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POWER OVER PENSIONS

Who should decide and how?

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ABSTRACT: The economic profession has widely examined the effects of the pension system on economic efficiency, intergenerational fairness and the sustainability of public finances, while less attention has been paid to the political decision making process. Yet, the essence of the problem is arguably a political bias in decision making in favour of the interests of the present generations. The young and unborn generations may receive little weight by politicians eager to please voters in the next election.

The focus in this paper is on decisions on pension entitlements and commitments within the framework of a very simple "overlapping generations model". The analysis is first applied to democratic decision making, based on majority voting. In Finland, however, the parliament has devolved much of its power over (earnings-related) pensions to the corporatist system. The democratic and corporatist decision making processes are compared and their relative pros and cons evaluated. The paper also considers the case for refining current decision making structures.

TIIVISTELMÄ:

KENEN TULISI PÄÄTTÄÄ ELÄKKEISTÄ JA MITEN?

Väestön ikääntyminen heikentää talouskasvua ja lisää julkisen sektorin ikäsidonnaisia menoja. Talouskriisi vaikeuttaa julkisen talouden rahoitusongelmia.

Eläkejärjestelmän suurimmat vaikeudet eivät kuitenkaan ole demografisia, taloudellisia tai rahoituksellisia; pohjimmiltaan ne ovat poliittisia. Ongelman ydin on, että demokratialla on taipumusta suosia nykyisyyttä tulevaisuuden kustannuksella. Syy on yksinkertainen: tulevilla ikäpolvilla ei ole äänivaltaa poliittisessa päätöksenteossa, vaikka se monella tapaa muokkaa tulevia elinolosuhteita.

Eläkepolitiikan päätöksenteon avainryhmiä ovat keski-ikäiset ja sitä vanhemmat ikäkohortit, joille eläke-etuudet ovat jo iän takia etusijalla suhteessa niiden rahoittamiseen edellyttämiin maksuihin ja veroihin. Näiden ryhmien poliittinen voima on monessa maassa johtanut taloudellisesti ylimitoitettuihin eläkkeisiin. Demokratian oloissa eläkejärjestelmää saatetaan lisäksi muuttaa tilannekohtaisten paineiden takia, mikä voi vähentää pitkäjänteiseksi tarkoitetun järjestelmän vakautta.

Suomen työeläkejärjestelmä on institutionaalinen kummajainen. Mutta eläkejärjestelmä ja julkinen sektorimme kokonaisuutena ovat kestävyysvajeestaan huolimatta kansainvälisesti katsoen melko hyvällä tolalla. Todellinen eläkepoliittinen päätöksenteko on paljolti pysynyt eduskunnan ulottumattomissa, mikä näyttää osaltaan suojanneen Suomen eläkejärjestelmää muualla usein rahoituksesta piittaamattomiin päätöksiin johtaneesta populismista. Työmarkkinaosapuolet ovat tuoneet päätöksentekoon asiantuntemusta ja taloudellista realismia.

Suomen eläkepoliittiseen päätöksentekoon liittyy silti ilmeisiä ongelmia. Valtaa on luovutettu työmarkkinajärjestöille epämääräisellä tavalla. Tämä voidaan nähdä demokratian kannalta pulmallisena; koskevathan eläkepolitiikan päätökset myös järjestöihin kuulumattomia kansalaisia. Eläkepolitiikka ei täytä pitkäjänteisyyden vaatimusta, sillä osapuolet eivät ole sopineet maksutasoon kohdistuvien nousupaineiden edellyttämistä toimenpiteistä pitkälle tulevaisuuteen. On kysyttävä mitä seuraa, jos päätösten edellyttämään konsensukseen ei järjestöjen välillä kyetä, tai jos ratkaisut eivät tyydytä poliittisia päättäjiä? Siirtyykö eläkepoliittinen valta silloin hallitukselle ja eduskunnalle? Johtaisiko tämä tempoilevaan ja/tai ajan mittaan rahoituksellisen kestävyyden vaarantavaan eläkepolitiikkaan?

Eläkepoliittisessa päätöksenteossa tulisi voida nykyistä paremmin yhdistää demokraattisen legitimiteetin sekä asiantuntemuksen ja pitkäjänteisyyden vaatimukset. Kaksi institutionaalista ratkaisua omaavat tältä kannalta erityistä mielenkiintoa.

Ensinnäkin voitaisiin yksittäisten ratkaisujen sijaan pyrkiä sopimaan päätössäännöistä. Näin siksi, että yhteisymmärryksen saavuttaminen kriisiin jo ajauduttua on paljon vaikeampaa ja kyseenalaisten päätösten (huonojen ”lehmänkauppojen”) riski suuri. Elinaikakerroin on hyvä esimerkki harkinnanvaraista päätöksentekoa vähentävästä sopeutumisesta. Ruotsin ns. ”eläkejarru” on toinen esimerkki. Myös eläkejärjestelmän ikärajat voitaisiin indeksoida elinaikaodotteeseen.

Toiseksi poliittinen järjestelmä voi delegoida valmistelu- ja jopa päätösvaltaa muille tahoille ml. asiantuntijoille. Rahapolitiikan valta on nyttemmin yleensä delegoitu itsenäiselle keskuspankille, joka mielletään asiantuntemusta edustavaksi pikemmin kuin poliittiseksi elimeksi. Järjestelmä täyttää demokratian vaatimukset, koska vallan delegointi tapahtuu demokraattisessa järjestyksessä, ja koska valtaa delegoinut taho (hallitus ja eduskunta) määrittävät vallan käytön rajat ja tavoitteet.

Päätössääntöjä ja modernin keskuspankkipolitiikan analogiaa hyödyntäen voisi korporatistisen päätöksenteon sovittaa yhteen demokratian vaatimusten kanssa seuraavasti:

Eduskunnan tulisi määrittää eläkepolitiikan tavoitteet ja periaatteet. Työeläkejärjestelmän tulee olla rahoituksellisesti kestävä kohtuullisen maksutason rajoissa (riittävällä todennäköisyydellä). Vaatimus tarkoittaisi sellaista eläkemaksun, rahastointiasteen ja etuuksien keskinäistä suhdetta, että eläkemaksuun ei kohdistu tulevina vuosikymmeninä kovin voimakkaita nousupaineita.

Eduskunnan tulisi hyväksyä ne pelisäännöt, joita noudattaen eläkejärjestelmän parametreja tarvittaessa muutetaan sen rahoituksen kestävyyden turvaamiseksi. Muutoksia tehtäessä voidaan eri tavoin painottaa rahastointiastetta ja eläköitymisikää sekä maksu- ja etuustasoja. Valinnat vaikuttavat eläkejärjestelmän kannustinvaikutuksiin sekä riskien kohdentumiseen nuorten ja iäkkäämpien sukupolvien kesken, minkä takia valintojen tulisi olla poliittisen arvioinnin kohteena.

Eduskunta nimittäisi eläkepoliittista valtaa käyttävän asiantuntijaryhmän (”Eläkepoliittinen neuvosto”) sekä määrittäisi sen toimivallan. Ryhmän tehtävänä olisi raportoida hallitukselle ja eduskunnalle eläkejärjestelmän kehityksestä ja näkymistä. Se vastaisi eläkepolitiikan toteuttamisesta hallituksen ja eduskunnan määrittämien periaatteiden mukaisesti. Lisäksi työryhmä osallistuisi lainsäädännöllisten uudistusten valmisteluun (tai vastaisi niistä). Ryhmä koostuisi ensisijaisesti työmarkkinaosapuolten edustajista, mutta siihen kuuluisi myös ministeriöiden virkamiehiä (STM, VM) sekä eläkepolitiikan ammattilaisia ja riippumattomia asiantuntijoita. Puheenjohtajan tulisi omata kiistatonta eläkepoliittista asiantuntemusta. Ryhmä tekisi päätöksensä konsensukseen pyrkien mutta tarvittaessa enemmistöllä.

1. Introduction

The on-going process of demographic change (aging populations) is weakening economic growth and increasing pressure on pensions and other age-related public spending. The public sector is faced with the gloomy long-term prospect of rising tax rates and/or increasing public indebtedness, developments which risk undermining the financial basis of the welfare state.

The economic profession has widely examined the demographic challenges and the effects of pension policies on economic efficiency, intergenerational fairness and the sustainability of public finances. Less attention has been paid to the political decision making process and the forces shaping its outcomes. Yet, the key issue is arguably not demographic, economic or financial; fundamentally it is political.

The essence of the problem is a political bias in favour of the present at the expense of the future. The reason for this bias is as basic as it is simple: future generations are not in a position to take part in current political decision making, yet many decisions made today have significant consequences far into the future. There are no assurances that the needs of presently unborn generations are paid sufficient attention to by politicians eager to please voters and pressure groups in the next election.

The focus in the following is on decision making with regard to pension entitlements and commitments, which are considered to constitute "implicit debt". Power over this debt policy is predominantly in the hands of middle-aged wage earners, for whom the pension entitlements are understandably more of a concern than the contributions and taxes needed for their financing. The priorities of the middle-aged voters and politicians are in many countries reflected in an overexpansion of social security and high public indebtedness.

This paper examines these issues in the framework of a very simple "overlapping generations model", set out in the Annex. The analysis is first applied to democratic decision making, based on majority voting, which is well known to assign the decisive role to the "medium voter" (section 2). In the case of Finland, however, it is far from clear that decisions on pension policy are to be regarded as the outcome of a democratic process. Arguably, the parliament has devolved much of its power over (earnings-related) pensions to the corporatist system. In section 3 the democratic and corporatist decision making processes are compared and their relative pros and cons evaluated.

The key challenge for pension policy is to reconcile short-term political pressures with requirements of long-term financial sustainability. The difficulties of meeting this challenge give rise to concern about time consistency and credibility, issues which are at the forefront also in other contexts, notably in monetary policy. It is therefore worth while asking whether the analogue of modern central banking might contain some lessons for pension policy. Another alternative is to put more emphasis on agreed decision rules as compared to specific decisions.

In section 4 it is in this spirit argued that the parliament could usefully define principles and rules of pension policy, delegating executive power to an independent expert group (headed by a "Chief Actuarian"). A more transparent differentiation of the roles of the political authority and experts could help reconcile the requirements of sustainability and credibility with democratic legitimacy.

2. Pension policy and majority voting

Why do we have public pension systems, why not leave it to each individual or family to cater for retirement needs through private saving or private insurance contracts?

The answer, from an economic point of view, is that there are several elements of market failure that justify public intervention. First, some individuals are myopic, unable to undertake appropriate long-term planning. Also, they may be prone to moral hazard and assume that others will anyway cater for them if they lack resources when old. Second, private markets for annuities are not well developed, making it difficult or costly to insure against longevity risks, and insurance markets may be unduly affected by adverse selection. Third, public pension systems allow broad risk diversification and are therefore less vulnerable to unexpected capital market developments. Also, public pension systems allow risk sharing between generations, and they have historically given much better protection than private saving plans against inflation risks. Fourth, administrative costs may be lower in a public ("one size fits all") system. These considerations amount to a robust case for a compulsory pension system.

While having their raison d'etre, it is also essential that public pension systems be well designed. This implies that they should provide incentives compatible with economic efficiency, that they should not unduly distort the intergenerational distribution of income, and that they should be financially sustainable. Obviously, public pension systems often fail to meet these requirements. In particular, they are in many cases financially unsustainable and reduce economic activity by encouraging early retirement. Arguably, these negative consequences reflect the wish and political power of the currently old or middle-aged to tilt the income distribution in their favour.[1]

This section draws on an extremely simplified "overlapping generations model", set out more fully in the Annex, to examine the political forces shaping decisions on pension entitlements and obligations. In this model it is assumed that the entire population can be subdivided into three age cohorts: the young, the middle-aged and the elderly. The young are just starting their working careers, the middle-aged are in the latter part of it, and the elderly are retired. The pension system is based on PAYG: the contributions of the young and middle-aged are used to pay for the pensions of the elderly. It is further assumed that the pension system is decided upon by majority voting in an elected parliament representative of its citizens.[2] What are the optimal pension benefit and contribution rates from the point of view of the various age cohorts? What are the pensions and contribution rates that will be decided?

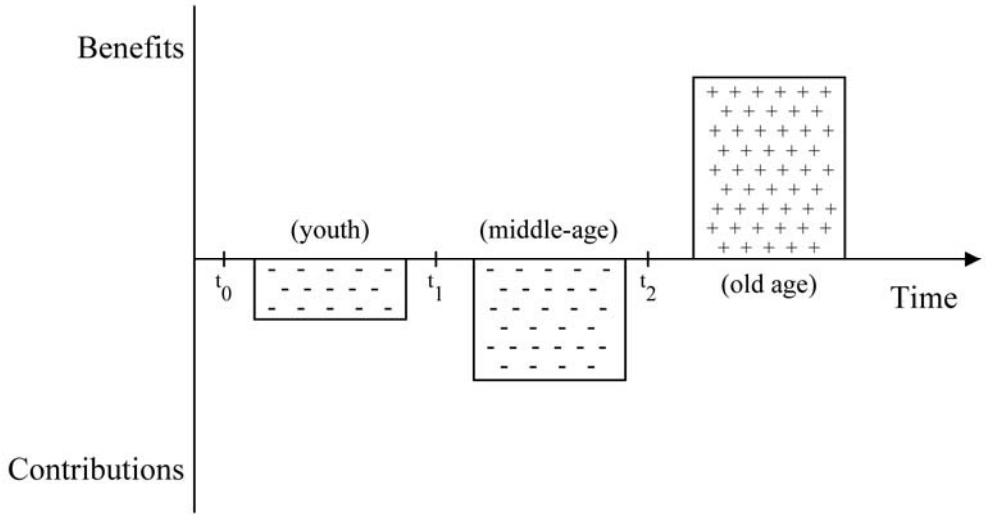
The attitudes to the pension system can be assumed to differ as between the age cohorts for a very simple and basic reason, which can be illuminated with the help of figure 1. The young will ponder, at time t_0, the relative size of the pension contributions that they expect to make during their working life and the benefit streams to be received when retired. The young, if well informed and rational, will consider the stream of contributions and benefits over the entire life cycle. The perspective of the middle-aged is rather different. The evaluation of the future, at time t_1, now focuses on the relative size of the contributions still to be paid and the expected stream of benefits, while the contributions made in the past are bygones ("sunk

[1] Market failure arguments can justify compulsory participation in funded pension systems but not the kind of transfers associated with PAYG-pensions; see Veall (1986).

[2] Actually the members of parliaments are elected on basis of party programmes bundling a number of issues, most of which do not concern pensions. It is therefore a bit simplistic to assume parliamentary decisions on pensions to reflect the majority view of citizens.

cost"). For the elderly finally, at time t_2 , the time horizon is even shorter: the contributions have been made and it is time to start receiving the benefits. The point illustrated in the figure is that the financial attractiveness of the pension system changes (increases) with age as the time horizon shortens.

Figure 1: Pension contributions and benefits over the life cycle



Examining more closely the situation of the young, it can be shown (cf. the Annex) that the expected (internal) rate of return on pension contributions of the young, i_Y , under steady state assumptions is given by

(1) $$i_Y = (1+n)(1+g) - 1 = n + g,$$

where n is the rate of growth of employment (population) and g is the rate of growth of productivity (and the real wage). It follows that the present value of participation in the pension system for the young is positive if $n + g > r$, where r is the rate of return on alternative assets, taken to be the market rate of interest or the expected rate of return on a diversified portfolio of financial assets.

During much of the past decades, the condition $n + g > r$ has probably been in force in Finland: population growth was rapid, as was the rate of growth of real wages, while financial markets were undeveloped and returns on financial assets (notably bonds) were often low. Presently, however, the growth rates (n and g) are low if not negative, and this will most likely be the case even more in the future, while the rate of return on a diversified portfolio of financial assets may be expected to be relatively high (for sufficiently long holding periods). It is therefore assumed that the reverse condition $n + g < r$ holds. This implies that the present value of participation in the pension scheme is negative, when the rate of interest or the return on the alternative assets is used as the discount rate.[3]

[3] The budget constraint of the PAYG-system is $m = k/h$, where k is the benefit rate (relative to wages), m is the contribution rate and h the number of workers per retirees. A favourable change in demographics (a higher h) obviously allows a higher benefit rate and/or a lower contribution rate. Above it has been assumed that the economy is in a steady state and the parameters of the pension system constant. However, changes in the contribution and benefit rates have significant effects on the rate of return achieved on the contributions. The pension system is financially very attractive for a generation, which during its lifetime benefits from a declining contribution rate and/or an increasing benefit rate. Past and projected changes in the parameters of the pension system are thus another reason why the financial attractiveness of the system for those presently young is much weaker than for older age cohorts.

The public pension system is likely to be a "bad deal" financially for the young. Nevertheless, they may still be supportive of the system for other reasons. The young may feel that participation is a moral obligation, as the PAYG system is based on a "social contract" and thrust. Also, they may be altruistic and wish retirees to receive generous pension benefits. Like others, the young may appreciate the economic advantages of public pension systems set out above. Nevertheless, the low internal rate of return on contributions to the system is shown below to imply that the optimal size of the contribution rate (and pension benefits) is lower for the young than for older age cohorts.

For the elderly, the situation is simple and clear: the pension system is better the bigger it is, as retirees are affected only by the benefit side. The wish for high pensions may be held in check only by altruism, concern about the burden imposed on the young, or fear that too generous benefits could lead to a political backlash threatening those benefits.

While the elderly wish for high benefits and the young prefer low contribution rates, the contribution and benefit rates that are optimal for the middle-aged will turn out to be somewhere in between. This is significant because, according to the "medium voter theorem", the middle-aged thus emerge as the group effectively shaping the decisions. As already noted, the middle-aged have a stake in the system, they have already made contributions into it. With retirement approaching and the time horizon getting shorter, the weight of the expected benefit increases relative to the contributions. The forward-looking internal rate of return for the middle-aged, i_M, is given by

$$(2) \qquad i_M = (1+g)h - 1 = (1+g)(1+n)(2+n) - 1,$$

which implies that i_M is much bigger than i_Y and definitely also bigger than r.

Given the high perceived rate of return, one can expect the middle-aged to be strongly in favour of the pension system. It is in their interest that the system offers high pensions, even if this requires high contribution rates as the expected length of the remaining working period relative to retirement has become rather short. What is there to contain the size of the pension system, given its attractiveness to this decisive constituency? At least three considerations are pertinent.

First, wage earners will presumably want to have a relatively smooth consumption profile over their life cycle. Assuming imperfect capital markets, this reduces the attractiveness of very high contribution rates, which postpone more of the income stream into the retirement years. Browning (1975) and Sjoblom (1985) assume that there are no alternative saving vehicles (no financial markets) and that the pension parameters determine the saving and the consumption path over the life cycle. For the middle-aged wage earners (the medium voters), this line of analysis implies that they choose the contribution rate so as to maximize

$$(3) \qquad U_M = u_2(c_2) + u_3(c_3) = u_2[(1-m)w] + u_3[mhw(1+g)],$$

where $u_i(c_i)$ is the utility of consumption in period i and g the rate of growth of wages. This formulation assumes static expectations with regard to the pension parameters.[4] The optimum

[4] Sjoblom (1985) offers some justification for the assumption of static expectations. However, the middle-aged workers deciding on the pension system may obviously worry that new decision can be made in the future, affecting their pensions. This is one reason for introducing uncertainty about future pensions below.

condition is that the marginal rate of substitution between consumption at working age and when retired should equal (one plus) the rate of return on pension savings:

$$(4) \qquad u'_2(c_2)/\, u'_3(c_3) = 1 + i_M\,,$$

where marginal utilities of consumption adjust to ensure an interior solution.[5]

Second, higher contribution rates might have negative effects on the economy and thereby on the rate of return on money put into the pension system. The contribution rate is partly a tax, and high tax rates may weaken employment and/or growth of productivity and real wages. At low tax rates these effects may be modest, but they will become progressively bigger the higher the tax rates. The present value of participation in the pension system of the middle-aged wage earners can be written (see Annex) as

$$(5) \qquad PV_M = (i_M - r)mw/(1+r),$$

where w is the wage and m the contribution rate. An increase in the contribution rate will reduce the present value of participation if

$$(6) \qquad \delta PV_M/\delta m = [\, i_M - r + m(\delta i_M/\delta m)]w/(1+r) < 0,$$

which could be the case if $\delta i_M/\delta m$ is negative and big enough.[6] Assuming perfect capital markets and the optimal contribution rate to be defined by the condition $\delta PV_M/\delta m = 0$, it is seen to be a positive function of the difference between the rates of return ($i_M - r$) and a decreasing function of the speed with which the rate of return on pensions saving decreases as the contribution rate is raised.

One obvious mechanism for high pension costs to affect the economy negatively is through the labour supply. Such a negative effect is much more likely if the pension contribution is a tax rather than to be regarded as earmarked saving. An actuarially fair pension contribution need not reduce labour supply, if the wage earner assumes that he/she will benefit from the contribution in the form of a corresponding pension. The contribution is a pure tax, however, if there is no link at the level of the individual between pension contributions and benefits. Köthenburger, Poutvaara and Profeta (2005) explore the "efficiency-redistribution" trade-off implied and demonstrate that it explains why (intragenerationally) more redistributive pension systems are smaller.

The trade-off between "efficiency" or actuarial fairness and size of the pension system is illustrated in figure 2, which shows the replacement rate and what the OECD calls the degree of "progressivity" of pensions (which is higher the lower the degree of actuarial correspondence between contributions and benefits). As is seen, the pension system is on average bigger (the replacement rate higher) the lower is the degree of progressivity, though Denmark is an outlier.

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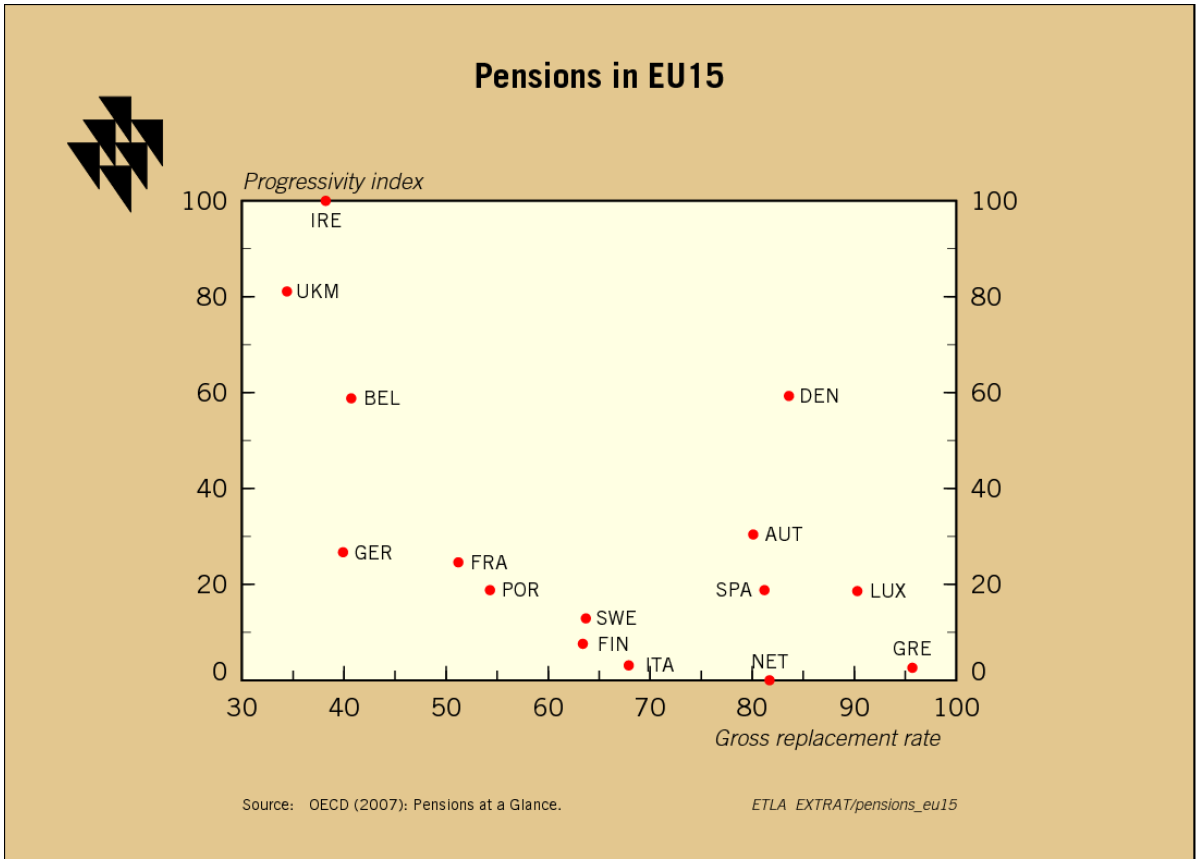
[5] Making the opposite assumption of perfect capital markets, the decision to invest in a particular asset becomes separable from the overall saving decisions. This would allow the middle-aged to benefit from a generous pension system without negative consequences for their current consumption. However, capital markets are in practice far from perfect; in particular, it may be difficult to borrow against future wage or pension income. Thus, the consequences of the pension system for liquidity constrained wage earners is likely to exert some influence on the optimal contribution rate, as indeed demonstrated by Boadway and Wildasin (1989).

[6] Various economic repercussions of the pension system, that could make it a declining function of the contribution rate, are surveyed by Breyer (1994), Cooley and Soares (1999) and Galasso and Profeta (2002).

Figure 2: Pension progressivity and the replacement rate



Third, the pension system is one instrument of saving for retirement, and all saving alternatives are associated with risk. The rate of return on collective pension saving is uncertain, as it depends on the growth rate of the overall wage bill in the economy. It is also subject to political risk, as pension rules may be changed during the working life of the wage earner or even while he is retired. Equally, private saving is vulnerable to unforeseen capital market developments, which have at times wiped out the pension savings of workers in past decades. It is also subject to political risk, as the tax treatment of private saving can be changed. The simplest way to take account of these uncertainties is by adding a term to the utility function, which for the middle-aged workers would then be

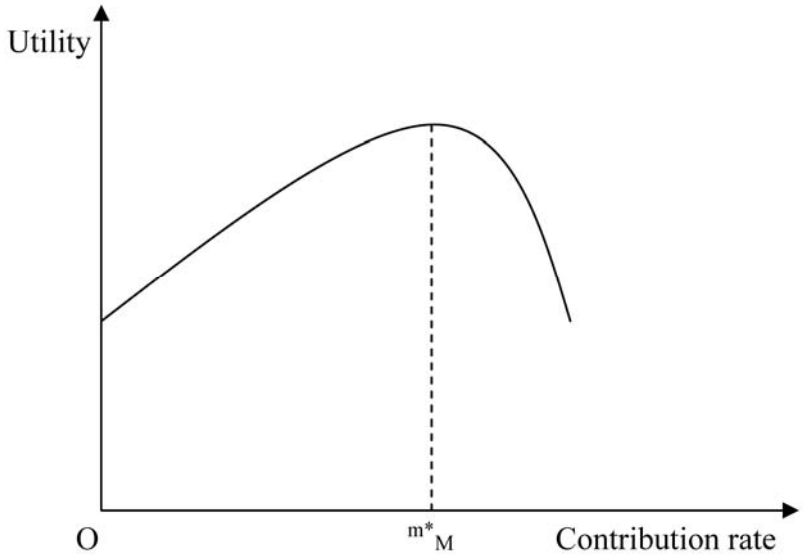
$$(7) \qquad U_M = u_2(c_2) + u_3(c_3) - (1/2)\beta v(c_3),$$

where $v(c_3)$ is the variance of consumption when retired and β indicates the degree of risk aversion. Maximizing U_M (with regard to m and c_2) will result in a certain "portfolio" including both private and collective pension saving.

The worst prospect for the middle-aged wage earner is that pension benefits are cut just before he/she retires. These political risks have to be considered when deciding on contribution and benefit rates. The fear that the "pension promise" might be broken or compromised is particularly relevant if projected increases in the old-age dependency ratio and the contribution rate trigger political debate on the need to contain costs and reduce the sustainability gap of the pension system.

From the perspective[7] of risks and uncertainties of the pension system, the optimal contribution rate of the middle-aged voters may be said to arise as the balance between hope and fear. Hope suggests deciding on a high contribution rate with a view to correspondingly generous pension benefits. Fear cautions against very high contribution rates because of their negative effects on the economy as well as on the risks and uncertainties, both economic and political. The optimal contribution rate m^*_M, indicating the most preferred size of the pension system from the point of view of the middle-aged, is where the marginal utility from the additional consumption made possible by an increase in the benefit rate is just offset by the negative repercussions of a higher contribution rate on risk (figure 3).

Figure 3: Optimal contribution rate of middle-aged wage earners



As shown in the Annex, the optimal contribution rate for the middle-aged cohort of wage earners can be written:

$$(8) \qquad m_M^* = \frac{(i_M - r)u'_3 + \beta s v(r)}{\beta w(1+i_M)^2 v(\varepsilon)},$$

where s is overall saving, $v(r)$ is the variance of return on private saving and $v(\varepsilon)$ the variance of the (expected) future contribution rate. The optimal contribution rate is positive if the rate of return on pension contributions is higher than the interest rate and/or if overall risk of saving can be reduced by combining private and public saving. The expression suggests that the optimal contribution rate is a positive function of the risk associated with private saving as well as a negative function of the risk associated with the pension system and the return on private saving. (The comparative statics of the model is discussed in the Annex.)

A similar analysis of the optimal contribution rate, as seen by the young and the old, shows that the optimal contribution rate is an increasing function of age:

$$m^*_Y < m^*_M < m^*_O.$$

[7] Somewhat surprisingly, the risk associated with future pension benefits has received but little attention in the literature, Hu (1982) being a significant exception.

This conclusion is a standard result given much attention in the literature on the politics of pension system. As seen above, a main reason why older age cohorts prefer big pensions is the (positive) effect of shorter time horizons on the forward-looking rate of return on pension contributions. The age-dependency of the optimal pension system is of great normative significance because arguably only the young generations give due weight to all costs and benefits of public pensions. The welfare of society, considering all present and future generations, would therefore be best catered for by optimizing the pension system from the point of view of the young (and future generations) rather than the currently middle-aged or old.[8]

The main results of the analysis in this section can now be summarized as follows: First, the overlapping generations framework explains the existence of the PAYG pension system by the interests and political power of the middle-aged workers and the elderly. Second, the model also points to the factors containing the generosity of the system, such as the effects of high contribution rates on the time profile of consumption as well as on return and risk. Third and most importantly, the model predicts that older age cohorts prefer higher contribution and benefit rates and assigns the medium voter role to the middle-aged wage earners. Their preferences will therefore determine the outcome of majority choice. This also implies the key result of the analysis, which is that the democratic decision process is likely to result in a contribution rate and a pension system exceeding the socially optimal level.[9]

A consideration neglected above, of some relevance in the case of Finland, is that the Finnish pension system is partially funded, the rate of prefunding being some 25-30 per cent of the liabilities. Prefunding may be seen as a tool of intertemporal smoothing of the burden of present and future generations, notably as a means for the baby boom generation to help finance part of the increase in pension costs due to its great size. Accumulation of funds may also be a way of improving the credibility of the pension system by reducing the uncertainty of future benefits.

However, middle-aged wage earners will normally have little inclination to opt for higher contribution rates without corresponding increases in benefit rates. Also, more funding and lower uncertainty may subsequently induce the medium voter to opt for higher benefit rates than otherwise. Thus, increased prefunding risks defeating its purpose (of enhancing credibility) if it triggers decisions raising benefit rates. While there seems to be no analysis of this issue in the literature, it seems a safe conjecture that prefunding of pensions, if taking place, will be on a scale which is smaller than would be socially optimal.

Another issue not dealt with above is that discretionary decision making by policy makers may react excessively to short term developments. The pension system should preferably be robust and stable over time. The short term focus of politicians may, however, lead to relatively frequent changes to the pension system, thereby undermining its stability.

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[8] It is a reasonable requirement that the social welfare function should give some or even equal weight to the interests of all generations, present and future, particularly when discussing the pension system (supposed to be very long lasting) A reasonable option is to focus on the interests of the presently young, assuming future young generations to face a similar situation. As an objection to this, it may be argued that the future young will for many reasons be in a different situation. For instance, the demographics may change (for the worse), or the level of income may be higher or environmental problems more serious. However, by making the decision on the basis of the interests of the middle-aged only, the democratic process clearly risks neglecting the future in favour of the present (unless the middle-aged are sufficiently altruistic). It is also pertinent to note that the problem is made worse by demographic change which increases the age of the medium voter.

[9] On this point see Browning (1975), Sjoblom (1985), Boadway and Wildasin (1989), Galasso and Profeta (2002), Cremer and Pestieau (2000) and Cooley and Soares (1999).

To repeat, this section has outlined the basic argument that democratic decision making results in an overexpansion of the pension system in the sense that both pensions and contribution rates are higher than is socially optimal. Another likely consequence is an insufficient degree of prefunding. The proposition that majority rule generates overexpansion of social security is, upon reflection, not surprising. There is no reason to assume democratic decision making to generate decisions which are in some general sense optimal; majority rule can only be taken to maximize the interests of the particular majority dominating the decision making.

Are these concerns justified by practical experience? The proposition that democratic choice risks leading to excessive social security does not seem far fetched in light of the great sustainability problems faced by most countries in the EU and elsewhere. Assessments made by the Commission (and the Economic Policy Committee in Brussels) suggest that almost all of the "old" member states will in the long run have to raise taxes substantially and/or cut public expenditure.

Only the Nordic countries are the exception and are assessed to have public finances on a sustainable basis. Given the significance of pensions, this is probably to a large extent due to a better or more responsible design of pension policies in the Nordic as compared to many other EU countries.

Projections for Finland indicate a substantial need to raise the contribution rate in coming decades if benefit rates are to be maintained. Calculations of the rate of return of the pension system for various age cohorts also confirm the view that the pension system is more profitable for the presently elderly and the middle-aged as compared to the young and future generations, not only in a forward-looking sense but when calculating contribution and benefits over the entire past and expected life span of age cohorts.[10] However, the situation of public finances in Finland is still reasonable or at least significantly better than in most other EU countries.

When pondering why, an obvious consideration is the relevance of the institutional context of decision making. In particular, pensions are not in Finland decided by majority decisions in the parliament. In practice, power of the earnings-related pension system has been in the hands of the corporatist system. This has probably shaped both the design and the financial sustainability of the pension system.

[10] As shown in Korkman et al. (2007), the rate of return for the age cohorts born after the war is very high, while if falls to between two and three per cent for young generations. Another way of making essentially the same point is by calculating effective tax rates of the pension system. Such calculations show that the pension system is a subsidy for the baby boom generation, while 25-30 % of contributions is projected to amount to a tax for young and future generations (the tax being calculated as the present value of net contributions at the time of birth for each age cohort). In other words, early post-war generations on average receive more in pensions than they pay in contributions, while the converse is true for the younger generations (in present value terms).

3. Corporatist pension policy

Finland has a long tradition and strong culture of corporatist decision making. This has its roots in history, particularly in the conflicts that for long times split the labour movement and the political left. Labour market organizations in Finland have participated not only in the preparation of labour market policy and legislation, but also in shaping tax and social policy and notably the earnings-related pension system. Consensual agreements of the social partners in the framework of comprehensive incomes policy settlements with governmental involvement have constituted a de facto decision mechanism of the society, often leaving little role for the parliament.

The institutions and governance of the earnings-related pension system in Finland is a very particular construction. It is managed by private companies, yet it is considered to be part of the public sector (in the national accounts) because of its collective character. The pension companies are supposed to compete with each other, but they all sell the "same" product and the contribution rate is (mainly) uniform. The pension system is meant to be long lasting if not eternal, but the labour market organizations agree on the contribution rates only for a year or two at a time. There is no agreed plan for how to meet the challenges raised by demographic change. The earnings-related pension system is a main pillar of social policy and a key determinant of the evolution of public finances as a whole, yet the parliament has very little of a role in decision making. Power is de facto in the hands of the organizations and the biggest pension companies.

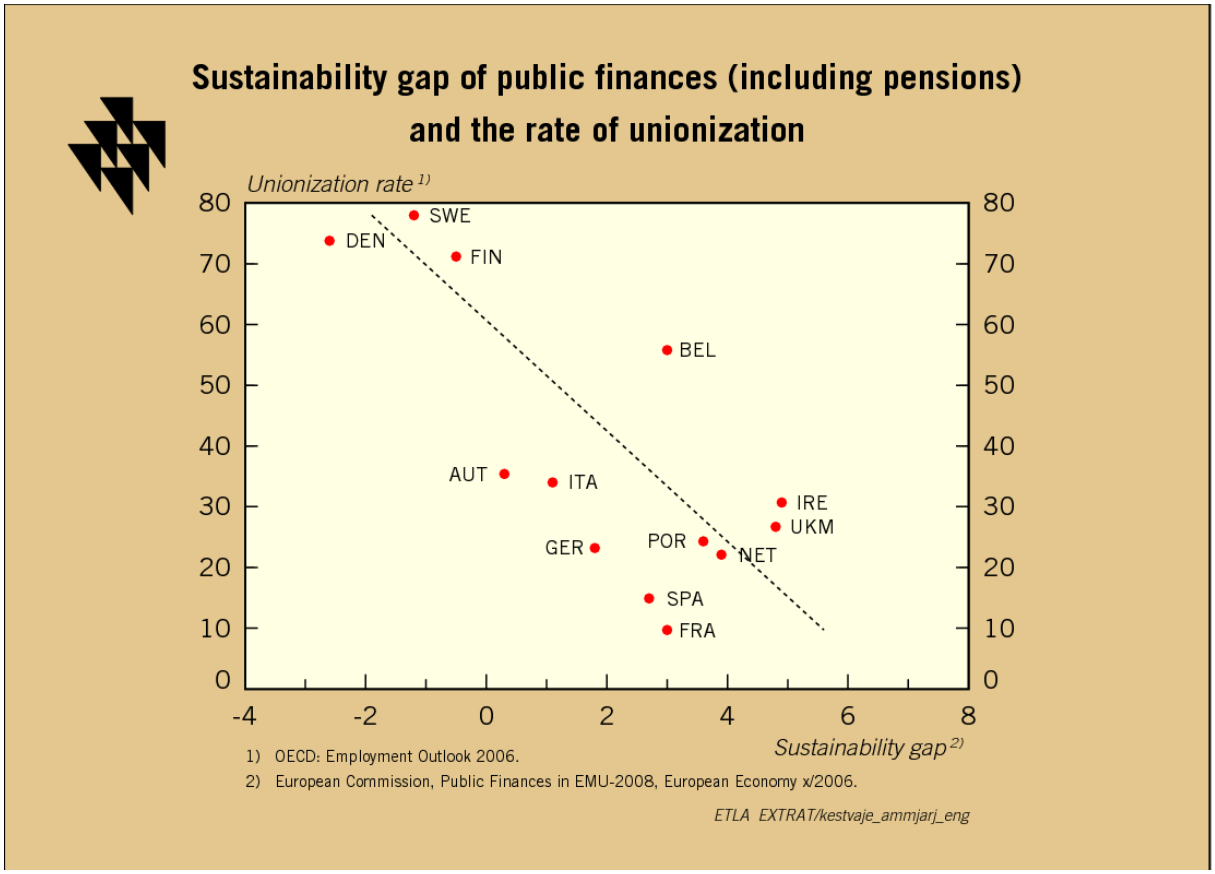
The construction of the earnings-related pension system in Finland can be understood only in the light of its history. It was agreed upon in the early 1960s in conditions, in which the organizations had (for good reasons) little trust in the willingness of the parliament to defend an earnings-related or actuarial system relative to a redistributive system with flat rate pensions. The system was therefore set up with a view to minimizing the role of the parliament and to safeguard the pension system against the redistributive inclinations of politicians.

Finland is thus a case of corporatist pension policy by design. The central labour market organizations are perceived as the stakeholders of the system and big pension companies provide the expertise. While this system of governance raises issues about democracy (see below), it may well have made a positive contribution to the financial sustainability of the pension system and public sector as a whole. This is an illustration of the pertinence of institutional considerations. In fact, correlating financial sustainability gaps of the EU15 (as calculated by the Commission) with trade union power as proxied by the degree of unionization, suggests that the public finances are in a better shape in countries with a strong corporatist influence (see figure 4 below). The correlation may indicate that labour market organization, as stakeholders in the pension system and when sufficiently strong and well organized, are more inclined to take a broad and long-run view of the system than political parties and parliaments with a more "populist" inclination. The Finnish case may give some clues as to why this could be the case.

First, the medium age of those working and represented by the organizations is significantly lower than the medium age of those exercising their vote in parliamentary elections. As discussed above, this implies that the optimal contribution rate of the medium voter will be lower; it will not be the optimal rate of the middle-aged but rather a weighted average of the

optimal rates for the young and the middle-aged. Simulations by Lassila and Valkonen (1995) indicate that the effect on the optimal contribution rate can be sizeable.

Figure 4: Sustainability of public finances and the rate of unionization



Second, and related to the preceding point, younger workers will often be liquidity constrained, implying that they will prefer higher wages and lower contributions. The considerations discussed in relation to eq. (3) will probably weigh more heavily the lower the mean age of the constituency making the pension decisions.

Third, the organizations have the capacity to internalize the importance of competitiveness for growth and jobs. Such a perspective suggests caution so as not to overburden companies with excessive taxes and contributions. The organizations are aware of and understand that their decisions will affect the behaviour of the economy as a whole and thereby also the return on pensions contributions (as discussed above in relation to equation (6)). The organizations have access to expertise on pension issues and they are (at least to some extent) committed to safeguarding its sustainability. Also, the leaders of the organizations have the confidence of the rank and file as well as the ability to explain and justify complex and difficult decisions to them.[11]

[11] The assumption that individual voters evaluate the macroeconomic consequences of various policy alternatives stretches imagination. Efforts to gather and evaluate information can more reasonably be assumed in the context of organizations having specialized staff.

Finally, corporatist decisions are usually taken on a unanimity basis. While this may cut both ways, it seems to have helped the employer side resist decisions in favour of more generous pensions. In particular, the employer organizations have never committed themselves to any particular level of pension benefits in the long run. Instead, they have stated that future benefits will have to depend on overall economic developments. The trade unions have been kept keenly aware of the fact that future decisions, reducing benefits, may be taken and are likely to be taken if the business sector gets into serious profitability problems. The institutional set up is such as to give importance to the uncertainty of the pension promise or the risks discussed in relation to eq. (8).

As an outcome of these factors, the corporatist pension policy has arguably resulted in lower benefit rates and less unfunded liabilities than would have been the case with a more democratic pension policy. Given the size and significance of the collective earnings-related pension system, the social partners may thus be given some credit for having contributed to the relatively good public finances in Finland as compared to many other EU member states. More generally, it seems a good idea to keep pension policy at an arms length from the populist pressures of party politics, because the parliamentary arena easily induces parties to compete by generous promises to current voters rather than financially responsible (sustainable) propositions.

Yet, the corporatist governance of pension policy also raises a number of questions. First, the delegation of power to the corporatist system is ambiguous; it is not based on any clear or explicit understanding of the roles of the organisations and the political decision makers respectively. Second, pension policy decisions affect also many citizens who are not members of the organizations (and the rate of unionization has in recent years been declining). While the organizations certainly have a legitimate stake in the system, there are also other constituencies such as the elderly and the very young as well as unborn generations.[12] Third, the corporatist system typically decides by consensus, which may enhance the commitment of all partners to the system, but which may also make it very difficult to agree on reform without quite costly concessions to minorities. Finally, there is no agreed long-term strategy for how to deal with demographic change (beyond the introduction of the so called age coefficient): agreements typically only cover contribution rates for one or two years at a time, which reduces the credibility of the system. Given the demographic changes and the projected increase in contribution rates, the sustainability of present benefit rates certainly cannot be taken for granted. This may be seen as a problem from the point of view of the possibilities of life time financial planning of young families.

These concerns give rise to further questions: What happens if the corporatist partners are at some stage unable to agree on the decisions necessary to fulfil the pension promise? Will power over pensions then shift to the government and the parliament (also de facto)? Is there not then the danger of populist policies, given also the lack of experience of preparation of pension policy decisions in the parliament? Would it be possible and make sense to clarify and develop the governance of pension policy so as to better combine sustainability and credibility with democratic accountability and legitimacy?

[12] This seems to be the motive for the recent decision to set up a ”pension forum” for discussions within a broader group of interested partners.

4. Delegation of pension policy: combining expertise and legitimacy

Democratic pension policy may turn out populist, while leaving it to the organizations risks making pension policy just one of the elements of corporatist negotiations. In searching for alternatives, there are at least two dimensions of decision making that seem relevant: to focus political decisions on rules and procedures rather than specific solutions, and to delegate some executive power to experts. Some inspiration for thinking along these lines can be sought in other areas and notably in the area of monetary policy.

The model of independent central banks has established itself firmly in the past decades globally and notably in the EU. The purpose of giving independence to the central bank is to take away executive power from populist politicians and hand it over to technocratic experts, more inclined to reasoned judgement compatible with long-run stability. Politicians will always want to pursue expansionary policies with a view to stimulating growth and creating jobs, even though such policies will in the longer term only cause inflation and instability. An independent and technocratic central bank can act with more responsibility and actually achieve over time (at least) the same rate of growth with more price stability, which in many ways is beneficial for the society.

Such a system is not to be considered undemocratic, as power is handed over to the bank by democratic means, through central bank legislation enacted in the parliament. After all, the parliament can through the legal act define the objectives of monetary policy (such as price stability) and impose reporting obligations on the bank to ensure accountability.[13] Also, there is usually an "escape clause", allowing the government to overrule decisions by the central bank in exceptional circumstances. This model is predicated on the assumption that there will always be a need also for analysis or judgement and discretionary decisions.

Another way to reduce the scope for (misguided) activism by politicians is for the parliament to define general decision rules to be applied as and when circumstances arise. Rules guiding the financing and adjustment of pension systems have attracted increasing interest in recent years. This interest is related to the observation that fully funded systems are able to adjust to changing age structures more or less automatically, and that defined contribution systems reduce uncertainty about the financial sustainability of pensions. There has been an increasing trend towards defining automatic or "quasi-automatic" adjustment mechanisms to be triggered if and when the financial balance of the pension system is undermined. The "age coefficient" introduced in Sweden and Finland is just one example of this.

The advantage of automatic or rules-based adjustment is that the politicians need to agree only on general principles of risk sharing. The actual decisions, which in practice are often painful for some groups in society, are then politically (somewhat) easier to arrive at as the decisions only implement general principles, without discretionary evaluation of specific actions from the point of view of a "fair" treatment of the various constituencies.

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[13] Similar arrangements have occasionally been proposed for fiscal policies. In particular, it has been proposed that a group of fiscal experts (a "Fiscal Policy Council") could define binding constraints for policies, for instance with regard to acceptable budget deficits. In Sweden such a Council has recently been established, though its mandate allows it only to make recommendations.

The elements of delegation and of rules-based decisions would seem mutually compatible. They suggest that power over pension policy could be shared and the key principles and responsibilities clarified along the following lines:

(i) The parliament should decide on general principles and objectives of pension policy. These would naturally concern financial sustainability and intergenerational fairness. For instance, the parliament could prescribe that the earnings-related pension system should be financially sustainable within a certain range of contribution rates (with a sufficiently high probability). This calls for combining contribution and benefit rates as well as prefunding in a way which effectively contains the risk of large increases in contribution rates in coming decades. This would be valuable because the pension system is a main pillar of the "social contract" and the pension promise should therefore have a very high degree of credibility. Achieving such an objective would also reduce the risk of distortions of the intergenerational income distribution. (Ideally, the principles defined by parliament would give expression to the "appropriate" social welfare function, giving due weight to the interests of future generations.)

(ii) The parliament should decide on rules of adjustment of the pension system. It will always be necessary that some parameters of the pension system are adjusted when developments or projections change. Such adjustments can strike a different balance as between prefunding as well as contribution and benefit rates. The choices affect the incentive effects of the system as well as the allocation of risks between age cohorts, and such choices should presumably be evaluated by politicians. Many countries have introduced "automatically" adjusted age coefficients and/or some form of a pension "brake" to the effect that, for instance, index compensations to pensions are compromised (not done in full) if the financial situation or outlook of the pension system has deteriorated severely. Agreement on principles and rules rather than on specific solutions is helpful for the clarity and predictability of pension policies. Reaching agreement in the midst of a crisis is much more difficult if rules have not been agreed in advance, and the risk of (unhelpful) logrolling is thereby magnified.

(iii) The parliament should nominate a pension policy expert group and define its mandate. The task of the group ("the Pension Policy Council") would be to report to the government and the parliament about the development of the pension system and its long term projections. The group could implement pension policy so as to achieve the objectives and in respect of the principles defined by the parliament. Also, the experts would naturally have an important role in preparations of new legislative initiatives when needed.[14] The chairman should have recognized and outstanding expertise in the pension area ("Chief Actuarian"), and the group would take decisions by consensus if possible and by majority otherwise.

The dilemma of the pension system is that it is asked to meet conflicting requirements: benefit rates should preferably be high and contribution rates low. Given rapid demographic change, it will become increasingly difficult to reconcile low cost with high pensions. The situation might call for increased saving, either on a private basis and/or by increased saving within the compulsory pension system (though possibly in the form of individual accounts). It would seem only natural that the alternatives of pension policy are the object of discussion in the

[14] The expert group would consist of personalities having a good knowledge of the pension system and its relevance for the functioning of labour markets. They could be affiliated with labour market organizations but should in this context in principle act in their capacity of experts. The group could also include representatives of the finance and social ministries as well as independent experts (without affiliation to interest organizations or ministries).

parliament. However, such discussions need to be carefully prepared, which again suggests a role for the expert group.

The system of governance set out above does not necessarily depart radically from the present mechanism of decision making. As noted above, the government and parliament in Finland have de facto devolved a lot of power over the earnings-related part of the pension system to the social partners. It is and will remain useful in normal circumstances to keep the parliament at an arms length from specific pension policy decisions. Arguably, however, the delegation of power could be done in a more democratic and transparent way, and the objectives and the roles of the various actors could be defined with greater clarity. The purpose would be to exploit expertise better and to ensure that the exercise of pension policy meets requirements of democratic accountability. At best, a reformed decision mechanism could strengthen the credibility and legitimacy of the pension system, which in coming years is likely to be subject to considerable pressure as a consequence of the changing demographics.

5. Concluding comments

Pension entitlements are for many citizens in Finland their most important asset. While pension rights accrue as a function of work and labour income, benefit levels and contributions depend importantly on political decisions. The power over pensions is therefore of great significance to the wage earners and the society as a whole. It would clearly be desirable that the rules for deciding on pensions are transparent and predictable, and that the exercise of power combines expertise and legitimacy.

Political decisions on pensions may become excessively influenced by electoral competition of political parties geared to maximization of support of voters in the short run. There is much to be said in favour of keeping pension policy at some distance from party politics. However, corporatist pension policy as run in Finland is open to objections regarding transparency, legitimacy and credibility. Also, the viability of future corporatist decision making is not to be taken for granted.

Modern central banking offers an interesting analogue for thinking about pension policy. The need to reconcile conflicting short and long term requirements is similar, as is the need to combine expertise and legitimacy. Arguably, pension policy is economically too important to be left to unconstrained politicians and politically too important to be handed over to democratically unaccountable corporatist decision making. This paper argues that a more rational approach is for the parliament to define the framework and principles of decision making, while delegating executive power of implementation to a body of experts.

Is pension reform possible, including of the decision making process? Experience suggests that serious pension reform is always against the odds, as any public debate easily raises fears and as reforms are felt to threaten vested interests. (The Swedish pension reform is the exception rather than the rule.) The prospects may change if the projected public finances worsen significantly and the uncertainty of future pension benefits becomes a main issue of debate, creating a crisis of confidence in the system. A severe deterioration of the outlook for public finances could create a climate conducive to reform, as the welfare of the majority could in such a situation be enhanced by putting the pension system on a sound financial basis (alleviating fears of insolvency). As recent developments in Finland illustrate, exceptional economic circumstances affect the climate for decision making in this area as well. While opening up new possibilities, a major crisis is obviously not something to wish for.

Annex: Pension policy in a simple overlapping generations model

A convenient framework for economic analysis of intergenerational issues is the overlapping generations model.[15] The version used here is extremely simple (and a bit ad hoc), but it nevertheless sheds light on some of the points made above.

Assume that the population can be divided into three age cohorts: the young, the middle-aged and the elderly. The young are at the beginning of their working career, the middle-aged are in the latter part of it, and the elderly are retired. Assume that the rate of growth of population in period t is n_t, which implies that there will be $1+ n_{t-1}$ young and $(1+ n_t)(1+ n_{t-1})$ middle-aged workers for each retiree. The basic budget constraint of the PAYG system is that aggregate contributions paid must match pension outlays, or that

$$m_t w_t h_t = k_t w_t,$$

$$h_t = (1+ n_t)(1+ n_{t-1})+(1+ n_{t-1}),$$

where w_t, m_t, and k_t refer to the wage rate, the contribution rate (out of wages) and the benefit rate (pension benefit relative to the wage rate), while h_t is the inverse of the dependency rate.

Assuming the economy to be in a steady state, thus allowing the time index to be dropped, the present value of the stream of contributions and benefits for the young is given by

$$PV_Y = - mw - mw(1+g)/(1+i) + kw(1+g)^2/(1+i)^2,$$

where g is the rate of growth of productivity and real wages and i is the discount rate. Setting this expression equal to zero gives the internal rate of return on contributions paid into the pension system from the perspective of the young as

$$(1+i_Y) = (1+n)(1+g) \text{ or (approximatively) } i_Y = n + g,$$

implying that the rate of return equals the rate of growth of population (employment) and productivity (the real wage), a result established originally by Samuelson (1958) and Aaron (1966). As noted in section 2, there are empirical grounds for assuming that the internal rate of return on payments by the young into the pension system is lower than the market rate of interest.[16]

Under reasonable assumptions on the rate of growth of the population (see Breyer (1994)), the middle-aged wage earners constitute the group of medium voters effectively deciding the outcome of majority choice. Contributions made as young are a sunk cost from their perspective, and the rate of return on pension contributions is determined by a forward-looking calculation of the contributions still to be made and the stream of pension benefits during retirement[17]

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[15] For a survey of the literature on political (public choice) analysis of pension systems see, e.g., Galasso and Profeta (2002).

[16] The reverse assumption would imply that ever increasing debts are a feasible option, as the share of debt to GDP would always tend to shrink through growth. In the analysis of public finance this case of "dynamic inefficiency" is usually assumed away.

[17] See also Galasso (2006).

$$PV_M = - mw + kw(1+g)/(1+i),$$

which gives the internal rate for the middle-aged as

$$i_M = h(1+g)(k^e/k) - 1,$$

where k^e is the benefit rate expected during retirement. Obviously the expected rate of return is much lower than otherwise if wage earners expect a decline of the benefit rate in the future ($k^e < k$). Also, risk adverse decision makers will find expanding the pension system less attractive if the future benefit rate is perceived as being uncertain (see below).Assuming $k^e = k$ and noting that (in the steady state) $h = (1+n)(2+n)$ implies the rate of return set out in equation (2) above. Calculating the present value of participation in the pension system of the middle-aged wage earners gives the expression in equation (5).

Above it was assumed that all wage earners have the same wage. In this case it makes no difference whether the pension is a flat rate or an earnings-related pension. The link to earnings matters, however, if there are wage differences. Assume that contributions are proportional to wages but pensions are flat rate. The rate of return on pension contributions of those with "low" wages is then

$$i_X = i / (w_X/w) - 1 > i ,$$

where w_X/w is the ratio of "low" to average wages and i is the average rate of return. Needless to say, flat rate pensions are quite attractive for low income earners if contributions are proportional. Not surprisingly, this is reflected in the political support for various pension alternatives. (In the early 1960s, when the earnings-related pension system was introduced in Finland, the agrarian party and the communists fought for flat rate pensions while the right wing parties and the social democrats were equally strongly in favour of earnings-related pensions.)

Given the attractiveness of good pensions, what is there to contain the contribution rate (and the size of the pension system) that is optimal for the middle-aged medium group voters? First, high contribution rates might have negative consequences on the rate of return or the present value of the pension system, as discussed in the context of the comments mad (and references given) in section 2. Negative repercussions could emanate from, inter alia, effects of the pension system on labour supply and employment or capital formation and productivity growth.

A second consideration is the consequences of pension saving for the intertemporal allocation of consumption. The analysis of Browning (1975) and Sjoblom (1985) of this issue can be recapitulated as follows. Assume that the utility functions of the three age cohorts are functions of present and future consumption, consumption must equal disposable income in each period because there is no capital market. This means that the age cohorts would maximize

$$U_Y = u_1(c_1)+ u_2(c_2)+ u_3(c_3) = u_1[(1-m)w] + u_2[(1-m)w(1+g)] + u_3[mwh(1+g)^2],$$

$$U_M = u_2(c_2)+ u_3(c_3) = u_2[(1-m)w] + u_3[mwh(1+g)],$$

$$U_O = u_3(c_3) = u_3(mwh)$$

respectively with regard to the contribution rate. Noting that the utility functions are single-peaked and taking the partial derivatives of the utility functions with respect to the contribution rate, one finds the ranking for the contribution rates to be

$$\delta U_O/\delta m \; > \; \delta U_M/\delta m \; > \; \delta U_Y/\delta m,$$

which implies the same ranking of optimal contribution rates.

A third approach is to consider the risks and uncertainties, which may differ significantly as between the pension system and private saving. The simplest way to do this is to add a variable to the utility function reflecting the negative effects of the perceived risks attached to future pension benefits.[18] Taking the case of the middle aged workers, the utility function is then

$$U_M = u_2(c_2) + u_3(c_3) - (1/2)\beta v(c_3),$$

where $v(c_3)$ is the variance of consumption at old age an where β reflects the degree of risk aversion. The pension policy decision amounts to maximizing the utility function w.r.t. c_2 and m subject to the budget constraint (assuming perfect capital markets)

$$c_3 = [s_1 + (1-m)w - c_2](1+r) + k_3 w(1+g),$$

where s_1 is saving in period 1, taking in consideration also that

$$v(c_3) = [s_1 + (1-m)w - c_2]^2 \, v(r) + [w(1+g)]^2 v(k_3).$$

It will be assumed that the expected future benefit rate is a positive function of the present contribution rate and that it is also affected by a random variable (with mean equal to 1) such that

$$k_3 = k_3^e \, \varepsilon = h m_3^e \, \varepsilon = h\theta(m_2) \, \varepsilon, \qquad \theta' > 0,$$

which implies that the variance of consumption at retirement is a positive function of the size of the contribution and benefit rates.

With no uncertainty, maximum would occur for $i_m = r$, where $i_m = h(1+g)\theta' - 1$ is the marginal return on saving through the pension system. This would imply a very high contribution rate and expected benefit rate as well as expectations of a certain decline of the rates in the future.

Assume instead static expectations ($\theta' = 1$) but allow for the uncertainty. Optimization w.r.t. c_2 and m then implies the relations

$$(1+r)u'_3 - u'_2 = \beta s v(r),$$

$$(i_M - r)u'_3 - \beta w(1+g)^2 h^2 v(\varepsilon) m + \beta s v(r) = 0,$$

where u'_i is the marginal utility of consumption in period i (assumed to be a declining function of consumption in that period).

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[18] Including uncertainty through a variance term implies that the utility function is quadratic and/or that the random variable has a normal distribution. The role of uncertainty with regard to future benefit rates have been analyzed under more general assumptions by Hu (1982). The present exposition can be seen as a simplified analysis along the lines of Hu.

The optimal contribution rate can be written

$$m_M^* = \frac{(i_M - r)u'_3 + \beta s v(r)}{\beta w(1+g)^2 h^2 v(\varepsilon)},$$

which shows it as an increasing function of the relative return on pension saving, as compared to private saving, as well as a decreasing function of the risks of pension saving and an increasing function of the risk of private saving. Examining the comparative statics of the model by differentiating the two optimum conditions and the budget constraint, while making the simplifying assumption that $v(r) = 0$, one finds, inter alia, that

$$m_M^* = f(g, r, v(\varepsilon), h, \beta).$$
$$\quad - \quad - \quad - \quad - \quad -$$

The optimum contribution rate is smaller the higher the return on private saving, the greater the uncertainty attached to the pension system in the future and the degree of risk aversion, and the higher the rate of growth of the population and of productivity.

The analysis can be repeated for the young wage earners by maximizing

$$U_M = u(c_1) + u_2(c_2) + u_3(c_3) - (1/2)\beta v(c_3),$$

subject to the budget constraint over the life cycle

$$c_3 = [(1-m)w - c_1](1+r)^2 + [(1-m)w(1+g) - c_2](1+r) + k_3 w(1+g)^2,$$

and taking account of the expression for the variance of consumption in retirement

$$v(c_3) = [(1-m)w - c_1]^2 v(1+r)^2 + [(1-m)w(1+g) - c_2]^2 v(r) + [w(1+g)^2]^2 v(k_3).$$

Maximizing the utility function w.r.t. c_1, c_2 and m gives the optimal contribution rate from the perspective of the young as[19]

$$m_Y^* = \frac{h(1+g)^2 u'_3 - (1+g)u'_2 - u'_1}{\beta w[(1+g)h^2]^2 v(\varepsilon)},$$

which can be shown to be smaller than m_M^*. For the elderly the optimal contribution and benefit rate are for obvious reasons as high as possible. Thus, the key relation $m^*_Y < m^*_M < m^*_O$ holds also in this version of the overlapping generations model.

[19] This analysis assumes that uncertainty attaches only to future pensions. For the young, also the contribution rate to be paid in the next period (as middle-aged) should in principle be considered to be a stochastic variable.

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