Supplement to "Designing Optimal Disability Insurance: A Case for Asset Testing"

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Contents

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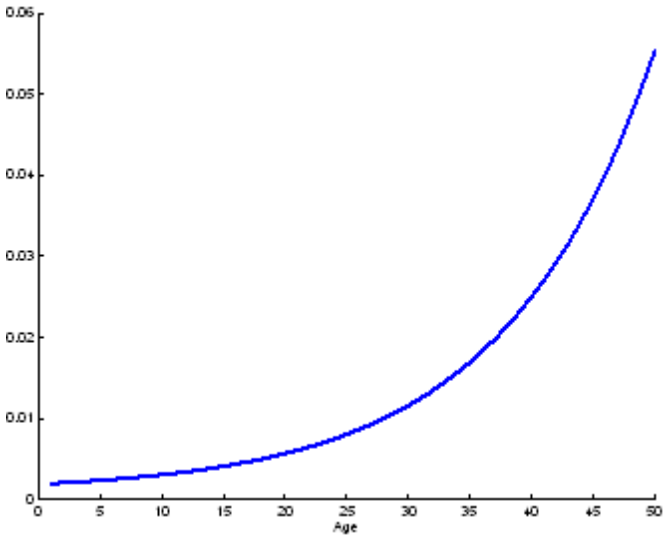
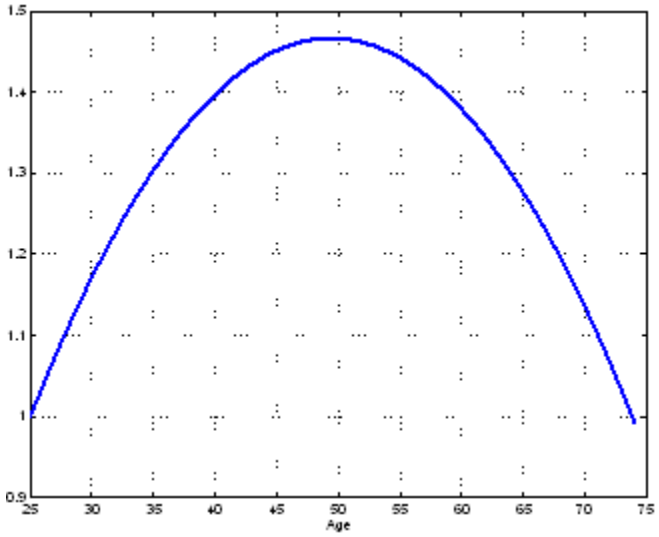
1 Stylized current social insurance system

In this subsection we report a numerical solution to the problem with a stylized disability insurance system. The nature of a decision problem of an agent is as follows. In each period an agent can be either able or disabled. If an agent is able, he faces uncertainty about becoming disabled in the following period. With some probability an agent remains able, and with a complementary probability an agent becomes disabled. If an agent is disabled he does not work and receives a disability transfer. An agent's strategy consists of two parts: at what age to claim disability and how much to consume, save, and work. An agent can insure himself against disability risk by accumulating savings. However, savings provide only imperfect insurance, because the return on savings is not contingent upon disability status.

Pictures that follow show the probability of becoming disabled and the labor profile used in the paper.



Conditional probability of becoming disabled



Skill profile

We report the results of computation of a stylized version of a disability insurance system. Agents choose to retire at age 62 ($j = 37$), which is consistent with the data on retirement, since disability insurance in our model also provides retirement benefits for older agents. We now proceed to discuss consumption and labor decisions of agents. Results are summarized in the figure that follows.

1.1 Consumption profiles

The uppermost line of the consumption graph represents consumption of agents who were able up to age 62 and then claimed disability benefits.

Consumption profiles have four distinct features:

(1) Consumption falls if an agent becomes disabled before age 62. Since there are no assets with a return contingent on disability, agents cannot fully insure against disability risk before age 62. For instance, consumption of an agent who became disabled at the age of 25 falls by 65 percent from 0.6 to 0.2. Consumption of a 55-year-old agent falls by the significantly smaller amount of 40 percent from 0.64 to 0.39.

(2) There is no drop of consumption at the age of retirement. An agent of age 62 applies for disability benefits regardless of whether he is truly disabled or not. After an agent chooses to claim disability, he no longer faces disability risk. Since the decision to claim disability is endogenous, an agent optimally saves capital to avoid a drop in consumption.

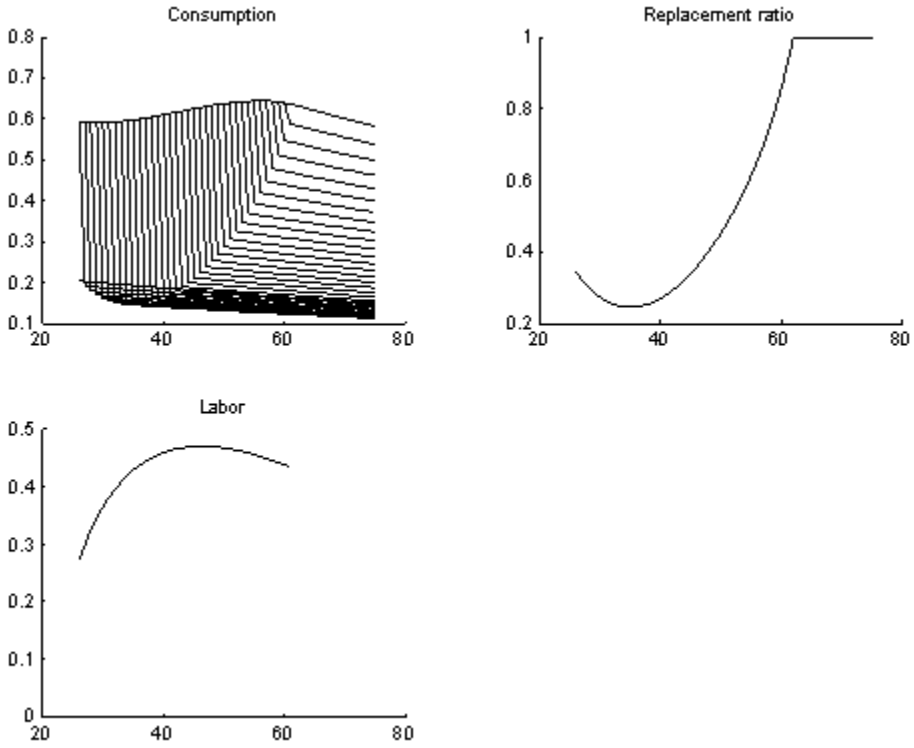
(3) The consumption profile decreases at a constant rate after an agent claims disability benefits. After an agent becomes disabled, he no longer faces uninsurable disability risk and can smooth his consumption by consuming capital income and disability transfers. Since a tax on savings is 15 percent, then the

consumption of a disabled agent will decline at a constant rate.

(4) A consumption replacement ratio depends mainly on two factors: the shape of the skill profile and the time remaining to retirement. The closer an agent is to retirement, the better he can smooth his consumption, and the consumption replacement ratio increases. An agent with higher skills has higher earnings and a higher consumption replacement ratio. When agents retire, their replacement ratio is equal to one.

1.2 Labor profiles

The labor profile reflects the shape of the skill profile. Agents work the most around the age of 50 when they are most productive, then decrease their work hours. At the age of 62 agents claim disability and stop working.



Stylized DI

2 Extension 1: Social Security as Disability Insurance (no forced retirement)

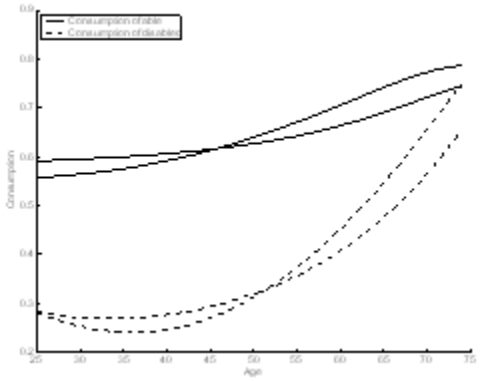
We consider a model of the Social Security as optimal disability insurance. One of the explanations for the existence of the Social Security system is its role as an optimal "retirement insurance". Diamond and Mirrlees (1978, pp. 331-332) view a setup similar to ours as a general way of modelling Social Security system, including the old age portion (also see Mulligan and Sala-i-Martin 1999). The Social Security system can be viewed as mandatory government insurance against becoming disabled (not being able to work) at old ages. While Social Security benefits are conditioned on retirement, in this modification of the model we condition benefits on a more fundamental risk – disability, that makes work very difficult or impossible.We consider a setup in which agents are not forced to retire at age 64. In particular, agents live for 75 years, the probability of becoming disabled is computed to this age, and there is no mandatory requirement.

2.1 Optimal System

In this section we describe numerical characterization of the optimal system without mandatory retirement.

2.1.1 Consumption profiles

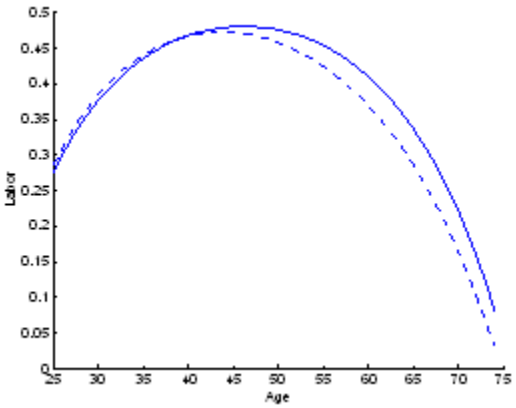
We report consumption profiles in the figure below. The thick solid line represents the consumption c_t of agents who were able all their lives. This consumption is monotonically increasing with the duration of agent's work history. The social planner partially rewards the agent for working in period t by allocating him higher continuation value, which leads to higher consumption at future dates.



Consumption with asset-test (thick lines) and without asset-test (thin lines).

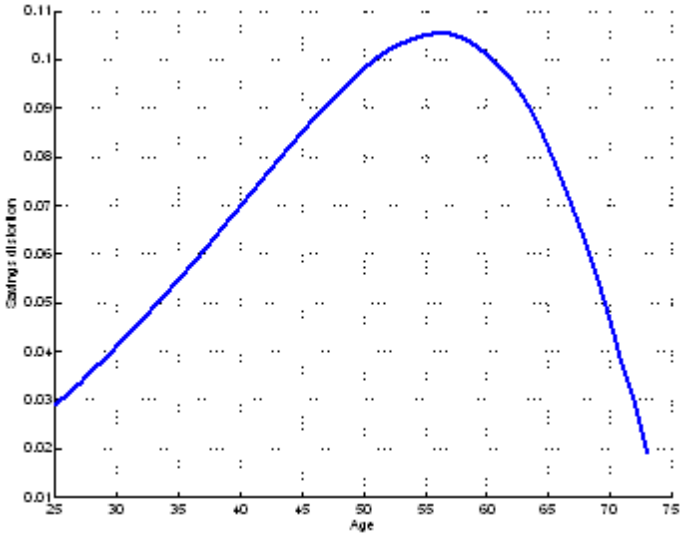
2.1.2 Labor

A solid line in the figure below represents optimal labor allocations. the In this economy it is optimal for all able agents to work. Optimal allocations are influenced by two effects in a way similar to the consumption profiles. Agents who are 45 to 55 year old and have the highest skills spend about 45 percent of their time working. Younger and older people are not as productive and work less.



2.1.3 Intertemporal distortion

We find the intertemporal distortion to be quantitatively significant. The wedge grows from 3 percent at age 24 to 10.5 percent at age 56, and decreases to 2 percent at age 74.



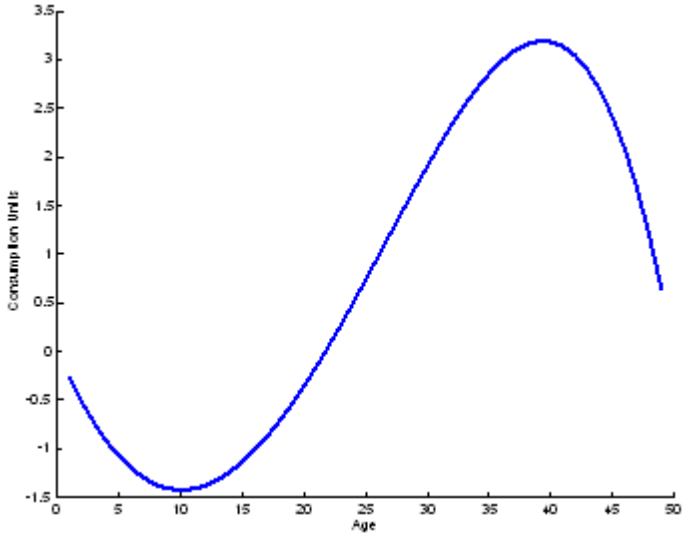
Intertemporal wedge in the optimal system

2.1.4 Welfare benefits of switching to an optimal system from a current stylized program

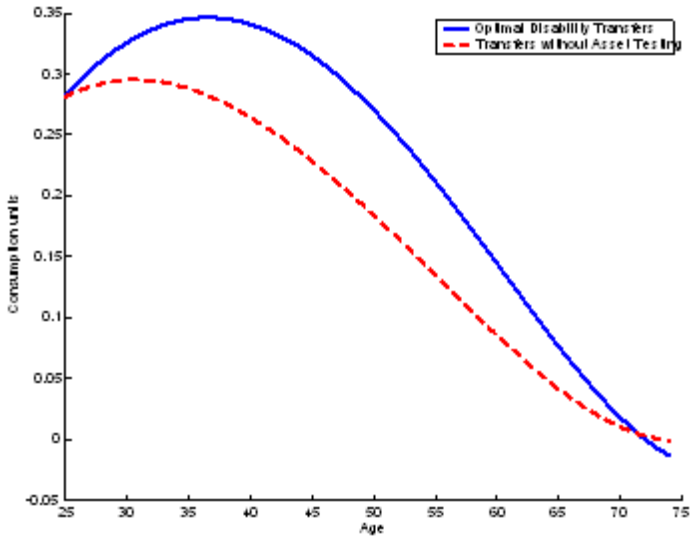
The welfare gain of a switch to the optimal insurance system from a stylized current social security system is equivalent to an increase of consumption by 3.6 percent for each history.

2.2 Tax system implementing the optimum

We calculate and plot asset limits and transfers to disabled. Asset limits are eventually increasing because agents become wealthier as they accumulate more capital. That is also the reason that disability transfers are decreasing as agents receive a larger proportion of their income from savings. One interpretation of this system is that individuals who became disabled early in life receive large transfers, while those who become disabled later are supposed to supplement their lower disability transfers with savings accumulated while able.



Asset limits $\bar{k}_t$ implementing optimal system



Transfers $T_d(t)$

2.3 Welfare benefits of asset testing

In the figure of consumption above, we compare the solution to the problem with asset testing (thick lines) to that of the problem without asset testing (thin lines). In the latter case, the planner does not have an ability to distort

an intertemporal margin.

In the figure of labor, we plot labor allocations with and without asset testing (solid and dashed lines, respectively). The labor profiles for both cases are virtually identical until age 40. After age 40, the absence of asset test implies that it is more difficult to provide incentives to work, and there is a smaller amount of labor provided.

In the figure of transfers, we plotted with a dashed line optimal disability transfers for the model where asset testing is not allowed. It is evident from this figure that asset testing allows a significant increase in the level of disability transfers.

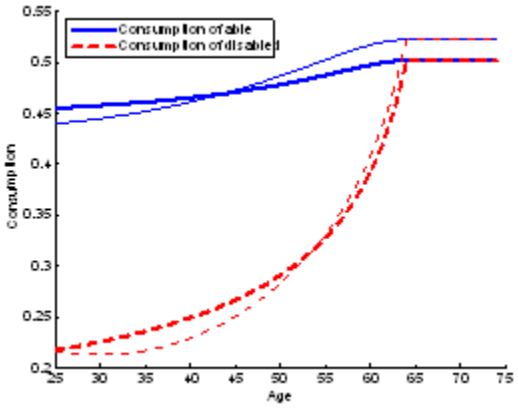
We use the following method to measure welfare gains from switching to an optimal system. We find that proportional increase in consumption by 0.65 percent for each history under the optimal system without asset testing produces the same lifetime utility as the lifetime utility in an optimal system with asset testing. This number indicates a significant gain to asset testing as the amount of consumption of disabled (the size of the program) in the model is equal to 4.7 percent of the total consumption in the optimal solution. The size of the program of 4.7 percent of total consumption is consistent with the current spending on Social Security and healthcare of elderly and disabled in the U.S.

3 Extension 2: Age-independent skills

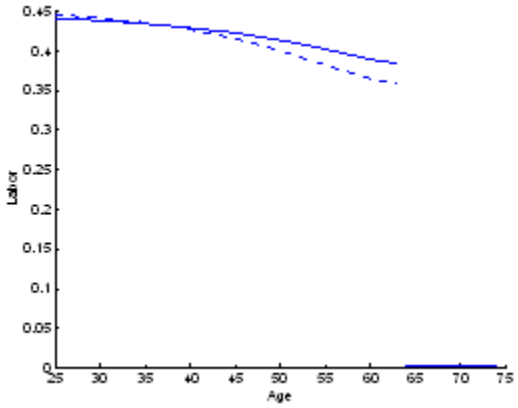
This subsection describes the characteristics of a version of a social planner's problem in which agents are forced to retire and in which the skills of able agents are constant across the lifetime and are equal to one. We are interested in analyzing this case because features of the optimal contract are no longer distorted by encouraging the most productive agents of ages 40 to 50 to work, and we can better understand the incentive effects of the optimal system.

First, consumption of disabled agents are increasing at all ages because the social planner wants to reward agents who have longer working histories. Second, the savings distortion is increasing everywhere and is larger than the savings distortion with the age-dependent skill profile. The savings distortion is very similar in shape to the conditional probability of disability. Finally, labor is decreasing with the age of the agents.

The welfare benefit of asset testing in such model is equal to 0.35 percent.



Consumption with asset-test (thick lines) and without asset-test (thin lines).



Labor with asset-test (solid) and without asset-test (dashed).

4 Extension 3: Imperfect observability

In this section we show how to modify the social planner's problem to include imperfect observability of disability. In practice, disability is partially unobservable, especially since there is no uniform and objective definition of disability. While it is possible to improve the quality of the screening process, evaluations of disability will probably always involve some subjective judgement, especially in the cases of multiple impairments, pain, or mental illness. (See Mashaw 1983 for further discussion of this issue.)

We incorporate imperfect monitoring in the problem in the following way. Assume that a social planner has an imperfect monitoring technology that has an award error of p^m. We model the cost of application as a percentage of a yearly consumption that is lost if an agent applies for disability benefits. In practice, the first step in determining the eligibility for disability benefits is whether an applicant "earns any sufficient gainful activity," that is earns more than $780 per month. For an able individual, applying for disability benefits means forgoing wages he is currently earning for the duration of the application process, which is on average equal to six months. We chose application costs to be equal 15% of the yearly consumption. This cost is calculated from a loss of utility in consumption terms for an agent who does not work for 6 month and receives roughly $5000 for half a year. We set $p^m = 50$ percent following Bound and Burkhauser (1999) and Bound, et al. (2002) to reflect the fact that, historically, half of individuals who apply for disability insurance are awarded benefits.

We report the results of computation of an optimal program with imperfect monitoring in the figure below.

Introducing a monitoring technology implies that incentive constraints are relaxed, since deviators will be detected with the probability p^m and receive only 85 percent of consumption. Optimal allocations with imperfect monitoring will be closer to the solution to the problem without informational frictions. Recall that in the problem with observable disability the consumption of able agents is equal to the consumption of disabled agents and is constant over time; the savings distortion is also equal to zero.

4.1 Consumption profiles

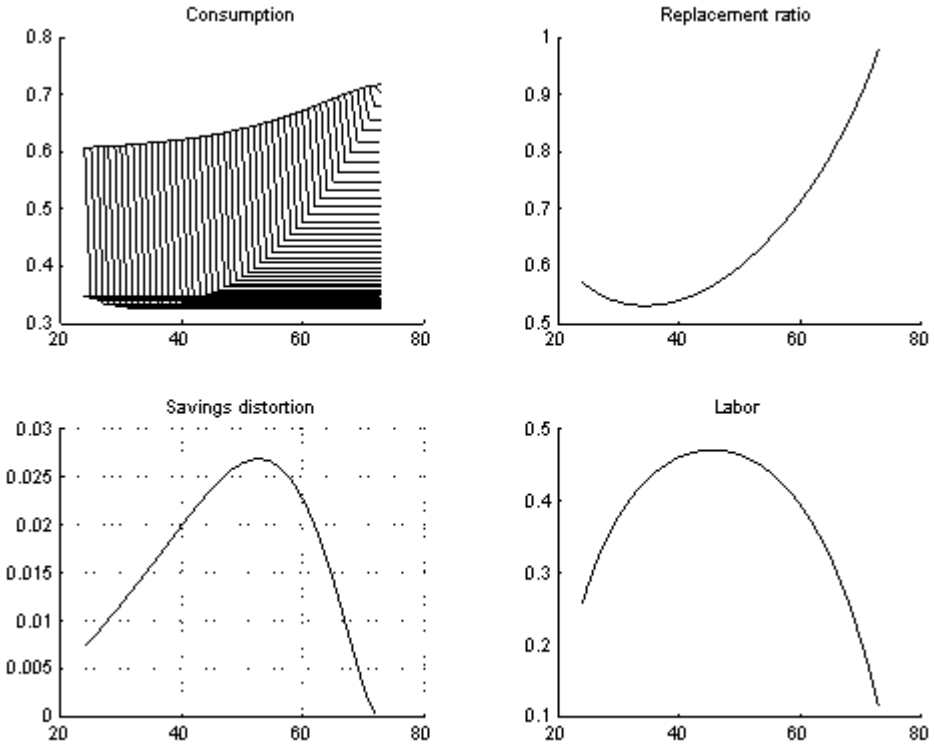
Even though the fall in consumption after becoming disabled is significant, it is smaller than in the case of no monitoring. The consumption replacement ratio is higher than in the benchmark case and is explained by the fact that agents become more insured. For instance, the consumption of a 25-year-old agent falls by 40 percent, and the consumption of a 60-year-old agent falls by approximately 30 percent. The consumption fall is approximately three-fifth of the consumption fall for the case with no monitoring.

4.2 Savings distortions

The savings distortion is lower, representing the fact that static as well as dynamic incentives are improved. The savings distortion remains quantitatively significant, but it is approximately a third of the size of the distortion in the case of unobservable disability. The distortion grows from 0.8 percent at age 25 to 2.5–3 percent around age 50, and decreases to almost zero at age 74.

4.3 Labor profiles

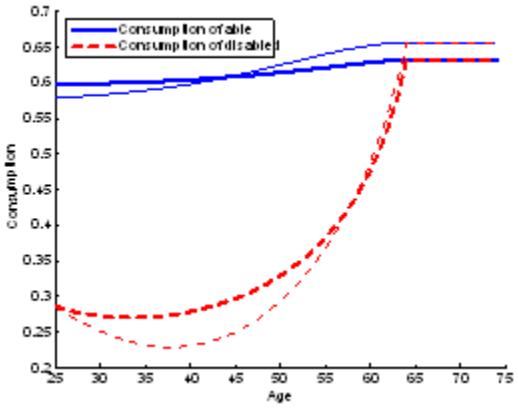
The labor profile is higher than in the case with no monitoring. At the age of 25 agents spend around 27 percent of their time working, whereas at the age of 74 agents work 12 percent of their time.



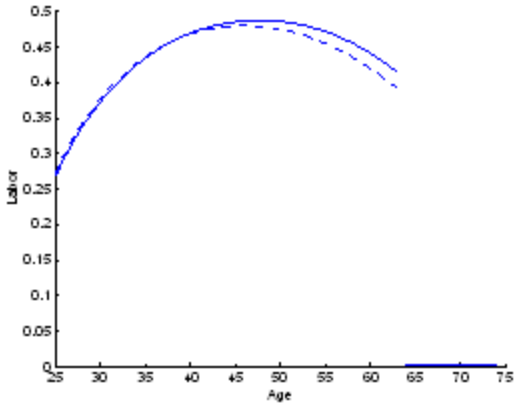
Optimal system: imperfect monitoring

5 Extension 4: Lower probability of disability

This model is specified to provide robustness to a different sepcification of probabilities of being disabled. We divide the probabilities used in the paper by two. The difference in welfare of the system with asset testing and the best system without asset testing is 0.3 percent of consumption. We present the results below.



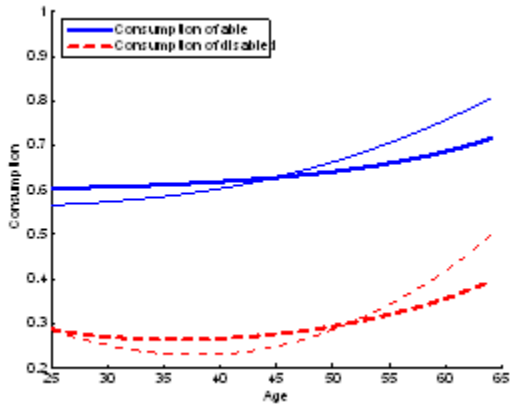
Consumption with asset-test (thick lines) and without asset-test (thin lines).



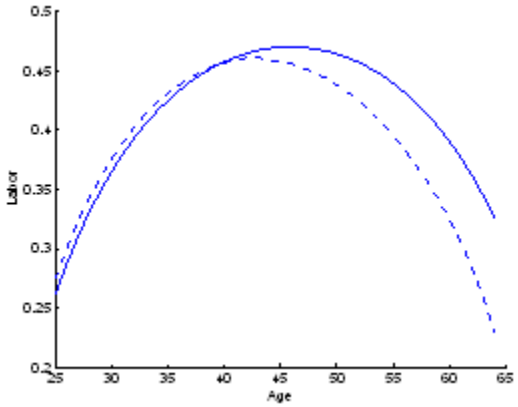
Labor with asset-test (solid) and without asset-test (dashed).

6 Optimal system: Agents live to age 64

Finally, we report the results of compitation from the model in which agents leave to 64 years. The welfare gains of asset testing are equal to 0.8 percent.



Consumption with asset-test (thick lines) and without asset-test (thin lines).



Labor with asset-test (solid) and without asset-test (dashed).