The Dead are Always Wrong

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Outline of the Talk

- Motivation
- Theory
- Application

Introduction

Economics literature abounds of statements indicating that agents are too impatient -or do not save enough.

Some nice old citations:

Böhm-Bawerk (1891): "We systematically underestimate future wants, and the goods which are to satisfy them. Of the fact itself there can be no doubt; but, of course, in particular nations, at various stages of life, in different individuals, the phenomenon makes its appearance in very varying degree. We find it most frankly expressed in children and savages."

Fisher (1930): "In the case of primitive races, children, and other uninstructed groups in society, the future is seldom considered in its true proportions."

For more recent work, on can read Laibson (1996) “Hyperbolic Discount Functions, **Undersavings** and saving policy”

It has now become a “stylized fact” that people “undersave”.

As a “natural consequence”, researchers and policymakers should help them to save more.

Twin citations

Duflo, Gale, Liebman, Orzag, Saez (QJE, 2006)
"Many low- and middle-income American families save little for retirement or for other purposes. Families with income below $40,000 are unlikely to participate in employer-provided pensions or Individual Retirement Arrangements (IRAs) and in 2001 had just $2,200 in median net financial wealth outside of retirement accounts. **Researchers and policy-makers have long considered ways to raise saving among these families**."

Duflo, Gale, Liebman, Orzag, Saez (JEEA, 2007)
"A significant share of low- and middle-income American families appear to be saving little, either for retirement or for any other purpose. Families with incomes below $40,000 have low rates of coverage under employer-provided pensions, are extremely unlikely to contribute to individual retirement accounts (IRAs), and in 2001 had median net financial wealth outside of retirement accounts of just $2,200. **Researchers and policymakers have long considered ways to raise saving among these families**."

"Paternalistic" views on health and safety

- People are also considered as taking excessive health risks.
- Regulation on safety belt, smoking. Taxes on Nutella and "Junk food".
- Literature on Sin Goods.
  A "sin good" is something which "is enjoyable to consume but creates negative health consequences in the future." (O'Donoghue and Rabin, 2006)
  The introduction of "sin taxes" is viewed as desirable.

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- The consumption of sin goods can be viewed as rational (Becker and Murphy, 1988).
- Addicting behavior can be seen as a rational commitment. There are many cases where the economists emphasize the virtuous aspects of commitments.

Paternalism?

Many contributions in economics seem to accept a particular "kind of paternalism", stating that:

- In some cases, the agents should take more risk than what they actually do (saving more)
- In other cases, the agents should take less risk than what they would do (investing more in health and safety)

Hypothesis

- (optional) Economics literature is -to some extent- the reflect of the "Social Planner's preferences" - or, at least, of an acceptable "normative point of view".
- The Social Planner has a stronger taste for savings and lower mortality rates than individual preferences.

Explaining this kind of "Paternalism"?

Many possible explanations. For example:

- Evolutionary theory
- There are externalities. Externalities related to poverty, health, capital accumulation, intergenerational transfers.
- An intrinsic element of Social Planner preferences that appear when combining lifetime uncertainty and indifference with respect to the dead.

A possible explanation

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- Because of lifetime uncertainty, population is random.
- At each period, the dead disappears from the society (and hence no longer enter in the social welfare objective).
- Developing strategies that negatively impact lifetime utility in case of an early death, is less "penalizing" for the society than for the individual point of view.

Example

- individual a
  - Born in $t = 1$ and survives until period 2 with probability π
  - Utility in period 1: $U_1(x_1, x_2, \pi)$
  - Utility in period 2, if alive: $v_a(x_1, x_2)$
- individual b
  - born in $t = 2$
  - utility in period 2: $u_b(y)$

Example

- "Individually paretian" welfare

$$\boxed{W^{IP} = \Phi\left(U_1(x_1, x_2, \pi), u_b(y)\right)}$$

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- "Socially paretian" welfare
    - Welfare in period 1: $U_1(x_1, x_2, \pi)$
    - Welfare in period 2, if a alive: $V_2^{a,b}(x_1, x_2, y) = V\left(v_a(x_1, x_2), u_b(y)\right)$
    - Welfare in period 2, if a not alive: $u_b(y)$
    - If not alive, individual 1 does not count in period 2

$$\boxed{W^{SP} = \Psi\left(U_1(x_1, x_2, \pi), V_2^{a,b}(x_1, x_2, y), u_b(y), \pi\right)}$$

Example

- Question : can we conciliate both approaches?
- Intuitively: can we find Φ, Ψ and V such that:

$$
\begin{aligned}
& \Phi\left(U_1(x_1, x_2, \pi), u_b(y)\right) \\
= \quad & \Psi\left(U_1(x_1, x_2, \pi), V_2^{a,b}(x_1, x_2, y), u_b(y), \pi\right)
\end{aligned}
$$

Roadmap

- A theoretical result
- An illustration with standard specifications

Economies

- One agent, one good, two periods
- Income in first period : ω
- Probability of surviving in second period : p
- Set of economies $\mathcal{E} = (0, 1] \times \mathbb{R}_+$
- Feasible allocations: $\mathbb{F}(\omega) = \{(x, y) \in \mathbb{R}^2_+ | x + y \leq \omega\}$

Utilities

- Measure of the individual's actual well-being in period 1
  - $V(x, y, p)$, continuous and differentiable
  - $V_1(0, y, p) > 0$
  - $V_2(x, 0, p) > 0$
  - $V(\cdot, \cdot, p)$ concave
  - MRS between two periods depends on p: $\frac{\partial}{\partial p}(V_1 / V_2) \neq 0$
- Measure of individual's well-being in period 2 (if alive)
  - $U(x, y)$ differentiable and strictly concave

Individual efficiency

Definition (Individual efficiency)

A feasible allocation (x, y) is *individually efficient* if there is no feasible allocation (x', y') such that

$$V(x', y', p) > V(x, y, p).$$

The set of individually efficient allocations is denoted $\mathbb{I}(\omega, p)$.

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Problems:

- Individual well-being in period 2 only matters insofar as it has an influence on individual well-being in period 1
- The point of view of individual in period 2 (if alive), should be taken into account.
- Both $V(x, y, p)$ and $U(x, y)$ should matter

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$$\left\{\begin{array}{l} V(x', y', p) \geq V(x, y, p) \\ U(x', y') \geq U(x, y) \end{array}\right.$$

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- Can we find allocations that are both Individually and Socially Efficient?

Non Dictatorial Allocations

- Any feasible allocation that maximizes individual's well-being in period 1 is socially efficient
- But does not take into account at all the point of view of the individual in period 2 (if alive)
- "Dictatorship" of individual in period 1
- Violate the spirit of social efficiency

Non Dictatorial Allocations

An allocation is Non Dictatorial if it guarantees individual in period 2 (if alive) with a level of utility strictly greater than what she could achieve if one were only aiming at maximizing individual well-being in period 1.

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Definition (Non Dictatorial Allocation)

Given an economy (ω, p), a feasible allocation (x, y) is *non dictatorial* if:

$$U(x, y) > U(\tilde{x}, \tilde{y}),\ \forall\, (\tilde{x}, \tilde{y}) \in \arg \max_{(x,y)\in\mathbb{F}(\omega)} V(x, y, p).$$

The set of non dictatorial allocations is denoted $\mathbb{ND}(\omega, p)$.

Proposition

$\mathbb{ND}(\omega, p) \cap \mathbb{I}(\omega, p) \cap \mathbb{S}^*(\omega, p) = \emptyset$ *(a.e.)*

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Individual makes consumption/saving trade-off in t.

- Savings = trade-off between ex-post utilities, depending on whether she will die or not
- High savings: "ex-post punishment" in case of early death

Social Planner anticipates in t that only the welfare of surviving agents will be taken into account in $t + 1$

- High savings: impacts welfare in t (through agent's expectation)
- No impact on the welfare in $t + 1$ in case of early death
- No possibility of an "ex-post punishment" for high saving
- Social planner makes the individual save more than what she would like

Sketch of the proof

$(x^*, y^*) \in \mathbb{I}(\omega, p)$

- $x^* \in \arg\max_x V(x, \omega - x, p)$
- $V_1 - V_2 = 0$

$(x^*, y^*) \in \mathbb{S}(\omega, p)$

- $x^* \in \arg\max_x \lambda(\omega, p) V(x, \omega - x, p) + (1 - \lambda(\omega, p)) U(x, \omega - x)$
  - If $\lambda(\omega, p) = 1$, (x^*, y^*) is Dictatorial.
  - If $\lambda(\omega, p) < 1$, $\lambda(V_1 - V_2) + (1 - \lambda)(U_1 - U_2) = 0$

$$\boxed{(x^*, y^*) \in \mathbb{I}(\omega, p) \cap \mathbb{S}(\omega, p) \Rightarrow U_1 - U_2 = 0}$$

Sketch of the proof

$$\boxed{(x^*, y^*) \in \mathbb{I}(\omega, p) \cap \mathbb{S}(\omega, p) \Rightarrow U_1 - U_2 = 0}$$

$\frac{\partial}{\partial p}\,(V_1\,/\,V_2) \neq 0$

- $\exists N(p) \,:\, V_1(x^*, \omega - x^*, p') \neq V_2(x^*, \omega - x^*, p'),\ \forall p' \in N(p) \setminus \{p\}$
- $(x^*, \omega - x^*) \notin \mathbb{I}(\omega, p')$

Let $(\tilde{x}, \omega - \tilde{x}) \in \mathbb{I}(\omega, p') \cap \mathbb{S}(\omega, p')$

- $U_1(\tilde{x}, \omega - \tilde{x}) = U_2(\tilde{x}, \omega - \tilde{x})$
- U strictly concave $\Rightarrow \tilde{x} = x^*$
- Thus for all $p' \in N(p) \setminus \{p\}$, $\mathbb{I}(\omega, p') \cap \mathbb{S}(\omega, p') = \emptyset$

Does not hold if there is no uncertainty

Illustration

Overlapping generation economy with age dependent mortality rates.

- N_t individuals born in t
- Probability to die after age $a = \mu_a$ ($\mu_a = 1$ for some finite a)
- Prob(alive at $a|$ alive at b) $= s_{a,b} = \prod_{\alpha=b}^{a-1}(1-\mu_\alpha)$ for $a \geq b+1$.
- Proba to live at least a years at birth$= s_a = s_{a,0}$.
- Prob(dying at age $a|$ alive at age b) $= \pi_{a,b} = \mu_a s_{a,b}$.
- The probability to live exactly a years at birth $= \pi_a = \pi_{a,0}$.
- Mortality rate at age $T = \mu_T = \frac{\pi_T}{\sum_{t=T}^{+\infty}\pi_t}$.

Individual preferences

Additively separable utility function:

$$U\left(c^{T}\right) = \sum_{t=0}^{T} \beta^{t} u\left(c_{T}\right)$$

Expected Utility:

$$\begin{aligned} E_T U\left(c^T\right) &= E_{T\geq a}\left[U\left(\left(c_0,\ldots,c_a,\ldots,\right)^T\right)\right] \\ &= \sum_{T=a}^{+\infty} \pi_{T,a} U\left(\left(c_0,\ldots,c_a,\ldots\right)^T\right). \end{aligned}$$

Welfare

- At time t: $s_a N_{t-a}$ individuals of age a
- Social welfare at time t, W_t: sum of agents' expected utilities

$$\begin{aligned} W_t &= \sum_{a=0}^{+\infty} s_a N_{t-a} E_{T\geq a}\left[U\left(\left(c_0^{t-a},\ldots,c_a^{t-a}\ldots\right)^T\right)\right] \\ &= \sum_{\tau=-\infty}^{t} s_{t-\tau} N_\tau E_{T\geq t-\tau}\left[U\left(\left(c_0^{\tau},\ldots,c_a^{\tau},\ldots\right)^T\right)\right] \end{aligned}$$

Social planner objective $\boxed{W=\sum_{t\geq 0}\lambda^t W_t}$

Paretian planner (at time 0) objective W^P

- sum of the EU in $t=0$ of individuals already alive in $t=0$
- $+$ discounted sum of the expected utilities at birth for individuals born in $t\geq 0$

Welfare

$$W = \frac{1}{1-\lambda} \sum_{\tau=-\infty}^{-1} N_\tau \sum_{T=-\tau}^{+\infty} \left(1 - \lambda^{T+\tau+1}\right) \pi_T U\left(\left(c_0^\tau, \dots, c_a^\tau, \dots\right)^T\right)$$
$$+ \frac{1}{1-\lambda} \sum_{\tau=0}^{+\infty} N_\tau \lambda^\tau \sum_{T=0}^{+\infty} \left(1 - \lambda^{T+1}\right) \pi_T U\left(\left(c_0^\tau, \dots, c_a^\tau, \dots\right)^T\right).$$

$$W^P = \sum_{\tau=-\infty}^{-1} N_\tau \sum_{T=-\tau}^{+\infty} \pi_T U\left(\left(c_0^\tau, \dots, c_a^\tau, \dots\right)^T\right)$$
$$+ \sum_{\tau=0}^{+\infty} \lambda^\tau N_\tau \sum_{T=0}^{+\infty} \pi_T U\left(\left(c_0^\tau, \dots, c_a^\tau, \dots\right)^T\right).$$

Remark: $\lambda = 0 \Rightarrow W = W^P$

Proposition

If lifetime is not deterministic and $\lambda > 0$, the benevolent social planner uses distorted mortality rates $\nu_{T,\tau}$ instead of the actual mortality rates μ_T that would be used by a paretian social planner. Moreover:

1. *the benevolent social planner underestimates the mortality rates, i.e., $\mu'_T < \mu_T$;*
2. *for the generations who are not yet born, the distortion only depends on λ;*
3. *for the generations who are already born, the distortion depends on λ and on their year of birth;*
4. *the smaller λ the larger the distortion*
5. *for those already born, the distortion is stronger for recent generations than for older ones.*

- Social planner underestimates mortality rates $\Rightarrow$ she wants people to save more than they would like
- May explains why governments generally try to push individuals to increase their savings
- Distortion of mortality rates depends on year of birth $\Rightarrow$ time inconsistency.

Simulation based on realistic demographic data

- $U(c) = \frac{c^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}}$
- $\sum_{t\geq 0} \frac{s_t c_t}{R^t} \leq \omega_0$ (perfect annuities and a riskless rate of return R)
- US mortality tables for males in 2000, for $\lambda = 0$ (Paretian objective) and $\lambda = 1$

Figure 1: Optimal consumption profile

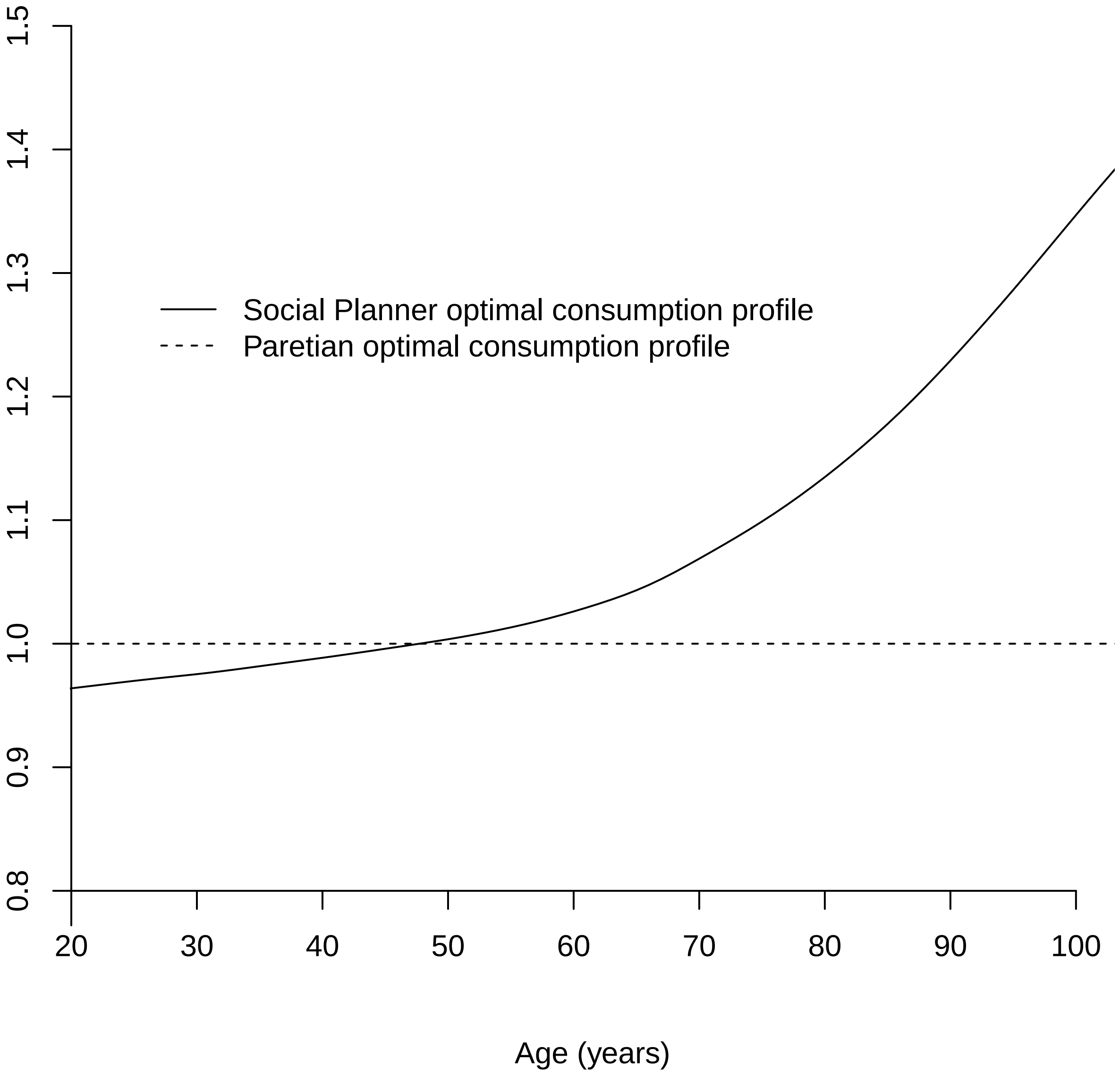
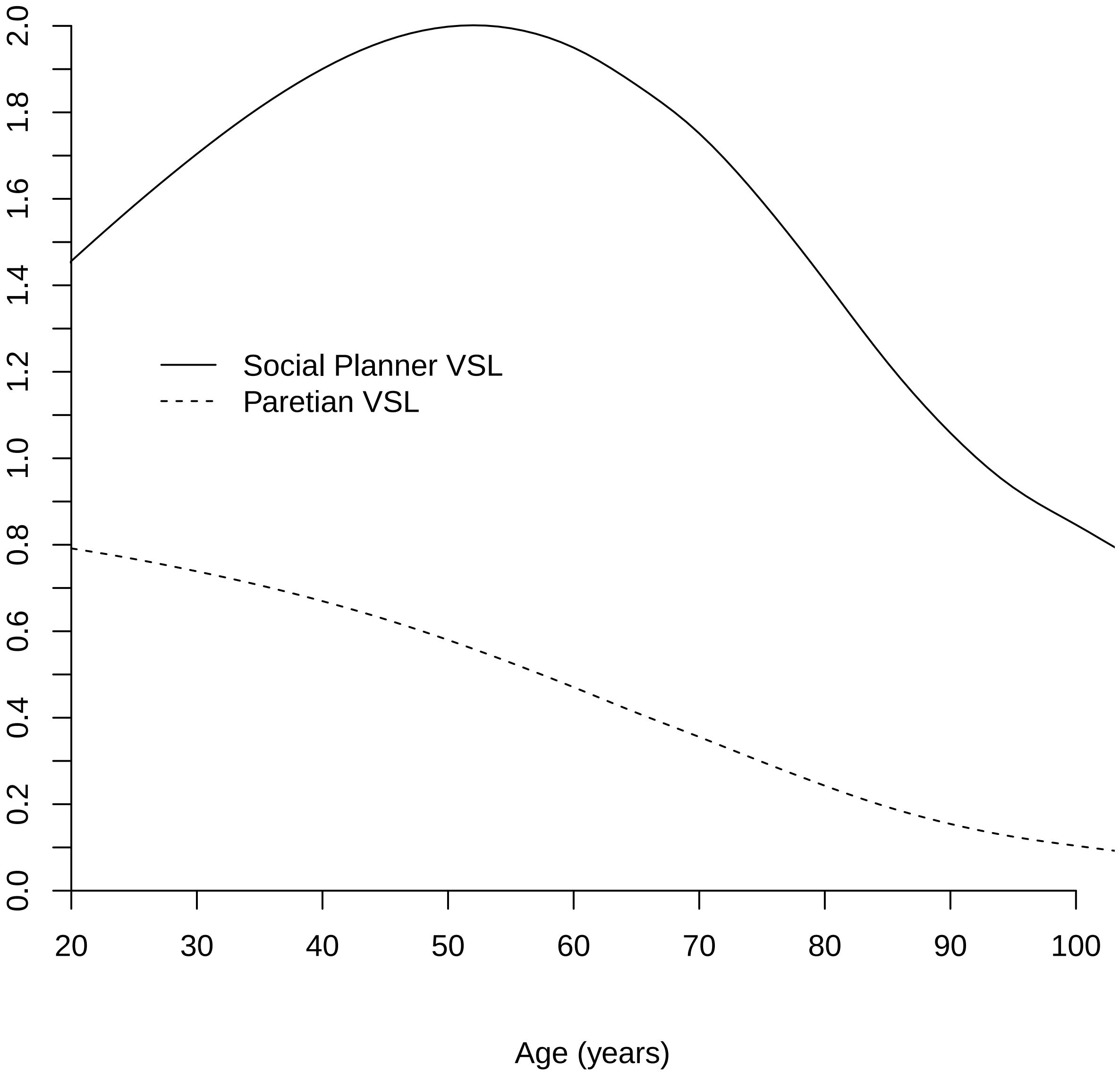


Figure 2: The Value of a Statistical Life



The Value of a Statistical Life along constant consumption path

Figure 3: Ratio of Planner's VSL to Individual's VSL