Rent and Redistribution

The welfare implications of financing low-carbon public investment

Linus Mattauch

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Technische Universität Berlin

MCC
Mercator Research Institute on
Global Commons and Climate Change

Rent and Redistribution in rich countries?

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- What to do to stop rising inequality in rich countries?

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Piketty (2014)

- Danger of future "patrimonial capitalism", as wealth inequality is rising.
- To reduce inequality, tax capital ...
- ... and finance public investment with it.

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- To reduce inequality, tax capital ...
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Stiglitz (2015)

- To reduce inequality, tax **rents**, not capital.
- **Two-class models** needed to evaluate impact of wealth taxation and public investment.

Rationale of Thesis

Climate policy also creates rents and redistributes wealth.

Implications of rents and redistribution for climate policy:

- **at a national level.**
- **in particular, for financing low-carbon public investment.**

National climate policy is more than carbon pricing . . .

Carbon pricing a necessary condition. Yet to assess climate policy:

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I. **Rent creation and redistribution:** atmosphere, (agricultural and urban) land.

II. **Heterogeneity:** distributional effects of low-carbon public investment.

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Carbon pricing a necessary condition. Yet to assess climate policy:

I. **Rent creation and redistribution:** atmosphere, (agricultural and urban) land.
II. **Heterogeneity:** distributional effects of low-carbon public investment.
III. **Behavioral effects:** of low-carbon public investment.

Building infrastructure may generate behavioral effects which cannot be evaluated by orthodox preference satisfaction.

Research questions of thesis

I. **When is rent taxation socially optimal?**
II. **Can public investment be both Pareto-improving and inequality-reducing?**
III. **How can the influence of infrastructure on preferences be evaluated?**

Main messages

I. **When is rent taxation socially optimal?**

- Rent taxation is efficiency-enhancing when capital is underaccumulated.
- Socially optimal outcomes can be reached when the revenue is additionally invested into productive public capital or redistributed to poor generations.
- This is valid for both the land rent and the climate rent.

Main messages

II. **Can public investment be both Pareto-improving and inequality-reducing?**

- If wealthy dynastic households exert a special influence on capital accumulation, there is an equity-efficiency trade-off between financing public investment through capital taxation and labor taxation.

Main messages

III. **How can the influence of infrastructure on preferences be evaluated?**

- Given actual behavior of users of transport infrastructure, evaluating the welfare gain of public investment in transportation requires to distinguish between subjective well-being or (modified) preference satisfaction.

Outline of the thesis

1 Introduction

Part One: Taxing rents to reach social optimality

2 Financing public capital through land rent taxation: A macroeconomic Henry George Theorem

3 Hypergeorgism: When rent taxation is socially optimal

4 Climate policy enhances efficiency: a macroeconomic portfolio effect

5 Avoiding carbon lock-in: policy options for advancing structural change

Part Two: Welfare effects of public investment

6 Distributional effects of public investment when capital is back

7 Infrastructure and Inequality: Insights from Incorporating Key Economic Facts about Household Heterogeneity

8 Happy or liberal? Making sense of behavior in transport policy design

9 Synthesis and outlook

Outline of the thesis

I. When rent taxation is socially optimal

Based on:

Edenhofer, O., L. Mattauch and J. Siegmeier (2015). [equal contribution] Hypergeorgism: When rent taxation is socially optimal. *Finanzarchiv*, accepted. [Ch. 3]

Extensions based on:

Mattauch, L., J. Siegmeier, O. Edenhofer and F. Creutzig (2013). Financing public capital through land rent taxation: a macroeconomic Henry George Theorem. *In preparation for resubmission to the Journal of Public Economic Theory* [Ch. 2]
and:
Siegmeier, J., L. Mattauch and O. Edenhofer (2015): Climate policy enhances efficiency: A macroeconomic portfolio effect. *In preparation for submission to the Journal of Environmental Economics and Management* [Ch. 4]

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- **Hypergeorgism:** For social optimality, tax proceeds must be recycled in a redistributive way.
- **Novelty:** When rents are not-neutral, **redistribution** is efficiency-enhancing.

Hypergeorgism: Model

Households

- Utility of agent born at time ν, at time $t > \nu$:

$$u(\nu, t) = \int_t^\infty \ln c(\nu, \tau) e^{-(\phi+\rho)(\tau-t)} \mathrm{d}\tau.$$

- Instantaneous budget with taxes (T) and transfers (γ):

$$\dot{k} + p\dot{s} = w + rk + (1-T)ls + \gamma + \phi(k + ps) - c.$$

- FOC: no arbitrage-condition and Keynes-Ramsey rule:

$$r = \frac{\dot{p}}{p} + \frac{(1-T)l}{p} \qquad \frac{\dot{c}}{c} = r - \rho.$$

- Firm's problem standard, government budget balanced.

...where $u(\nu, \tau)$: utility, $c(\nu, \tau)$: consumption, ϕ: birth/death rate, ρ: pure rate of time preference, k: capital assets, p: land price, s: land asset, r: interest rate, w: wage rate, l: land rental rate, T: land rent tax, γ: transfers.

Hypergeorgism: Model

Aggregate results

Integrating over all cohorts' survivors yields aggregate quantities.

- Land trades sum to zero, taxation and transfers cancel out:

$$\dot{K}(t) = w(t) + r(t)K(t) + l(t)S - C(t)$$

- Consumption growth is lower since newborns inherit nothing:

$$\frac{\dot{C}(t)}{C(t)} = r(t) - \rho - \phi(\rho + \phi)\frac{K(t) + p(t)S + \bar{\Gamma}(t) - \bar{\gamma}(t,t)}{C(t)}$$

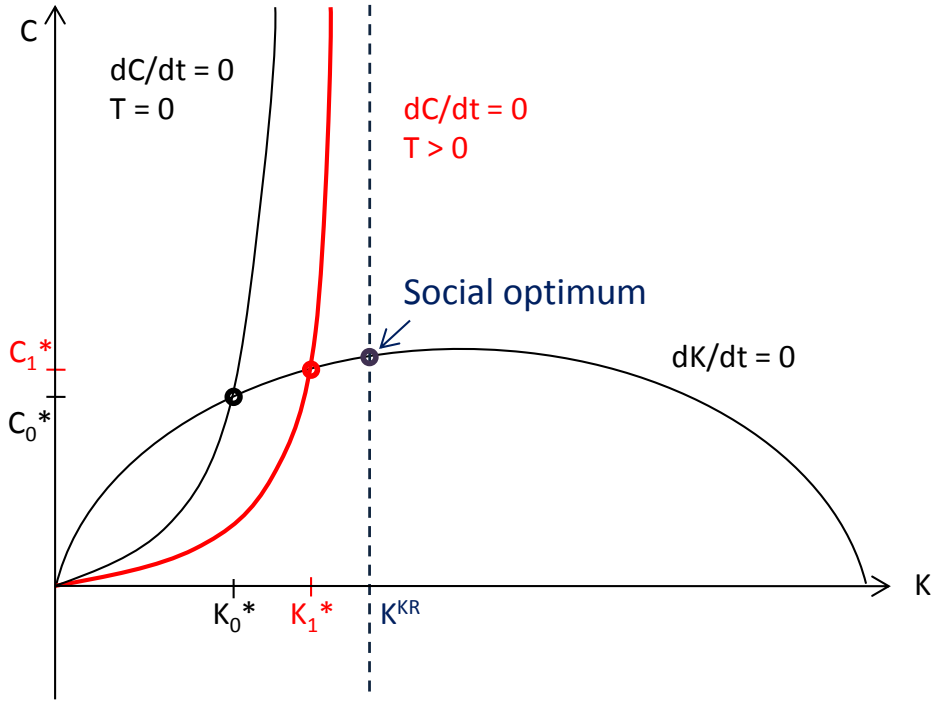
- Reference point for *dynamic* social optimum: Keynes-Ramsey level of capital and consumption (see Calvo-Obstfeld (1988) approach to preference satisfaction in OLG).

...where

$$\bar{\Gamma}(t) = \int_{-\infty}^{t} \bar{\gamma}(\nu, t)\phi e^{-\phi(t-\nu)}\mathrm{d}\nu \text{ with } \bar{\gamma}(\nu, t) = \int_{t}^{\infty} \gamma(\nu, \tau)e^{-R(t,\tau)}\mathrm{d}\tau \text{ and } R(t,\tau) \equiv \int_{t}^{\tau} (r(\tilde{t})+\phi)\mathrm{d}\tilde{t}.$$

Hypergeorgism: Results

Uniform redistribution



Proposition

Suppose land rent tax revenues are redistributed uniformly. Then land rent taxation increases social welfare, but the social optimum cannot be reached.

Hypergeorgism: Results

Redistribution to newborns only

Theorem

In the steady-state, the socially optimal outcome can be implemented with a land rent tax and a redistribution of the tax revenue *to the newborns only* if

$$\phi K^* \leq l^* S.$$

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Interpretation

- The missing capital of the newborns must be lower than the maximally possible transfers: the entire land rent.
- This redistribution achieves both the dynamic and the static social optimum.

Extensions

Public investment and the climate rent

Productive public investment: a macroeconomic Henry George Theorem

- When is rent taxation sufficient to finance public capital stocks optimally?
- Land must be sufficiently productive relative to public capital.
- Valid with or without heterogeneous households.

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The climate rent

- Similarly to land rent taxation, climate policy induces an efficiency-enhancing portfolio effect.
- An application of Hypergeorgism to the case of an exhaustible resource, such as atmospheric disposal space, is possible.

II. Distributional effects of public investment: a two-class approach

Based on:

Mattauch, L., O. Edenhofer, D. Klenert and S. Bénard (2014). Distributional effects of public investment when capital is back. Revise and resubmit to *Metroeconomica* [Ch. 6]

Extension based on:

Klenert, D., L. Mattauch, O. Edenhofer, K. Lessmann (2014). Infrastructure and Inequality: Insights from Incorporating Key Economic Facts about Household Heterogeneity. Revisions submitted to *Macroeconomic Dynamics* [Ch. 7]

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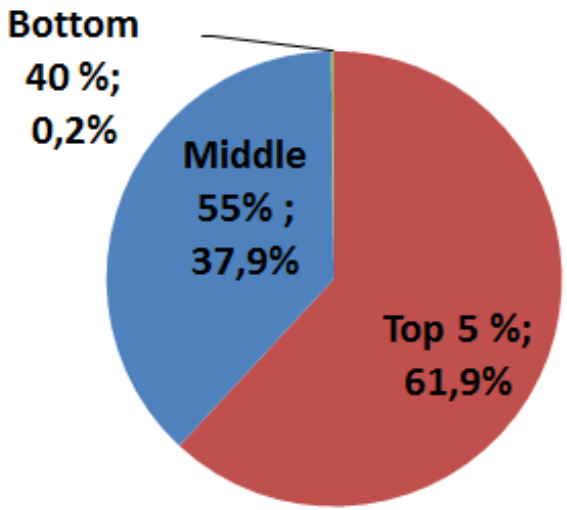

Model

Capitalist (dynastic)

$$\max_{C^c, K^C} \sum_{t=0}^{\infty} \frac{1}{(1+\rho_c)^t} \ln(C_t^c),$$

subject to

$$K_{t+1}^c - K_t^c = (1-\tau) r_t K_t^c - C_t^c.$$

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Workers (life-cycle savers)

$$\max_{C^y, C^o, S} \ln(C_t^y) + \frac{1}{1+\rho_w} \ln(C_{t+1}^o).$$

subject to

$$w_t L = S_t + C_t^y \quad \text{and}$$

$$C_{t+1}^o = (1 + (1-\tau) r_{t+1}) S_t.$$

...with capitalists': K_t^c capital stock, C_t^c: consumption, ρ_c: time preference rate. With workers': S_t: capital stock, C_t^y, C_t^o: consumption when young and old, ρ_w: time preference rate. With: r_t: interest rate, τ: the capital tax rate. w_t: wage rate, L: labor (fixed).

Model: Steady State

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A variant of the Pasinetti (1962) Paradox

- The capitalists determine the interest rate and so the size of the *total* stock of private capital, the workers determine each group's *share* of capital.

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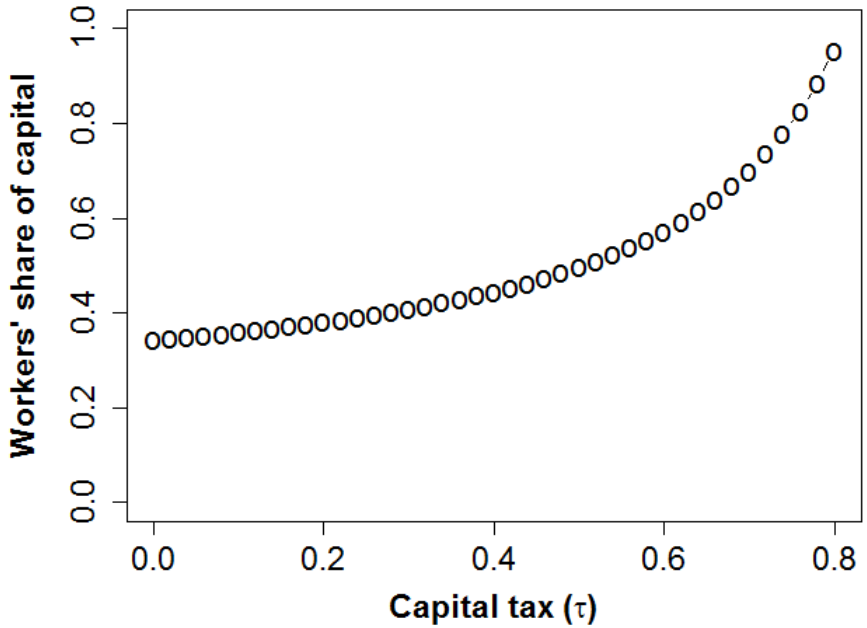
Results



Propositions

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3. There exists a Pareto-improving range of capital tax rates.

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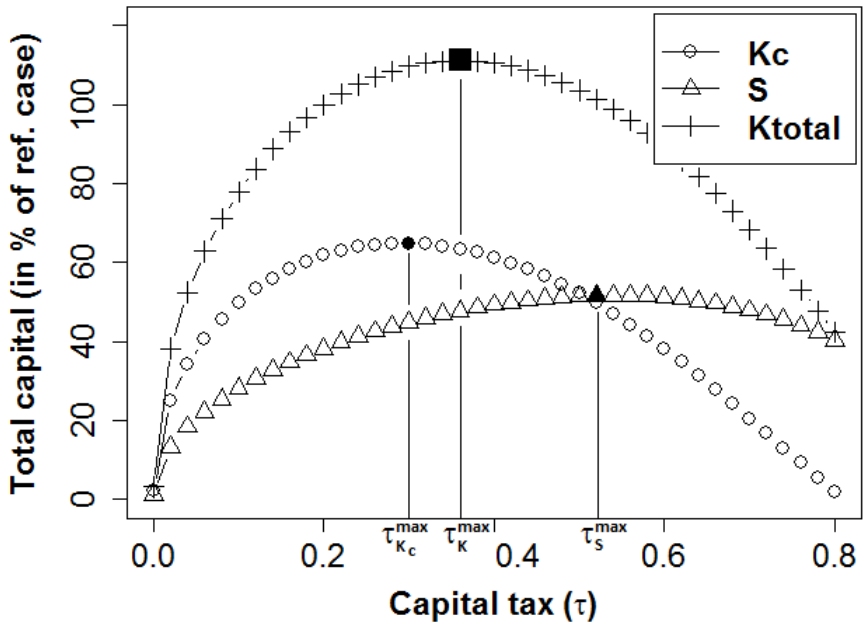

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Extension to further policy instruments

With a labor-leisure choice and
utility-enhancing public investment:

Additional results

- Labor taxation increases inequality.
- Consumption taxation is distributionally-neutral.
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Theoretical robustness

No need for

- endogenous growth
- identical time preference rates.

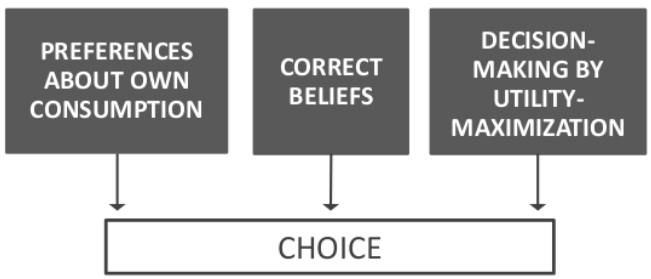
III. Happy or liberal? Making sense of behavior in transport policy design

Based on:

Mattauch, L., M. Ridgway and F. Creutzig (2015). Happy or liberal? Making sense of behavior in transport policy design. *Transportation Research Part D: Transport and Environment*, accepted. [Ch. 8]

Behavioral economics and transportation

Rational choice



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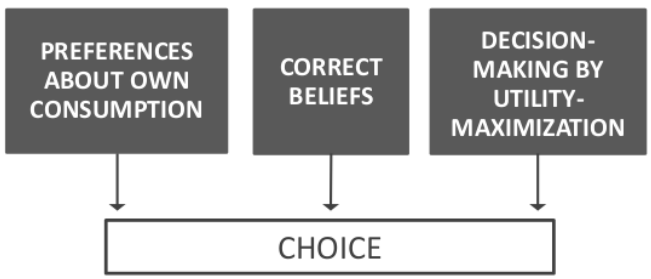

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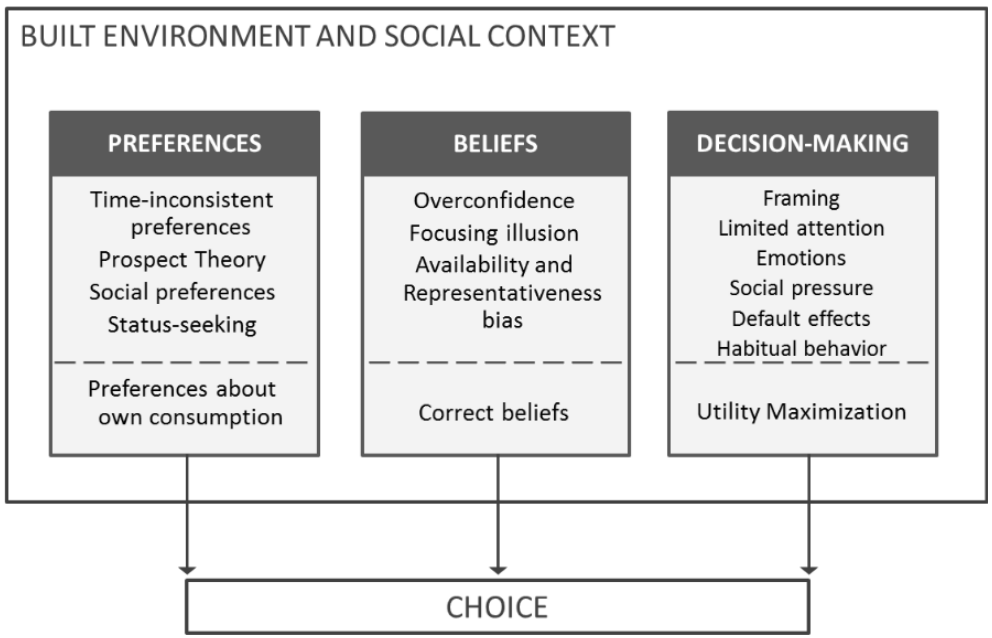

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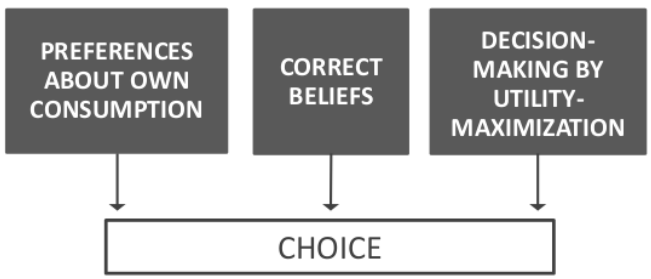

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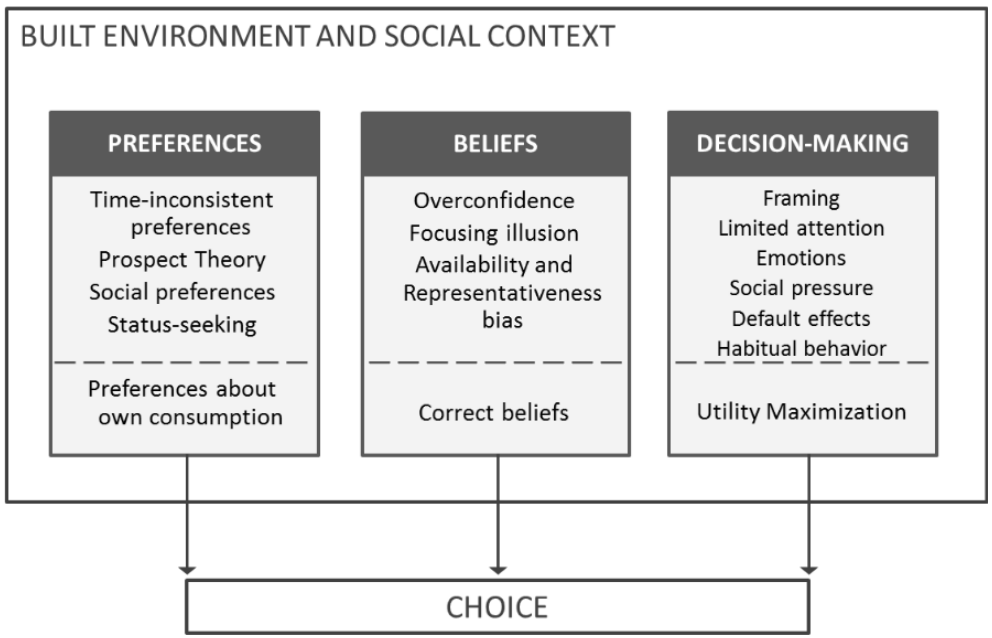

- Traffic psychology studies behavioral effects in mobility.
- Yet effects not well integrated into behavioral *economics*.
- So far relevance for welfare analysis not discussed.

Mobility choices – major behavioral effects

Mobility aspects	Particular Effects	Behavioral Explanations
Environmental awareness	Willingness-to-pay for fewer emissions	Social preferences, framing
Mode choice	Habitual car use	Time-inconsistent preferences, representativeness, status quo, default effects
Safety	Safety valuation across modes, safety-compromising behavior	Prospect theory, overconfidence, emotions, social pressure
Commuting	Commuting time lowers subjective well-being	Adaptation, focusing illusion, status quo effect
Travel time	Average constant travel time, travel time valuation	Direct utility of travel, Prospect theory
Fuel economy	Undervaluation	Prospect theory
Car purchases	Lower-than-expected-search effort	Status-seeking behavior, limited attention, emotions, social pressure
Infrastructure and social context	Self-selection	Default effects, context shapes preferences

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Implications for policy evaluation?

Happy or liberal?

Two positions in current welfare theory

Happiness

Welfare is to increase happiness,
determined by self-reports of quality of life and feelings.

Liberalism

Welfare is to give people what they want,
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The main arguments

- Pro happiness: In real-world policy decisions, detecting true preferences is infeasible.
- Pro liberalism: People legitimately have other goals than making themselves happy.

Applying the distinction to policy design

From a happiness perspective:

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Conceiving welfare as happiness means decreasing the modal share of cars!

Infrastructure shapes preferences?

A difficulty for the liberal perspective:

In the long-run, the physical and social context of mobility shapes *preferences*, not decisions. (Weinberger and Goetzke 2010, 2011)

Conclusions

Based on:

Chapter 1 and Chapter 9.

Two stories about capitalism and economic theory

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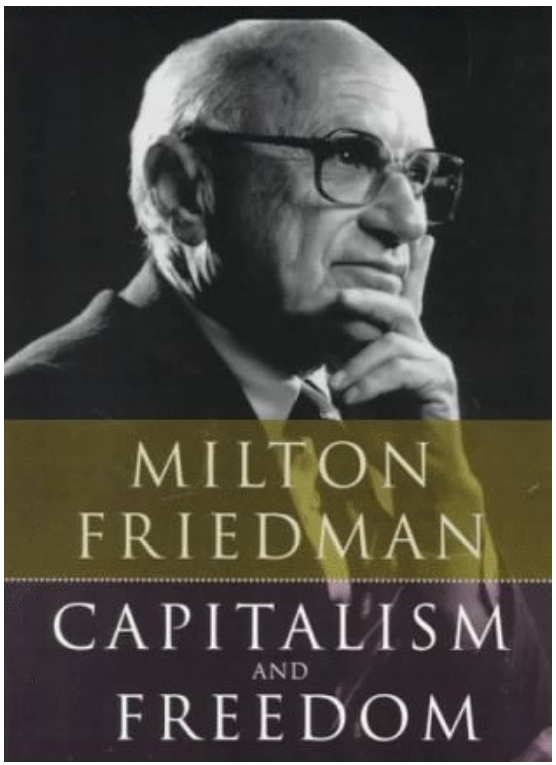

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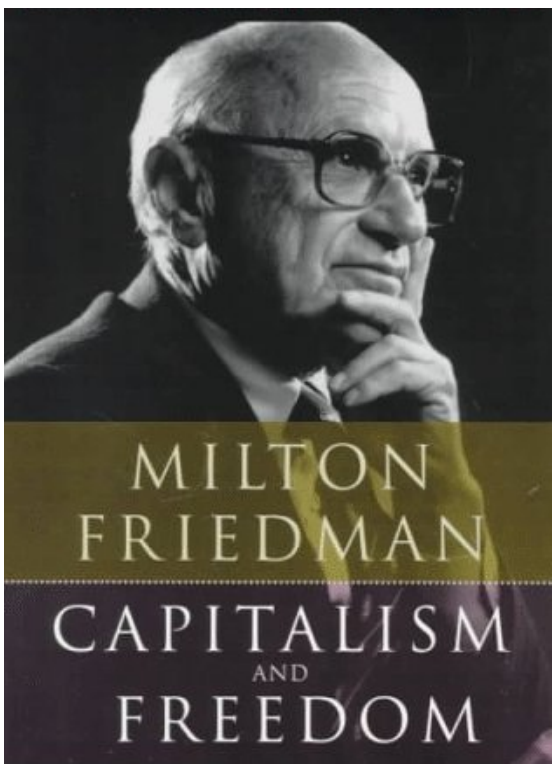

Source: https://eleonoragozzini.files.wordpress.com/2011/10/i-want-you-to-buy-crap.jpg

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- The thesis argues that these are decisive elements for economic theory of climate policy in a rich country.

Summary: Rents and class distinctions

I. Rents

- Tax rents, not capital, to mitigate inequality!
- In environmental policy, rents are not neutral, but appropriating rents by the government may increase efficiency.

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II. Two-class models

For (low-carbon) public investment, efficiency and equality considerations cannot be separated.

Summary: Critiques of materialism

III. The System of Automobility

- Provides autonomy and privacy.
- Detrimental for health, happiness and the environment.

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III. The System of Automobility

- Provides autonomy and privacy.
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III. Consumerism

in view of obesity, anonymity, stress –
need a normative viewpoint that allows for counting *some* consumption as *not* welfare-enhancing:
Happiness may be the best candidate.

Specific implications for national climate policy analysis

I. Appropriate and redistribute rents of the carbon budget, bioenergy and compact cities.
II. Distributional conflicts of carbon pricing: stronger heterogeneity assumptions needed.
III. Climate policy induces behavioral effects that are difficult to evaluate.

Thank you for your attention.

References

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General back-up

Why we do not choose what makes us happy

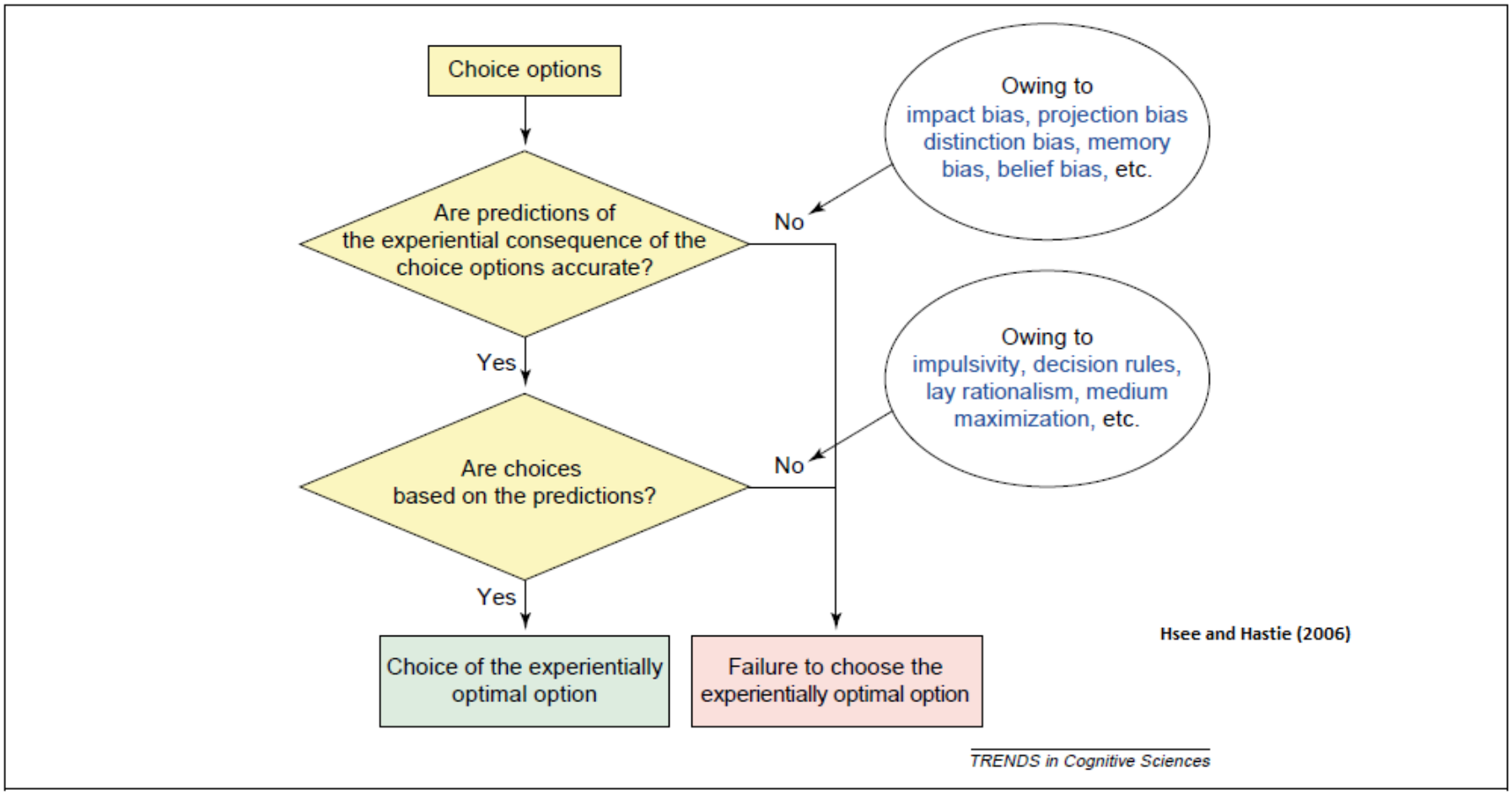
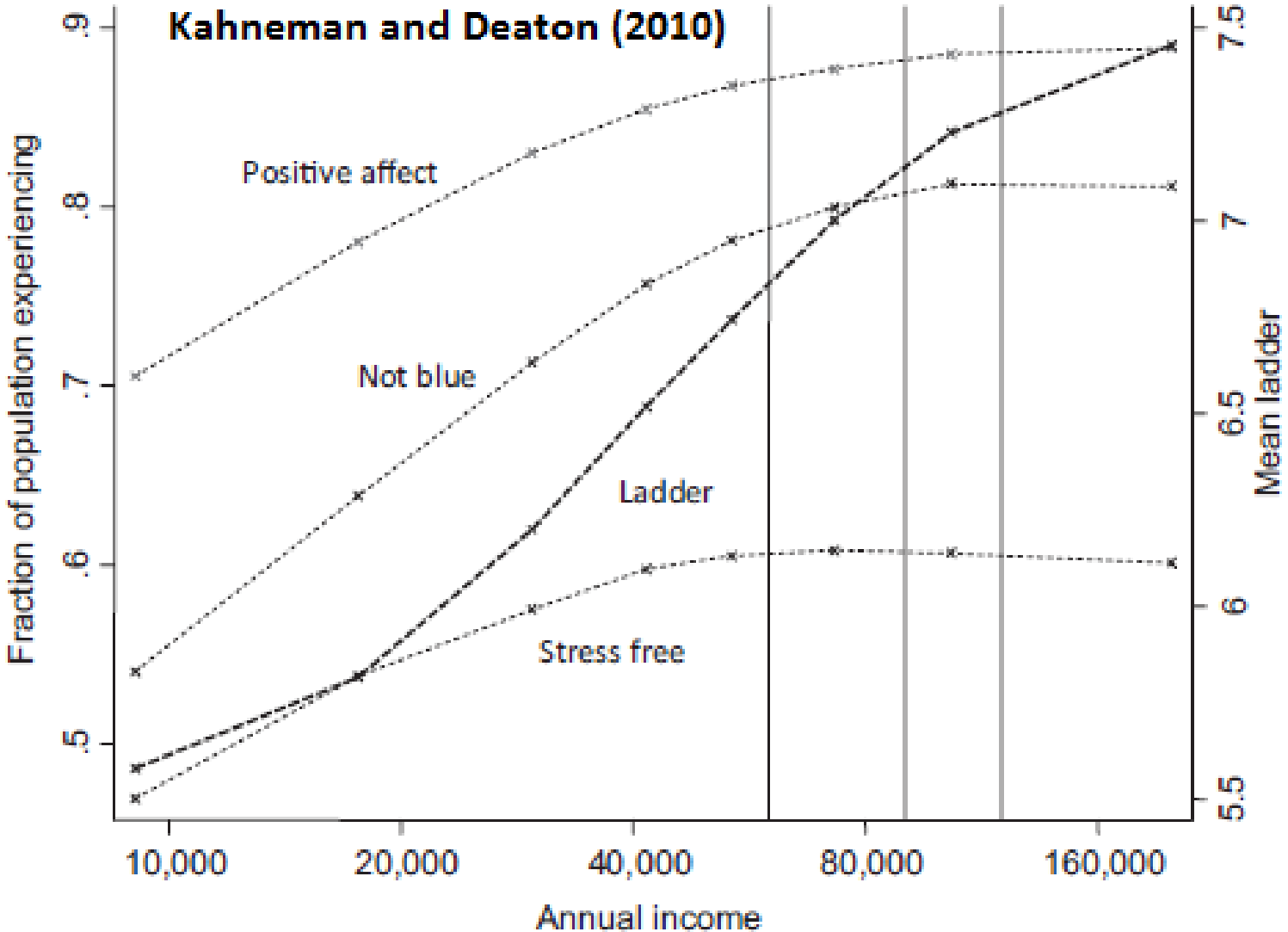
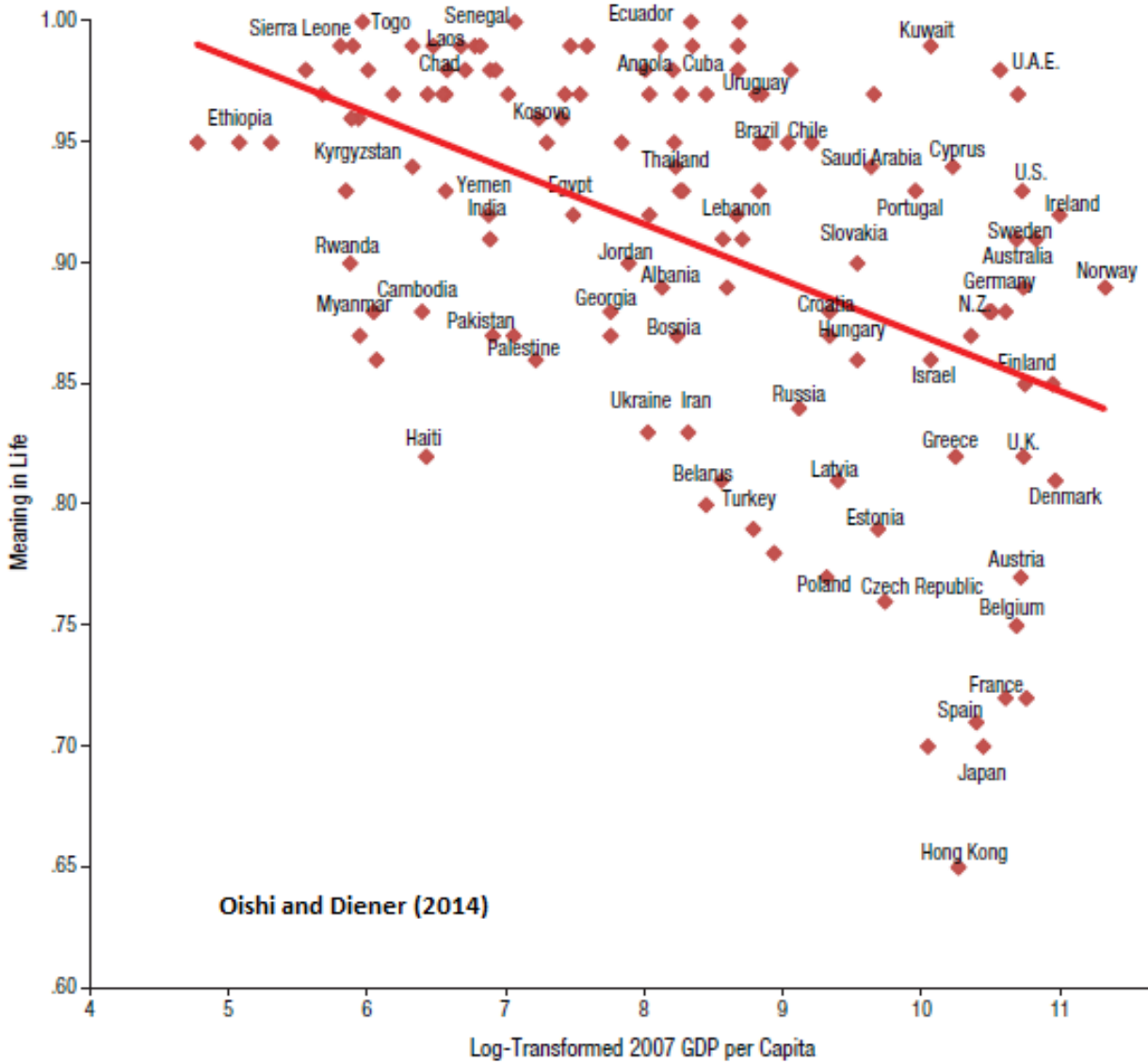


Figure 1. Causes of sub-optimal decisions. The biases listed in the upper right ellipse are discussed in the first part of this review; the factors in the lower ellipse are discussed in the second part of the review.

Happiness and income across a society



Meaning and Income across countries



"O.K., if you can't see your way to giving me a pay raise, how about giving Parkerson a pay cut?"

Source: Layard (2005)

"But I don't want comfort. I want God, I want poetry, I want real danger, I want freedom, I want goodness. I want sin."
(Huxley, Brave New World, quoted by Sunstein (2015))

Optimal taxation

Standard assumptions

- Infinite lifetimes (dynastic households)
- Complete, perfect markets: no rents.
- Households are heterogeneous in one dimension only (e.g. productivity or initial endowment)
- Preferences are stable.

Atkinson-Stiglitz (1976)

It is optimal to tax **only labor and to set zero consumption taxes**, as non-linear consumption taxes are infeasible.

Chamley-Judd (1985)

Optimal capital taxes are zero.

Equivalence of intertemporal and instant maximization of the firm

Intertemporal firm problem

Firm's value:

$$V(0) = \int_0^{\infty} \left[F(K(t), L(t)) - I(t) - w(t)L(t)\right] e^{(-R(t))} \mathrm{d}t$$

with $R(t) = \int_0^{\infty} r(\tau)\mathrm{d}\tau$.
Equivalent to the static problem by

- inserting the investment constraint: $\dot{K}(t) = I(t) - \delta K(t)$.

because the above integral is equivalent to:

$$K(0) + \int_0^{\infty} \left[F(K(t), L(t)) - (r(t) + \delta)K(t) - w(t)L(t)\right] e^{(-R(t))} \mathrm{d}t$$

The Calvo-Obstfeld approach

Social welfare V is here defined as the preference satisfaction of all (living and future) heterogenous agents, as usual:

$$W(t) = \int_{-\infty}^{t} \left\{ \int_{t}^{\infty} u(c(\nu,\tau)) e^{-\delta(\tau-\nu)} \phi e^{-\phi(\tau-\nu)} \mathrm{d}\tau \right\} e^{-\rho\nu} \mathrm{d}\nu$$
$$+ \int_{t}^{\infty} \left\{ \int_{\nu}^{\infty} u(c(\nu,\tau)) e^{-\delta(\tau-\nu)} \phi e^{-\phi(\tau-\nu)} \mathrm{d}\tau \right\} e^{-\rho\nu} \mathrm{d}\nu.$$

Intuition:

- The utility of those already living
- plus the utility of those (future people!) to be born,
- appropriately weighted by their respective cohort size and
- with differing social (ρ) and private (δ) rates of time preference.

Achievement of Calvo-Obstfeld

- Time-inconsistency issues sorted: The approach above is time-consistent, the approach of weighing all generations alive at time t regardless of their date of birth is not!
- In the paper, we assume $\rho = \delta$, for simplicity.

Two-step procedure

Calvo and Obstfeld (1988)

- Determining the socially optimal *intertemporal* allocation can be separated from determining the optimal *static* allocation.
- The static problem is a standard dynamic optimization problem with an integral constraint, with solution $U(C(t)) = \ln(C(t))$.
- In fact, and non-trivially, the *intertemporal* allocation is described (for common utility functions) by a standard Ramsey-type problem.

$$\max_{C(t)} \int_{t=0}^{\infty} U(C(t))e^{-\rho t}dt$$

$$\text{with} \quad U(C) = \ln(C)$$

$$\text{s.t.} \quad \dot{K}(t) = F(K(t), L(t), S(t)) - C(t) - \delta K(t).$$

Potential lives??

- Average utilitarianism
- Classical utilitarianism
- Critical-level utilitarianism

Present-dependent betterness (Dasgupta) vs. present-independent betterness (Broome)

Conclusion: Future research?

Henry George's Proposal

"What I, therefore, propose, as the simple yet sovereign remedy, which will raise wages, increase the earnings of capital, extirpate pauperism, abolish poverty, give remunerative employment to whoever wishes it, afford free scope to human powers, lessen crime, elevate morals, and taste, and intelligence, purify government and carry civilization to yet nobler heights, is – to appropriate rent by taxation." (Henry George, Progress and Poverty, 1879/2006, Bk. 8, Ch. 2, §15)