Revision on

"Aging, Private Health Expenditure and Environmental Quality"

1. This paper has several problems. First, there is no convincing argument from the authors that the imagined conflict exists except in their paper. The population structure of the model does NOT include population growth. It is absolutely standard – one old agent and one young agent coexist at each time. The authors want readers to believe there is an uncertain lifetime once agents hit old age. For modeling purposes the authors assume a positive probability the young agent doesn't actually survive to start old age. A survival probability is used much like a discount factor in the formal model machinery. So, here's my first question: what is the sense of market clearing when the young agent doesn't actually consume in the second period? Where do the goods go? To whom are they delivered? My first recommendation is to get rid of this uncertain lifetime setup altogether and simply replace p by a discount factor and use time preference instead.

I will get rid of the survival probability and replace it by a discount factor and use time preference instead.

2. Re. the definition of equilibrium in Section 3.3 – it is asserted that only old agents maximize their utility function. This is, of course, absurd. Likely a typo?

A competitive equilibrium for the economy under analysis is a sequence, $\{c_t^1, c_{t+1}^2, m_t, w_t, r_t, s_t, z_{t+1}, k_t, E_t\}_{t=0}^{\infty}$ such that, given the initial conditions of the state parameters k_0 and E_0: firms maximize profits; consumers maximize their utility function; and markets clear.

3. There is a curious statement at the bottom of a page with italiced Private health expenditure support: followed by some computations on the next page. Those computations, which require proving the determinant of $|D|$ is negative, yield the statement:

   "In aging population, the positive effects of supporting healthcare on capital accumulation overcome the negative ones."

This statment makes no sense whatsoever. First, it is, at best, about a steady state comparative statics exercise. Presumably, the determinantal condition (derived earlier in section 3.4) is

some sort of stability condition for a linear approximation model for the steady state as best I can tell from APPENDIX B. This condition is then used to sign steady state comparative statics results. However, it is absolutely unclear to this reader how the quoted result follows. First, where is the aging population in a steady state? The problem is, at this point, effectively a static one. Indeed, if we take the story about uncertain lifetimes seriously the population is declining, not aging! In any event, health care is not a state variable as imagined in the italicized statement, but an endogenous variable chosen via the agents optimization problem.

I will interpret the results as follow:

We explain now the intergenerational conflict between old and young populations that lead to the results obtained.

Actually, at an international level, there is an intergenerational conflict between young and old over two types of defensive expenditures due to their contradictory interests. Crucially, the young individuals support environmental care while retirees prefer investing in healthcare. Old individuals appreciate private health-care expenditures instead of the environmental investments due to the fact that they take usually more time to be totally effective although, they can last for a longer time. They do not enjoy future environmental improvements. The young generation prefers environmental expenditure as they yield to results over a longer horizon. The benefit that the young generation receives when being old from the investment in environmental quality when young generates a longer remaining lifespan in which to enjoy enhanced environmental quality. It is worth mentioning that we are not claiming that old people are not interested at all in environmental maintenance, but that they are less concerned than the young people are.

Elderly cannot enjoy improvements in the quality of future environment. They prefer spending in private health-care expenditures in the detriment of environmental investment in order to live longer and to raise their utility. They continue to invest in this curative option until a critic value which is the total return of capital $z < \left(1 + f'\left(\bar{k}\right) - \sigma\right)\bar{k}$. By choosing the curative option when young, they also chose to invest more of their wage for the next period (negative consumption effect in the period t). Therefore, they have more precautionary savings which lead to capital accumulation and to worsening the environment quality by increasing their consumption possibilities (positive consumption effect in the period $t + 1$).

For young generation now, environmental expenditure is supported over health-care. They have a good motive to spend in maintaining the environment healthy – as they are going to live longer to benefit from it. So, a higher environmental maintenance at young age forces

them to lower their savings and consumption in first period t. Thus, environmental investment has a negative effect on capital accumulation and a positive effect on environment. On the other hand, the young generation consumption possibilities in second period $t+1$ are reduced since their precautionary saving is low due to maintenance effort in t. Then, this is another positive effect on the environmental quality.

It is however important to note that if the young individuals may have a stronger incentive to save and accumulate capital for the next period, in order to increase their consumption and to face the health costs when old, than to invest in maintenance expenditures seeing as the environment is not much of a problem for the time being. As a result, they reach the second period with a quite high capital stock, thus a high production as well, which enhances their second period consumption (positive consumption effect in $t+1$) and worsens the environment. However, young people will need then to invest much more in healthcare in their second period of life since the environment has been severely damaged due to the lack of expenditures in maintenance in period$t$. Thus, a disincentive by young generation towards environmental expenditures in aging economy has a negative effect on environment and a positive effect on capital accumulation.

The intergenerational conflict that arises from different attitude of young and old towards environment and health spending leads to contradictory effects on capital accumulation and on environmental quality. In order to recognize whether the positive effects overcome the negative effects or vice versa, we studied the impact of a higher healthcare support by aging population on capital stock and the environment. We find that it is possible that health and the environment can flourish simultaneously. We have shown that an increase of the support to private health expenditures leads to a higher level of capital accumulation and leads to a higher level of environmental quality if the maintenance efforts are bigger than the consumption externalities.