

Optimal risk allocation in pension arrangements

David Hollanders

Amsterdam Institute for Advanced Labor Studies (ALAS), University of Amsterdam

d.a.hollanders@uva.nl

This paper will be presented at the **Ilera Conference** in Amsterdam, June 22th 2013.

This version is preliminary, please do not cite without permission of the author

Abstract

This paper distinguishes four risks in pension arrangements. These risks are investment risk, longevity risk, operational risk and inflation risk. It discusses which party is most able to influence those risks, considering that it is optimal that this party also bears the risk. Based on the discussion it proposes that investment risk and operational risk should be borne relatively most by asset managers and inflation risk and longevity risk by the government. The corollary is that it is not optimal that all these risks are borne by employers –as in traditional DB-arrangements- or individual participants –as in DC-arrangements.

I. INTRODUCTION

This paper addresses a question in the realm of pension arrangements. This question is:

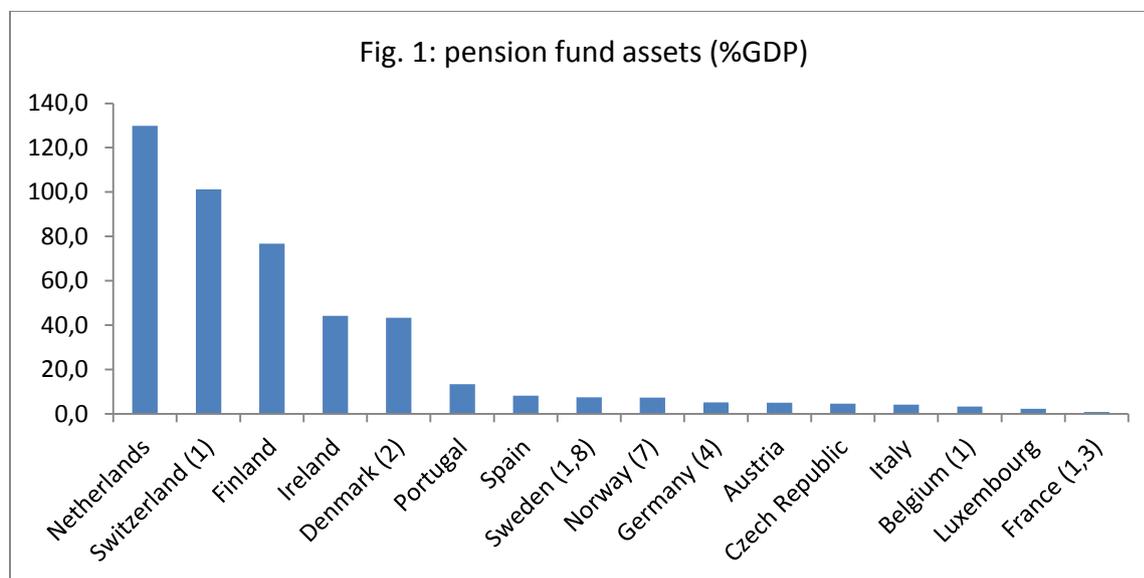
*Which party is or which parties are able to **influence** pension-risks?*

This question is crucial for optimal risk allocation, because –abstracting from risk aversion, that is, the *willingness* to bear risks- the party that is able to **influence** the risk most, should optimally **bear** the risk. The reason is that such an arrangement incentivises the party that is most able to reduce the risk to actually do so.

To answer this question adequately, it is necessary to distinguish between different kind of risks in pension arrangements. In what follows I consider four risks: inflation risk, investment risk, operational risks and longevity risk.

The relevance of optimal risk allocation follows directly –I believe- from the following observations:

- 1) pension arrangements involve many risks and involve high risks.
- 2) Virtually everyone is involved in a pension arrangement.
- 3) the (implicit) liabilities of pension arrangement are huge. So is –in the case of full funding- the value of the assets of pension funds to finance them. Figure 1 shows assets of pension funds as %GDP in several European countries. The figure shows two things. First, it shows that for some countries pension assets are large –relative to GDP. This is the case in for example the Netherlands, Switzerland and Finland. Second, it shows that there is quite some variation in pension assets. This partly reflects the difference in how pension liabilities are financed. In case of full funding, future liabilities of current pension fund participants are financed by savings of those same participants. In a Pay-as-you-go system all current benefits are financed with current contributions.
- 4) pension arrangements are widely discussed and highly contested issue, in the public sphere, political arena and academic discussions.



Ideally the party that is able to influence a particular type of risk –that is: is able to reduce it-, also bears it. In that case we live –again abstracting from willingness to bear risks, as measured by risk aversion- in the best of all possible worlds, insofar risk allocation is concerned. The last paragraph documents that –alas- we do not live in an ideal world as risks in Western countries are not allocated according the optimality principle.

To be clear, this paper does not address the appropriate *size* of the benefits nor the optimal risk level when allocating pension funds' assets nor any redistributive issues. These issues are no doubt important, but are ignored here in order to focus on the important issue of risk allocation.

II. FOUR DIFFERENT RISKS

Pension arrangements involve several types of risk. Four important types of risk are:

- i) Inflation risk
- ii) Investment risk (including default-risk)
- iii) Longevity risk
- iv) Operational risk

There are other risks in pension arrangements. Examples are 'political' risk (expropriation by the government), the risk of becoming unemployed or sick (in turn affecting possibility to save for a pension) and mortality risk (which may necessitate a surviving relatives' pension). These risks are however not dealt with here. That is, I abstract from sickness, health, pre-retirement mortality and expropriating governments. This enables to focus on the risks intrinsic in pension arrangements.

These four risks are now discussed in turn.

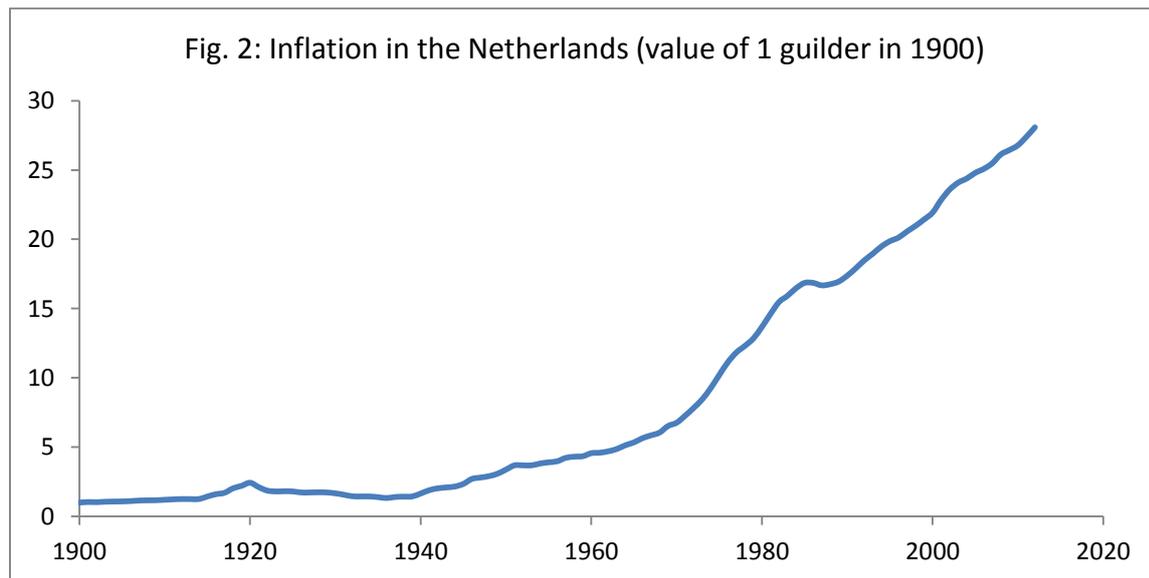
Ad i) **Inflation risk** is the risk that savings lose their purchasing power due to inflation. That is, in the case of inflation, the real value of pension savings decreases -or increases less than would have been the case without inflation. In a Defined Contribution-scheme, inflation risk is typically borne by participants. This may or may not be the case in a Defined Benefit-arrangement. If pension benefits and pension accruals are nominally guaranteed, inflation risk is borne by individual participants. If pension benefits are indexed to inflation instead, inflation risk is borne by the (sponsor of the) pension fund.

Inflation cannot be influenced by any individual participant nor by any individual pension fund, asset manager or employer. From the perspective of all these parties, inflation risk is thus exogenous. (The party that invests pension assets can hedge inflation by investing in assets categories that are closely linked to inflation, for example real estate and commodities. However the risk itself cannot be reduced, let alone eliminated.)

There are essentially two parties in modern economies that are able to influence inflation. First, the central bank –like the European Central Bank (ECB)- can influence inflation indirectly by changing the money supply. The ECB can change the money supply by changing short-term interest rate –or more generally: borrowing conditions- against which banks borrow from the ECB. Second, the government can influence several prices directly. The ultimate control over several prices presides by the government as it can induce price controls –or price ceilings-, as is

common in the realms of housing and health care. Exercise of such ultimate price control may or may not be desirable from an economic (distortion of the price mechanism) or political (the threat of abuse of state power) perspective, but it is important here that the government has both the power as well as the legitimacy to influence prices.

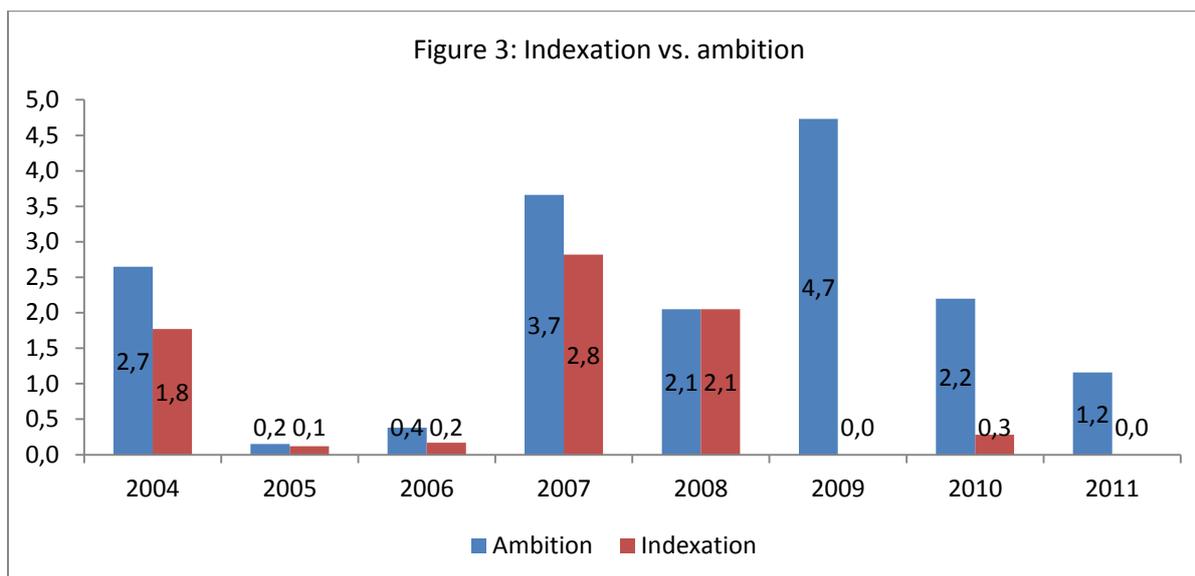
Figure 2 shows inflation in the Netherlands from 1900 till 2012. That is, it shows the value of one guilder in 1900 in subsequent years. The graph shows that inflation differs across time. (If inflation would not vary, there would be no risk.) Inflation was –for example- virtually absent between 1900 and 1940.



Source: International Institute of Social History

Until recently the Netherlands had occupational pensions linked to inflation (or wages). However, since the beginning of this century indexation is conditional on the financial condition of the pension fund. This introduces a “DC-element” in an otherwise DB-arrangement. Inflation risk now lies with participants. Figure 3 shows how this worked out for the years 2004-2011. In all years –except 2008- actual indexation fell short from the ambition level (that is, actual inflation¹). As a result, pension benefits were decreased in real terms.

¹ Sometimes pension benefits are indexed to wage growth, which is however generally higher than or at least equal to inflation.



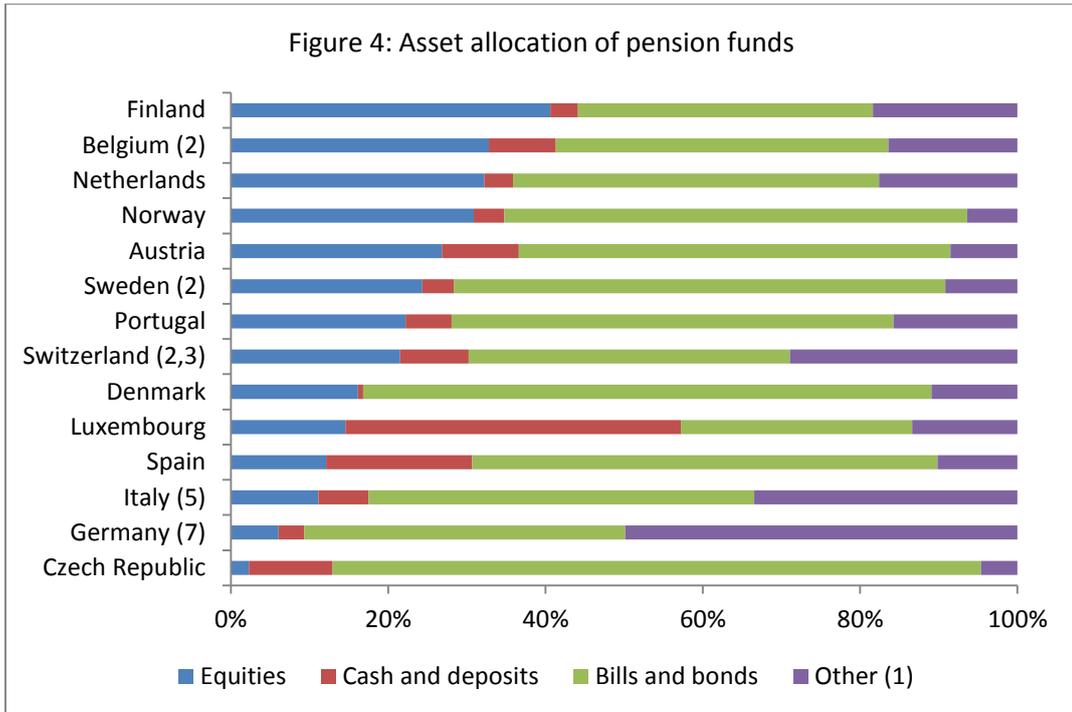
Source: Dutch Central Bank (DNB). In 2008 so called recovery indexation (2,0%) took place.

Ad ii) **Investment risk** is the risk that asset returns are low (or even negative).² Investment risk crucially depends on the asset category the assets are invested in. For example, bonds (or fixed-income securities) are generally less risky than (private) equity. (However, as the private sector involvement in restructuring of Greek bonds has shown investing in bonds is also not riskless.)

Which party is able to determine investment risk solely depends on the particularities of the pension arrangement. In an individual DC-account, individual participants may be able to decide on investment risk. (Whether many individuals are competent and/or motivated to decide, is another issue. As it is, few individual participants seem both competent and willing to determine their own asset allocation, Kooreman and Prast (2007), Lusardi and van Rooij (2007).) In collective schemes, it is normally the pension fund that decides on the risk level (within the limits allowed by the supervisor, who generally places an upper-limit on the risk-level). Individual asset managers subsequently decide on the exact investment, that is, in which company, country or project assets are invested. Placing control over asset allocation in the hands of experts has advantages and disadvantages. The advantages are that transaction costs are reduced –as not everybody has to decide for him- or herself- and that experts are –or should be- experts that can earn higher (risk-adjusted) returns. However, this kind of outsourcing, comes with all agency-problems that comes with any outsourcing (De Deken, 2008; Dixit, 2002). Asset managers may not exert as much effort as they can or may take more risks than participants on whose behalf they are investing, prefer. The latter is especially the case when asset managers receive a bonus in case returns are high but do not have to pay a malus in case returns are low.

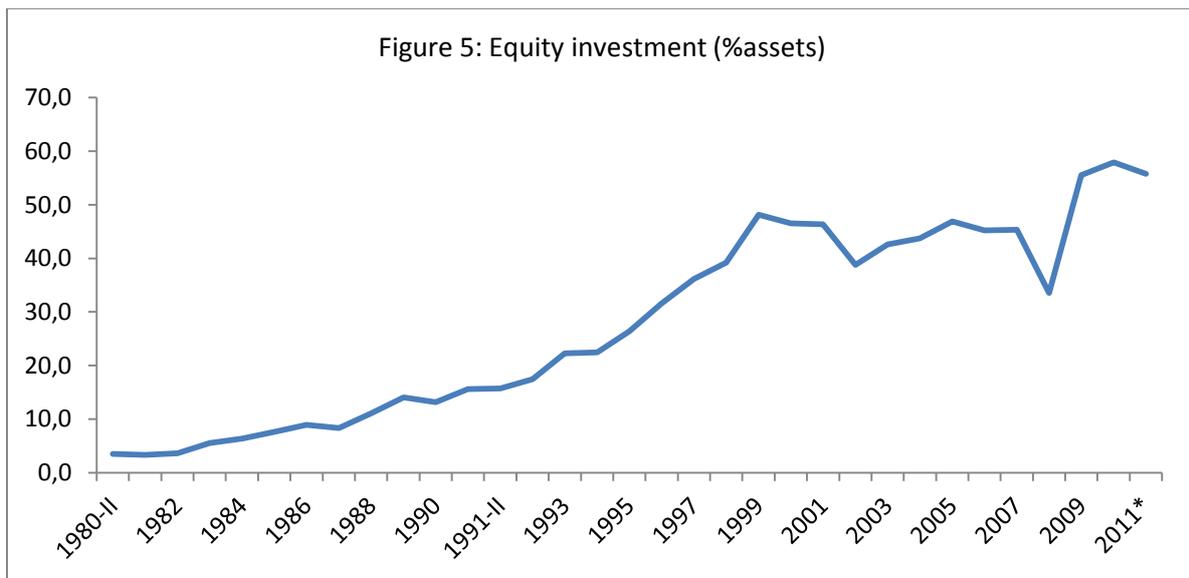
The risk level varies over time and across countries. Figure 4 shows the asset allocation for several European countries. As can be seen, the fraction invested in equity –a risky category-varies considerably across countries. Finland and Belgium invest over 30% in equity, whereas Germany and the Czech Republic invest less than 10% in equity.

² Note that investment risk is only relevant in pension systems that are financed via full funding.



Source: OECD (2011)

Figure 5 focuses on the Netherlands and shows the fraction invested in equity between 1980 and 2011. As can be seen, investment risk has increased hugely in this period, from less than 5% in 1980 to close to 50% in 2011.



Source: Statistics Netherlands

Ad iii) **Longevity risk** is the risk that a person lives longer –or shorter- than expected. As a consequence, that person needs a pension longer than anticipated. (An increase of) Longevity

risk should not be confused with (an increase of) life expectancy. An increase in life expectancy by itself does not increase the risk that someone lives longer than expected. As an example, if everybody would reach the age of 100 with certainty, to die the next day with certainty, the result is an increase in life expectancy but a simultaneous decrease in longevity risk. In fact, all longevity risk is completely eliminated, as everybody's date of dying is known in advance.

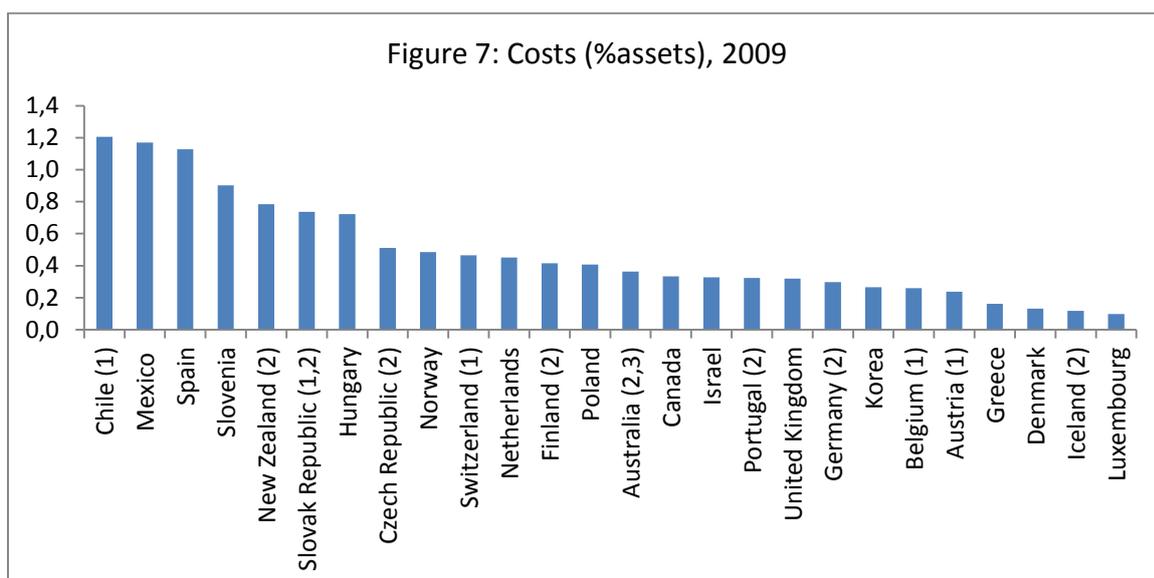
The crucial factor is the sensibility of the retirement period for (unexpected) changes in life-expectancy. That is, the crucial factor is whether an (unexpected) change in life-expectancy leads to a substantial increase in the retirement period, and therefore to an increase of the pension wealth needed to finance the prolonged retirement period. Figure 6 shows the change in the retirement period (in percentages) resulting from a unexpected 1-year increase in life-expectancy. Figure 6 is based on remaining life time expectancy in 2045/2050 at the age of 65 year presumably the retirement age. The increase in the retirement period (that is, the life expectancy at the age 65) as a result from an unexpected increase in the life-expectancy at the age 65, hovers between 4-5%.



Source: OECD (2011)

Longevity risk cannot sensibly be influenced by any party. Of course, individual participants –by living healthy- as well as the government –by improving health care- can try – and indeed have tried successfully- to increase life expectancy. But –to reiterate- in itself that does not reduce longevity risk. As a consequence longevity risk should be shared by as many parties as possible, that is, it should be borne by the largest collectivity possible, that is, by the government.

Ad iv) **Operational risk** is the risk that something goes wrong in designing, implementing or executing the pension-arrangement (including the investment policy), in turn increasing costs. This can be the consequence of mismanagement, computer errors, scale disadvantages or even fraud. As figure 7 shows, costs –as % of assets under investment- vary considerably across countries. This in turn implies that it is worthwhile to try and decrease costs. Generally, pension funds and asset managers are the parties making the costs, hence most able to reduce them.



Source: OECD (2011)

Finally, table 1 summarizes the four risks and the parties able to influence those risks.

Table 1

Risk	Party able to influence it
Inflation risk	1) Central bank 2) government
Investment risk	Depends on the arrangement.
Longevity risk	Nobody
Operational risk	1) Pension fund board members 2) asset managers

III. OPTIMAL RISK ALLOCATION

Based on the previous paragraph, the optimal risk allocation can now be determined. This is done based on the following principles.

Proposition 1: the party that has the ability to influence the risk the most, should bear the risk, to the extent that limited liability allows.

Consideration: a party that bears risk may or may not be (fully) compensated for bearing that risk by a lump-sum transfer from other parties. The size of such a transfer is in itself not relevant for efficiency. (It is relevant for redistributive issues.)

Proposition 2: if all parties have the same degree of risk aversion and if no party can influence a risk, that risk should be shared between all parties.

If there is at least one party risk neutral (or even risk seeking), all risks could –and therefore: should- be shifted to that particular party to the highest extent limited liability allows. That is, the problem of optimally allocating risks becomes trivial then. Unfortunately virtually all individuals and institutions are risk averse (at least for the large sums that are at stake in pension arrangements). Throughout this paper it has therefore been (tacitly) assumed that all involved parties are risk averse.

Proposition 3: if parties have different degrees of risk aversion and if no party can influence a risk, that risk should be shared between all parties, where parties with relatively low risk aversion should bear a relatively high degree of risk.

For an overview of risk sharing, including technical issues, see Bovenberg et al. (2007).

Based on table 2 and the previous statements and under the provisos mentioned, the risks should be allocated to the different parties in pension arrangements as follows.

Table 2

Party	Optimal risk allocation
Individual participants	Longevity risk
Government	Longevity risk Inflation risk
Asset managers	Operational risk Investment risk
Employer (that is their shareholders)	Longevity risk
Pension fund board members	Operational risk Investment risk

Several parties have a form –de facto or de jure- of limited liability. Shareholders of sponsoring companies can only lose what they chipped in, and cannot be held liable if losses exceed equity. Asset managers have a form of de facto limited liability, as any ‘negative bonuses’(malus), should be such that the minimum wage (or some higher negotiated, legally binding wage minimum) is respected. That is the legal or factual capability to bear risks is not open-ended for some parties. Limited liability can lead –and frequently does lead- to moral hazard. If a party can influence a risk, but is partly sheltered from its negative consequences, that party has every incentive to

increase beyond the point that is socially optimal (Bebchuk and Spamann, 2009). As a consequence it may be optimal to allocate no risk at all to those parties, that is, to do away with bonuses all together and/or to remove employers as a risk bearing party and as a pension fund board member. Whether this is indeed optimal, depends on risk aversion and degree of limited liability of the party involved.

It should be noted that some of these risk bearers partly coincide. For example, participants of a pension fund are usually also tax payers. And if the sponsoring company is the risk bearer, the risk may be partly transferred to active participants in the form of lower wages and/or to consumers in the form of higher prices. While this is important to bear in mind, the crux is that while these parties overlap, they do not fully coincide. Most participants pay taxes, but there are also non-participating tax payers like companies. For example, a company might not be able –and often is not able- to pass on all risks immediately, due to labor agreements, legal restrictions or political resistance.

IV. HOW ARE RISKS ALLOCATED?

The way risks are allocated depends on the details of a particular arrangement, which varies over time and across countries and across companies. Therefore no general assessment can be made. To give an idea nonetheless, consider table 3.

Table 3

Defined Benefit	Defined Contribution
Austria	Denmark
Belgium	Italy*
Czech republic	Norway
Finland	Sweden
France*	
Luxembourg	
Netherlands	
Portugal*	
Spain	
Switzerland	

Source: OECD (2011)

Although there are substantial differences between different DB-arrangements and between different DC-arrangements (indeed, “the devil is in the details”), as a general rule it holds that in DC-arrangements inflation risk (in the accumulation phase at least), investment risk and operational risk are borne by individual participants, whereas in a DB-arrangements these risks are borne by the pension fund (that is, the sponsoring company and/or participants in their role as active, contribution-paying members). Both arrangements are sub-optimal.

V. CONCLUSION

The main conclusions are the following:

- 1) It is crucial to distinguish between different kind of risks, as different risks are influence able by different parties and it is in principle optimal to shift risks to the party able to influence that risk.
- 2) Inflation risk should be borne by the government. The government can do so by issuing inflation-linked bonds (Bodie (2009)).
- 3) Longevity risks should be borne by the government. The government can do so by issuing longevity-linked bonds.
- 4) Operational risks should be borne exclusively by pension fund board members and asset managers. If limited liability renders this impossible, it may be optimal to not have bonuses all together.
- 5) Investment risk should be borne by pension fund board members and asset managers. If limited liability renders this impossible, it may be optimal to not have bonuses tout court.
- 6) The optimal risk allocation as described in 1) to 4) has not been fully implemented in any country. Therefore risk allocation can improve

LITERATURE

Bebchuk, L. A. and H. Spamann (2009), Regulating Bankers' Pay, Harvard Law School Discussion Paper 641 6/2009.

Bodie, Z. (2009). TIPS for Holland Inflation-Linked Bonds, Transparency and the Public Interest, *Netspar NEA Paper 22*.

Bovenberg, A.L., Koijen, R.S.J., Nijman, T.E. and Teulings, C.N. (2007). Saving and investing over the life cycle and the role of collective pension funds, *De Economist*, 155(4), 347-415.

De Deken, J.J., 2008, Pension Fund governance and stakeholding: the double trust dilemma in the control of supplementary pensions in Europe, paper presented at the ESPANET 2008 conference held in Helsinki September 18-20.

Dixit, A., 2002, Incentives and Organizations in the Public Sector: An Interpretative Review, *The Journal of Human Resources*, vol. 37(4): 696-727.

Kooreman, P. and H. Prast (2007), What does behavioral economics mean for policy?, Challenges to savings and health policies in the Netherlands, *Netspar Panel Paper*.

Lusardi, A. and M. van Rooij (2010), Financial Literacy: Evidence and Implications for Consumer Education, *Netspar Panel Paper*.

OECD (2011). *Pensions at a Glance 2011: Retirement-income Systems in OECD and G20 Countries*, OECD Publishing.

Pugh, C. & Yermo, J. (2008). Funding regulations and Risk Sharing, *OECD Working Papers on Insurance and Private Pensions*, No. 17.