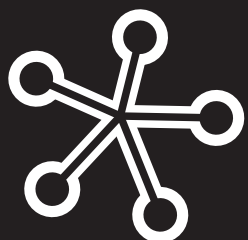




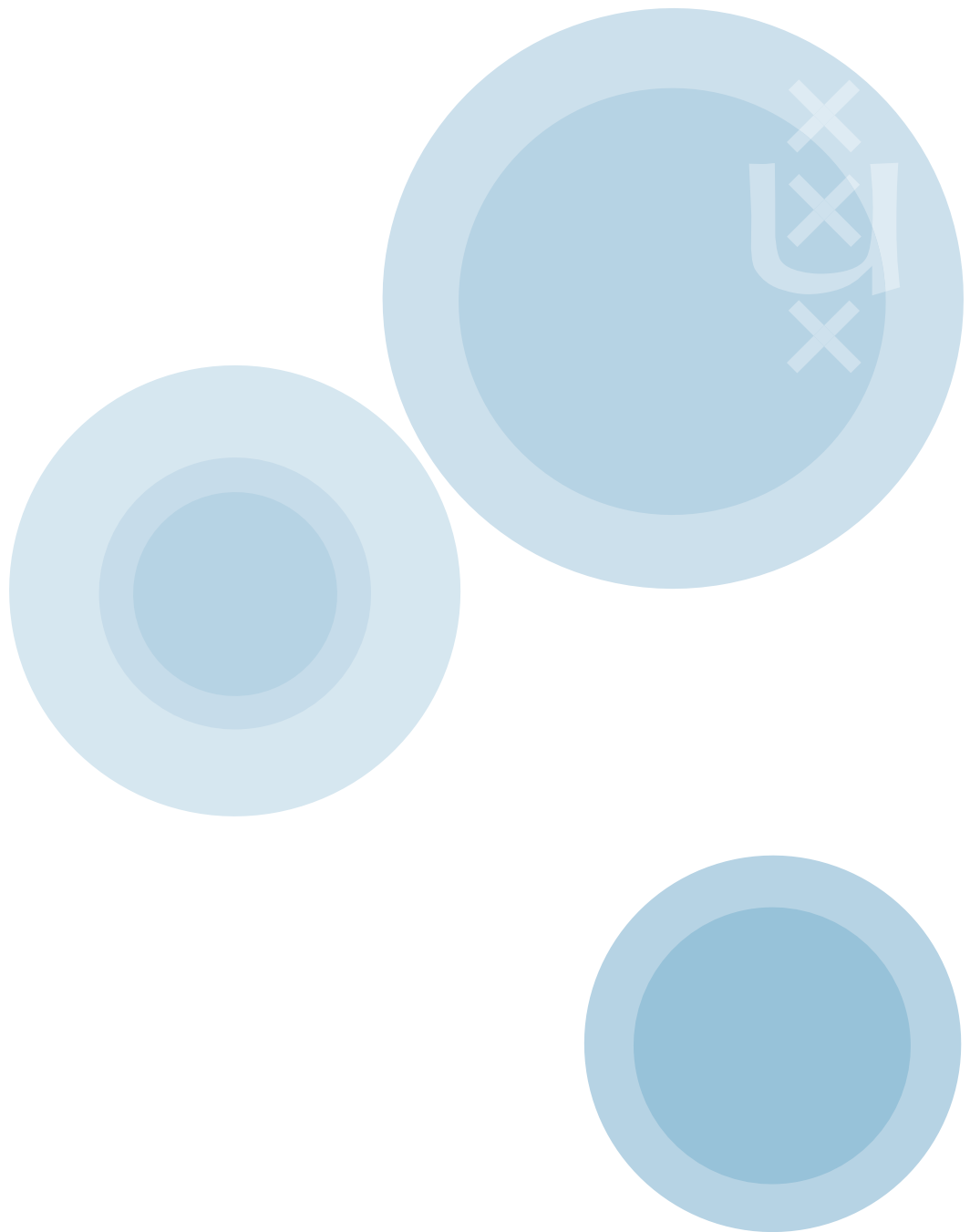
The political economy of risk allocation in the pension domain

David Hollanders



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The political economy of risk allocation in the pension domain

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Abstract

This paper analyzes the political economy of risk allocation in the pension domain. In particular three theoretical mathematical models are analyzed that can inform the public and academic debate on pension fund governance. In the first case employers and employees bargain over the allocation of risk and control over the investment risk of the pension fund. If employees are forward-looking and fully informed, a conflict over the investment risk of pension funds will not arise; conflicts may thus be due to participants being ill-informed or to lack of control of the pension fund board. The second case involves the principal-agent problem between the pension fund and asset managers. If ‘performance-pay’ for asset managers is asymmetric, they will have an incentive to increase risk. The third case involves risk sharing and risk allocation between generations. Intergenerational transfers in a pension fund can be efficient from both an ex ante perspective and an interim perspective, but whether young and/or old participants will support them depends on circumstances.

1 Introduction

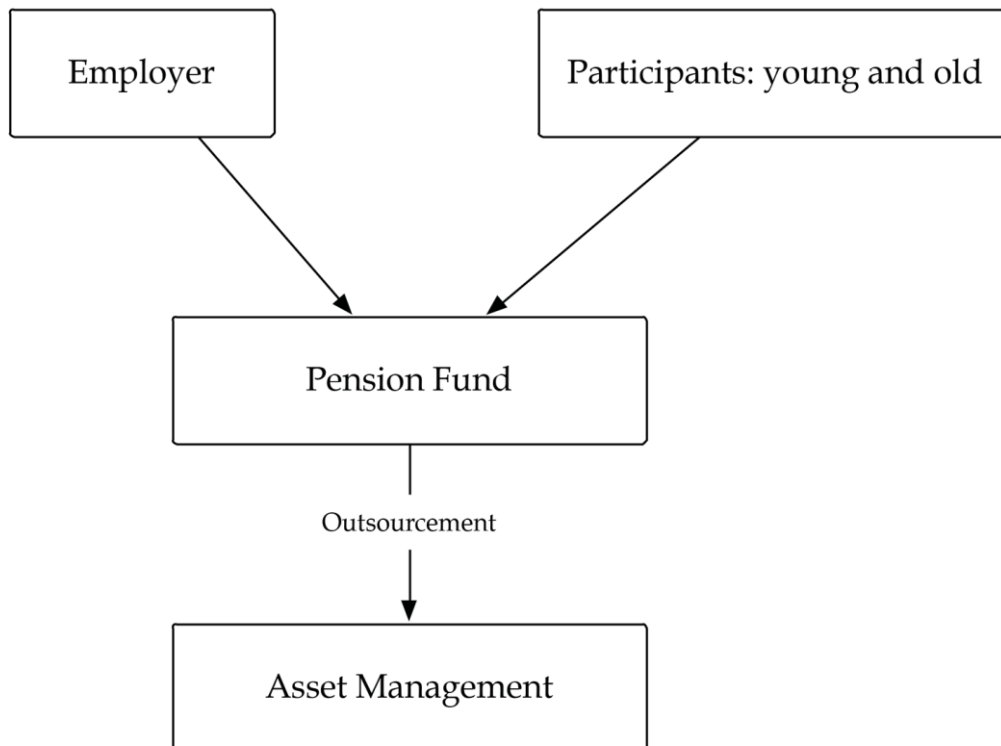
Pension plans involve several risks. First, pensions insure against longevity risk of participants. Other risks include investment risks (in case the pension plan is prefunded), inflation risk, operational risks (e.g. high costs) and demographic risk (in case the plan is financed via PAYG). Pension plans, implicitly or explicitly, allocate these risks between all parties involved. It thus allocates risks between employer and employees, between active and retired participants and between government, pension fund and social partners.

Risk sharing has the potential to increase welfare and is one of the most important functions of pension plans in the first place. Pension plans insure longevity risks and it does so by sharing individual risks collectively. This paper is not aimed at optimal risk sharing per se, but focuses on the political economy of risk sharing instead. That is, the focus of this paper is how risks are shared between stakeholders, given institutional arrangements, bargaining positions and political power.

To shape and focus the argument, three models of conflicts over risk allocation are analyzed. Section two analyzes employers and employees negotiate on control over investment risk and distribution of the resulting risks. Section three focuses on pension funds that outsource advice on or control about the risk-level, which may create a conflict over investment risk level between the fund and asset managers. Section 4 analyzes intergenerational risk sharing –and resulting conflicts- between participants. This section highlights that intergenerational transfers are a potential source of conflict, but that they also offer the opportunity for risk sharing.

This paper focuses on wage-related occupational pension plans (so called second pillar). No attention is paid to the first pillar (public flat-rate pensions) and the third pillar (tax-deferred voluntarily personal savings). The second pillar consists of wage-related supplementary pensions. Often, these are occupational pension plans that are part of the terms of employment. The employer and employees –or their union- agree upon a pension plan for employees. Participants consist of both active participants paying contributions and retired participants receiving benefits. The pension plan is typically carried out on behalf of employers and participants –both young and old- by a pension fund. The pension fund is an agent that carries out the plan for the principals, employer and participants. Often the fund itself outsources tasks (e.g. administration, asset management, compliance, oversight) to private firms. The most important function that is outsourced is

asset management, as this involves handing over to a third party partial control over the assets. This leads to a chain of principle-agent relations; figure 1 depicts the main parties and their relations.



2 Employers and employees

Most occupational pensions are prefunded. Employers and/or employees pay contributions to a separate legal entity, a pension fund. The pension fund in turn invests pension assets on behalf of the participants.

The legal separation of the fund from the sponsoring company is meant to ensure that the employer does not use pension assets for purposes other than financing of pension benefits. While this may solve one important source of conflict, two other potentially remain. The first is a potential conflict over the size of the employer's contribution. *Ceteris paribus*, the employer wants contributions to be as low as possible, whereas the opposite holds for employees. The second potential source of conflict is the investment risk the pension fund takes. These sources of conflict are linked, as will be clarified shortly.

The two conflicting interests –and how they relate- is illustrated here by a model taken from Sharpe (1976). The central result of the model is that there will be no conflict over pension benefits between employers and employees *if* the latter are forward-looking, rational and fully informed. Given that there *are* conflicts and disagreements in the real world, one or more of the assumptions are apparently violated. The validity of the assumptions is discussed.

The model

Consider the following two-period model. In the first period, denoted $t=1$, a firm pays an employee a positive wage w . The firm also promises –as part of the total pay package- to pay in the next period ($t=2$) positive pension benefit b . The expected value at $t=1$ of the total wage-package of the employee equals $w+E[B]$; the expectations operator indicates that pension benefits are uncertain at $t=1$ and capital B is a stochastic variable, denoting the distribution of the benefit b . All cash transfers (w and b) are in real terms; there is no inflation.

Denote the utility value of the reservation compensation package by U . The employee will not accept a compensation package –in utility terms- smaller than U . The reservation compensation can be interpreted as the outside option (either another job, unemployment benefit, leisure or some other alternative) of an employee.

The firm prefunds its pension obligations by paying contributions C_1 to a pension fund at $t=1$. The fund invests the contributions. At the end of the year the contributions are worth $C_2=rC_1$, where r represents the *realized* gross capital return in the first period. Gross return is uncertain at $t=1$ and is denoted by the stochastic variable R . It is therefore unknown at $t=1$ whether C_2 will overshoot, undershoot, or match liabilities b .

Given C_1 , b and r the following situations occur:

- i) If $C_2 > b$, the employee receives b as promised. The remaining $C_2 - b$ returns to the employer.
- ii) If $C_2 = b$, the employee receives b as promised.
- iii) If $C_2 < b$, the fund is underfunded. The employee receives *at least* C_2 and *no more* than b .

Here only case (iii) is considered. Case (iii) captures the situation that a fund is underfunded. This is the relevant situation for most –though not all- pension funds in Western-Europe nowadays. It is also the case that is politically most interesting, as it is arguably more difficult to allocate losses than to share gains.

In the first two cases the employee receives upon retirement b as promised. In case (iii) it is however not certain what (s)he receives. The shortfall $C_2 - b$ can be financed by the employer, by the employee (via a cut in benefits) or by both. Now the two extreme positions are analyzed.

Employer fully liable

Consider first the case that the employer is fully liable for the shortfall. In that case the employee receives b irrespective of the realized gross return and irrespective of C_1 . The expected total wage-package at $t=1$ then equals $w+b$. Employees will accept this wage package if and only if $w+b \geq U$. Furthermore, the investment risk (affecting the distribution of r) is of no material interest to the employee, as it does not have an effect on pension benefits. The governance of the pension fund –including investment risk- is of no material interest for participants for the same reason. No matter how ill-managed the fund, pension benefits are guaranteed by the sponsoring company. It is assumed here however that the employer cannot go bankrupt at $t=2$. If instead the employer can go bankrupt with positive probability, then there is a positive probability pension benefits will not be fully paid in case $C_2 < b$.

Employer not fully liable

Consider now the case that the employer is not liable for the shortfall. That is, the promised benefit b is (i) not legally binding and (ii) this is understood as such by both parties. (It can be interpreted in the current context as an ambition level, a so called Defined Ambition.) In this case the employee receives C_2 , which is strictly smaller than b . Foreseeing this, the employee will demand compensation in the form of a higher wage w .

How high will w be? Given C_1 and b this now depends on the investment risk, which jointly determine the distribution of the shortfall $C_2 - b$. The investment risk and the capital market are discussed now.

The capital market

The capital market consists of two asset categories. Pension assets C_1 can be invested in any convex combination of those two categories.

First there is a safe asset –denoted S – that provides a certain return M . Second, there is risky asset –denoted R –, the return of which is Bernoulli distributed. With probability λ gross return equals H and with complementary probability $1 - \lambda$ the return equals L , where $0 < \lambda < 1$ and where $0 < L < M < H$.

Furthermore $LC_1 < b < HC_1$; when return is low, the fund is underfunded and when return is high, the fund is overfunded.

There are three possible configurations and now it becomes crucially important which party controls risk level.

$$(i) \quad MC_1 > b;$$

This case is not discussed here. As mentioned, most funds are not overfunded and overfunding is a less interesting case from a theoretical political perspective. This case is however a mirror image of case (iii). That is, the employer will generally prefer lower investment-risk than employees.

$$(ii) \quad MC_1 = b;$$

In this case employees want to invest pension assets safely. The safe investment ensures the pay-out of b , whereas investment in the risky asset will result in underfunding with a strictly positive probability $1-\lambda > 0$.

The employer however does *not* want to invest in the safe project; there will be no pay-out to the firm in that case. If assets are invested risky instead, there is a strictly positive probability for a pay-out to the employer (since $b < HC_1$ by assumption). Therefore, the firm prefers the risky investment.

$$(iii) \quad MC_1 < b;$$

In this case the employer prefers the risky investment. Irrespective of the fraction invested in category S, the employer will receive nothing in case return is L. It will only receive a positive amount if the pension funds' assets are invested in category R in a sufficient fraction *and* if return of the risky asset is high. Indeed, the higher the fraction invested in the risky return, the higher the pay-out for the firm in case return of category R is high. Therefore, the employer wants to invest all assets in R.

The preferences of the *employee* are not straightforward and crucially depend on his or her risk aversion. The higher risk aversion, the less the employee prefers risky investing. However, even if the employee is risk neutral, (s)he will not prefer to invest all pension assets in R.

Denote the fraction invested in S by γ , where $0 \leq \gamma \leq 1$.

The employee will choose γ as to maximize the following expression:

$$(1) \quad \max_{\gamma} \lambda u[\min(b, \gamma MC_1 + (1-\gamma)HC_1)] + (1-\lambda)u[(1-\gamma)LC_1 + \gamma MC_1]$$

Here $u(\cdot)$ denotes a concave utility function.

The optimizing value of γ depends on the parameter-values and the functional form of the utility function. One exact and crucial observation can be made however: the optimal value of γ is always larger than 0 (it will thus will *never* be 0). That is, employees will never want to invest all assets in the risky project, irrespective of the other parameter-values and irrespective of his or her risk aversion. The reason is that at first employees benefit from investment gains (benefits increase) but at some point all investment gains go to the employer. This point is reached when $C_2 = b$. Therefore it cannot be beneficial for employees in any circumstance to investing in the risky asset beyond the point that doing exactly that results in benefits b , so beyond

the point where $\gamma MC_1 + (1-\gamma)HC_1 = b$. This point is reached for some $\gamma > 0$, since $HC_1 > b$ by assumption.

The following proposition formalizes.

Proposition: If $HC_1 > b$ the optimizing value of γ , denoted γ_{\max} , is larger than 0, that is: $\gamma_{\max} > 0$.

Proof: denote the value of γ for which $b = \gamma MC_1 + (1-\gamma)HC_1$ by γ^* . If $HC_1 > b$, then γ^* exists and $\gamma^* > 0$. Now, $\lambda u[\min(b, \gamma MC_1 + (1-\gamma)HC_1)] + (1-\lambda)u[(1-\gamma)LC_1 + \gamma MC_1] = \lambda u(b) + (1-\lambda)u[(1-\gamma)LC_1 + \gamma MC_1] < \lambda u(b) + (1-\lambda)u[(1-\gamma^*)LC_1 + \gamma^* MC_1]$ for all $\gamma < \gamma^*$ by inspection. In particular $\lambda u(b) + (1-\lambda)u(LC_1) < \lambda u(b) + (1-\lambda)u[(1-\gamma^*)LC_1 + \gamma^* MC_1]$. Therefore $\gamma = 0$ cannot be a maximand.

The employer *always* prefers a *strictly* riskier investment strategy than the employee. It thus becomes crucial which of the two party controls the risk level.

Now two polar cases are considered. The first case considered is when the employee controls the risk level.

Employee sets investment risk

If the employee sets investment risk, (s)he will choose that investment risk that maximizes his or her utility.

That is, (s)he will choose γ as to maximize the following expression:

$$\max_{\gamma} \lambda u[\min(b, \gamma MC_1 + (1-\gamma)HC_1)] + (1-\lambda)u[(1-\gamma)LC_1 + \gamma MC_1]$$

As an example consider the case when the employee is risk neutral and where $HC_1 > b$. It is further assumed that the expected return of the risky asset is larger than the return on the safe asset. That is: $\lambda(H-L) + L > M$.

In this case the optimizing value of γ is the solution of $b = \gamma MC_1 + H(1-\gamma)C_1$.

So: $\gamma_{\max} = (HC_1 - b) / (HC_1 - MC_1)$. Note that indeed $0 < \gamma_{\max} < 1$ since $MC_1 < b$. Given γ_{\max} , the expected value of the compensation package –including wage in the first period– is: $w + \lambda b + (1-\lambda)[(1-\gamma_{\max})LC_1 + \gamma_{\max} MC_1]$, where γ_{\max} is as given. The employee will only accept this if $w + \lambda b + (1-\lambda)[(1-\gamma_{\max})LC_1 + \gamma_{\max} MC_1] \geq U$. Denote the value of w for which $w + \lambda b + (1-\lambda)[(1-\gamma_{\max})LC_1 + \gamma_{\max} MC_1] = U$ by w^* . Employees will accept any wage package for which $w \geq w^*$. Since employees will not voluntarily pay more than w^* , the employee will arrive exactly at his or her reservation utility U .

Employer sets investment level

If the employer controls the risk level, (s)he will choose $\gamma=0$. Note that the promise to do otherwise is not credible. The expected value of the compensation package now equals: $w+\lambda b+(1-\lambda)LC_1$. Note that $w^*+\lambda b+(1-\lambda)LC_1 < U$, since $(1-\gamma_{\max})LC_1+\gamma_{\max}MC_1 > LC_1$. Therefore the employee will demand a wage w that is strictly larger than w^* , given that demanding control of the risk level and/or a higher value of C_1 is fruitless. The employer will accept a higher w if and only if that is needed to hire the employee. The outcome of wage negotiations will thus be that the employee will again arrive exactly at his or her reservation utility U .

A governance irrelevance theorem

The model has one central implication which can be summed up as follows.

- If liabilities are underfunded in the sense that assets are insufficient to guarantee benefits $-MC_1 < b$ - and if there is positive probability for a refund to the company in case capital return is high $-HC_1 > b$ -, then the employer prefers a risk-level that is *strictly higher* than the level optimal for employees. The employer does not internalize costs associated with low return –as these are borne by employees- but partly share in high capital return.
- If the employer controls the risk-level, the employee will successfully demand compensation in the form of a higher base salary such that the total value of the compensation package is unaffected (though its composition changes).

Therefore, for employees it is irrelevant which party controls the risk level, as long as this is anticipated at the time of wage negotiations. Pension fund governance essentially does not matter, from the perspective of the employee.

This ‘governance irrelevance theorem’ is however frequently violated in practice, as disagreement can be observed between participants on the one hand and employers and pension funds on the other hand over governance, benefits-cuts and risk level. This indicates that the central prediction of the model –the irrelevance of governance- does not (always) apply. Apparently one or more of the underlying assumptions is

violated. If, when and how the model applies, in particular which assumption is violated, can only be assessed on a case-by-case basis.

- A first interpretation is that *b* in reality is not a legally binding promise, but has been understood as such by employees. This may in turn result from the fact that it was represented as such by funds. Conflicts in the pension realm can then be interpreted as a misunderstanding. In terms of the model-assumptions, employees did not have full information (and might have been ill-informed) and/or were not forward-looking.
- A second interpretation is that the promise of *b* was legally *binding*, but turns out to be not legally *enforceable* (for example due to changed political circumstances).
- A third interpretation is that unions- bargaining on behalf of employees- do not have enough bargaining power to demand full compensation ex-ante in the case employers decide on investment risk. Agreeing with a possible future pay cut (in the form of lower expected pension benefits) may be an easier way for unions to “sell” a suboptimal wage-bargaining result to their members than a lower wage in the first period. Fully informed and forward looking employees would not accept this, if the utility value of the total pay package would become lower than *U*. So, observable decreases in pension benefits can in this interpretation only be understood if it is assumed that employees are not forward looking or were somehow not fully informed (by unions).
- A fourth possibility is that –even jointly- employees and employer do not fully control the investment risk the pension fund takes. This would be the case if the pension fund board is not fully in control. The board may lack the power to enforce implementation of their decisions. Organizations to which asset investment is outsourced, might not follow up on the decisions made by the pension fund board. That is, there might be a principal-agent problem. The next section focuses on the principal-agent problem between a pension fund (the principal) and asset managers (the agents).

3 Participants and pension fund governance

Many pension funds outsource investment of asset to asset managers. Asset managers invest the assets on behalf of participants. Outsourcing is a form of specialization. Asset managers ideally operate cost-efficient and/or are able to increase (risk-adjusted) return. Outsourcing may however come with a principal-agent problem, if actions of asset managers are not fully observable and/or verifiable for the fund.

The principal-agent problem is present whenever there is a misalignment in risk-incentives between asset managers and fund participants (Dixit, 2002; Bebchuk and Spamann, 2010). This may be the case when rewards of asset managers depend on the capital return ex post. Typically, asset managers receive a bonus when return is high (exceeds a certain benchmark), but do not pay a malus –a ‘negative bonus’- when this is not the case. Although bonuses should increase performance, they may simultaneously result in a misalignment between interests of asset managers and participants. The following model illustrates.

Model

Suppose an asset manager invests pension assets on behalf of a customer. There are two projects the investor can invest in.

First, project S –a “safe” project- gives a strictly positive return M with probability (w.p.) 1. Second, there is a risky project –project R- that provides a return H w.p. $\lambda+e(c)$ and a return L w.p. $1-\lambda-e(c)$, where $0<\lambda<1$.

Effort of the asset manager is represented by c . If the asset manager performs effort, then $c=1$, if not, $c=0$.

The function $e(c)$ captures the effect of effort on the probability return is high:

$$e(0)=0 \text{ and } e(1)=\varepsilon \text{ with } 0<\varepsilon<1-\lambda.$$

The asset manager has two choices to make:

- (i) Which of the two projects to invest in.
- (ii) Whether to perform effort or not (in the case project R is selected).

Note that the asset manager sets the risk-level. This can be interpreted in two ways. First, it can be part of a mandate that the asset manager chooses the risk level. A second interpretation is that the risk level is set by the fund, but the asset manager is able to increase risks without this being observable to the fund.

Performing effort is costly for the manager. A bonus should ensure that (s)he performs effort in case project R is selected.

The manager receives a bonus $b > 0$ in case return is high. The bonus b is such that the *increase* in the *expected* size of the bonus in case of effort (ϵb) outweighs the cost of effort (denoted μ , so $\mu < \epsilon b$). (Note that the utility function of the manager is not specified here.)

What will be the behavioral effect of the bonus and is the resulting outcome profitable for participants?

The bonus has two effects, one intended, one unintended. First, it incentivizes –by assumption and as intended- the asset manager to perform effort *if* project R is chosen. An unintended second effect is that the manager has an incentive to choose project R over S, even if this is *not* in the interest of participants. The incentives of the asset manager are adversely affected by the bonus-scheme.

Participants want the asset manager to select project R –given $c=1$ - if and only if:

$$(\lambda + \epsilon)(H - b) + (1 - \lambda - \epsilon)L > M.$$

The inequality would for example hold with the following parameter-values: $H=1.25$, $L=0.9$, $\lambda=0.5$, $b=0.02$, $\epsilon=0.01$ and $M=1.05$. If however H decreases to 1.2 or b increases to 0.06, then –*ceteris paribus*- the inequality does not hold anymore –and participants would not want project R selected.

However, the asset manager will select project R as long as $\epsilon b > \mu$, which holds by assumption.

The crucial observation is that the interests of participants and the manager are not aligned. In particular, H , M and L do not affect incentives of the manager (as long as $H > M$), whereas these parameters are crucial in determining whether the project is optimal for participants. This illustrates that asymmetric bonus-schemes have negative side-effects that may outweigh benefits. Symmetric bonus-schemes won't have this kind of adverse effects, but are hard to implement for legal reasons, as it implies that asset managers might have to pay back a considerable part –and possibly everything- of their base salary.

The model formalizes that incentive-schemes may lead to a conflict of interest between participants and the pension fund or asset managers to which the fund has outsourced tasks. Ideally the pension fund operates on behalf of participants. However funds may lack incentives, information or knowledge to monitor asset management fully.

4 Intergenerational risk sharing, coordination and redistribution

Thus far pension fund participants have been treated as individuals with identical interests. This abstracts from differences between participants –such as differences in age, gender, occupation, income, assets, risk aversion- that may weaken or even overturn shared interests. A much analyzed source of heterogeneity are age-differences (or cohort-differences). Intergenerational risk sharing offers the possibility to enhance welfare of all living and future generations ex ante.¹ However, this necessitates intergenerational transfers ex post that may lead to intergenerational redistributive conflicts.

This section discusses a formal framework to analyze this tension. The main conclusions are:

- *Intergenerational transfers may improve welfare of all generations vis-à-vis individual accounts.
- *Not all intergenerational transfers are efficient.
- *Support of a generation for a transfer-scheme depends on (i) that generational interests and may (ii) further depend on the ability to coordinate within a generation.
- *No general conclusions can be reached about the optimal collective decision making-process. In particular both older and younger generations may support efficient as well as inefficient transfer-schemes.

Model

Consider a simple economy consisting of individuals who live for two periods: youth (first period) and old age (second period). There is constant geometric population growth n : $N_t = (1+n)N_{t-1}$, where N_t is the number of young agents in period t and $n > -1$.

The young inelastically supply one unit of labor, for which they receive a strictly positive wage $w > 0$. The young save a fixed share -denoted s - of their wage, where $0 < s < w$. The young consume that part of their wage that is not saved ($w-s$).

The savings are transferred to a pension fund, which invests the savings on behalf of their participants. The pension fund invests the savings s on a capital market. The capital market consists of one risky asset.

¹ See Hollanders (2012) for a discussion.

The gross return of the asset is Bernoulli distributed. With probability λ gross return equals H and with complementary probability $1-\lambda$ the return equals L , where $0 < \lambda < 1$ and $0 < L < 1 < H$.

The pension fund provides the old with a pension benefit, which is related to –but not necessarily fully determined by– savings and capital return. The old consume their entire benefits (that is, they do not leave bequests).

Utility in the first period is normalized to 0 (utility in the first period is non-stochastic and known in advance). Utility in the second period is given by a logarithmic utility function, $u(x) = \ln(x)$ where $x > 0$ represents consumption in the second period.

Benchmark: Individual Defined Contribution

Consider first as a benchmark an individual Defined Contribution-plan. In a DC-plan, the fund invests s on behalf of participants. When participants are old, the fund pays-out the accrued savings.

Expected lifetime utility equals:

$$(3) \quad U^{\text{aut}} \equiv \lambda \ln[Hs] + (1-\lambda) \ln[Ls]$$

For further reference this utility is denoted utility in autarky (U^{aut}).

The pension fund merely acts as a middle man investing on behalf of participants. It does not add value; in particular, it does not complete financial markets by offering an instrument that is not available already on the capital market.

While members of both generations participate in the same pension fund, they do not have any (financial) relation with each other beyond this formal tie. There is thus no conflict of interest between generations.

Collective Defined Contribution

Next a Collective Defined Contribution-plan is considered. The CDC-plan consists of the following elements:

- (a) Participants contribute –as before- the amount s to the pension fund in the form of contributions.
- (b) Participants build-up pensions *as if* the plan is Defined Benefit.²

Underfunding of the pension fund occurs when accrued individual contributions fall short of the ambition level. This can be solved in two ways. Entitlements of the old can be decreased and/or the fund could use part of the savings of the young participants to finance the entitlements of older participants –in the hope that future returns will make up for the incurred losses.

Denote the defined benefits based on contribution s the ambition level a , with $sL < a < sH$. That is, the pension fund aspires to pay out at least a to the old.

As before, there are two possible outcomes for the gross return:

In case $R=H$, old participants receive sH .

In case $R=L$, old participants receive *at least* sL and *not more* than a .

In the latter case ($R=L$), the pension fund has the discretionary power to decide to pay-out an extra, positive amount to the old, denoted $t > 0$.³ The extra pay-out is directly financed out of savings s of the young. That is, the young pay t out of their savings s , such that $(1+n)t \leq (a-sL)$, so $t \leq (a-sL)/(1+n)$. The latter inequality ensures that the old do not receive more than the ambition level a . (Recall that n denotes population growth).

The pension fund has the *discretionary power* to transfer t to the old, but does not have the *obligation* to do so. The remainder of this section is devoted to two questions.

- Will the fund decide to transfer t from the young to the old?
- Is a transfer t efficient?

2 However as there is no party that guarantees the benefits, they are not defined in an economically meaningful and legally binding sense. Defined Benefits could be interpreted alternatively as an ambition level. The pension fund does however try to honor benefits by sharing risks between generations. Therefore such plans are called Collective Defined Contributions or hybrid DC/DB-plans.

3 Note that here t is a parameter with a fixed value. A more general approach considers the optimal value of t and considers voting over the particular value of t (see Sjoblom, 1985). Both expansions are ruled out here, as they are not needed to arrive at the conclusions.

The answer to the first question crucially depends on pension fund governance.

Here the case of majority voting is considered. Voting takes place over t if and only if capital return is low ($R=L$). Each participant makes a yes/no decision on whether to transfer t . Whether or not t is transferred, solely depends on the majority vote. Timing of events in each period is then as follows:

- (i) The young are born;
- (ii) Capital return of the previous period materializes;
- (iii) The young enter the labor market, earn w and contribute s to the pension fund;
- (iv) Voting takes place over t if (and only if) capital return was low;
- (v) The old receive their pension benefits;
- (vi) Consumption takes place;
- (vii) The pension fund invests its assets.

The outcome of voting

The outcome of the voting process depends on which generation holds a majority, which in turn depends on population growth, which is fully determined by the parameter n . There are two cases to consider. (The case $n=0$ is not considered here, because the probability that n is exactly equal to zero is taken to be zero.)

Case I: $n < 0$

In this case the old generation has a majority.⁴ Each member of the old generation will vote in favor of the transfer t as the old are on the receiving end of the transfer. (Note that the utility function is defined in terms of outcome, which rules out altruism or other regarding preferences.) As the old have a majority, the transfer will be implemented, regardless of the voting behavior of the young.

Case II: $n > 0$

In this case the young generation has a majority. In this case, there are two possible equilibria: a cooperative and a non-cooperative equilibrium. These are now discussed in turn.

⁴ Note that the population shrinkage leads to a majority for the old, because this is a two-period model. In reality, population shrinkage would not suffice for a political majority for old voters. The shrinkage would need to be large.

The non-cooperative equilibrium

Consider the following strategy of the young:

$S = \{\text{Vote N}\}$ in all circumstances.

This strategy constitutes a Nash equilibrium if it is a best response for all young generations –given that all young participants play this strategy. It is indeed a best response to vote N given that all other generations do likewise. If all other generations vote N –including in particular the next generation- then a generation will not gain anything by voting Y (in particular it will not receive an extra transfer in case return is L). It is then best to not provide anything to the old themselves.

The cooperative equilibrium

Young participants are identical and therefore have identical interests. If young participants can coordinate on their voting behavior, it suffices to consider a representative young individual.

Consider the following strategy of a representative young individual:

- Vote Yes (abbreviated Y) if and only if the previous generation voted Y (in case voting took place).
- Vote Y if the return was H in the previous period.
- Vote No (abbreviated N) otherwise.

Note that the young condition their vote on the voting behavior of the old in the previous period (when the old generation was young itself). For such conditional voting to be possible, it is necessary that the voting behavior of previous generations is observable to the young.

For the proposed strategy to be a Nash equilibrium, it must be a best response for a young participants, given that all other young participants –both the current and future young- play this strategy. Consider a young generations which plays this strategy. Would it be worthwhile to deviate?

If the young vote N, they would receive 0 in the next period in case $R=L$, since the next young generation will not make transfers to a generation that did transfer itself. This provides exactly the same utility as when

the generation operates in autarky (not transferring anything and receiving nothing). So the strategy is a best-response iff:

$$(4) \quad \lambda \ln[H(s-t)] + (1-\lambda) \ln[L(s-t) + (1+n)t] \geq U^{\text{aut}}$$

Whether this inequality holds depends on the value of parameter-values. Some simple comparative statics can however be derived. Note that the right-hand-side (RHS) does not depend on n and t . The LHS increases in n and therefore the inequality is more likely to hold when n increases. The LHS is strictly increasing in t if and only if:

$$(5) \quad (1-\lambda)[(1+n)-L]/[L(s-t) + (1+n)t] > \lambda/(s-t)$$

The inequality holds for example for the following parameter-values: $H=1.25$, $L=0.9$, $n=0.05$, $s=100$, $t=20$ and $\lambda=0.1$. It does not hold –*ceteris paribus*– if λ increases to 0.2.

A necessary condition for this latter inequality to hold is $1+n > L$. That is, the implicit return of intergenerational transfers –given by $1+n$ – need be larger than the lowest possible capital return. Further note that inequality (5) is more likely to hold if λ decreases. If state L is more likely to occur –as implied by a decrease of λ – the more likely a young generation is to profit from intergenerational transfers.

Efficiency

In the presence of risk, efficiency is not a straightforward concept. Whether any outcome is efficient crucially depends on the information at the moment efficiency is evaluated. It is therefore useful to start with some definitions.

If inequality (4) holds, then the arrangement of intergenerational transfers is advantageous for both the young and the old generation and it is therefore strictly welfare improving vis-à-vis an individual DC-plan. The following definition formalizes this.

Definition: A transfer-scheme with a transfer t from a young to an old generation in case capital return is low is **interim efficient** if and only if inequality (4) holds.

If the transfer is not interim efficient, then the transfer -by definition- does not improve welfare for the young generation that *knows* it has to contribute (as it knows capital return is low).

There is however no reason why a transfer that is not interim efficient may not be welfare improving if the young generation does not yet know in which state of the world it is borne (either state H or state L). A transfer may be welfare-improving for the young, when evaluated behind a ‘veil of ignorance’.

The concept of ex-ante utility evaluates utility of a generation that does not know in which state of the world it is borne. Absent any transfer-scheme, ex ante utility equals utility is simply given by U^{aut} .

With a transfer-scheme, it matters however in which state of the world a participant is borne. If a transfer-scheme has been implemented, ex-ante expected utility, denoted U^{ca} , equals:

$$(5) \quad U^{ca} \equiv \lambda^2 \ln[HS] + (1-\lambda)^2 \ln[L(s-t) + (1+n)t] + \lambda(1-\lambda) \ln[H(s-t)] + \lambda(1-\lambda) \ln[LS + (1+n)t]$$

If U^{ca} is higher than U^{aut} , the transfer scheme is ex-ante efficient.

Definition: A transfer-scheme with a transfer t from a young to an old generation in case capital return is low is **ex-ante efficient** if and only if $U^{ca} \geq U^{aut}$

The following proposition gives the relation between the two efficiency-concepts. It formalizes that interim efficiency is a stricter condition than ex-ante efficiency.

Proposition: if a transfer-scheme is interim efficient then it is also ex-ante efficient

Proof:

$$U^{ca} = \lambda^2 \ln[HS] + (1-\lambda)^2 \ln[L(s-t) + (1+n)t] + \lambda(1-\lambda) \ln[H(s-t)] + \lambda(1-\lambda) \ln[LS + (1+n)t] >$$

$$\lambda^2 \ln[H(s-t)] + (1-\lambda)^2 \ln[L(s-t) + (1+n)t] + \lambda(1-\lambda) \ln[H(s-t)] + (1-\lambda) \lambda \ln[L(s-t) + (1+n)t] = \lambda \ln[H(s-t)] + (1-\lambda) \ln[L(s-t) + (1+n)t] \geq U^{aut}$$

The latter inequality holds if the transfer is interim efficient. In that case, $U^{ca} \geq U^{aut}$ and the transfer is also ex-ante efficient.

Given the proposition, three situations can be distinguished:

- (i) The transfer scheme is interim efficient;
- (ii) The transfer scheme is ex-ante efficient but not interim efficient;
- (iii) The transfer scheme is not ex-ante efficient (and therefore also not interim efficient).

Combining this three possibilities with the possible demographic scenarios, the following six scenarios unfold:

	$n < 0$	$n > 0$
The transfer is interim efficient	The transfer-scheme is implemented, as the old form a majority. The young contribute voluntarily.	The transfer-scheme is in the interest of the young, but whether it is implemented depends on which equilibrium, the young coordinate.
Ex ante efficient, not interim efficient	The transfer-scheme is implemented. The young do not contribute voluntarily, though the scheme is in their interest from an ex-ante perspective.	The transfer-scheme is not implemented, though the scheme is ex-ante efficient.
Not ex ante efficient	The transfer-scheme is implemented, though it is inefficient (it is not in the interest of the young).	The transfer-scheme is not implemented. Transfers are not ex-ante and not interim efficient.

The different outcomes in the six scenarios can be summed in the following observations.

Without further information, it cannot be inferred whether it is efficient that the young or the old form a majority. In particular, the old will always vote in favor of a positive transfer, whether or not it is efficient. On the other hand, the young will never vote in favor of an equilibrium that is not ex-ante efficient. However, if an equilibrium is ex ante efficient –but not interim efficient– the young will never be in favor. And if the equilibrium is interim efficient, there are two equilibria when young voters form a majority. One cooperative equilibrium in which the young vote Y and one uncooperative equilibrium in which the young vote N.

The main implications of the model are the following. First, intergenerational transfer schemes may lead to intergenerational conflicts. This is one rationale for individual DC-accounts, which avoid conflicts between different groups of participants. However, second, an intergenerational transfer scheme may be welfare improving for all generations.⁵ Third, once there is risk involved, there are different conceptualizations of efficiency, depending on the information available at the time of evaluating. Fourth, whether a transfer scheme is implemented in the presence of majority voting –one among many possible decision-making processes–

⁵ A collective DC-plan may thus be preferable to an individual DC-plan. Several solutions have been proposed to combine intergenerational risk sharing with avoidance of potential conflicts (see Teulings and de Vries, 2006). The common feature of the proposed solutions is that legal ownership of assets are defined ex-ante in each possible contingency. However, the long time-horizon and complexity of pension plans virtually unavoidably lead to incomplete contracts once the possibility of transfers is introduced.

depends on the demographic structure of the fund. No general conclusion can be drawn whether efficient transfer schemes are supported in particular by the young or the old. Both generations may –depending on the situation- support efficient as well as inefficient transfers. Fifth, support of the young generation for a transfer scheme may depend on its ability to coordinate. A young generation may coordinate on a good equilibrium with interim efficient transfers, or absent coordination they may arrive on a bad –that is, inefficient- equilibrium of zero transfers.

The model in this section is the simplest way possible to illustrate these points. The model nonetheless misses important features which may lead to other interesting results and/or may qualify the conclusions mentioned. Two potentially stringent assumptions should in particular be mentioned. First, individuals do not care about (consumption of) other people in the model. Obviously, people do care about other people's well-being (which can be formally modeled by allowing utility functions to include consumption of other people). Social Security can perfectly well result from altruism (Hansson and Stuart (1989), Veall (1986) and Tabellini (2000)). The model in this section thus illustrates that *altruism is not a necessary condition for implementation of (welfare-improving) intergenerational transfers*.

Second, there is one source of heterogeneity in the model (age), disregarding other sources of heterogeneity (gender, income, political preference, risk attitude). These other sources are important for a complete political analysis as well as for welfare evaluations. For example, people with high incomes have a longer life expectancy than people with low incomes and women live longer on average than men. The model however illustrates that already with one source of heterogeneity, there might be political conflict, which may or may not result in an efficient outcome.

Third, the model is static. It cannot be analyzed within the model what happens when n changes –although comparative statics have been discussed. As the model is not dynamic, changes in the collective decision making-process are not analyzed. These limitations are recognized.

5 Conclusions

This paper has analyzed the political economy of risk allocation in three cases. In the first case employers and employees bargain over the allocation of risk and control over the investment risk of the pension fund. The second case involves the principal-agent problem between the pension fund and asset managers, who may take more investment risk than is in the interest of the fund. This may particularly be the case when performance pay is asymmetric. The third case involves risk sharing and risk allocation between generations.

The main conclusions are the following. First, if employees are forward-looking and fully informed, a conflict over the investment risk of pension funds will not arise (section 2). In particular, if the employer sets the risk level and if this lowers the expected utility of pension benefits, employees will demand compensation in the form of a higher net wage. However, conflicts over pension fund governance in general and risk management in particular can be witnessed nowadays. A possible explanation is that employees were not well-informed; they thought benefits were legally enforceable, whereas they are not. Another explanation is that the pension fund board does not fully control the risk level. Asset managers have discretionary power to deviate from the risk level set by the board.

This relates to the second conclusion. If so called performance-pay for asset managers is asymmetric, asset managers will have an incentive to increase investment risk beyond the level that is optimal for the fund (section 3). ‘Performance-pay’ is asymmetric if extra payments in case of high returns (bonus) is larger than extra negative payments (malus or performance-penalty) in case of low investment returns.

Section 4 leads to the third conclusion. Intergenerational transfers in a pension fund can be efficient from both an ex ante perspective and an interim perspective. Whether a transfer –efficient or not- will be implemented depends on the collective decision making process. If the decision making process consists of voting with a simple majority rule, it is decisive which generation (the only source of heterogeneity in the model) has a majority. No general conclusion can be drawn whether efficient transfer schemes are supported in particular by the young or the old. Both generations may –depending on the situation- support efficient as well as inefficient transfers.

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