Public Economics
Social Security

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Social security (public pensions) is the biggest social insurance program. In the EU, pension expenditure represents approximately 16% of GDP.

The main difference with the chapter on Social Insurance is that public pensions do not insure against unanticipated shocks like, for example, unemployment insurance.

In the future it is expected that these programs will experience difficulties due to demographic changes. For instance, while the average contribution rate in the EU is 16%, the estimation is that it has to be increased to 27% in 2050 if present rules are kept unchanged (more on this below).
Three-dimensional classification: **defined contribution** versus **defined benefit**, **funded** versus **unfunded**, **actuarial** versus **non-actuarial**

- Defined contribution: the contribution rate is exogenous while benefits are endogenous
- Defined benefit: the benefit is either a fixed lump sum or an amount determined by previous earnings
- This implies that future contribution rates have to be endogenous to balance the system
Funded vs Unfunded

- Unfunded (pay-as-you-go): aggregate benefits are financed by a tax on currently working generations
- Fully funded: benefits are financed by the return on previously accumulated pension funds
- The term actuarial has two meanings: one is macroeconomic and refers to long-run financial stability. We will require that pension systems must be financially stable
- The second one refers to the link between contributions and benefits at the individual level
Why government provision?

1. **Paternalism**: A mandatory system prevents myopic individuals from ending up in poverty in old age. A more recent view is that of hyperbolic discounting: individuals are concerned about the future, but tend to discount the near future at a higher rate than the distant future. At each period he would like to save for retirement, but continually postpones savings until the next period (it is like the smoker who decides every morning to quit smoking “tomorrow”)

A mandatory pension system serves as a commitment device, that prevents the individual from procastinating

2. **Adverse selection**: Different individuals have different life expectancies
Why government provision?

- A firm selling annuities faces a self-selection problem. Only those with high life expectancy purchase the annuity, forcing the firm to pay a lot to their costumers. The firm will have to raise rates, exacerbating the problem of adverse selection.

- Government can force all individuals to purchase insurance avoiding this problem by pooling risks. This argument provides a rationale for making social security compulsory, but only with a low and flat pension benefit (maybe even means-tested).

- **3. Portfolio diversification:** a pay-as-you-go system introduces a new type of “asset,” a pension claim whose rate of return is tied to the growth in the country’s tax base, providing an opportunity for better portfolio diversification.
4. Distributional concerns: the introduction of a pay-as-you-go system is a gift to the first cohorts that will be paid by subsequent cohorts in the form of an implicit tax on labor earnings.

This can be justified by the increase in general standard of living in the last century: many of the elderly, who had very low incomes during a large part of their lives were entitled to share the living standard of active workers.
Samuelson (1958) showed how a PAYGO system has a rate of return equal to the rate of growth of the tax base.

Consider an OLG model where individuals live 2 periods. They work a fixed amount in the first and retire in the second.

Population grows at a rate $n$ per period and there is no capital good in the economy.

All products are consumed in the period in which they are produced ("ice-cream" economy).

Then, individuals cannot save for their old age.
We add a PAYGO system in which each working generation transfers a fraction $\theta$ of earnings to current retirees.

Samuelson proved that with this system, each generation gets an **implicit rate of return** equal to the rate of population growth, called by Samuelson the “biological rate of return”.

We call $L_t$ the number of workers at $t$, $w$ the constant wage rate (below we allow for wage growth).

Then $L_{t+1} = (1 + n)L_t$.

Aggregate taxes paid at time $t$ are $T_t = \theta wL_t$. 
Pension benefit

- The benefit that this working generation will get upon retirement, $B_{t+1}$, is:
  \[ B_{t+1} = T_{t+1} = \theta wL_{t+1} \]

- The ratio of benefits received to taxes paid is:
  \[ \frac{B_{t+1}}{T_t} = \frac{T_{t+1}}{T_t} = \frac{\theta wL_{t+1}}{\theta wL_t} = \frac{L_{t+1}}{L_t} = 1 + n \]

- Social Security permits individuals to retire and consume despite the lack of any nonperishable good in the economy
With technological progress, $w_{t+1} = (1 + g)w_t$, where $g$ is the productivity growth rate:

$$\frac{B_{t+1}}{T_t} = \frac{T_{t+1}}{T_t} = \frac{w_{t+1}L_{t+1}}{w_tL_t} = (1 + g)(1 + n) \approx 1 + g + n$$

In addition to this positive rate of return, the PAYGO system provides a one-time windfall to the initial generation of retirees that receive the initial benefit $B_0 = T_0 = \theta w_0 L_0$, without having paid for it.

Thus, without any durable capital asset, the introduction of a PAYGO system is a **Pareto improvement**

With capital stock this is no longer true. The initial generation gains, but future generations lose.
The initial generation gets $T_0$ and each generation gets an implicit rate on the taxes $T_t$ paid of:

$$(1 + n)(1 + g) - 1 = \gamma$$

If the return on capital is $\rho$, and the economy is dynamically efficient, $\rho > \gamma$. Each working generation loses.

In fact, the present value of all losses is exactly equal to the windfall received by the first generation.

Recall that $T_0 = \theta w_0 L_0$. Each generation pays $\theta w_t L_t$ and gets $\gamma \theta w_t L_t$.

Investing in capital, the return would have been $\rho \theta w_t L_t$. 

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The loss is \((\rho - \gamma)\theta w_t L_t\) during the second period of life. In terms of the first period, it is \((\rho - \gamma)\theta w_t L_t / (1 + \rho)\).

Since wages grow at rate \(g\) per period and population at rate \(n\):

\[
(\rho - \gamma)\theta w_t L_t / (1 + \rho) = (\rho - \gamma)\theta w_0 L_0 (1 + \gamma)^t / (1 + \rho)
\]

The present value of all these losses is:

\[
\sum_{t=0}^{\infty} (\rho - \gamma)\theta w_0 L_0 (1 + \gamma)^t / (1 + \rho)^{t+1}
\]

\[
= (\rho - \gamma)\theta w_0 L_0 (1 + \rho)^{-1} \sum_{t=0}^{\infty} (1 + \gamma)^t / (1 + \rho)^t
\]
The summation is simply:

\[
\frac{1}{1 - \left(\frac{1+\gamma}{1+\rho}\right)} = \frac{1 + \rho}{\rho - \gamma}
\]

Then:

\[
(\rho - \gamma)\theta w_0 L_0 (1 + \rho)^{-1} \frac{1 + \rho}{\rho - \gamma} = \theta w_0 L_0 = T_0
\]

The present value of all losses is exactly \( T_0 \). There is no Pareto improvement.
Objective: What is the optimal size of Social Security?

Individuals are myopic in their consumption-savings decision and may end up without enough resources without government intervention.

The basic model follows Samuelson’s (1958) life-cycle OLG model:

- Individuals live 2 period, work in the first, retire in the second. Labor is supplied inelastically. Exogenous retirement date. Equal earnings and tastes. No uncertainty.
- Population grows at constant rate $n$ per period. Marginal productivity of capital $\rho$ (constant).
Complete myopia (benchmark case)

- Labor force in period $t$ is $L_t$. Number of retired is $A_t$
- As $L_t = (1 + n)L_{t-1}$, we have:
  \[ L_t = (1 + n)A_t \]
- Each worker earns wage $w_t$ in $t$. Government taxes period $t$ earnings at rate $\theta_t$. Total tax revenue is:
  \[ T_t = \theta_t w_t L_t \]
- Each retiree gets benefits $b_t$, so total pension payments are:
  \[ B_t = b_t A_t \]
Government constraint

- As the system is PAYGO:

\[ B_t = T_t, \quad \text{or} \quad \theta_t w_t L_t = b_t A_t \]

- We write the pension benefit as:

\[ b_t = \frac{B_t}{A_t} = \frac{\theta_t w_t L_t}{L_{t-1}} = \theta_t w_t (1 + n) \]

- Utility is separable in first and second period consumption, \( u(\cdot) + v(\cdot) \)

- Individuals are completely myopic, they believe there is only period 1. Then, they do not save at all. (Indirect) utility is \( u(w_t (1 - \theta_t)) + v(b_{t+1}) \)
The government is a benevolent planner that maximizes a Utilitarian SWF (sum of all utilities):

\[
W_t = L_t u(w_t(1 - \theta_t)) + A_t v(b_t)
\]

\[
= \{(1 + n)u(w_t(1 - \theta_t)) + v(b_t)\} L_{t-1}
\]

\[
= \{(1 + n)u(w_t(1 - \theta_t)) + v(\theta_t w_t(1 + n))\} L_{t-1}
\]

Only variable is \(\theta\). The foc is:

\[-(1 + n)w_t u' + (1 + n)w_t v' = 0,\]

or simply \(u'(w_t(1 - \theta_t)) = v'(\theta_t w_t(1 + n))\)
Assuming $u = v$, the foc implies $w_t(1 - \theta^*_t) = \theta^*_t w_t (1 + n)$, and 
\[ \theta^*_t = \frac{1}{2+n} \]

The ratio of benefits to current wages (replacement rate) is:
\[ \beta^*_t = \frac{\theta^*_t w_t (1 + n)}{w_t} = \frac{1 + n}{2 + n} \]

If $n = 0$, $\beta^*_t = \theta^*_t = 1/2$. The tax smooths consumption across generations alive at $t$. At the optimum, the pension benefit and the after-tax wage are exactly equal.

If $n > 0$, there are more workers being taxed than retirees getting benefits. We can tax workers less than half of current wages, while giving benefits to the retirees higher than current workers.
Example

- Suppose an annual population growth of 1.4% and periods of 30 years
- Then $(1 + 0.014)^{30} = 1 + n = 1.52$, and $n = 0.52$. We obtain $\theta^* = 0.4$ and $\beta^* = 0.6$
- If population grows only 0.7% per year, then $1 + n = 1.23$, and $\theta^* = 0.45$, $\beta^* = 0.55$
- We find high replacement rates, but this is because we have assumed that all individuals are completely myopic. Next we consider that individuals save some money
With partial myopia we have to compare the advantage of income support for the myopic against the distortion caused by reduced saving.

We assume that individuals, instead of maximizing the “true” utility $u + v$, they maximize $u + \lambda v$, where $\lambda \leq 1$ is the degree of discounting of future utility.

The case $\lambda = 1$ means no myopia at all, while $\lambda = 0$ is complete myopia (this is the case we have seen above).

Savings are $s_t$, first period consumption is $c_{1,t}$ and second period consumption is $c_{2,t+1}$. 
Budget constraints

- Restrictions are $c_{1,t} = (1 - \theta_t)w_t - s_t$, and $c_{2,t+1} = s_t(1 + \rho) + b_{t+1}$
- We consider a second type of myopia. Individuals may underestimate future SS benefits
- They believe future consumption will be $c_{2,t+1} = s_t(1 + \rho) + \alpha b_{t+1}$, where $\alpha < 1$ ($\alpha = 0$ means they ignore completely public pensions, no distortion on savings)
- The intertemporal restriction is:

$$c_{2,t+1} = [(1 - \theta_t)w_t - c_{1,t}] (1 + \rho) + \alpha b_{t+1}$$

- Individual maximizes $u + \lambda \nu$ subject to this restriction. Government chooses $\theta$ to maximize the sum over all periods of the true utilities
Consumer choice

- For $\theta_t$ and $b_{t+1}$ given, the foc is $\frac{u'}{\lambda v} = (1 + \rho)$. The slope of $u + \lambda v$ is higher in absolute value than the slope of the true utility $u + v$.

- For a fixed value of $\alpha$, the lower is $\lambda$, the higher is $c_1$ relative to $c_2$. Overall effect on $s$ not clear, the two types of myopia have opposite effects (a fall in $\lambda$ reduces savings, a fall in $\alpha$ raises savings).

- In the sequel we take $u(c_1) = \ln c_1$ and $u(c_2) = \ln c_2$. Optimal savings are:

$$s^*_t = \frac{1}{1 + \lambda} \left[ \lambda (1 - \theta_t) w_t - \frac{\alpha b_{t+1}}{(1 + \rho)} \right]$$

- If $\lambda = 1$ and $b = 0$ (no myopia and no social security), we get $s^*_t = c^*_1 = 0.5(1 - \theta_t) w_t$ and $c^*_2 = (1 + \rho) 0.5(1 - \theta_t) w_t$. We see $\frac{\partial s^*_t}{\partial \lambda} > 0$, $\frac{\partial s^*_t}{\partial b} < 0$, $\frac{\partial s^*_t}{\partial \alpha} < 0$.
First generation

- Using government constraint, defining $w_{t+1} = (1 + g)w_t$ and $(1 + g)(1 + n) = (1 + \gamma)$, where $\gamma$ is the rate of return of the PAYGO system (recall $b_{t+1} = \theta(1 + \gamma)w_t$):

$$s_t^* = \frac{1}{1 + \lambda} \left[ \lambda (1 - \theta_t) - \frac{\alpha \theta (1 + \gamma)}{1 + \rho} \right] w_t$$

- This describes saving behavior of all generations but the first one. First generation received pension benefits without paying contributions.

- They obtained $b_0 = \theta(1 + n)w_0$. However, they did not anticipate this at time $-1$. They saved (for them $\alpha = \theta = 0$):

$$s_{-1}^* = \frac{\lambda}{1 + \lambda} w_{-1} = \frac{\lambda}{1 + \lambda} \frac{w_0}{1 + g}$$
When they retire at \( t = 0 \), their utility (when old) is:

\[
\ln \left[ (1 + \rho)s_{-1}^* + b_0 \right] = \ln \left( 1 + \rho \right) \frac{\lambda w_0}{1 + \lambda} \frac{1 + g}{1 + g} + \theta (1 + n) w_0
\]

Total utility at \( t = 0 \) is the sum of all those individuals currently living. \( W_0 \) is:

\[
(1 + n) \ln \left[ (1 - \theta)w_0 - s_0^* \right] + \ln \left( 1 + \rho \right) \frac{\lambda w_0}{1 + \lambda} \frac{1 + g}{1 + g} + \theta (1 + n) w_0
\]

We have normalized dividing by \( \frac{1}{1+n} \), the number of retired in the first period.
At all future periods $t > 0$, we have:

$$W_t = (1 + n)^{t+1} \ln [(1 - \theta)w_t - s^*_t] + (1 + n)^t \ln[(1 + \rho)s^*_{t-1} + b_t]$$

We can write $W_t$ as:

$$(1 + n)^{t+1} \ln \left[ (1 - \theta)w_t - \frac{\lambda(1-\theta)}{1+\lambda}w_t + \frac{\alpha\theta(1+\gamma)}{(1+\lambda)(1+\rho)}w_t \right] + (1 + n)^t \ln \left[ \frac{\lambda(1+\rho)(1-\theta)}{1+\lambda}w_{t-1} + \frac{\theta(1+\gamma)(1+\lambda-\alpha)}{1+\lambda}w_{t-1} \right]$$
Utility in future periods, cont.

- As $w_t = w_0(1 + g)^t$, we can simplify $W_t$ into:

$$W_t = (1 + n)^t f(\theta) + C_t$$

- Here, the term $f(\theta)$ is:

$$f(\theta) = (1 + n) \ln \left[ 1 - \theta + \frac{\alpha \theta (1 + \gamma)}{(1 + \rho)} \right] +$$

$$+ \ln \left[ \lambda (1 + \rho)(1 - \theta) + \theta (1 + \gamma)(1 + \lambda - \alpha) \right]$$

- And $C_t$ collects all terms that do not depend on $\theta$:

$$C_t = (1 + n)^{t+1} \ln \left[ \frac{1}{1 + \lambda} (1 + g)^t w_0 \right]$$

$$+ (1 + n)^t \ln \left[ \frac{1}{1 + \lambda} (1 + g)^{t-1} w_0 \right]$$
If \( \theta \) maximizes \( W_t \), it also maximizes \( W_{t'} \) for \( t' > t \). However, that value of \( \theta \) would not be a full optimum, because it ignores the transfers to the retired people in \( t = 0 \).

Unless future utility is discounted at a very high rate, this initial period effect will be unimportant relative to the effect of all future periods.

The true optimum \( \theta^* \) is the one that maximizes:

\[
S = \sum_{t=0}^{\infty} \frac{W_t}{(1 + \eta)^t} = W_0 + \sum_{t=1}^{\infty} \frac{W_t}{(1 + \eta)^t},
\]

where \( \eta \) is a time preference discount rate (\( \eta = 0 \) no discounting).

We take into account currently living individuals as well as future generations.
In particular:

\[ S = W_0(\theta) + f(\theta) \sum_{t=1}^{\infty} \left( \frac{1 + n}{1 + \eta} \right)^t + \sum_{t=1}^{\infty} \frac{C_t}{(1 + \eta)^t} \]

- Last term independent of \( \theta \)
- We need \( \eta > n \) to guarantee convergence
- Evaluating the infinite sum, and eliminating constant terms, the true optimum \( \theta^* \) is the maximizer of:

\[ W_0(\theta) + f(\theta) \frac{1 + n}{\eta - n} \]
True optimum always between the maximizer of $W_0$ and the maximizer of $f(\theta)$. As $\eta \to n$, the relative size of $W_0$ goes to zero, since the weight of $f(\theta)$ goes to infinity.

First, we ignore $W_0$ (this is the case if $\eta \approx n$). The value of $\theta$ that maximizes the steady-state level of utility is the one that maximizes $f(\theta)$.

The foc is:

$$
(1 + n) \left[ \frac{\alpha(1+\gamma)}{1+\rho} - 1 \right] + \frac{(1 + \gamma)(1 + \lambda - \alpha) - \lambda(1 + \rho)}{\lambda(1 + \rho)(1 - \theta) + \theta(1 + \gamma)(1 + \lambda - \alpha)} = 0
$$
Optimal solution

- We start with the case $\alpha = 0$. Here the existence of a SS benefit does not distort savings at all.
- Taxes are only affected by the reduction in disposable income due to the tax $\theta$.
- We have (note that $\theta$ can be negative):

$$\theta^* = \frac{(1 + \lambda)(1 + \gamma) - \lambda(1 + \rho)(2 + n)}{(1 + \lambda)(1 + \gamma)(2 + n) - \lambda(1 + \rho)(2 + n)}$$

- With complete myopia ($\lambda = 0$) this reduces to $\theta^* = \frac{1}{2+n}$.
- It is also immediate to see that $\frac{\partial \theta^*}{\partial \lambda} < 0$. So complete myopia ($\alpha = 0$) puts an upper bound on the optimal level of $\theta$. 
Comparative statics

- We can also check that $\frac{\partial \theta^*}{\partial \rho} < 0$ (for $\lambda > 0$) and that $\frac{\partial \theta^*}{\partial \gamma} > 0$
- The first comes because, when myopia is not complete, individuals save and social security distorts savings and the welfare loss of this distortion is greater the greater is $\rho$ (the return of savings)
- The second comes from the fact that $\gamma$ is the rate of return of the PAYGO system
- We can also study for which configurations of parameters, the optimal value of $\theta$ is $\theta^* = 0$
- As the denominator above is always positive, this will happen when the numerator is negative, that is, when:

$$ (1 + \lambda)(1 + \gamma) < \lambda(1 + \rho)(2 + n) $$
This in fact establishes a critical value:

\[ \hat{\lambda} = \frac{1 + \gamma}{(1 + \rho)(2 + n) - (1 + \gamma)} \]

such that for all \( \lambda > \hat{\lambda} \), it is optimal to set \( \theta^* = 0 \)

**Example:** Population grows at 1.4% per year, wages grow at rate 2.2% per year and the annual increase in marginal productivity of capital is 11.4%

Then, \( 1 + n = (1 + 0.014)^{30} = 1.52 \),
\( 1 + \gamma = (1.014)^{30}(1.022)^{30} = 2.92 \), \( 1 + \rho = (1.114)^{30} = 25.5 \)

We get \( \hat{\lambda} = 0.048 \)
Now we use standard values employed in the literature: Population grows at 1% per year, wages grow at rate 2.5% per year and the annual increase in marginal productivity of capital is 6%.

We have $1 + n = (1 + 0.01)^{30} = 1.35$, $1 + \gamma = (1.01)^{30}(1.025)^{30} = 2.83$, $1 + \rho = (1.06)^{30} = 5.74$

We get $\hat{\lambda} = 0.26$. This is much lower than the typical value for $\lambda$ in the literature (0.55 in the book by Barro and Sala-i-Martin).

Moreover, note that this optimal value of $\theta$ is calculated by assuming $\alpha = 0$. If $\alpha > 0$, the optimal value of $\theta$ is even lower. In particular, if $\alpha = 1$, then $\theta^* = 0$. 
In the table population grows at a 1.4% yearly ($1 + n = 0.52$), wages grow at 2.2% per year and the annual increase in marginal productivity of capital is 8%:

<table>
<thead>
<tr>
<th>$\alpha$</th>
<th>$\theta^*$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.28</td>
</tr>
<tr>
<td>0.1</td>
<td>0.26</td>
</tr>
<tr>
<td>0.5</td>
<td>0.19</td>
</tr>
<tr>
<td>0.67</td>
<td>0</td>
</tr>
</tbody>
</table>
We turn to the opposite case, that is, when $\eta = \infty$. In this case, only the utility of the first period matters.

We find the value of $\theta$ that maximizes $W_0$:

$$
(1 + n) \ln \left( (1 - \theta)w_0 - \frac{\lambda}{1 + \lambda} (1 - \theta)w_0 + \frac{\alpha \theta (1 + \gamma)}{(1 + \lambda)(1 + \rho)} w_0 \right) + \\
+ \ln \left( (1 + \rho) \frac{\lambda}{1 + \lambda} \frac{w_0}{1 + g} + \theta (1 + n)w_0 \right),
$$

Or simply:

$$
W_0 = (1 + n) \ln \left( \frac{w_0}{1 + \lambda} \left[ 1 - \theta + \frac{\alpha \theta (1 + \gamma)}{1 + \rho} \right] \right) + \\
+ \ln \left( (1 + n)w_0 \left[ \frac{\lambda}{1 + \lambda} \frac{(1 + \rho)}{1 + \gamma} + \theta \right] \right).
$$
Eliminating constant terms, we have to maximize:

\[(1 + n) \ln \left[ 1 - \theta + \frac{\alpha \theta (1 + \gamma)}{1 + \rho} \right] + \ln \left[ \frac{\lambda (1 + \rho)}{1 + \lambda (1 + \gamma)} + \theta \right] \]

The foc is:

\[
\frac{(1 + n) \left[ \frac{\alpha (1 + \gamma)}{(1 + \rho)} - 1 \right]}{1 - \theta + \frac{\alpha \theta (1 + \gamma)}{(1 + \rho)}} + \frac{(1 + \gamma)(1 + \lambda)}{\lambda (1 + \rho) + \theta (1 + \gamma)(1 + \lambda)} = 0
\]

The first term is exactly the same than in the first order condition above. However, the second term is greater than before.
The optimal value of $\theta$ obtained from the foc higher than obtained above (when the weight of 1st generation was 0)

If, in particular, $\alpha = 0$, the foc is:

$$\frac{-1 + n}{1 - \theta} + \frac{(1 + \lambda)(1 + \gamma)}{\lambda(1 + \rho) + (1 + \lambda)(1 + \gamma)\theta} = 0$$

Using the first set of values, we need $\lambda \leq 0.083$ for having $\theta^* \geq 0$. For the second set of values, we obtain $\lambda \leq 0.575$

If we take $\lambda = 0.55$, and this second set of parameters, we obtain $\theta^* = 0.012$

Even in the case without myopia ($\lambda = \alpha = 1$), the equilibrium is not efficient, unless we are at the Golden rule
A fraction $\mu$ of the population are myopic ($\lambda = \alpha = 0$), and a fraction $1 - \mu$ are life-cyclers ($\lambda = \alpha = 1$)

Total welfare in $t$ is:

$$W_t = (1 + n)\mu \ln[(1 - \theta)w_t] +$$
$$+ (1 + n)(1 - \mu) \ln 0.5[(1 - \theta)w_t + \frac{b_{t+1}}{1 + \rho}] +$$
$$+ \mu \ln[b_t] +$$
$$+ (1 - \mu) \ln 0.5[(1 - \theta)w_{t-1}(1 + \rho) + b_t]$$
The function to maximize, eliminating constant terms and simplifying is:

$$W' = (1 + n)\mu \ln[1 - \theta] + (1 + n)(1 - \mu) \ln[1 - \theta + \frac{\theta(1 + \gamma)}{1 + \rho}] +$$

$$+ \mu \ln[\theta] + (1 - \mu) \ln[\frac{(1 - \theta)(1 + \rho)}{1 + \gamma} + \theta]$$

In particular, if all individuals are myopic ($\mu = 1$), we have again $\theta^* = \frac{1}{2+n}$. It is an upper bound on the possible values of $\theta$.

If population grows 1.4% every year, $1 + n = (1 + 0.014)^{30} = 1.52$ and then $\theta^* = 0.4$. If population grows a 1%, then $\theta^* = 0.43$.
Heterogeneous Population, examples

- The opposite case is $\mu = 0$. Then $\theta^* = 0$
- So the optimal value of $\theta$ goes from 0 to $\frac{1}{2+n}$ as $\mu$ moves from 0 to 1
- If we take US data with $n = .52$, etc., we obtain $\theta^* = 0.11$ for $\mu = .25$, $\theta^* = 0.21$ for $\mu = .5$, $\theta^* = 0.31$ for $\mu = .75$
Think of annuity markets with public information on survival probabilities

In the stationary competitive equilibrium the old of type \( i \) \((i = A, B)\) share the estate of deceased members of type \( i \)

The CE creates actuarially fair discrimination between groups, inducing risk-sharing within but not between groups

Any annuity policy that does not discriminate between groups will yield inefficient risk-sharing and outcomes that are not Pareto efficient

Government intervention is not necessary
Asymmetric information

- The interesting case is when there is private information on survival probabilities. The CE is not generally Pareto efficient, and there is a role for government intervention.
- The set of optimally designed mandatory social security programs will:
  1. Lead to a Pareto improvement with respect to the CE
  2. Allow for the coexistence of public and private annuity contracts
Model

- OLG economy with 2 periods
- Individuals are either of type A or B, with survival probabilities
  \[ 0 < \pi_A < \pi_B < 1 \]
- This means that a proportion \( 1 - \pi_i \) of individuals of type \( i = A, B \) dies at the end of the first period, while a proportion \( \pi_i \) is alive in the second period
- Here B’s are the “bad” risks. There are \( \gamma \) individuals of type B for each agent of type A, where \( \gamma > 0 \)
- Utilities are \( u^i = u(c_1^i) + \pi_i u(c_2^i) \) for \( i = A, B \)
- Agents know their own type, and the values \( \pi_A, \pi_B \) and \( \gamma \). The government and private annuity sellers know \( \pi_A, \pi_B \) and \( \gamma \). No agent knows the longevity type of any other agent
Annuities

- An annuity policy $\alpha$ is represented by a contract $(s^\alpha, R^\alpha)$ where an agent that purchases $\alpha$ enjoys a consumption bundle $(c_1, c_2) = (w - s^\alpha, R^\alpha s^\alpha)$ if she lives in both periods and $(c_1, c_2) = (w - s^\alpha, 0)$ if she lives only in the first period.

- Indirect utility is:

$$V^i(s, R) = u(w - s) + \pi_i u(Rs), \text{ for } i = A, B$$

- The slope of an indifference curve in space $(c_2, c_1)$ through allocation $(w - s, Rs)$ is:

$$\frac{\partial c_1}{\partial c_2} = -\pi_i \frac{u'(Rs)}{u'(w - s)}$$
Single-crossing

- Since $\pi_B > \pi_A$, in the space $(c_2, c_1)$ the indifference curves of the low-risk individuals (A) will be flatter than those of individual B.
- Then, for any $R$, type B individuals (those with higher surviving probability) would like to purchase more annuities than type A individuals.
- Note that axis are not as usual.
Single-crossing, representation
Symmetric information

- We start with the case of symmetric information and actuarially fair annuities
- With a policy \((s, R)\) profits are:
  \[
  \pi(s - Rs) + (1 - \pi)s = s(1 - \pi R)
  \]
- By competition this is driven to zero, implying \(R = 1/\pi\)
- Since \(c_1 = w - s\), \(c_2 = Rs\), we can write the budget constraint as
  \[
  c_1 = w - c_2/R = w - \pi_i c_2 \quad \text{for } i = A, B
  \]
Symmetric info, foc

- The slope of the budget constraint in the space \((c_2, c_1)\) is \(-\pi_i\). For each type, at those combinations below the line the firm makes a positive profit.
- The foc is:
  \[-\pi_i \frac{u'(c_2^*)}{u'(c_1^*)} = -\pi_i\]
- This implies \(u'(c_1^*) = u'(c_2^*)\) and, therefore, \(c_1^* = c_2^* = \frac{1}{1+\pi_i} w\)
- Both types maximize at the 45 degree line.
Symmetric info, representation

Figura:
Asymmetric information

- With asymmetric information, the equilibrium concept is exactly the same as in Rothschild-Stiglitz
- It is a set of contracts such that when agents choose contracts to maximize expected utility: (i) No contract in the equilibrium set makes negative profits and (ii) there is no contract outside the equilibrium set that, if offered, would make non-negative profits
- As in RS, there is no pooling equilibrium. If there is equilibrium, it is a separating equilibrium where bad risks (B) are fully insured, while the good risks (A) are not fully insured
- For $\gamma <<<$, there is no equilibrium (low proportion of bad risks)
Candidate for separating equilibrium: (C,E)
Equilibrium?

- As in RS, the above example will be an equilibrium provided that no pooling contract may destroy it.
- This depends on the value of $\gamma$. If $\gamma$ is small, it can be the case that firms can offer a contract above the indifference curve of type A through contract E, which is profitable for the firm.
- If $\gamma$ is large, there is a separating equilibrium.
- High risk individuals (type B, those with a higher life expectancy) impose a negative externality on low risk individuals (type A).
- In the separating equilibrium above, type A individuals are worse off than in a situation with symmetric information.
In this situation, government intervention can be Pareto improving.

The trick is that the government can propose contracts that yield negative profits separately, but which together yield non-negative profits.

Private firms cannot do this. This means contracts where one risk class subsidizes the other.

Government intervention requires all individuals to pay $x$ when young obtaining a return $\bar{R}$ (average return). Private markets for residual demands are allowed to operate.

This plan breaks even. Initial endowments go from $(w, 0)$ to $(w - x, x\bar{R})$. 
It has been claimed that Social Security affects negatively savings. We want to see if this is true and in that case, how large is the crowding-out effect.

Using only theory the effect is not clear (Feldstein (1974)). Social security may induce workers to retire earlier. Then, they have to save more to cover the increased length of retirement and the overall impact can be ambiguous.

Individuals may also save with other purposes, not only to finance their retirement. One of the classical motives for saving is to protect themselves against uncertain events as the loss of a job, medical expenses, etc. This is *precautionary* saving.

This type of saving might be not affected by Social Security.
Some people save to provide bequests to their children. Social Security is a transfer from the young to the old. Some old people may offset that transfer by increasing their bequests. To do this, they need to save more. This increased saving may offset the reduction in saving for retirement.

Some people may use simple rules of thumb to choose their saving. For example, to save a fixed amount or a fixed fraction of income. Small changes in Social Security would have little effect on saving.

Finally, some people may make no provision for retirement, due to myopia, or because they discount heavily future utility, or because they assume that the government will provide for them. These individuals will not change their behavior.

The conclusion is that economic theory alone cannot answer this question.
Savings, empirical

- Cross-section analysis examines data on people to see if those expecting to receive higher Social Security benefits have saved less and thus accumulated lower levels of private (nonpension) wealth, controlling for other factors such as age and income.

- The explanatory variable is Social Security wealth: the total value of Social Security benefits that a person expects to receive, less taxes to be paid, adjusted for the length of life before retirement and the probability that the recipient will survive.

- The variable we want to explain is private wealth.

- Different studies have estimated the coefficient of Social Security wealth. Estimates vary from $-1.67$ to $0.30$. However, most estimates lie between $-0.5$ and $0$. 
Social Security may affect retirement choices through different channels.

If individuals are myopic or liquidity-constrained, Social Security transfers resources from working years to retirement years. The income effect should induce additional consumption of leisure when old. This means that individuals wish to retire earlier.

Second, in most countries benefits are available only upon retirement.

Third, Social Security may change social conventions regarding retirement dates, affecting the design of private plans, firm mandatory retirement ages, and worker tastes.
Available empirical data prove that retirement behavior of men in the OECD countries has changed dramatically over the 20th century.

In the US, labor participation rates of men aged 65 and over fell from 65% in 1900 to 20% in 2010.

Labor participation fell at younger ages as well. In the US, labor participation of men aged 55-64 fell from 91% in 1900 to 64% in 2010.

Some part of this reduction is due to unemployment. Much of this decline is due to early retirement.
**Elderly Work and Social Security, 1959–2004**

There is a striking negative correspondence over time between the labor force participation (LFP) rates of the elderly (which have fallen) and the size of the Social Security program (which has risen).

Early retirement means retirement before the normal retirement age.

In the US, 26% of men have left the labor force by the age 59. In Belgium 58%, in France and Italy 53%, and 47% in the Netherlands. In Spain, more than 40% of individuals retire at age 60 or earlier.

This trend is particularly striking in light of the impressive improvements in the health of older workers and in life expectancy. Successive cohorts of workers are spending smaller percentages of their lives in the work force.

The evidence from different countries seems to support the view that it is Social Security that affects retirement behavior.

In each country relaxation of early retirement rules and expansions in benefits at younger ages were followed quickly by trends toward early retirement.
The Social Security tax increases marginal tax rates and can produce deadweight losses if workers do not perceive the link between the taxes they pay and the benefits they receive.

What happens if the benefits of every individual provide an actuarially fair return?

The problem with giving an estimation of the loss is that workers may perceive some or all of that link. And the net marginal tax rate that a worker faces depends on several factors like age, sex, marital status, and income.

The marginal tax rate is the Social Security tax rate minus the present actuarial value (discounted for time preference and mortality risk) of the additional Social Security benefits per dollar of additional earnings.
For example, in Spain the formula to calculate the pension benefit only takes into account the earnings over the last 15 years before retirement.

Young workers face the full payroll tax, since an increase in their supply, provided that it was positive initially, has no effect in their pension benefit.

Also this is the case for low-income workers who will qualify for minimum pensions.
Unfunded (PAYGO) Social Security transfers large sums of money from workers to retirees. To assess the overall impact of Social Security on income distribution is difficult.

The ideal experiment should be to compare current income distribution with the income distribution in a world without Social Security.

Instead of this, most research has focused on measuring ways in which the system treats different individuals differently over their lifetimes.

We know that in a PAYGO system the initial generation receives a windfall and the next generations earn a steady-state rate of return equal to the growth of the wage base.

The internal rate or return, \( i \), is the return that equalizes the present discounted value of the total contributions paid and benefits received for the cohort:

\[
0 = \sum_{\text{age}=0}^{\text{age}=\max \text{ age}} \frac{\text{benefits}_{\text{age}} - \text{taxes}_{\text{age}}}{(1 + i)^{\text{age}}}.
\]

Another measure is to compute lifetime net transfers. That is, the present value of benefits received minus taxes paid, using a real discount rate (2% in the table below).
## Redistribution Across Cohorts in the U.S. Social Security System

<table>
<thead>
<tr>
<th>Birth cohort</th>
<th>Internal rate of return (%)</th>
<th>Aggregate Lifetime Net Intercohort Transfer evaluated in billions of 1989 dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1876</td>
<td>36.5</td>
<td>12.1</td>
</tr>
<tr>
<td>1900</td>
<td>11.9</td>
<td>112.0</td>
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<tr>
<td>1925</td>
<td>4.8</td>
<td>99.6</td>
</tr>
<tr>
<td>1950</td>
<td>2.2</td>
<td>14.0</td>
</tr>
<tr>
<td>1975</td>
<td>1.9</td>
<td>-8.0</td>
</tr>
<tr>
<td>2000</td>
<td>1.7</td>
<td>-15.2</td>
</tr>
</tbody>
</table>
Another question is intra-cohort redistribution. Low earners get a greater fraction of the lifetime earnings than higher earners because the system is not proportional.

However, Coronado, Fullerton and Glass (2000) argue that much of the intra-cohort redistribution in the system is related to factors other than income.

For example, Social Security transfers resources from people with low life expectancy to people with high life expectancy, from single workers to married couples who receive spouse benefits, and from people who work for more than 35 years to those who concentrate their earnings in 35 or fewer years (taxes are paid on all years of earnings but benefits are based only on the highest 35 years).
Since high-income households tend to have higher life expectancies and begin to work later, some of the progressivity of the basic benefit formula is offset

In social security those who live long get back far more than they contribute, while those who die before retirement get back less

This is not inequitable in itself. It is like saying that a person who buys fire insurance loses if he does not have a fire, and gains if he has a fire

Other examples are: For comparable contributions women receive back more than men, because they live longer

Also smokers vs. non-smokers
<table>
<thead>
<tr>
<th>Country</th>
<th>0.5</th>
<th>0.8</th>
<th>1.0</th>
<th>1.5</th>
<th>2.0</th>
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<td>67.9</td>
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<tr>
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<td>95.7</td>
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<td>51.0</td>
<td>36.6</td>
<td>30.8</td>
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</tr>
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<td>United States</td>
<td>40.8</td>
<td>50.3</td>
<td>42.6</td>
<td>38.7</td>
<td>34.1</td>
</tr>
<tr>
<td>OECD</td>
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<td>59.0</td>
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<td>EU15</td>
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<td>38.1</td>
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<td>77.1</td>
<td>77.0</td>
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I. Iturbe-Ormaetxe (U. of Alicante) Social Security 2011-12 69 / 97
<table>
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<th>1,0</th>
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<td>74,8</td>
<td>74,8</td>
<td>74,8</td>
<td>77,1</td>
</tr>
<tr>
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<td>82,1</td>
<td>84,1</td>
<td>84,7</td>
<td>85,3</td>
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<tr>
<td>Greece</td>
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<td>110,1</td>
<td>110,8</td>
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<tr>
<td>United Kingdom</td>
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<td>48,0</td>
<td>40,9</td>
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<tr>
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<td>82,4</td>
<td>74,0</td>
<td>70,3</td>
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<tr>
<td>EU15</td>
<td>75,9</td>
<td>85,5</td>
<td>77,5</td>
<td>74,6</td>
<td>71,9</td>
</tr>
<tr>
<td>Nordic</td>
<td>78,3</td>
<td>95,3</td>
<td>81,3</td>
<td>76,4</td>
<td>76,1</td>
</tr>
<tr>
<td>Anglophone</td>
<td>51,2</td>
<td>73,1</td>
<td>55,6</td>
<td>46,3</td>
<td>35,0</td>
</tr>
<tr>
<td>S Europe</td>
<td>92,3</td>
<td>93,0</td>
<td>91,8</td>
<td>92,9</td>
<td>93,6</td>
</tr>
</tbody>
</table>

Median earner 0,5 0,8 1,0 1,5 2,0

OECD 71,8 82,4 74,0 70,3 65,5 60,8
EU15 75,9 85,5 77,5 74,6 71,9 66,5
Nordic 78,3 95,3 81,3 76,4 76,1 74,3
Anglophone 51,2 73,1 55,6 46,3 35,0 28,5
S Europe 92,3 93,0 91,8 92,9 93,6 91,6
According to Stiglitz (2000), there are typically five major complaints against social security:

1. It is contributing to the country’s long-run fiscal crisis
2. It discourages savings, and thus reducing growth
3. It reduces labor supply
4. It gives a low rate of return
5. There are a number of inequities in the system

We have already discussed (2), (3) and (5). In the sequel we will discuss (1) and (4)
Financial viability

- The financial viability of the system depends on many factors.

- To simplify, we can write the underlying accounting identity in a PAYGO system as:

\[ t = \frac{S}{N} \times \frac{B}{W} = d \times r \]

- Here \( t \) is the payroll tax, \( S \) is the number of pension recipients, \( N \) is the number of workers, \( B \) is the average pension and \( W \) represents average taxable wages.

- The overall numerator \( (S \times B) \) is aggregate social security benefits and the overall denominator \( (N \times W) \) is aggregate taxable wages.

- We call \( d \) the aggregate dependency ratio and \( r \) the aggregate replacement rate.
To illustrate further, we write the identity as:

\[ t = \frac{S}{P} \times \frac{P}{N} \times \frac{B}{W} = d_1 \times d_2 \times r \]

where \( P \) is total population in working age (say, between 16 and 65), \( d_1 \) is \( S/P \) and \( d_2 \) is the inverse of the employment rate.

In general, the evolution of \( d_1 \) is expected to be very negative in the next future in western countries. For Spain, this ratio is expected to rise from 0.25 in 2000 (4 to 1) to 0.6 in 2050 (1.7 to 1).

This change is due to two main reasons: increased longevity and slower population growth (another reason in the recent past was earlier retirement ages).
The ratio $d_2$ also had a negative evolution in the recent past. This was particularly the case in Spain.

Data on employment rates by age group in 2005:

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Spain</th>
<th>US</th>
<th>OECD</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-24</td>
<td>41.9</td>
<td>53.9</td>
<td>42.9</td>
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<tr>
<td>25-54</td>
<td>74.4</td>
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<td>75.8</td>
</tr>
<tr>
<td>55-64</td>
<td>43.1</td>
<td>60.8</td>
<td>52</td>
</tr>
</tbody>
</table>

It is not clear at all how will be the evolution of $d_2$. In general it is expected an increase in the labor-force participation of women.
In Spain the average replacement rate $r$ was around 0.4

Combining everything we get

$$t = 0.25 \times \frac{1}{0.48} \times 0.4 \simeq 0.21$$

In 2050, and assuming $d_1 = 0.6$, $d_2 = \frac{1}{0.61}$ (the current level of employment in the EU) and $r = 0.4$:

$$t = 0.6 \times \frac{1}{0.61} \times 0.4 \simeq 0.39$$

Boldrin, Dolado, Jimeno and Peracchi (1999) simulate the ratio Pensions/GDP for OECD countries. They argue that, provided the evolution of the labor force participation rate is good enough, and some minor adjustments to the generosity of the system are made, the financial position of the system will be balanced for the next 50 years.
A problem with these simulations is the assumption of strong increases in participation rates. This implies that in the future there will be an increase in the number of pensions.

The quantitative effect depends on whether the participation rate increases among those already entitled to some minimum pension or not. Some authors believe an increase in female participation rates will be more a problem than a solution. Two effects:

1. First the positive effect taken into account by the authors (a rise in contributions)
2. Second, these extra workers would be accumulating pension entitlements themselves and thus pension expenditures would be increased.

This effect is not quantified and would, to some extent, offset the positive short and medium-run positive effect of increasing contributions.
Social security does not pay a rate of return comparable to that of private pension plans.

However, this comparison is not fair. The return should be contrasted with a security with comparable risk properties, like government bonds indexed against inflation.

Moreover, investments in equity have greater returns, but also greater risks.

In any case, the question is misplaced. We know that in a PAYGO system, the steady state rate of growth is simply the rate of growth of the economy, which is typically lower than the rate of return on capital.

The low rate of return is not the result of bad investments, but simply the result of having a PAYGO system.
The return could be increased by prefunding (partly) the system.

As we know, the present value across all cohorts (from the beginning of the system till infinity) of the net transfers must sum to zero. It is a zero-sum game among all generations.

Since past cohorts received positive net transfers, some present and future cohorts must receive negative net transfers.

Or, if past cohorts received rates of return greater than market rates, current and/or future cohorts must receive rates of return lower than market rates.

Besides, it is not clear at all that the rate of return would be higher under a privatized system.
Transition costs

- As Geanokoplos, Mitchell and Zeldes (1998) point out, upon privatization, the unfunded liability must be converted into explicit debt. These are the **transition costs**

- New taxes should be raised to pay the interests on the recognition bonds. These taxes can be set to keep the path over time of recognition bonds debt the same as the path of implicit debt under the current system. But then, they would eliminate all the higher returns on individual accounts

- If instead of smoothing the taxes the government raises very high taxes on current cohorts, these cohorts would suffer from the transition since they would be obtaining a lower return

- Also, if contributions would be invested in stocks, this would not affect the rate of return for those families who are not constrained in their investment decisions
Suppose a family pays $5,000 per year in SS taxes, which initially were being placed into a personal account in the bond market. This family was also saving outside of the SS account an additional $10,000 per year, $9,000 in stocks and $1,000 in bonds. Overall, this family puts 60% in stocks and 40% in bonds.

If SS switches the entire social security account into stocks, this household could restore the 60-40 split by putting $4,000 into stocks and $6,000 into bonds out of its private saving.

No matter how the social security account is invested, this household will be no better or worse off. For this family, the return from a privatized and diversified system is not higher than the current system.

Households that could benefit are those that, for different reasons, do not participate in diversified capital markets.
Some proposals simply try to restore fiscal balance in the long run, while others are more drastic, including full privatization.

Proposal 1: “Adjusting” the normal retirement age

Better overall health has lead to increased longevity. On average, individuals should be able to remain in the labor force longer.

The policy recommendation would be to raise the retirement age so as to leave the relative length of the retirement period in adult life constant.

For example, in the US and in Spain the normal retirement age will be increased from 65 to 67. This means that benefits available at 65 would not be available until 67.
Increasing retirement age, cont.

- Assuming that early retirement benefits are reduced actuarially, benefits at any age would be lower than they were.
- Thus the increase in the normal retirement age is equivalent to a reduction in benefits while leaving the normal retirement age unchanged (and obviously it is easier to implement from a political point of view).
- Simulations by Jimeno (2000) imply that in Spain, an increase in the normal retirement age from 65 to 70 would reduce the expenditure in pensions as a percentage of GDP by one half in 2025.
- Some authors critique this proposal of increasing normal retirement age. They argue that by reducing retirement age the unemployment among the young can be reduced. But this is based on the widespread idea among the media that the total amount of labor is fixed.
Increasing retirement age, critiques

- Another critique is that firms have used early retirement ("prejubilaciones") to adjust personnel. Increasing retirement age would eliminate this possibility, thus making labor decisions less flexible for firms.

- But adjusting the amount of labor in this way implies lowering participation rates of older workers, and this seems to go against the intention of moderating the growth of pensions as a percentage of GDP.
In the US, benefits are based on the highest 35 years of contributions. Those who work longer, but whose income in those later years are not among their best, for example if they work part-time, receive no increase in benefits in return for their additional contributions.

The formula could be adjusted to provide greater incentives for work.

In Spain from 01-01-2002, benefits are based in the last 15 years of contribution before retirement. Several authors propose to increase further this number of years, reflecting the whole working history.
Increase the early retirement age

- According to Boldrin, Jimenez-Martin and Peracchi (1999) this may have the effect of increasing the number of individuals who only qualify for a minimum pension. As these are the workers with the strongest incentive to anticipate retirement, the final outcome of this proposal may be that of just increasing the proportion of the workforce to whom such incentives matter.

- Increasing the early retirement age would have a positive effect because it would delay the retirement of most persons who now leave the labor force at the early retirement age.

- As labor force participation would be prolonged, social security tax receipts would be increased.

- To get a positive effect an actuarial reduction in early retirement benefits would be necessary.
Once in retirement, benefits increase with the rate of inflation. In some countries like Spain there is full indexation of benefits.

Since the Boskin Report there is widespread agreement that, for technical reasons, the CPI (IPC in Spain) overstates increases in the cost of living.

According to their calculations, the CPI overstates inflation by 1.1 percent per year.

Even a 1/2 percent correction in the CPI would reduce the long-term social security deficit substantially, by as much as one third.

However some worry that the CPI understates increases in the true cost of living of the elderly, especially because the elderly have higher medical costs. But the rise in medical costs has been moderate.
Also quality improvements in medical care imply that this is an area in which the overstatement is greater. Adjusting for quality, health care costs may be increasing more slowly than prices in general, and might even be decreasing.

Politically difficult without reforming first the way CPI is calculated.
Means testing benefits

- Social security redistributes income, but without looking at the overall well-being of the recipient. It looks only at the social security wage income.
- Subjecting the redistributive component to means testing would increase equity and reduce expenditures.
- In Spain there is means testing for the minimum pension complements ("complementos de mínimos"). In particular, individuals need to have total income (pension benefit plus other income) below some threshold.
In general it would be difficult to extend means-testing to the general (contributory) system. It would make explicit the redistribution role of social security:

According to Stiglitz (2000, p. 375):
“Today, many if not most individuals think of social security more as a government-run retirement program, to which they make contributions (pay premiums), with benefits commensurate with the contributions. Making social security means tested would convert it into a welfare program; and social security advocates worry that in the long run, this will undermine support for the program”
Increasing revenues

- Apart from increasing directly the payroll tax there are other less direct possibilities.
- One possibility is to increase the “covered” earnings limit or to eliminate it. However this could have negative effects on the overall revenue for the government.
- Another possibility would be to increase taxation on pension benefits. The tax on social security benefits depends on total income. Only families with incomes above a given level pay taxes on social security benefits. This threshold income level could be lowered.
- There is also the possibility of using other taxes to pay social security benefits. In some countries there has been discussion of using the budget surplus to build up a social security trust fund.
Major proposed changes

- There are two major proposed changes. One entails social security investing its trust fund in equities (pre-funding). The other entails privatization of social security (by means of individual accounts).
- Fundamental change 1. **Investing the Trust Fund in Equities**
  - For the past 75 years, anyone who invested in equities and held them for 20 years or more would have done better than if she had invested a comparable amount in government bonds.
  - According to some estimates, the differential of average returns is 4% per year, with no additional risk. If a fraction of the social security trust fund would be invested in a portfolio of equities, the financial position of social security would be improved.
Investing the trust fund in equities, problems

- The first problem is risk. There is always the possibility of a crash in the stock market.
- Another problem is that today much of the deficit is financed by borrowing from the social security. Social security invests its holdings only in government debt. The position of the social security would be improved at the price of worsening the position of the rest of the government.
- Finally, government ownership of equities would affect the private equities market. In the US this effect would not very large due to the huge size of the stock market. If the Trust Fund would invest 30% of its funds in equities, government ownership would be under 5% of the market.
In Spain the Trust Fund amounts to 66,814 million euro at the end of 2011.

Not much. Pension expenditure was about 113,400 million euro in 2011. The “Fondo de Reserva” would be enough to pay pensions of 7 months.

Investing 30% in the stock market, government ownership would be a small fraction of the market (total market capitalization was 561 billion euros, 16-02-2010).
Fundamental change 2: **Privatization** (as in Chile)

But remember that privatization entails funding the unfunded liability. Chile used the funds from privatization of the copper mines.

A possibility would be to fund the unfunded liability in some other way, for example, increasing VAT.

But, if society is willing to pay higher taxes, social security would face no significant financial problem, and there would be no need for privatization. Simply increase the payroll tax.
Motivations for privatization

- First, private investments provide a higher return. But as we saw, the low return of the social security is due to its PAYGO structure. By switching to a FF system, later generations could achieve a higher return. But the temporary tax to finance the transition would be equivalent to lowering the returns of the generations affected by the transition. And this could be done by the social security trust fund, lowering the associated risk.

- An additional problem would be higher transaction costs (we have to pay the brokers!)

- Also, a moral hazard problem could arise. If individuals anticipate that the government will help them if their investments finally get a low return, they can take more risks than without this safe net.
Second, national saving could be increased. We know that under a FF system, total savings are higher than under a PAYGO system. However, the differences are often exaggerated.

Under a FF system, the elderly are dissaving, at the same time that the young are saving. Net national saving is the difference between the two.

If the economy is growing very slowly, this difference is likely to be small, and so the contribution to net national savings from retirement saving will be small. Now, what will happen in the transition to a FF system? If instead of privatizing, the social security administration would create a larger trust fund, national savings in the short run would increase in the same amount.
Privatization, conclusion

- The arguments for and against privatization are largely political
- According to Stiglitz (2000, pp. 380-1), the fundamental question is: “Can the government make the relative minor adjustments required to restore the program to long-run financial viability? If it cannot, the hard budget constraints imposed by privatization may be the only way out of the political morass in which problems are continually being passed from one generation to the next.”