement based on each cohort's expected mortality patterns and system returns.

From the individual worker's perspective, a well-specified NDC policy looks similar to a funded DC plan with mandatory annuities. That is, the NDC system requires individual accounts, where the fundamental unit is the individual, rather than a married couple or family. Every contributor has his own account and makes his own contributions and receives his own annuitized benefit at retirement; there is no ex ante redistribution within a cohort. From the government's viewpoint, however, NDC financing in steady-state is more similar to the PAYG model, as there is a mandatory contribution rate and each birth cohort's implicit rate of return on contributions is realized only over time. Accordingly, in the NDC plan, each worker builds up a notional capital sum in his individual account throughout his working life. In turn, at retirement, this notional accrual is then converted to an annuity, using prevailing estimates of returns and projected mortality patterns. Various life payout patterns could be specified; an NDC annuity is usually price-indexed, but it may also include escalation clauses to take account of rising community standards over time (e.g., an average of price and wage indexation is sometimes used).

The rate of return on notional accumulations is typically indexed to the aggregate wage bill or some related magnitude. This is what is meant by a NDC system's implicit return. When the labor force is shrinking, as in many aging economies (for example Japan), then returns are reduced and may even fall below zero. At

[10] The idea of the appropriate wage – mean or median – is itself not straightforward. For may years Japan had a system of standard bonuses which were excluded from the contribution base of social security, and other payments (e.g., overtime allowances, etc.) are also typically excluded.

retirement, each worker's notional accumulation is converted to a pension payout annuity using a standard annuity conversion factor.

A perfectly constructed notional account annuity should vary with evolving mortality experience, and the benefit computations based on rate of change of the covered wage bill. No country adopting an NDC plan has explicitly laid out such adjustments ex ante, although some (e.g., Sweden) have committed to contingency rules for changing benefits if there are unanticipated increases in longevity (Sunden 2006).

Any NDC plan that is rigorously followed despite demographic disequilibrium or macroeconomic fluctuations will inevitably confront year-by-year deficits and surpluses. That is, an NDC structure will be indexed to accommodate predictable adjustments attributable to increased cohort longevity and macroeconomic fluctuations impacting the time path of aggregate contributions. But it will generate low or even negative returns as population aging proceeds, unless adjustments are made such as raising the retirement age to offset labor force reductions.

One poorly-appreciated aspect of a canonical NDC plan is its inability to diversify risks either within or across cohorts – all redistribution is indexed out of any discretionary reach. For instance, a cohort that experiences a long-term economic depression will pay less money and receive lower retirement benefits than some other cohort with a stronger contribution history. Similarly, a cohort that experiences poor system returns will be disadvantaged relative to a cohort with high system returns. As a consequence, one policy objective of social security, namely cross-cohort risk spreading, is not readily handled in the NDC context. As a result, adopting an NDC may require a separate means-tested safety net to support the poor. More generally, some of the implicit subsidies inherent in a conventional PAYG plan are not present in NDC, and if they are socially desirable, will require separate implementation.

Source: Lu et al. (2008).

2.2 Which Benchmarks?

The ultimate value of any payment or threshold will depend on the underlying instrument that is used as a benchmark. In this section we present the various benchmarks that are available and the trade-offs associated with each. Wage and price indexation benchmarks may initially appear to be clear, but on further consideration complexities rapidly arise. For example, with community standards indexation, should median or mean wages be used? Or should we use a measure of per capita GDP rather than wages? In this section we offer a brief introduction to these issues, but, as with several other indexation topics that we touch upon, evidence is sparse and analytics incomplete.

2.2.1 *Which Price Index?*

Price indexation has usually been carried out by benchmarking to the Consumer Price Index (CPI). There are some variations around this index: For example, in Belgium pensions are uprated on the basis of a "health index" which is the same as the CPI but does not include the price of alcohol or tobacco products. The United Kingdom calculates a "Rossi Index" which is the same as the Retail Price Index (RPI) but excludes rent, mortgage interest payments, council tax and depreciation costs and uses it to update income-related benefits, but not pensions which use the RPI. The use of the CPI as a measure of the cost-of-living puts forth questions on two levels: around the accuracy of the CPI in general and in measuring price change of the elderly in particular.

Many analysts claim that consumption bundles of the elderly are significantly different from that of the average population resulting in over- or understatement of price change by the CPI. One of the first to deal with this question was the Boskin Commission (1994), which found an upward bias in the CPI of about 1.1 percentage points every year but no evidence of the likeliness of different groups in the population having faster or slower growth in their cost of living than recorded by changes in the CPI. Studies on this subject were carried out by Brzozowski (2005) for Canada, Australian Bureau of Statistics (2008) for Australia and Leicester et al. (2008) for the United Kingdom. The issue continues to be unresolved and requires further research before a price index for uprating pensions is decided upon.

2.2.2 Which Wage Index?

The choice of an appropriate benchmark to community living standards is more complicated than the issue of the relevant price index. Most countries use average wages, but the superiority of average wages over other earnings measures (e.g., household income) has, to our knowledge, not been adequately explored in the context of pensions indexation. Harmer (2009) discusses the usefulness and drawbacks of "household disposable income" and "national accounts"-based measures for determining community living standards. It also analyses in some detail, the problems associated with the current measure of living standards, the Male Total Average Weekly Earnings (MTAWE) used to index the age pension in Australia. The Review also points out that the Wage Price Index in Australia that focuses solely on earnings of individual employees showed lower growth than the MTAWE over the decade from June 1998 to 2008. Another unresolved issue is around the choice of means vs. median wages. These choices highlight the difference a benchmark can make to benefit values of recipients as well as well as outflows on the pension account.

Box 5: Different Price Index for the Elderly?

United States: The Boskin Commission (1994) found no evidence of the likeliness of different groups in the population having faster or slower growth in their cost of living than recorded by changes in the CPI. However, they did concede that the benefits of quality change and introduction of new products may diffuse unevenly throughout the population and also that the prices actually paid by households may differ apart from just the expenditure shares. They called for further investigation on the subject.

Canada: Brzozowski (2005) investigated the variation in household-specific inflation rates to measure the extent to which the CPI overstates the true mean inflation rate. He claims that from the mid-1970s till the end of 1980s the Canadian CPI overestimated the true inflation faced by seniors by about 50 percent. He concludes that the limitations of the CPI as a measure of inflation are equally present when looking at either the senior or the non-senior segments of Canadian population.

Australia: ABS (2008) designed the Analytical Living Cost Indexes to measure the impact of changes in prices on the out-of-pocket costs experienced by four kinds of Australian households, one of which were age pensioner households and one were self-funded retiree households. They do find notable differences in the expenditure weights across different household types. For example, amongst households on the age pension, the proportion of expenditure allocated to food is the highest. Health costs are also higher for age pensioners and retiree households. It is the change in the prices of these goods that will have an impact on the purchasing power of these households and not the CPI overall.

United Kingdom: Leicester et al. (2008) find that between 1977 and 2008 average inflation for pensioners has been virtually the same as that for non-pensioners, but that ranking changes from year to year and differences within a particular year may be large. They claim that inflation experience of pensioner households may differ depending on the age and income of pensioners. They also find that the basic state pension increased by less than pensioner inflation in 2006, 2007 and 2008 along with the guaranteed pension (even though the latter is indexed to average earnings).

Source: ABS (2008); Brzozowski (2005); Leicester et al. (2008); The Boskin Commission (1994).

2.2.3 *Which Longevity Index?*

Longevity presents one of the thorniest benchmarks to decide upon. Should life expectancy be calibrated from birth? From some pre-determined "retirement" age, such as 60? Should it be the same for men and women? Life expectancy at retirement has traditionally been higher for females leading to questions around an appropriate life expectancy measure for pricing of annuities as well as for determining the appropriate access age. Recent research, however, reveals that there is in fact some convergence around these mortality rates. And should only access age be calibrated to the longevity index, or should payouts be calibrated as well? That is, should the value of a payout from a social security defined benefit promise be varied as life expectancy varies? Policy needs to address questions around the correct measure of longevity for determining the pension payout. Recent innovations

include the development of longevity indexes by firms such as Credit Suisse First Boston and JP Morgan to benchmark, structure and price instruments that deal with longevity risk; yet reliable estimation procedures for forecasting changes in longevity are only in the early stages of development. At this point, a period table calculation of life expectancy from a given age, such as 60 or 65, linked to access age, would seem to be the most practical in determining how access age might be indexed. Perhaps life expectancy from the actual date of payout commencement might be an appropriate benchmark in determining the value of a periodic payout in systems that recognize sensitivity to the expected present value of payouts.

III. Principles

In this section we abstract from the plethora of indexation specifications encountered in extant social security and pension systems, and seek to identify some essential criteria, or principles, which should guide pension indexation policy. As illustrated in Section 2, most OECD countries have put in place a system of automatic indexation, often written into the law to insulate benefit determination from political manipulation. If indexation rules are to be embedded in the law, it becomes even more important to ensure that the rules take into account the various concerns about sustainability and fairness over what are essentially long-term and often intergenerational contracts.

It is convenient to begin with a simple list of criteria that well-formulated indexation policies might meet, or equivalently, the principles that indexation design should adhere to. Because indexation is a design feature of the pension system in general, we focus on those that we think are essential to a well-functioning pension system, namely financial sustainability, incentive compatibility and consistency across government policy. We identify the various ways in which indexation choices may have an impact on any of the three principles and thereby highlight the trade-offs in the choices available.

3.1 Financial Sustainability

Population ageing is placing pressure on the financial sustainability of social security systems (defined benefit or defined contribution); even when from an individual standpoint, their specification is actuarially neutral. This fiscal pressure has led to the erosion of benefit promises in many countries, and frequently these involve some revision of indexation arrangements, or discretionary changes in promises along a dimension of entitlement that could have been indexed, but was fixed nominally, such as access age.

In defined benefit schemes in particular, entitlements are generally quite complex to calculate, and a range of unexpected changes – of which the most obvious is increasing longevity – can compromise the actuarial equivalence that may have informed the policy's initial specification. Here, comprehensive indexation can help keep the contribution-benefit relationship in actuarial balance. In aggregate, however, indexation will not be sufficient to deliver financial sustainability. Different kinds of indexation essentially involve a trade-off between higher benefits and financial sustainability; careful consideration

should drive such a choice. For example, wage indexation of the stream of pension payments may mean higher benefits for retirees, but also a higher burden for those contributing to the system.

Indexation works differently depending on whether the scheme is funded or not. Typically, in PAYG schemes, contributions from working members finance the benefits of current retirees. At the level of the individual, contribution rates are usually set, at least initially, to bear some actuarial relationship to the expected value of benefits. They are (at least approximately) automatically indexed to wages, since the social security tax rate applies to wages paid. In the decumulation phase, indexation issues revolve around determination of the initial payout and the pensions in payment thereafter. Social security in the United States revalues wages to the current wage rate to determine the initial payout and price indexes benefits thereafter. If wages grow faster than prices, then the benefits of people retiring later will be higher in terms of purchasing power than the benefit of retirees today, although not in terms of replacement of earned income. One of the proposals of the *President's Commission to Strengthen Social Security* (2001) was to substitute away from wage indexation to price indexation, thereby reducing social security benefits relative to a worker's lifetime wages, thus trading off benefits for financial sustainability.

Full indexation of a PAYG system, including the internal rate of return (IRR), is found only in a pure Notional Defined Contribution (NDC) plan. Aggregate financial consistency requires that the implicit rate of return in the pension promise be the same as the growth rate of the contribution base. Adherence to this implies that benefits are automatically indexed to payroll growth, a combination of productivity (or wage) growth and labor force participation. There has been wide research over the exact structure of the IRR and the indexation mechanism in NDC schemes. While there is substantial support for the covered wage bill to be the appropriate measure of IRR, Robalino and Bodor (2007) point out that it is appropriate only in restrictive theoretical settings. They propose a new measure for the IRR that depends on the growth of the reserves and assets of the system. They also suggest the investment of contributions towards the NDC in GDP-indexed government bonds thereby making pension liabilities explicit.

While several countries have introduced NDC structures; all have stopped short of a pure plan, since in the presence of demographic transition, this would necessarily deliver very low implicit rates of return. In practice, indexation to a wage index is more routine, thus keeping the system broadly consistent in terms of promises to the individual, but not sustainable financially without increases in contribution

rates or subsidies from general revenue. Many countries have taken both these actions, and have additionally reduced future benefits.

In Sweden, the NDC has constituted an automatic balance mechanism that uses the notion of turnover duration (or the amount of time contribution assets will be in the system before they are paid out) to come up with a measure of the assets and liabilities of the system. The IRR is then the rate at which the pension liability is indexed to assure that liabilities grow at the same rate as assets. The Swedish system also calculates a balance ratio (of the assets and liabilities) on a regular basis. If the balance ratio falls below 1, cohort wealth accumulates at a lower rate and the gross rate of growth used to adjust pension benefits of retirees also falls by the balance ratio (Settergren 2001). Other countries have other adjustment mechanisms. [11]

In the case of funded DB schemes, contributions may be pooled into a reserve or a fund. To be able to pay out indexed pensions, the fund needs to invest in a mix of debt and equity instruments, possibly inflation-indexed bonds. Bikker and Vlaar (2006) claim that those pension funds in the Netherlands, which have serious indexation ambitions, need to build up earmarked indexation reserves. In their simulations, they find that realizations of unconditional indexation will be far more difficult because very large implicit capital buffers need to be shored up. One way of ensuring solvency for such funds is to have a mechanism of conditional indexation. In the Netherlands, funds that provide an earnings DB pension can grant indexation only if the asset value of the fund is sufficient to cover all future obligations (de Jong 2008).

In funded DC schemes, such protection can be construed as a real-annuity bought with the accumulated capital at the time of retirement. This usually involves investing the proceeds in inflation-indexed bonds. An inflation-protected annuity might translate to lower nominal payments to begin with.

3.2 Redistribution and Incentives

Redistribution may be an explicit objective of pension system design,[12] and indexation policy may continue with the redistribution put in place by the broader pension policy. As mentioned in the discussion on financial sustainability, social security in the United States uses a wage index for revaluing

[11] See Borsch-Supan et al. (2003) for a discussion of the German sustainability factor, and Vidal-Melifia et al. (2008) for a comparison of the automatic balance mechanisms in Canada, Finland, Germany, Japan and Sweden.

[12] For example, the PIA formula in the Social Security scheme in the United States is designed such that a dollar for dollar is not returned to people in higher income brackets.

past contributions, although reform deliberations have considered switching from wage to price indexation. While this may achieve financial stability, it does have repercussions on the redistribution possible. Pozen et al. (2004) argue that this may be very unfair to low income workers and support wage indexation for those in bottom 30 percent of the average indexed monthly earnings (AIME) distribution. For workers beyond the 30 percent, they suggest adjusting benefits on a sliding scale between full-wage indexation and full-price indexation. The latter would be applicable at the highest level of the earnings distribution.

Generous indexation, on the other hand, may also lead to transfers from the poor to the rich as it is the rich who have a higher life expectancy. Creedy et al. (1993) illustrate how the two tiers of the benefit scheme and the contribution rules in the United Kingdom interact to generate redistributive outcomes, and how these interactions are affected by pre- and post-retirement indexation rules. They find that among the factors affecting individual entitlements and benefit-cost ratios, differential mortality is central.

A lot has been written on perverse incentives on savings and labor supply caused by high taxation often required for welfare policies. Indexation design is no exception. Jaag et al. (2007) argue that moving from wage to price indexation has important consequences for implicit taxes and labor market incentives of the active workforce. While it is true that the young have significantly greater human capital to deal with unanticipated economy-wide changes, incentive effects need to be assessed before deciding upon the indexation promise. As it is possible to redistribute by way of explicit transfers, we believe indexation policy may well be kept redistributively neutral with minimal distortions on savings and labor supply.

3.3 Consistency across Government Policy

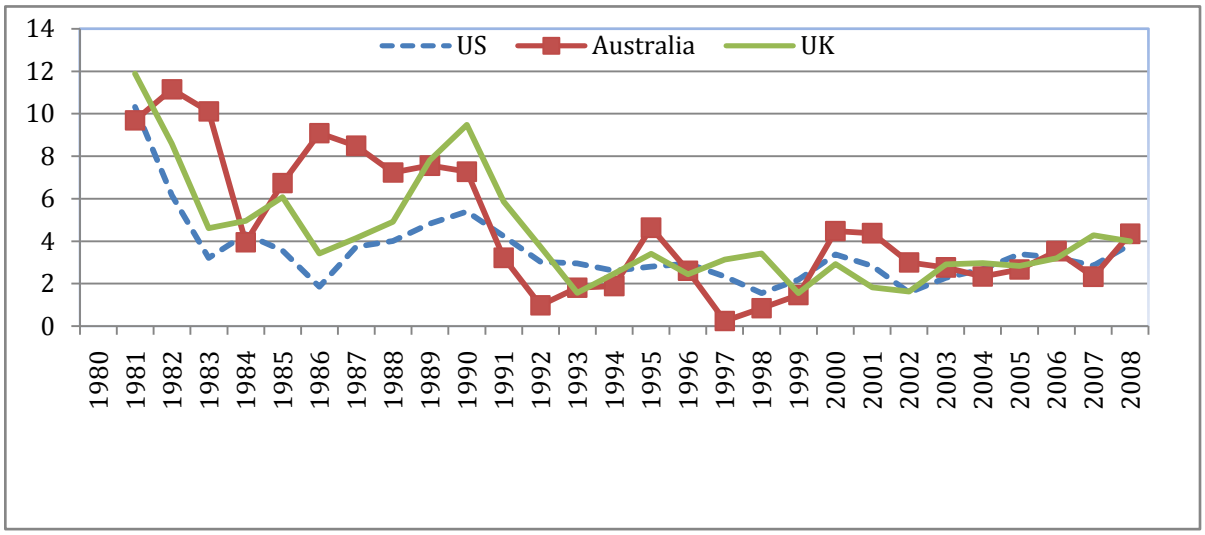
Pension schemes are usually a part of larger welfare programs covering disability, unemployment, health and other social contingencies. Often enough, different welfare schemes index payments under different rules. Within a pension system too, different tiers are indexed differently engendering incentives to select oneself into the scheme with more generous indexation arrangements. An example of this kind is presented in Box 1 in Section 2. Indexation of public pensions with no such requirement for schemes that operate in the private sector leads to a potential moral hazard problem

where people may draw down their private wealth and enjoy generous public payouts in later years. Good indexation design needs to guard against such possibilities.

While outside the scope of this paper, it is important to recognize that indexation design has repercussions beyond just welfare system design. Price indexation may lead to a class of people who do not gain from anti-inflationary policies. On the other hand, governments might be tempted to engage in inflationary policy to reduce the value of its own debt. If the government is financing indexed benefits through the issue of bonds, then in times of high price inflation, bond-holders end up subsidizing pension beneficiaries. If pension beneficiaries are holders of bonds, then it is not clear who the actual recipients of such transfers are.

It is tempting to think that inflation has been beaten, through inflation-targeting policies, but this is probably too sanguine a view. It is true that some OECD countries have put in place inflation-targeting policies: New Zealand (December 1989), Canada (February 1991), the United Kingdom (October 1992), Sweden (January 1993), Australia (June 1993) and the European Central Bank covering 16 member states of the Euro zone (1998). Graph 1 shows that since the 1990s, with inflation-targeting in place, inflation in the three countries (Australia, United Kingdom and United States) has been consistent between 0 and 4 percent. Nevertheless, historically inflation has had episodes of low and high rates, and the current fiscal stimulus packages have exacerbated already-burgeoning public debt in several major economies. This is the kind of environment in which inflation may well increase once more.

Figure 3: Inflation Rates in Australia, U.K. and U.S.



Source: IFS statistics, IMF.

IV. A Model of Indexation

In this section, we present results from a simple numerical model of a pension system designed to illustrate the impacts of alternative indexation rules. Our exemplar system is a second tier PAYG scheme with a minimum pension as a floor. In this context, we report variations in both financing requirements and replacement rates received by pension recipients. We refer to the second tier scheme as the earnings-related (ER) scheme in the model. If the outcome from the ER scheme is lower than the value of the minimum pension in a particular year for a pension recipient, then the payout will be increased to the minimum pension from general tax revenue. We ask how indexation of various parameters of both schemes affects outcomes for individuals who might be recipients of both the tiers. We also take a holistic look at pension expenditures and examine the impact of indexation design on expenditures on account of the PAYG scheme as well as the minimum pension.

4.1 Pension System Set-Up

4.1.1. A PAYG System, with a Minimum Pension

We stipulate an overlapping generations' structure in which each cohort lives for 60 adult years, the first 40 in the labor force, followed by 20 years in retirement. Death occurs with certainty at 60. Cohorts gradually diminish in size, by 1 percent each year. Once the pension system is mature, this generates the kind of demographic scenario that many developed nations are facing or will face over the next period. This leads us to have an age-dependency ratio of 0.58 by 2057, which increases to 0.68 by 2060. While such ratios are not unusual in many OECD countries; demographic transition in our model is more rapid and is a deliberate creation to highlight the impact of demographic change and shrinking workforce on system finances.

To give a calendar reference point, the first cohort begins to work in 2000, and payouts start in 2040. The pension is set at 60 percent of final salary. Indexation can be set to either prices or wages. Contributions are set at 15 percent of gross wages every year. These numbers are typical of developed country PAYG social security policies. While these parameters generate a financially sustainable system in a stationary demographic equilibrium, falling fertility generates persistent and significant deficits unless parameters are changed.

To this standard structure we add a minimum pension, set at 30 percent of average wages in the economy in 2040. It is indexed to either prices or mean wages. There are five equal-sized categories of workers (with wages in 2000 corresponding to $1000, $2000, $3000, $4000 and $5000 respectively).[13] The wage distribution is important because it has implications for the minimum pension thresholds that are a function of average wages, and thus the number of people who qualify for the minimum pension.

Wages and inflation in this model are drawn from a normal distribution. Average wage growth rate is 6 percent with a standard deviation of 3 percent. Average inflation is 4 percent with a standard deviation of 4 percent. We draw 5000 observations of wage-inflation combinations and measure the impact on the present value of the fund and on pension outcomes for all five categories of workers.

4.2 Outcomes

We first consider the impact of the indexation of the pensions in payment on the year-on-year balance of the fund as well as the present value in 2040. We consider two scenarios: wage and indexation.

Table 4: Impact of Indexation Design on Finances of a PAYG Scheme

Indexation (Pensions-In-Payment)	First Year of Negative Net Outflows	Average Present Value of Fund (In$ Million 2040)
Wage	2048	-55898
Price	2046-2053	-30479

Source: Authors' calculations.

We find that the year-on-year outflows from the pension fund go negative in 2048 in the case of wage indexation, whereas in the case of price indexation they vary between 2046 and 2053. We assume a discount rate of 5 percent to calculate the present value of the fund under both indexation regimes. We find that the average present value of the fund in 2040 is lower in the case of price indexation, thereby implying lower outflows on account of pensions. We present the distribution of the present values of the fund in the case of wage and price indexation in Figures4 and 5.

[13] While in principle other settings are possible, for example a proportion of median earnings, we do not present outcomes from other settings. With this distribution, the mean and the median wage is the same. For a distribution with a greater proportion of poor people, the median wage is likely to be much lower.

Figure 4: Present Value, Wage Indexation ($ Million)

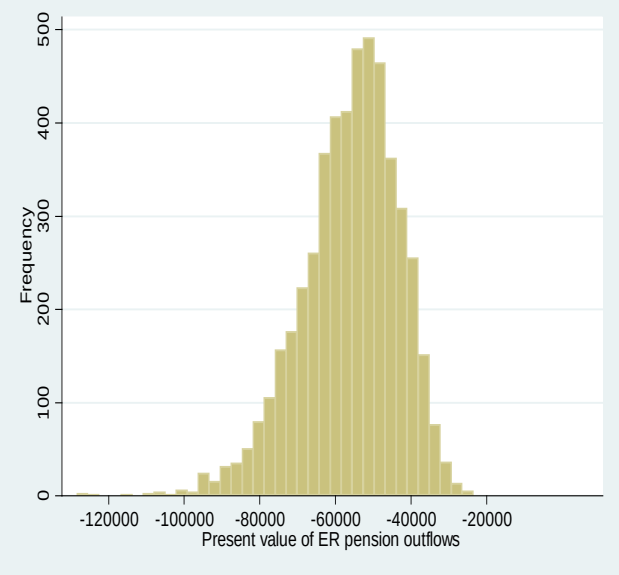
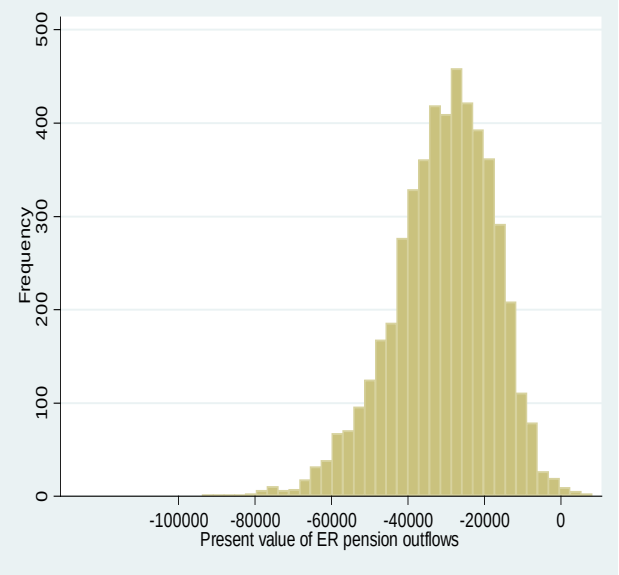


Figure 5: Present Value, Price Indexation ($ Million)



Source: Authors' calculations.

From the figures, we find that the distribution of present values under wage indexation is skewed more to the left, indicating that outflows are higher in the case of wage indexation. While price indexing is less expensive than wage indexation, it also implies lower replacement rates. The replacement rate in case of wage indexation stays a constant 56 percent of the working-age population wage throughout the period of retirement (2040 to 2060 in our model), whereas in the case of price indexation it falls to 47 percent in 2050 and further down to 39 percent in 2060.

Price and wage indexation also imply different outcomes for different cohorts. Table 5 presents the value of the pension of two persons from the $1000 wage group who retired in 2040 and 2041 respectively.

Table 5: Pension Values for Successive Cohorts

	Value of the Pension in 2040 (Current Dollars)	Value of the Pension in 2041 (Current Dollars)
Price Indexation		
Retired in 2040	8927	9376
Retired in 2041		9356
Wage Indexation		
Retired in 2040	8927	9493
Retired in 2041		9356

Source: Authors' calculations.

A person retiring in 2040 will have the same pension payment in the first year regardless of the indexation regime as that is a function of final year's salary. However, as compared to a person retiring in 2041, the 2040 retiree may do better or worse depending on the wage and price outcome. In the illustration in Table 5, we find that on an average, the 2040 retiree does far better than a 2041 retiree under wage indexation, than under price indexation.

Lower pension outcomes matter the most for lower income groups, who are more likely to qualify for the minimum pension. We define the top-up as the difference between the minimum pension of that year and the pension from the second tier earnings-related scheme. We find that people in the $1000 wage group will always qualify for a minimum pension and the average amount of top-up required in 2040 is around $3,438 per person. By 2050, the average top-up includes not only the outflows on the minimum pensions of the 2040 cohort, but also all the other cohorts who retired between 2040 and 2050. These outflows differ depending upon the indexation rules of both: the second tier earnings-related scheme and the minimum pension thresholds. If the thresholds are not indexed, or indexed to prices, while the ER pension is indexed to wages, then fewer people will qualify for the minimum pension. On the other hand, if the ER pension is indexed to prices, while the minimum pension thresholds are indexed to wages, more people may find themselves eligible for the top-up.

If the outflows on the earnings-related pension exceed the inflows or if greater numbers of people are now eligible for a minimum pension, the expenditure will have to be financed out of tax revenues. We examine the average outflows out of tax revenues under different indexation rules of earnings-related and minimum pensions.

Outflows on account of the ER pension are higher when the ER pension is wage-indexed as shown in Table 6. The ER fund goes in the negative only in 2048 (as shown in Table 4) and therefore there are no outflows from that fund in 2040 under either indexation rule.

Table 6: Outflows on Earnings-Related Pensions ($ Million)

	2040	2050	2060
Wage	0	4079	33359
Price	0	2613	24128

Source: Authors' calculations.

As mentioned earlier, outflows on minimum pensions will depend on not only their indexation rule but also of the ER pension. This is because generous indexation of the ER pension will ensure that fewer people qualify for the minimum pension. If the ER pension is price-indexed, and the minimum pension is wage-indexed, over time more people may end up qualifying for the minimum pension, leading to greater outflows.

Table 7: Outflows on Minimum Pensions ($ Million)

	2040	2050	2060
ER Pension Indexed to Wages			
Minimum Pension: Wage	34	643	2094
Minimum Pension: Prices	0.00	0.17	0.74
ER Pension Indexed to Prices			
Minimum Pension: Wage	34	764	3060
Minimum Pension: Prices	34	445	958

Source: Authors' calculations.

As shown in Table 7, by 2060, the outflows are highest when the minimum pension is indexed to wages and ER pension to prices, followed by a system where both minimum and ER pensions are indexed to wages. Outflows on the minimum pension are lowest when the minimum pension is indexed to prices and the ER pension to wages because greater numbers of people receive pensions above the minimum pension limits.

The total outflow for the government is the sum of outflows on minimum pensions and ER pensions. While the government may lower the outflow by price indexation of the ER pension, it may have to pay out the minimum pension to a greater number of people, in which case, the total outflows may not be that much lower.

Table 8 presents the average outflows on ER and minimum pensions under different indexation arrangements. We add the spending on the minimum pensions of the 2041 retiree cohort to the total spending on the ER pensions.

Table 8: Total Outflows on Minimum and Earnings-Related Pensions Under Different Indexation Arrangements ($ Million)

	Total Outflows (Minimum Pension + ER Pension)		
	2040	**2050**	**2060**
Minimum Price, ER Wage	0	4079	33360
Minimum Price, ER Price	34	3058	25086
Minimum Wage, ER Wage	34	4721	35453
Minimum Wage, ER Price	34	3377	27188

Source: Authors' calculations.

The highest outflow in 2060 occurs when the minimum pension and the ER pension are wage-indexed, followed by a system where the ER pension is wage-indexed while the minimum pension is price-indexed.

In conclusion, we find that wage indexation of the second tier pension is more expensive than price indexation but delivers higher replacement rates. Wage-indexing the minimum pension implies that more people qualify, especially if the second tier pension is price-indexed. If the minimum pension is indexed to median wages, in situations where the wage distribution consists of more people at lower incomes, outflows would be lower but would also imply lower pension income for poorer recipients.

V. Cost of the Indexation Guarantee

Our discussion so far has focused on the notion of indexation as an anchor to anticipated economy-wide changes. While an annuity with an escalation factor set to expected inflation (or expected nominal wage growth) might be one solution, it still does not cover beneficiaries against unexpected inflation (Doyle and Piggott 2002). Indexation, on the other hand, is insurance against unanticipated changes in the economy as well. An indexation promise can be construed as a guarantee against certain specified events such that a payment is made only if the contingency occurs.

Guarantees on individual accounts in DC systems have been well explored in pension literature. These include minimum benefit guarantees and minimum rate of return guarantees. In the case of the former, participants are assured of a minimum level of benefit, irrespective of the actual performance of their individual account. (e.g., Chile). In the case of the latter, participants are assured a minimum rate of return on their investments (e.g., Uruguay). In either case, the guarantee is not "free" just because governments shoulder the burden. Feldstein and Samwick (2001) talk about a "real principal guarantee" under which participants are guaranteed their lifetime contributions into the DC account adjusted for inflation. They value such a guarantee by projecting what pension guarantee payments might be according to a set of stochastic assumptions and take their expectation. Several papers have explored risk-neutral valuation techniques to "price" the guarantee (Pennachi 1999, 2000; Fischer 1999; Zartia 1994). Lachance and Mitchell (2003) provide five examples of guarantee designs and their costs as well as alternative financing options for each.

These guarantee pricing techniques can be applied to price indexation insurance. One example of indexation insurance is against inflation. Bodie (1990) was the first to identify the insurance contract against $1 inflation as a European call option on the consumer price index. He developed an indexation contract with a deductible such that the contract compensates the holder only for inflation above a specified rate of i per year. The exercise price on the option is then the "deductible". He found the price for this contract using the standard Black-Merton-Scholes valuation methodology. This idea was developed further by Formica and Kingston (1991). They develop a "real value protection" concept of inflation insurance whereby a fixed nominal escalating annuity would be the norm and inflation insurance would kick in only if that usual escalation factor proved unsatisfactory at a point in time. This way the annuitant would be protected against erosion in purchasing power if inflation continues to be high but just below the deductible. This insurance is usually cheaper than full insurance as the escalation

factor is built into the contract and it takes a number of years for the inflation points to accumulate beyond the deductible.

Piggott and Doyle (1998) present the payouts calculated by incorporating the cost of partial inflation insurance for a range of real value protection factors and inflation volatilities. They find that the initial payout on an annuity with a 20 percent inflation deductible is about 14 percent higher than that on a fully indexed annuity. An escalating annuity therefore may be cheaper in many instances than full insurance coverage. A particular example of alternative cost of living insurance regimes occurs when choosing between wage and price indexing of pensions in payment. As Whitehouse (2009) points out, it may be desirable to allow people to choose between a lower initial payment with wage indexation and higher payout with price indexation.

While this analysis has been towards annuities bought with accumulations from a DC individual account, the principle of valuing inflation insurance can be extended towards PAYG DB systems as well. One way of implementing this is to ask what the sum-total of the inflow of contributions would have to be if a cohort retiring in a particular year needs to be given an escalating annuity with different deductibles.

In an era of massive demographic upheaval, where governments are resorting to changing indexation promises to curtail pension expenditure, valuing of the indexation benefit may prove very useful. In case of second tier systems, instead of guaranteed price indexation, governments could only provide for escalating payments and leave it to individuals to buy the amount of real value protection (or deductible) they find most comfortable. This way, the cost of “insurance” is paid for by individuals, but the cost of anticipated inflation is borne by taxpayers.

VI. Conclusions

Indexation of pensions to safeguard against a fall in purchasing power in old age is a ubiquitous phenomenon in most OECD countries and several developing nations as well. While there is widespread acceptance on the importance of indexation, academic and policy deliberations on its design and implementation are scant.

In this paper we examine indexation design in a holistic manner and stress the importance of anchoring indexation policy to one or more economic and demographic indicators so that pension parameters adjust appropriately to changing circumstances. We focus especially on the various aspects of a pension system that have a bearing on the final pension received by beneficiaries. This includes not just the pensions-in-payment, but also contribution ceilings, pension access-age, revalorization formula, first pension payment formula and means-test thresholds that determine eligibility to first tier pensions. We then identify the issues around the relevant benchmarks that get used for indexation and point out that the question of the most appropriate benchmark has yet not been resolved in many instances. For example, consensus around a separate price index for the elderly, or the use of mean vs. median wage has yet to be arrived at. We then emphasize some guiding principles that might inform indexation policy: financial sustainability, incentive compatibility and consistency across government policy.

We present a simple model of indexation where we are able to show the interactions between indexation rules of the first and second tiers of a pension system and point out that these interactions have a bearing on which individuals find themselves as recipients of both tiers and therefore the ultimate replacement rate as well as outflows from general tax revenues. We find that wage indexation of the second tier pensions is generally more expensive but provides a higher replacement rate. Wage indexation of the first tier minimum pension and price indexation of the second tier pension imply that a lot more people will find themselves eligible for the minimum pension over the course of retirement.

At the risk of oversimplification, we conclude that

- Aspects of pension policy that relate to accumulations should be indexed to some variant of wages.
- Second tier schemes that aim for income-replacement could be indexed to prices.
- First tier or poverty replacement schemes should be indexed to community standards that include measures such as wages or per-capita GDP.

- Recommendations around longevity indexation are more difficult to crystallize. But the idea that access age should be linked to some measure of longevity has great intuitive appeal and warrants further research.

As with any guarantee, we think governments should price the indexation guarantee. We look at the guarantee pricing literature that revolves around minimum benefit and rate of return guarantees on defined contribution individual accounts and believe that these techniques could be utilized to price the indexation guarantee. With a price, governments will then be able to offer escalating payments and leave it to individuals to buy the amount of real value protection or deductible they find most comfortable. This allows for risk diversification between various stakeholders of the pension system and is extremely valuable as governments grapple with burgeoning retirement payouts. This is left for further research.

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Summary Findings

Pension indexation should anchor the parameters of the pension system to one or more economic and demographic variables to ensure that the system is implemented in a sustainable way, while minimizing distortions affecting important economic choices. Arguing that financial sustainability, incentive compatibility and consistency across multiple government programs are critical, we examine the many linkages between the various parameters of pension schemes. Finally, we turn to the cost of the insurance dimension of indexation, and suggest that option pricing techniques could be used to price indexation guarantees, and that this approach may suggest refinements to indexation practice not thus far implemented.

HUMAN DEVELOPMENT NETWORK