

CENTER FOR
ECONOMIC
BEHAVIOR &
INEQUALITY

Claus Thustrup Kreiner
Barcelona
June 2019

 Danmarks
Grundforskningsfond
Danish National
Research Foundation

UNIVERSITY OF COPENHAGEN



Overview of talk

Research Program

Behavioral Heterogeneity, Inequality
and Public Policy

Research Paper

Time Discounting and Wealth Inequality

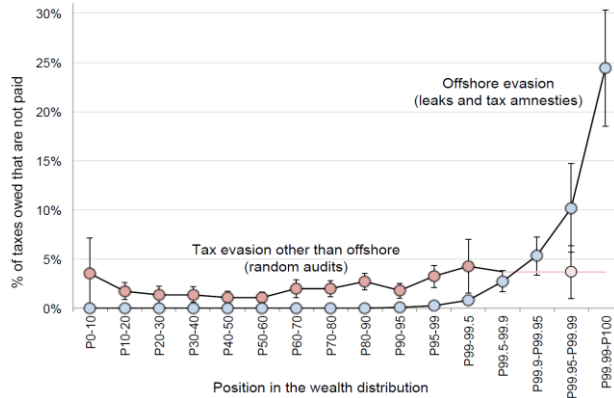
CEBI team



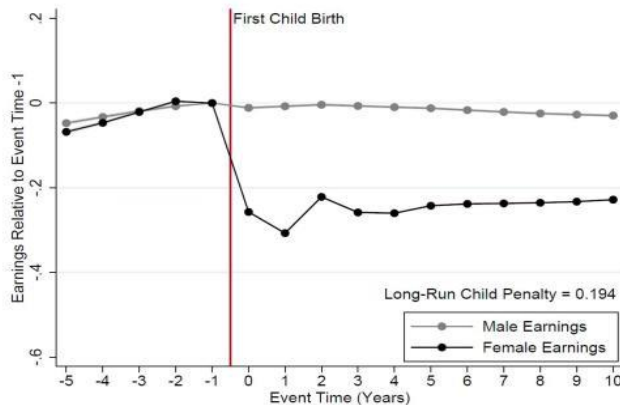
Many different fields: Public Economics, Labor Economics, Health Economics, Experimental Economics, Behavioral Economics, Household Finance, Political Economy, Microeconometrics...

CEBI research program: Examples of CEBI projects

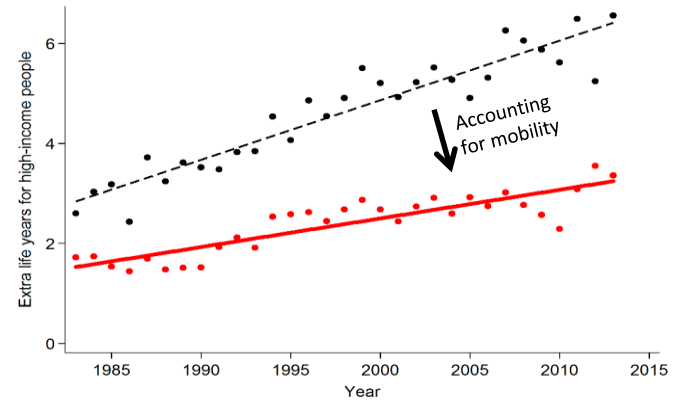
Wealth Inequality: Role of tax evasion behaviour, preference heterogeneity and wealth taxation...



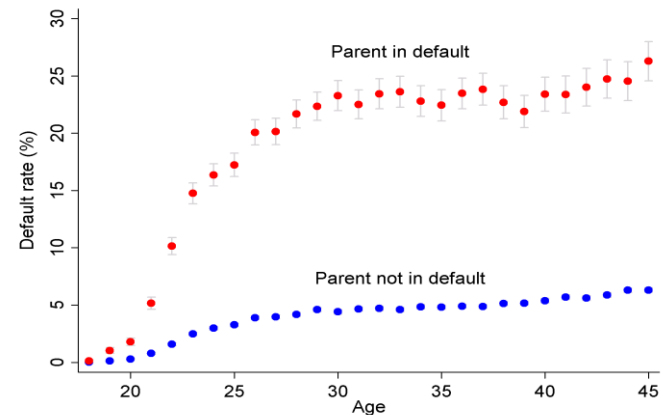
Gender inequality: Role of children, social norms and parental leave policy



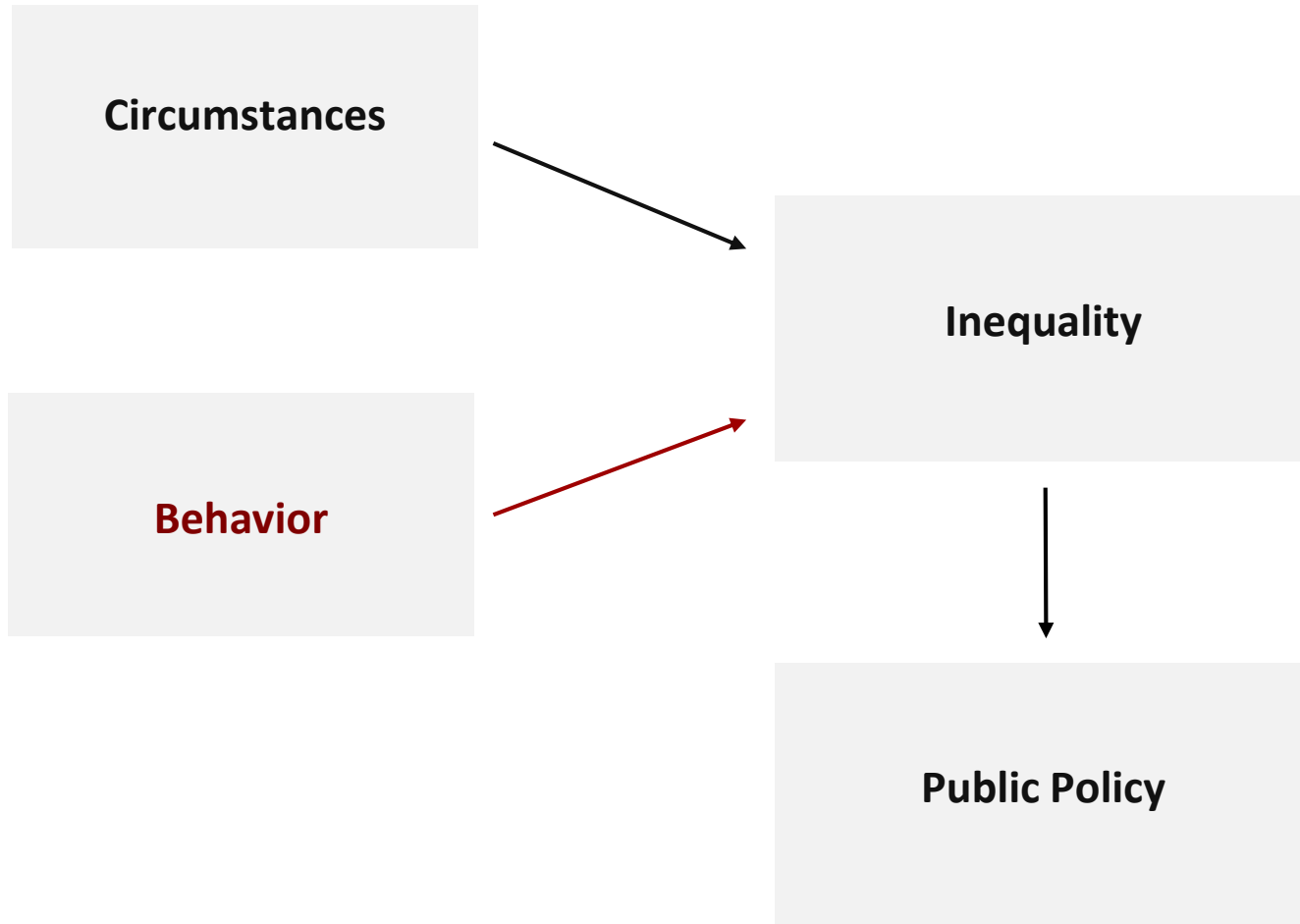
Life-expectancy inequality: Role of income mobility, innovations and technology adoption



Inequality in financial trouble: Role of shocks vs behavioral heterogeneity

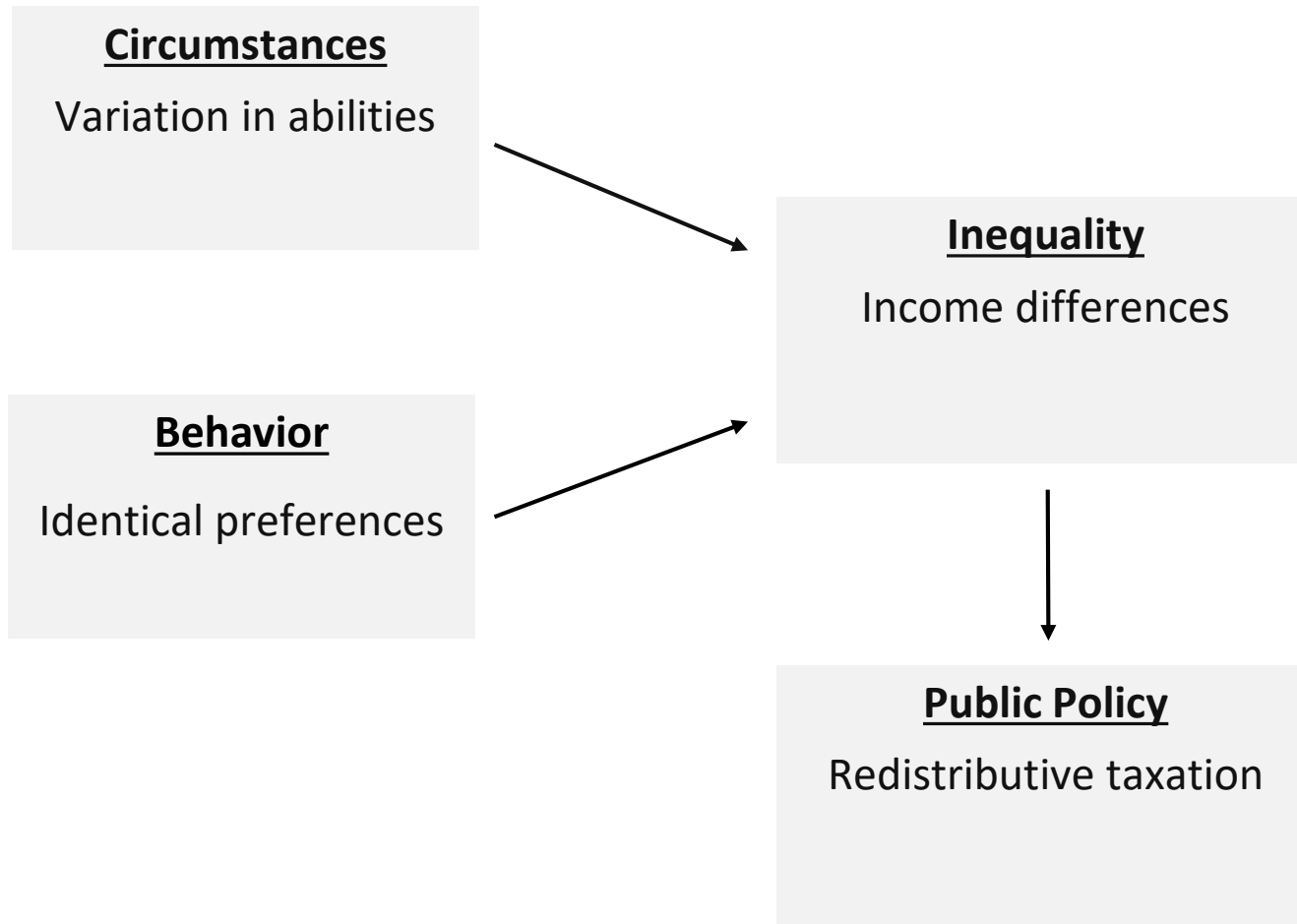


CEBI research program: Behavioral Heterogeneity, Inequality and Public Policy



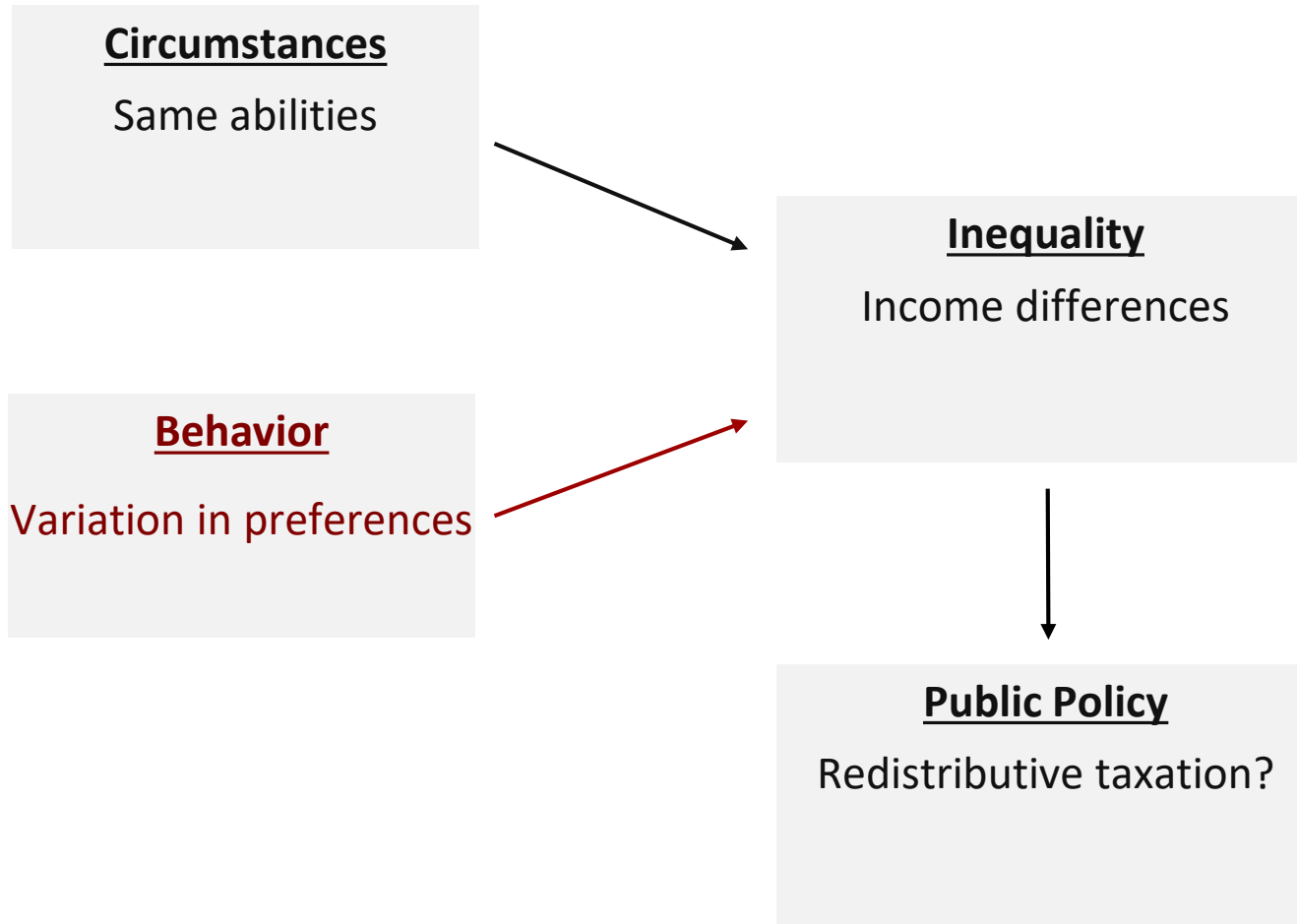
CEBI research program: Behavioral Heterogeneity, Inequality and Public Policy

Example: Standard Mirrleesian optimal tax theory



CEBI research program: Behavioral Heterogeneity, Inequality and Public Policy

Alternative model:



Example: Standard Mirrleesian optimal tax theory

$$\max_{T(z)} \int_{\underline{\theta}}^{\bar{\theta}} S \left(u \left(z - T(z), \frac{z}{\theta} \right) \right) f(\theta) d\theta \quad \text{st.} \quad \int_{\underline{\theta}}^{\bar{\theta}} T(z) f(\theta) d\theta \geq 0$$

where $S(\cdot)$ is social prefs, $u(\cdot)$ is individual utility, z is earnings, $T(\cdot)$ is the tax function, and θ is the hourly wage rate (innate ability).

Variation in abilities (θ) \Rightarrow unequal income \Rightarrow redistribution policy

Example: Standard Mirrleesian optimal tax theory

$$\max_{T(z)} \int_{\underline{\theta}}^{\bar{\theta}} S \left(u \left(z - T(z), \frac{z}{\theta} \right) \right) f(\theta) d\theta \quad \text{st.} \quad \int_{\underline{\theta}}^{\bar{\theta}} T(z) f(\theta) d\theta \geq 0$$

where $S(\cdot)$ is social prefs, $u(\cdot)$ is individual utility, z is earnings, $T(\cdot)$ is the tax function, and θ is the hourly wage rate (innate ability).

Variation in abilities (θ) \Rightarrow unequal income \Rightarrow redistribution policy

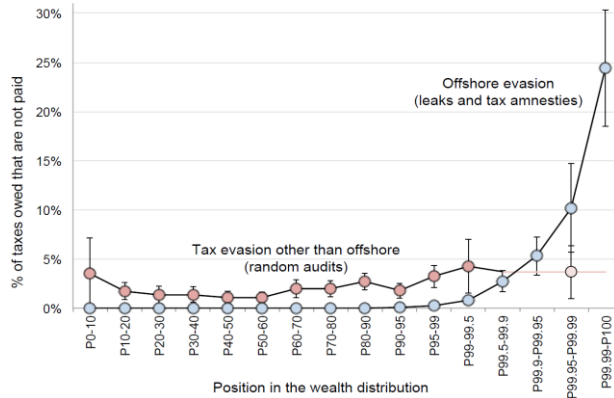
Alternative interpretation

Variation in leisure preferences (θ) \Rightarrow unequal income \Rightarrow redistribution policy?

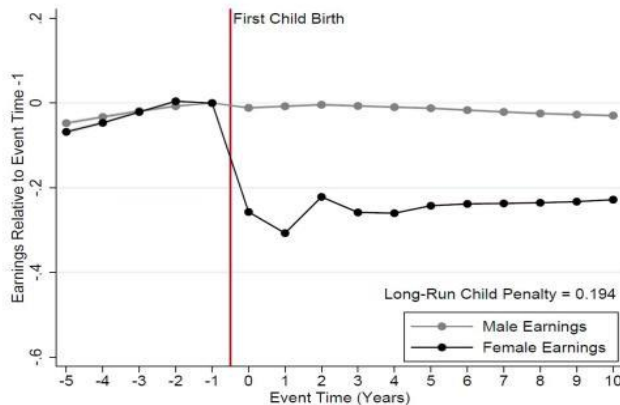
Unequal opportunities in the standard model, but not in the alternative interpretation!

CEBI research program: Examples of policy relevance

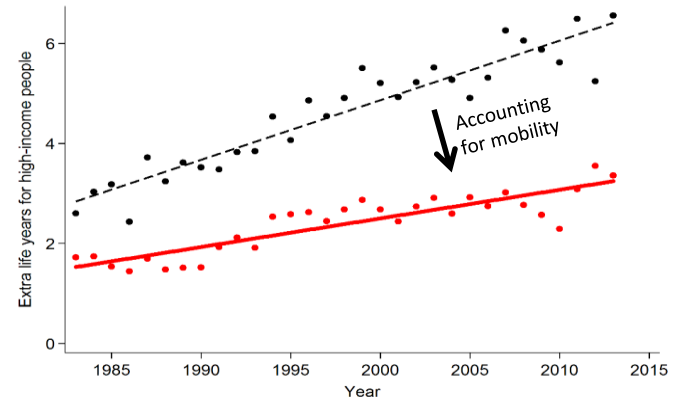
Wealth Inequality: Role of tax evasion behaviour, preference heterogeneity and wealth taxation...



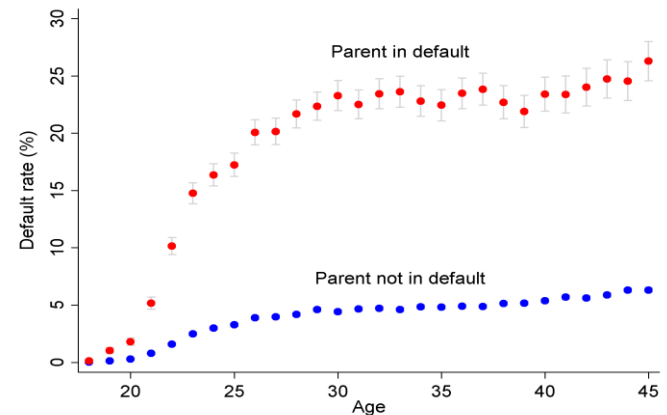
Gender inequality: Role of children, social norms and parental leave policy



Life-expectancy inequality: Role of income mobility, innovations and technology adoption



Inequality in financial trouble: Shocks vs behavioral heterogeneity



Why little research historically on behavioural heterogeneity?

“The establishment of the proposition that one may usefully treat *tastes* as stable over time and *similar among people* is the central task of this essay.” Stigler and Becker (“De Gustibus Non Est Disputandum”, American Economic Review 1977)

“Preference heterogeneity represents an alternative way to introduce differences in initial conditions. Historically, macroeconomists have been *reluctant to fiddle too much with preferences*, because their *inherent unobservability* puts little discipline on the exercise.” Heathcoate, Storesletten and Violante (Annual Review of Economics 2009)

CENTER FOR
ECONOMIC
BEHAVIOR &
INEQUALITY

Claus Thustrup Kreiner

Barcelona

June 2019



UNIVERSITY OF COPENHAGEN

Time Discounting and Wealth Inequality

Thomas Epper

Ernst Fehr

Helga Fehr-Duda

Claus Thustrup Kreiner

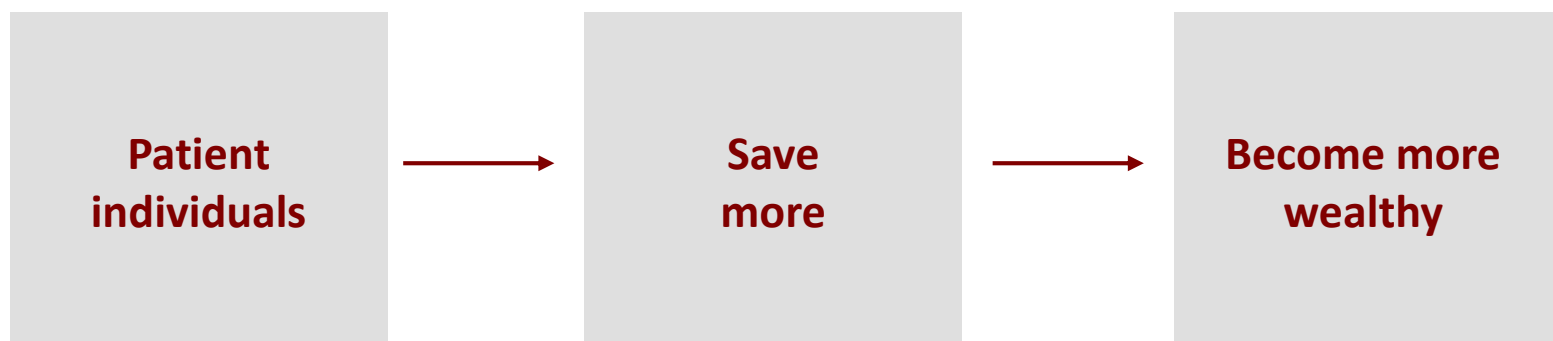
David Dreyer Lassen

Søren Leth-Petersen

Gregers Nytoft Rasmussen

Research agenda

Hypothesis from basic theory of savings behavior:



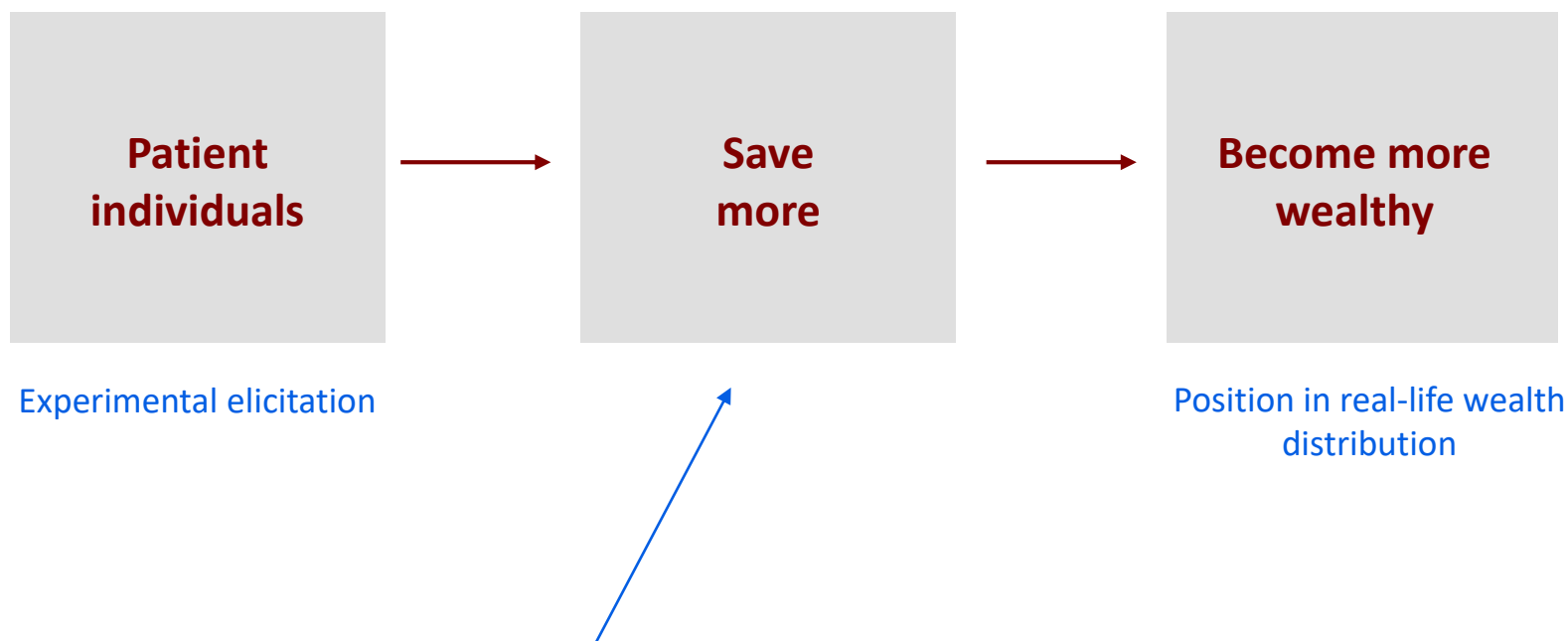
Contribution

I. Measure whether differences in patience predict wealth inequality:



Contribution

I. Measure whether differences in patience predict wealth inequality:



II. Provide suggestive evidence about the role of the savings channel by controlling for other factors relevant according to theory

Contribution

Public Finance and Macro literature (e.g. Krusell & Smith 1998; Carroll et al. 2014, 2017; Krueger et al. 2016; Boserup et al. 2016, 2018; De Nardi and Fella 2017; ...)

Models with heterogeneity in time discounting better at matching wealth inequality + propagation of business cycle shocks and effects of stimulus policy

Experimental literature (e.g. Mishel et al 1989; Harrison et al 2002; Andreoni & Sprenger 2012; Attema et al 2016; ...)

Evidence starting with the famous marshmallow experiments w. children in the 60s to recent research using intertemporal choices of adults point to pervasive heterogeneity in time discounting

Has predictive power of behavior outside the laboratories

We bridge these literatures

Q: Do differences in *elicited* time discounting predict *real-life* wealth inequality?

Savings Theory

$$\max_{(c(a))_0^T} U = \int_0^T \frac{c(a)^{1-\theta}}{1-\theta} e^{-\rho a} da$$

$$\text{s.t. } \dot{w} = rw(a) + y(a) - c(a)$$

⇓

$$w(a) = Y \left(\gamma(a) - \frac{1 - e^{\frac{r(1-\theta)-\rho}{\theta} a}}{1 - e^{\frac{r(1-\theta)-\rho}{\theta} T}} \right) e^{ra}$$

where

- Y is life-time resources/permanent income
- $\gamma(a)$ is share of life-time resources received up to age a

Savings Theory

$$\max_{(c(a))_0^T} U = \int_0^T \frac{c(a)^{1-\theta}}{1-\theta} e^{-\rho a} da$$

$$\text{s.t. } \dot{w} = rw(a) + y(a) - c(a)$$

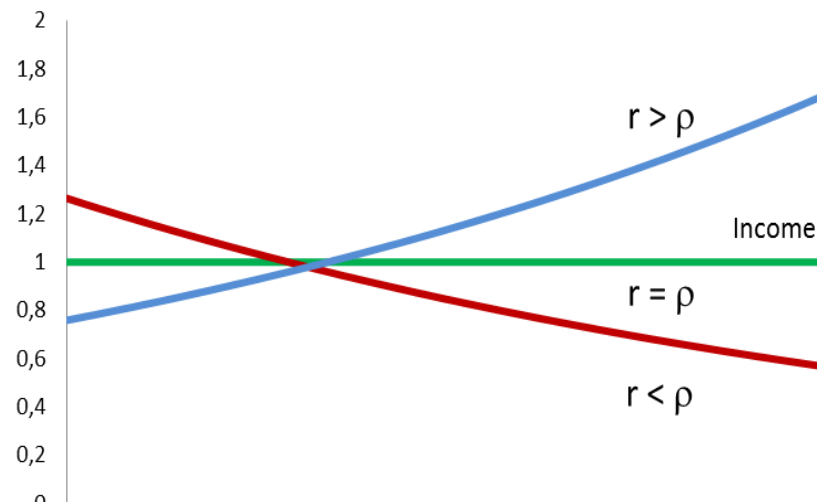
⇓

$$w(a) = Y \left(\gamma(a) - \frac{1 - e^{-\frac{r(1-\theta)-\rho}{\theta} a}}{1 - e^{-\frac{r(1-\theta)-\rho}{\theta} T}} \right) e^{ra}$$

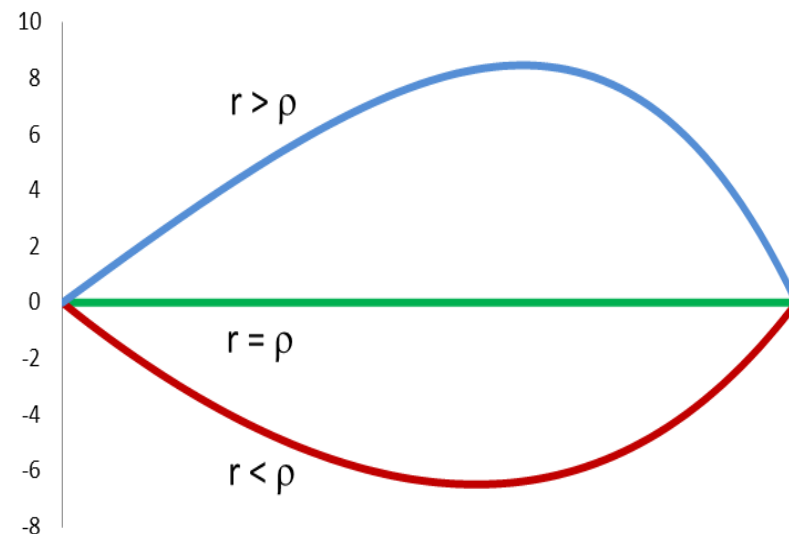
where

- Y is life-time resources/permanent income
- $\gamma(a)$ is share of life-time resources received up to age a

Income/consumption over the lifecycle



Wealth over the lifecycle



Savings Theory

Main results

- Patient individuals hold more wealth *at all ages* in the life cycle
 (Conditional on permanent income, timing of income, market interest rate, CRRA parameter)
- No clear cross sectional relationship between patience and levels of consumption and savings \Rightarrow focus on wealth
- Borrowing constraints
 - Low-patience individuals more likely to be borrowing constrained
 - No patience-wealth relationship for borrowing constrained individuals (\Rightarrow mutes the association btw. patience and wealth inequality)

Data: overview

Experimental data

Online Experiment 2015

Invite individuals born in
Copenhagen 1973-83

3620 respondents

Choice tasks measuring:

- Patience
- Risk aversion
- Altruism

Typical after-tax payout:
245 DKK (\approx €33)

Pay-out transferred
directly to bank account

CPR



Administrative data

Info during adulthood about

- Wealth
 - Bank deposits
 - Market value stocks, bonds
 - Tax assessed property value
 - Pension wealth and market value of cars (only 2014-)
- Income
- Education
- Demographics

Also information for

- non-respondents
- 10% random sample

Data construction: Summary statistics

| | (1) Respondents vs. non-respondents | | | (2) Respondents vs. 10% of population | |
|----------------------------------|-------------------------------------|------------------------|----------------------------|---------------------------------------|----------------------------|
| | (a) Respondents | (b) Non-respondents | (c) Difference, (a)-(b) | (d) Population | (e) Difference, (a)-(d) |
| Age | 37.32 | 36.46 | 0.86 | 37.37 | -0.05 |
| Woman (=1) | 0.50 | 0.49 | 0.01 | 0.51 | -0.01 |
| Single (=1) | 0.28 | 0.38 | -0.10 | 0.28 | 0.00 |
| Dependent children (=1) | 0.61 | 0.57 | 0.04 | 0.63 | -0.02 |
| Years of education | 14.89 | 14.16 | 0.73 | 14.64 | 0.25 |
| <u>Gross income distribution</u> | | | | | |
| p5 | 135745 | 98974 | 36772 | 130343 | 5402 |
| p25 | 287472 | 234966 | 52506 | 270900 | 16572 |
| p50 | 383040 | 341611 | 41429 | 360132 | 22908 |
| p75 | 484472 | 434678 | 49795 | 456263 | 28209 |
| p95 | 720178 | 654999 | 65179 | 700517 | 19661 |
| <u>Wealth distribution</u> | | | | | |
| p5 | -337615 | -351123 | 13507 | -241803 | -95812 |
| p25 | 93898 | 48919 | 44978 | 144177 | -50280 |
| p50 | 487002 | 317400 | 169602 | 483217 | 3785 |
| p75 | 1066942 | 800074 | 266868 | 972420 | 94522 |
| p95 | 2397821 | 2024448 | 373373 | 2254289 | 143532 |
| Observations | 3620 | 23626 | 27246 | 67539 | 71159 |

Data construction: Experiment



Notes: (a) Five savings tasks with different gains from postponing
(b) 100 points = DKK 25 ≈ €3.60

Data construction: Experiment

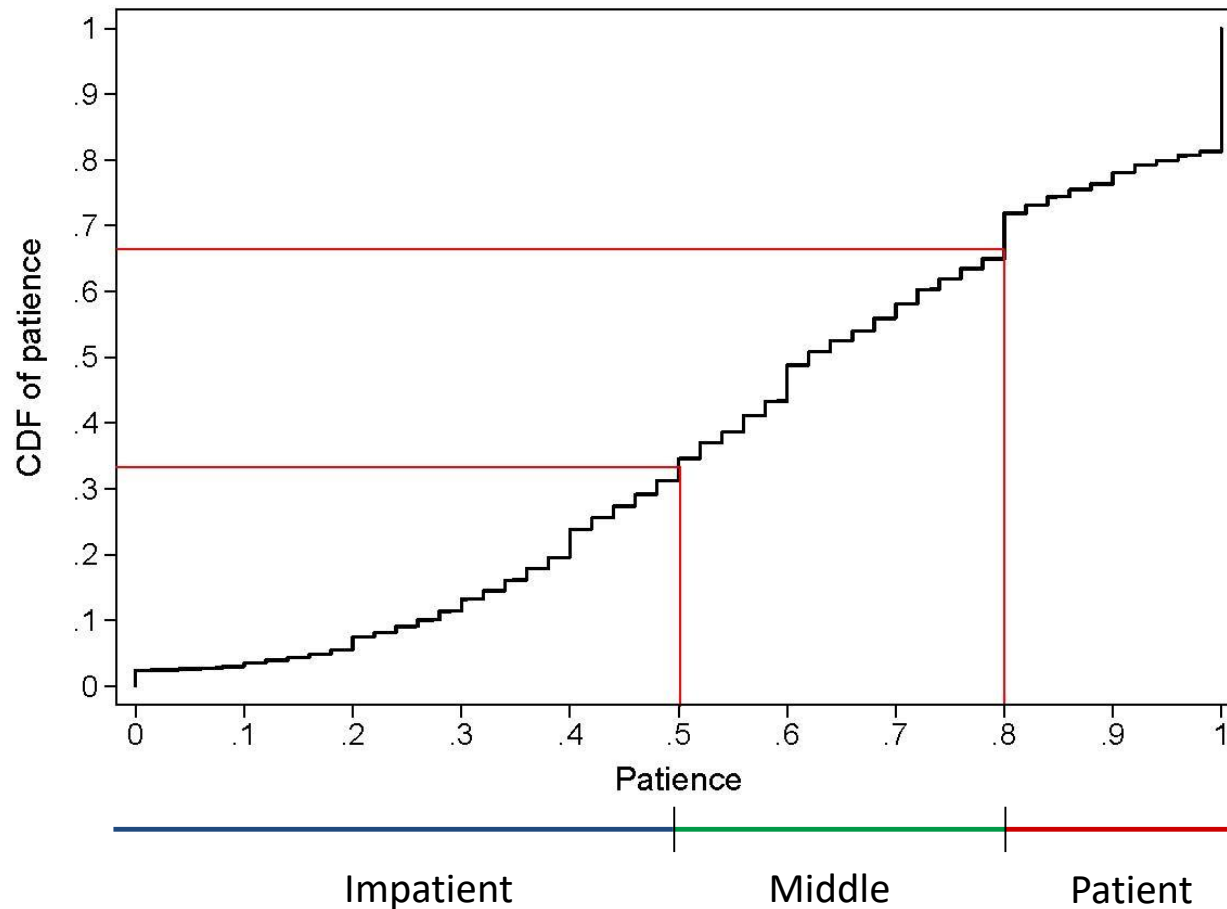
The interface displays a savings task with the following components:

- Control buttons: "save more +" and "save less -"
- Current savings tasks: 4 green bars, each labeled "100"
- Summary bar: "you keep 400", "you save 600", "you receive 630"
- Future outcomes (in 8 weeks): 7 grey bars, each labeled "100"
- Future outcomes (in 16 weeks): 6 green bars, each labeled "105"
- Time points: "today", "in 8 weeks", "in 16 weeks"
- Confirmation button: "Confirm"

Notes: (a) Five savings tasks with different gains from postponing
(b) 100 points = DKK 25 \approx €3.60

Data construction: Elicited patience

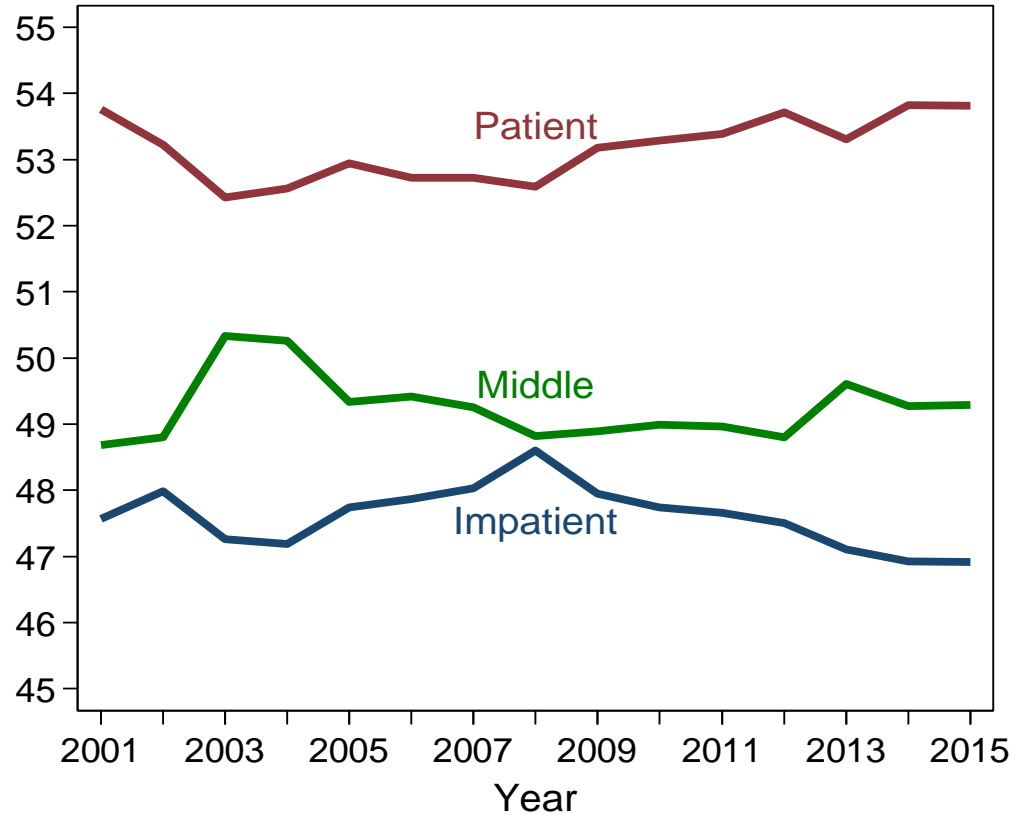
Measure of patience: $\text{mean}\left(\frac{z_1}{10}, \dots, \frac{z_n}{10}\right)$, where z_i is # blocks saved



Results:

Patience and position in the wealth distribution

Wealth rank by patience group, 2001-2014

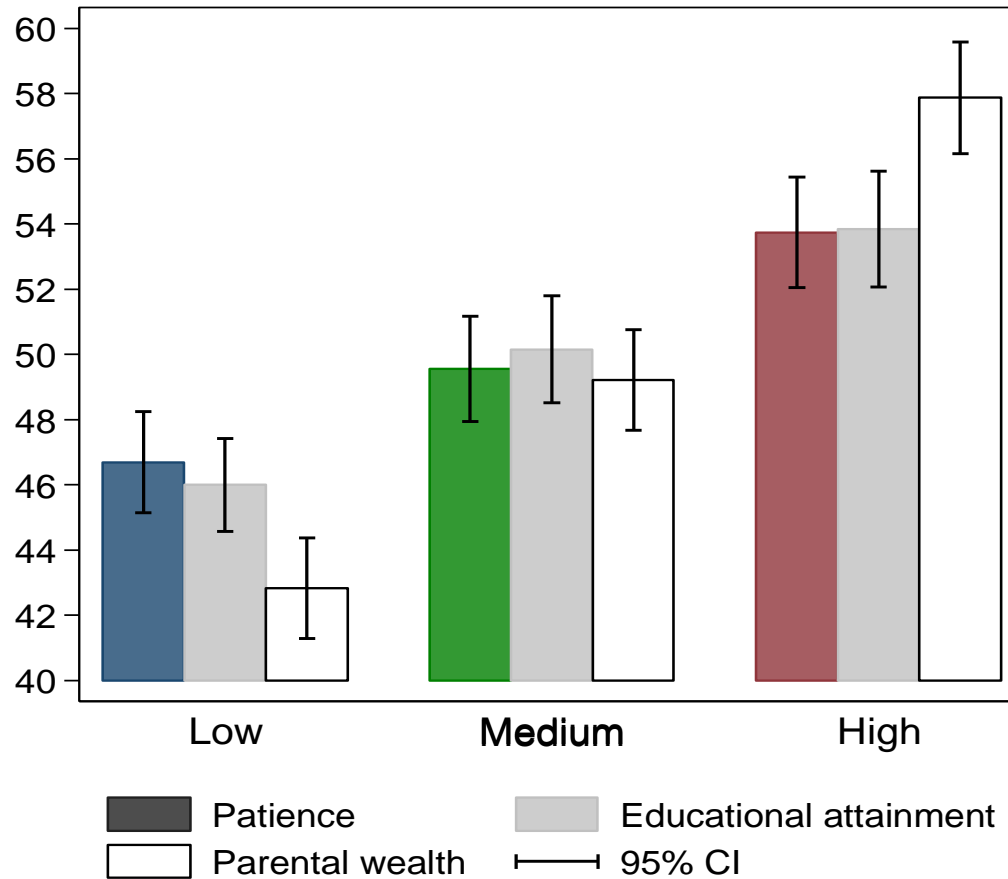


Stable association over more than a decade

Results:

Patience and position in the wealth distribution

Wealth rank by patience , education, and parental wealth

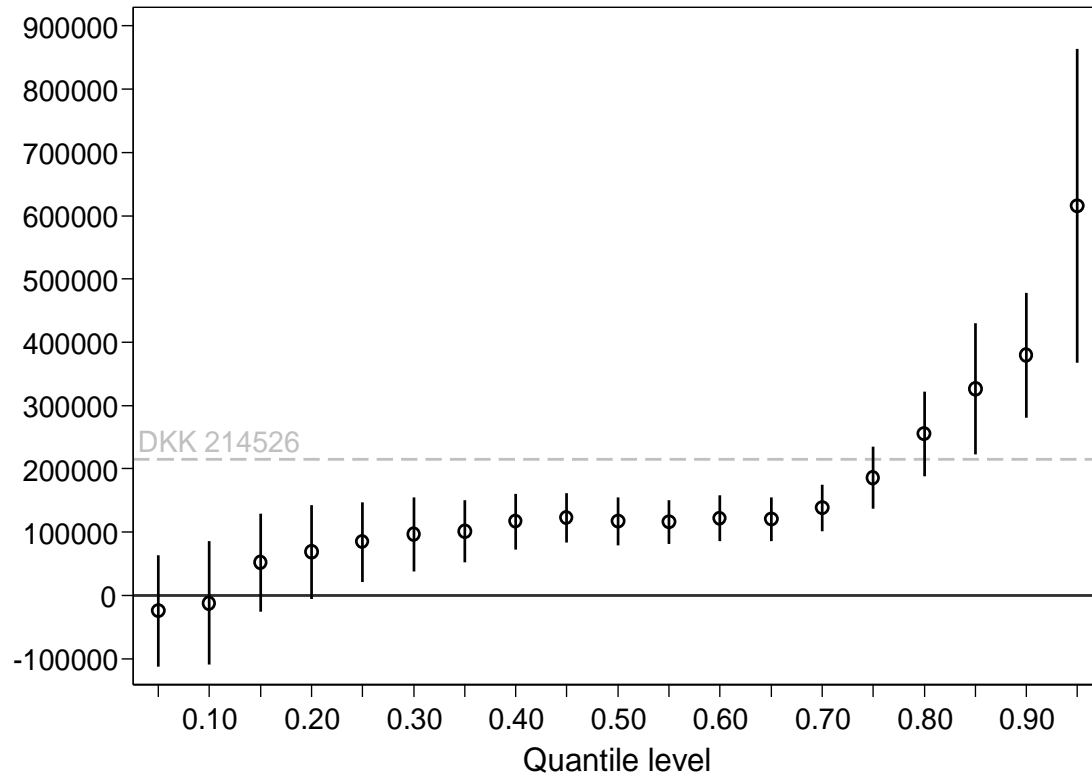


Association is quantitatively important

Results:

Patience and position in the wealth distribution

Quantile regression of wealth on patience



Association exists throughout the wealth distribution

Results:

Effect still large in multivariate setting

| Dep. var.: Wealth | (1) Rank | (2) Rank | (3) Rank | (4) DKK | (5) Rank | (6) Rank | (7) Rank | (8) Rank |
|--|--------------------|--------------------|--------------------|-----------------------------|--------------------|--------------------|--------------------|--------------------|
| Patience | 11.37*** (1.73) | 9.59*** (1.75) | 8.45*** (1.75) | 146914.66*** (39742.53) | 9.45*** (1.92) | -1.44 (2.29) | 11.14*** (2.41) | 7.71*** (2.25) |
| Risk aversion | | | 2.53 (2.04) | 49227.45 (56820.65) | 2.45 (2.04) | -2.81 (2.84) | 5.31* (2.70) | 3.18 (2.54) |
| Altruism | | | | | -3.67 (2.16) | | | |
| Future bias=1 | | | | | 2.58 (1.32) | | | |
| Present bias=1 | | | | | 1.23 (1.33) | | | |
| Non-monotonic choices in time tasks=1 | | | | | -1.99 (1.07) | | | |
| Interest rate on liquidity | | | | | | | | -1.63*** (0.10) |
| Owned stocks, 2008-2014=1 | | | | | | | | 6.21*** (1.56) |
| Rate of return on stocks, 2008-2014 | | | | | | | | 0.36 (0.54) |
| Year dummies for educational attainment | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Gross income decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Steepness of income profile decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Expected income growth decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Self-reported school grades decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Parental wealth decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Wealth at age 18 decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Demographic controls | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Age dummies | No | No | No | Yes | No | No | No | No |
| Constant | 42.81*** (1.16) | 39.56*** (1.82) | 31.84*** (3.94) | -305236.88*** (82509.23) | 32.13*** (4.24) | 38.56*** (4.95) | 26.64*** (6.40) | 45.80*** (6.00) |
| Observations | 3620 | 3620 | 3552 | 3552 | 3552 | 1353 | 2157 | 2157 |
| Adj. R-squared | 0.01 | 0.02 | 0.08 | 0.08 | 0.08 | 0.03 | 0.08 | 0.19 |

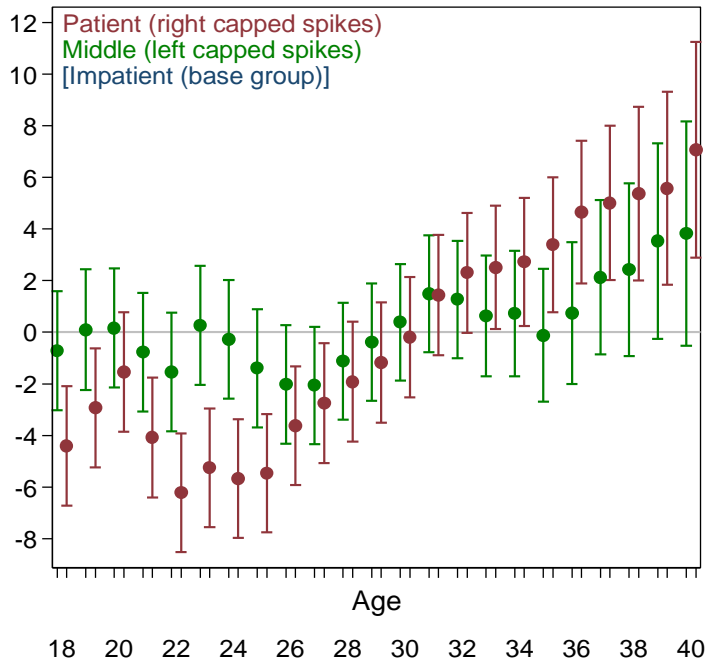
Bivariate

Results:

Controlling for level and timing of income

Patient individuals have different permanent income and timing of income

Income profiles and patience



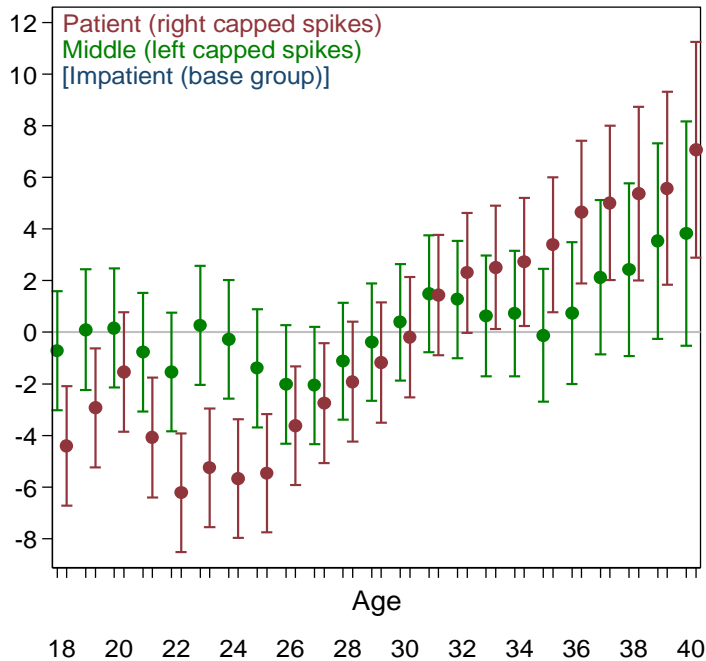
Results:

Controlling for level and timing of income

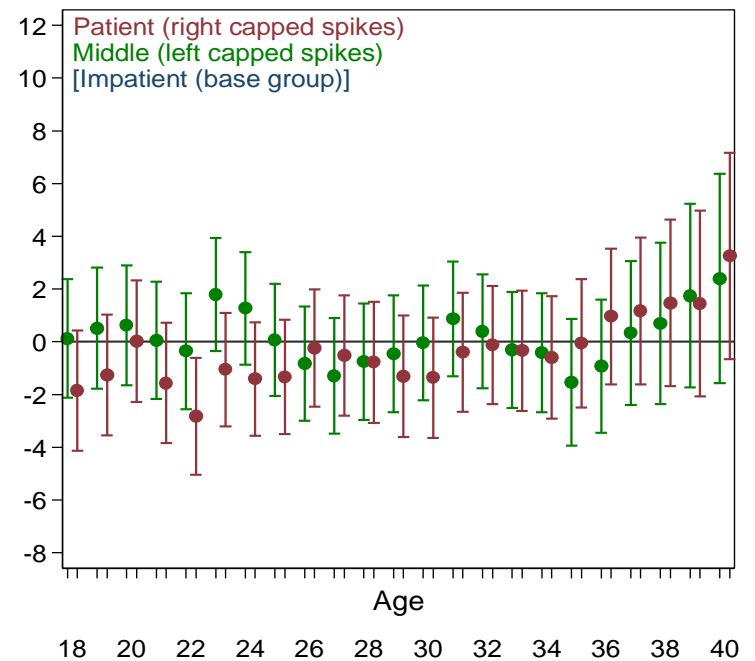
Patient individuals have different permanent income and timing of income

These differences vanish when controlling for education

Income profiles and patience



After controlling for education



Results:

Effect still large in multivariate setting

| Dep. var.: Wealth | (1) Rank | (2) Rank | (3) Rank | (4) DKK | (5) Rank | (6) Rank | (7) Rank | (8) Rank |
|--|--------------------|--------------------|--------------------|-----------------------------|--------------------|--------------------|--------------------|--------------------|
| Patience | 11.37*** (1.73) | 9.59*** (1.75) | 8.45*** (1.75) | 146914.66*** (39742.53) | 9.45*** (1.92) | -1.44 (2.29) | 11.14*** (2.41) | 7.71*** (2.25) |
| Risk aversion | | | 2.53 (2.04) | 49227.45 (56820.65) | 2.45 (2.04) | -2.81 (2.84) | 5.31* (2.70) | 3.18 (2.54) |
| Altruism | | | | | -3.67 (2.16) | | | |
| Future bias=1 | | | | | 2.58 (1.32) | | | |
| Present bias=1 | | | | | 1.23 (1.33) | | | |
| Non-monotonic choices in time tasks=1 | | | | | -1.99 (1.07) | | | |
| Interest rate on liquidity | | | | | | | | -1.63*** (0.10) |
| Owned stocks, 2008-2014=1 | | | | | | | | 6.21*** (1.56) |
| Rate of return on stocks, 2008-2014 | | | | | | | | 0.36 (0.54) |
| Year dummies for educational attainment | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Gross income decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Steepness of income profile decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Expected income growth decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Self-reported school grades decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Parental wealth decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Wealth at age 18 decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Demographic controls | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Age dummies | No | No | No | Yes | No | No | No | No |
| Constant | 42.81*** (1.16) | 39.56*** (1.82) | 31.84*** (3.94) | -305236.88*** (82509.23) | 32.13*** (4.24) | 38.56*** (4.95) | 26.64*** (6.40) | 45.80*** (6.00) |
| Observations | 3620 | 3620 | 3552 | 3552 | 3552 | 1353 | 2157 | 2157 |
| Adj. R-squared | 0.01 | 0.02 | 0.08 | 0.08 | 0.08 | 0.03 | 0.08 | 0.19 |

Education

Results:

Effect still large in multivariate setting

| Dep. var.: Wealth | (1) Rank | (2) Rank | (3) Rank | (4) DKK | (5) Rank | (6) Rank | (7) Rank | (8) Rank |
|--|--------------------|--------------------|--------------------|-----------------------------|--------------------|--------------------|--------------------|--------------------|
| Patience | 11.37*** (1.73) | 9.59*** (1.75) | 8.45*** (1.75) | 146914.66*** (39742.53) | 9.45*** (1.92) | -1.44 (2.29) | 11.14*** (2.41) | 7.71*** (2.25) |
| Risk aversion | | | 2.53 (2.04) | 49227.45 (56820.65) | 2.45 (2.04) | -2.81 (2.84) | 5.31* (2.70) | 3.18 (2.54) |
| Altruism | | | | | -3.67 (2.16) | | | |
| Future bias=1 | | | | | 2.58 (1.32) | | | |
| Present bias=1 | | | | | 1.23 (1.33) | | | |
| Non-monotonic choices in time tasks=1 | | | | | -1.99 (1.07) | | | |
| Interest rate on liquidity | | | | | | | | -1.63*** (0.10) |
| Owned stocks, 2008-2014=1 | | | | | | | | 6.21*** (1.56) |
| Rate of return on stocks, 2008-2014 | | | | | | | | 0.36 (0.54) |
| Year dummies for educational attainment | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Gross income decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Steepness of income profile decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Expected income growth decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Self-reported school grades decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Parental wealth decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Wealth at age 18 decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Demographic controls | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Age dummies | No | No | No | Yes | No | No | No | No |
| Constant | 42.81*** (1.16) | 39.56*** (1.82) | 31.84*** (3.94) | -305236.88*** (82509.23) | 32.13*** (4.24) | 38.56*** (4.95) | 26.64*** (6.40) | 45.80*** (6.00) |
| Observations | 3620 | 3620 | 3552 | 3552 | 3552 | 1353 | 2157 | 2157 |
| Adj. R-squared | 0.01 | 0.02 | 0.08 | 0.08 | 0.08 | 0.03 | 0.08 | 0.19 |

Risk aversion + Education + Income + Income growth + Expected income growth
+ GPA + Initial wealth + Parental wealth + Demographics

Results:

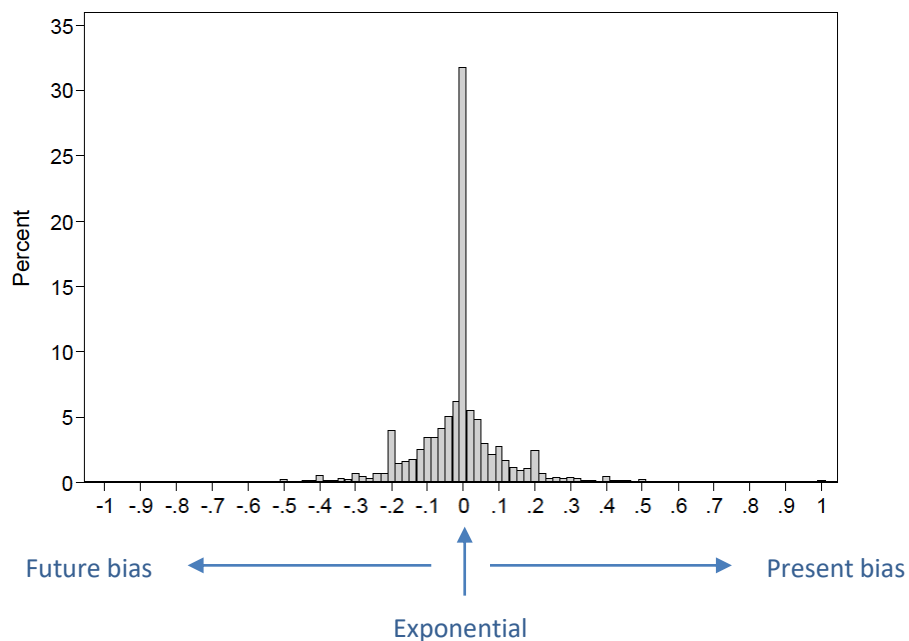
Effect still large in multivariate setting

| Dep. var.: Wealth | (1) Rank | (2) Rank | (3) Rank | (4) DKK | (5) Rank | (6) Rank | (7) Rank | (8) Rank |
|--|--------------------|--------------------|--------------------|-----------------------------|--------------------|--------------------|--------------------|--------------------|
| Patience | 11.37*** (1.73) | 9.59*** (1.75) | 8.45*** (1.75) | 146914.66*** (39742.53) | 9.45*** (1.92) | -1.44 (2.29) | 11.14*** (2.41) | 7.71*** (2.25) |
| Risk aversion | | | 2.53 (2.04) | 49227.45 (56820.65) | 2.45 (2.04) | -2.81 (2.84) | 5.31* (2.70) | 3.18 (2.54) |
| Altruism | | | | | -3.67 (2.16) | | | |
| Future bias=1 | | | | | 2.58 (1.32) | | | |
| Present bias=1 | | | | | 1.23 (1.33) | | | |
| Non-monotonic choices in time tasks=1 | | | | | -1.99 (1.07) | | | |
| Interest rate on liquidity | | | | | | | | -1.63*** (0.10) |
| Owned stocks, 2008-2014=1 | | | | | | | | 6.21*** (1.56) |
| Rate of return on stocks, 2008-2014 | | | | | | | | 0.36 (0.54) |
| Year dummies for educational attainment | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Gross income decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Steepness of income profile decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Expected income growth decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Self-reported school grades decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Parental wealth decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Wealth at age 18 decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Demographic controls | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Age dummies | No | No | No | Yes | No | No | No | No |
| Constant | 42.81*** (1.16) | 39.56*** (1.82) | 31.84*** (3.94) | -305236.88*** (82509.23) | 32.13*** (4.24) | 38.56*** (4.95) | 26.64*** (6.40) | 45.80*** (6.00) |
| Observations | 3620 | 3620 | 3552 | 3552 | 3552 | 1353 | 2157 | 2157 |
| Adj. R-squared | 0.01 | 0.02 | 0.08 | 0.08 | 0.08 | 0.03 | 0.08 | 0.19 |

Quantitative effect still large with
controls (median: 487k)

Non-constant discounting and monotonicity violations

- Non-constant discounting:
 - # blocks paid out early: (0;8) - (8;16)
 - For each of five interest rates offered in the experiment
 - Calculate average within each individual.



- Monotonicity violations in choice tasks: dummy.

Results:

Effect still large in multivariate setting

| Dep. var.: Wealth | (1) Rank | (2) Rank | (3) Rank | (4) DKK | (5) Rank | (6) Rank | (7) Rank | (8) Rank |
|--|--------------------|--------------------|--------------------|-----------------------------|--------------------|--------------------|--------------------|--------------------|
| Patience | 11.37*** (1.73) | 9.59*** (1.75) | 8.45*** (1.75) | 146914.66*** (39742.53) | 9.45*** (1.92) | -1.44 (2.29) | 11.14*** (2.41) | 7.71*** (2.25) |
| Risk aversion | | | 2.53 (2.04) | 49227.45 (56820.65) | 2.45 (2.04) | -2.81 (2.84) | 5.31* (2.70) | 3.18 (2.54) |
| Altruism | | | | | -3.67 (2.16) | | | |
| Future bias=1 | | | | | 2.58 (1.32) | | | |
| Present bias=1 | | | | | 1.23 (1.33) | | | |
| Non-monotonic choices in time tasks=1 | | | | | -1.99 (1.07) | | | |
| Interest rate on liquidity | | | | | | | | -1.63*** (0.10) |
| Owned stocks, 2008-2014=1 | | | | | | | | 6.21*** (1.56) |
| Rate of return on stocks, 2008-2014 | | | | | | | | 0.36 (0.54) |
| Year dummies for educational attainment | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Gross income decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Steepness of income profile decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Expected income growth decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Self-reported school grades decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Parental wealth decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Wealth at age 18 decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Demographic controls | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Age dummies | No | No | No | Yes | No | No | No | No |
| Constant | 42.81*** (1.16) | 39.56*** (1.82) | 31.84*** (3.94) | -305236.88*** (82509.23) | 32.13*** (4.24) | 38.56*** (4.95) | 26.64*** (6.40) | 45.80*** (6.00) |
| Observations | 3620 | 3620 | 3552 | 3552 | 3552 | 1353 | 2157 | 2157 |
| Adj. R-squared | 0.01 | 0.02 | 0.08 | 0.08 | 0.08 | 0.03 | 0.08 | 0.19 |

Non-constant time discounting +
monotonicity violations + altruism

- **Credit constraint:** $1[\text{Liquid assets} < 1 \text{ month disposable income}]$
E.g. Zeldes 1989; Johnson et al. 2006; Leth-Petersen 2010
- **Soft credit constraint / marginal interest rate**
 - Use account level data for all our subjects (from tax authorities), 2014
 - Marginal interest rate = highest rate from loan accounts or lowest rate from deposit accounts if no loans
 - Kreiner et al. (AEJ: POL 2019)
- **Stock market participation and rate of return**

Results:

Effect still large in multivariate setting

| Dep. var.: Wealth | (1) Rank | (2) Rank | (3) Rank | (4) DKK | (5) Rank | (6) Rank | (7) Rank | (8) Rank |
|--|--------------------|--------------------|--------------------|-----------------------------|--------------------|--------------------|--------------------|--------------------|
| Patience | 11.37*** (1.73) | 9.59*** (1.75) | 8.45*** (1.75) | 146914.66*** (39742.53) | 9.45*** (1.92) | -1.44 (2.29) | 11.14*** (2.41) | 7.71*** (2.25) |
| Risk aversion | | | 2.53 (2.04) | 49227.45 (56820.65) | 2.45 (2.04) | -2.81 (2.84) | 5.31* (2.70) | 3.18 (2.54) |
| Altruism | | | | | -3.67 (2.16) | | | |
| Future bias=1 | | | | | 2.58 (1.32) | | | |
| Present bias=1 | | | | | 1.23 (1.33) | | | |
| Non-monotonic choices in time tasks=1 | | | | | -1.99 (1.07) | | | |
| Interest rate on liquidity | | | | | | | | -1.63*** (0.10) |
| Owned stocks, 2008-2014=1 | | | | | | | | 6.21*** (1.56) |
| Rate of return on stocks, 2008-2014 | | | | | | | | 0.36 (0.54) |
| Year dummies for educational attainment | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Gross income decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Steepness of income profile decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Expected income growth decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Self-reported school grades decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Parental wealth decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Wealth at age 18 decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Demographic controls | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Age dummies | No | No | No | Yes | No | No | No | No |
| Constant | 42.81*** (1.16) | 39.56*** (1.82) | 31.84*** (3.94) | -305236.88*** (82509.23) | 32.13*** (4.24) | 38.56*** (4.95) | 26.64*** (6.40) | 45.80*** (6.00) |
| Observations | 3620 | 3620 | 3552 | 3552 | 3552 | 1353 | 2157 | 2157 |
| Adj. R-squared | 0.01 | 0.02 | 0.08 | 0.08 | 0.08 | 0.03 | 0.08 | 0.19 |

Low / high
Split by hard constraint

Results:

Effect still large in multivariate setting

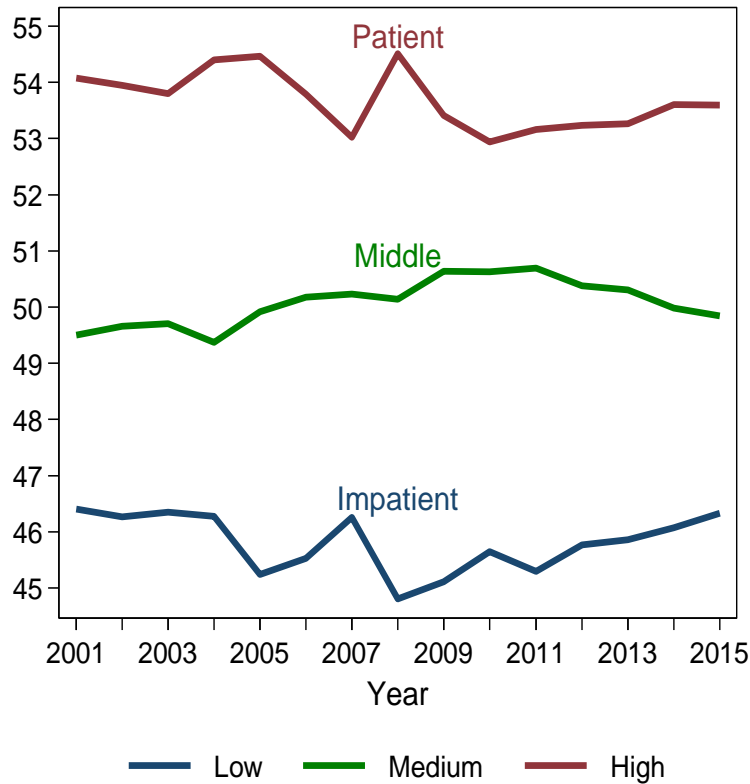
| Dep. var.: Wealth | (1) Rank | (2) Rank | (3) Rank | (4) DKK | (5) Rank | (6) Rank | (7) Rank | (8) Rank |
|--|--------------------|--------------------|--------------------|-----------------------------|--------------------|--------------------|--------------------|--------------------|
| Patience | 11.37*** (1.73) | 9.59*** (1.75) | 8.45*** (1.75) | 146914.66*** (39742.53) | 9.45*** (1.92) | -1.44 (2.29) | 11.14*** (2.41) | 7.71*** (2.25) |
| Risk aversion | | | 2.53 (2.04) | 49227.45 (56820.65) | 2.45 (2.04) | -2.81 (2.84) | 5.31* (2.70) | 3.18 (2.54) |
| Altruism | | | | | -3.67 (2.16) | | | |
| Future bias=1 | | | | | 2.58 (1.32) | | | |
| Present bias=1 | | | | | 1.23 (1.33) | | | |
| Non-monotonic choices in time tasks=1 | | | | | -1.99 (1.07) | | | |
| Interest rate on liquidity | | | | | | | | -1.63*** (0.10) |
| Owned stocks, 2008-2014=1 | | | | | | | | 6.21*** (1.56) |
| Rate of return on stocks, 2008-2014 | | | | | | | | 0.36 (0.54) |
| Year dummies for educational attainment | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Gross income decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Steepness of income profile decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Expected income growth decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Self-reported school grades decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Parental wealth decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Wealth at age 18 decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Demographic controls | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Age dummies | No | No | No | Yes | No | No | No | No |
| Constant | 42.81*** (1.16) | 39.56*** (1.82) | 31.84*** (3.94) | -305236.88*** (82509.23) | 32.13*** (4.24) | 38.56*** (4.95) | 26.64*** (6.40) | 45.80*** (6.00) |
| Observations | 3620 | 3620 | 3552 | 3552 | 3552 | 1353 | 2157 | 2157 |
| Adj. R-squared | 0.01 | 0.02 | 0.08 | 0.08 | 0.08 | 0.03 | 0.08 | 0.19 |

High Liquid asset group: marginal interest rate + stock ownership + stock return

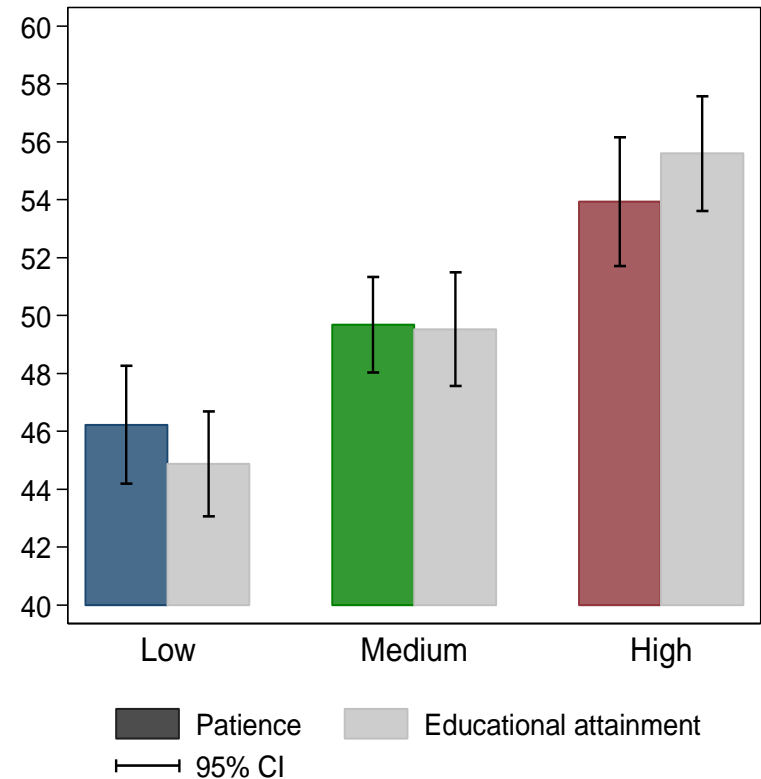
Robustness: Measure of time discounting thirty years earlier

Patience 1973 and wealth rank

Patience 1973 and wealth rank, 2001-2015



Patience 1973 vs education, wealth rank 2001



Robustness - summary

- Broad wealth concept (housing, car assets, pension wealth – only 2014)
- Narrow wealth concept (financial wealth)
- Structural estimation of preferences (RUM), including present bias
- 248 education groups
- Subsample: Stable income (no health events, no unemployment shocks), average income and wealth over 3, 5, 7 years to reduce importance of transitory components...
- Rank based on wealth-to-permanent income
- Selection into experiment: Inverse probability weighting
 - respondents vs. non-respondents
 - respondents vs. population
-

Summary and conclusion

Association between patience and position in the wealth distribution:

- Quantitatively important
- Precisely estimated
- Stable over time
- Operates throughout the wealth distribution

Still large association when including a comprehensive set of theory motivated controls for life-time resources \Rightarrow suggests that savings behaviour is a driver as predicted by standard savings theory

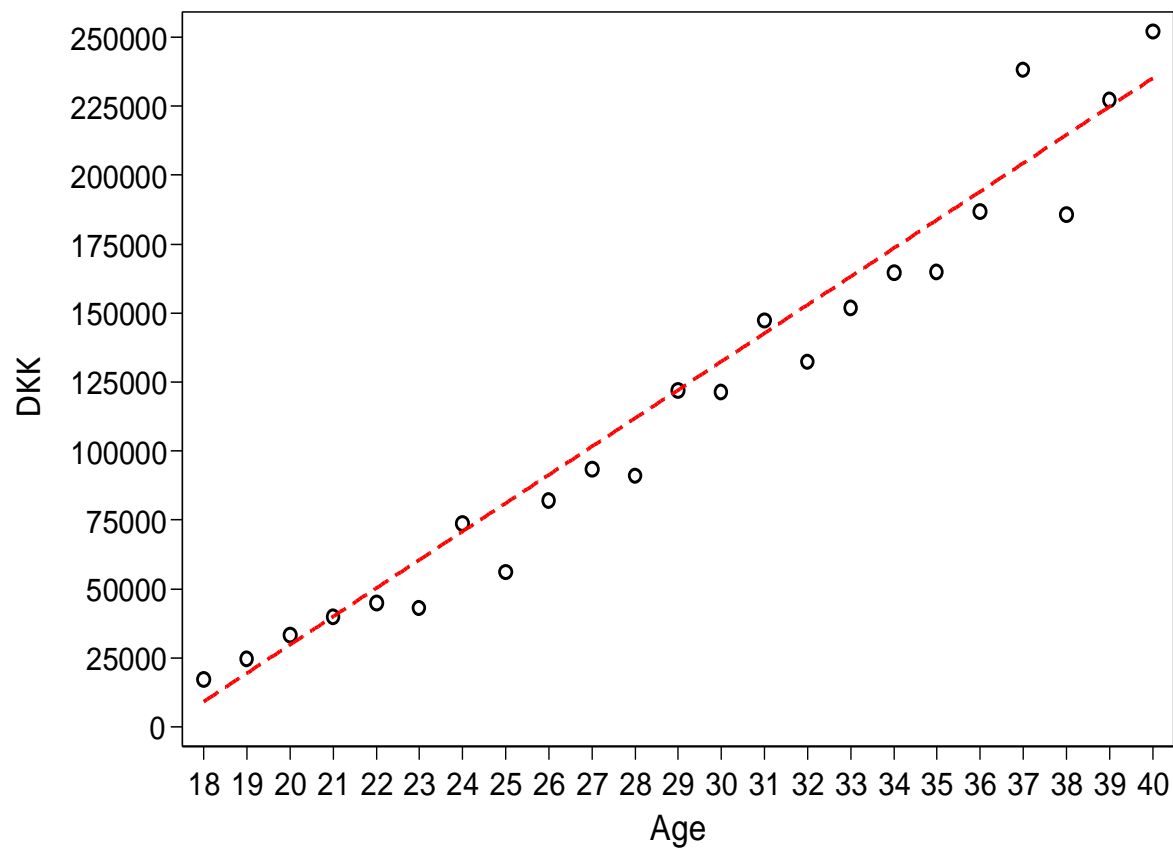
Point to the fruitfulness of incorporating heterogeneous time discounting in models of consumption and savings behavior

Krusell and Smith (1998), Hubmer et al. (2016), Krueger et al. (2016), Carroll et al. (2017), De Nardi and Fella (2017) and Alan et al. (2018)

More generally, the findings suggest that behavioral heterogeneity has an important role to play in the formation of inequality

EXTRA SLIDES

Relationship between wealth and patience by age



Early measurement of time discounting

Danish Longitudinal Survey of Youth (DLSY)

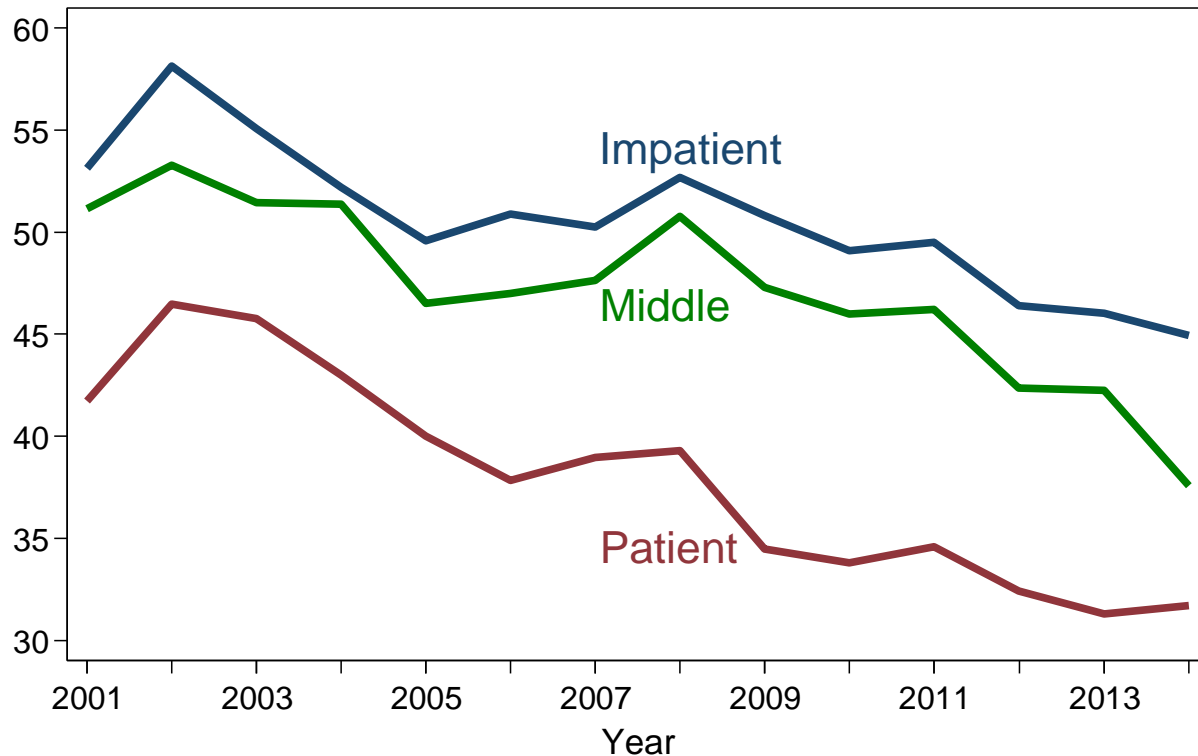
Crude measure of time discounting collected in 1973 for a sample of 2,389 individuals from the 1952-1955 cohorts

If given the offer between the three following jobs, which one would you choose?

- (i) A job with an average salary from the start (impatient)*
- (ii) A job with low salary the first two years but high salary later (middle).*
- (iii) A job with very low salary the first four years but later very high salary (patient)*

Results:

Credit constraints, market interest rates, asset returns



Persistent differences across patience groups over a long period \Rightarrow

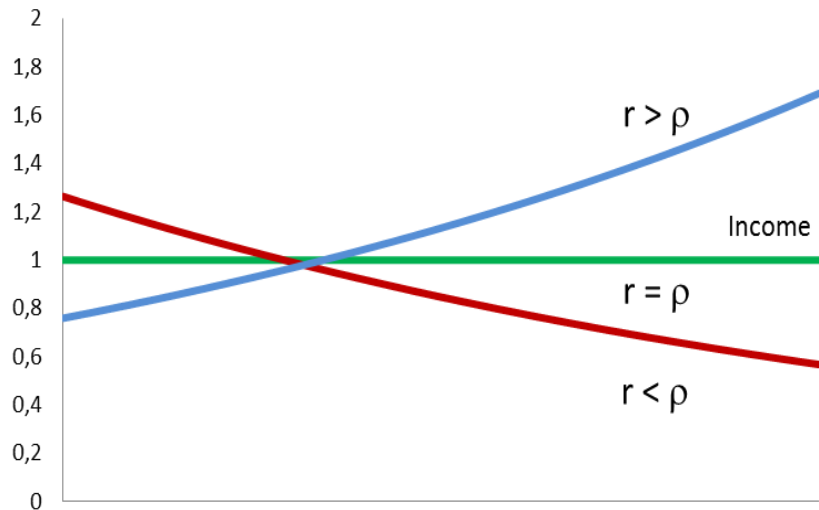
- pattern not generated by short-term shocks
- suggests a persistent behavioural factor at work

Early measurement of time discounting

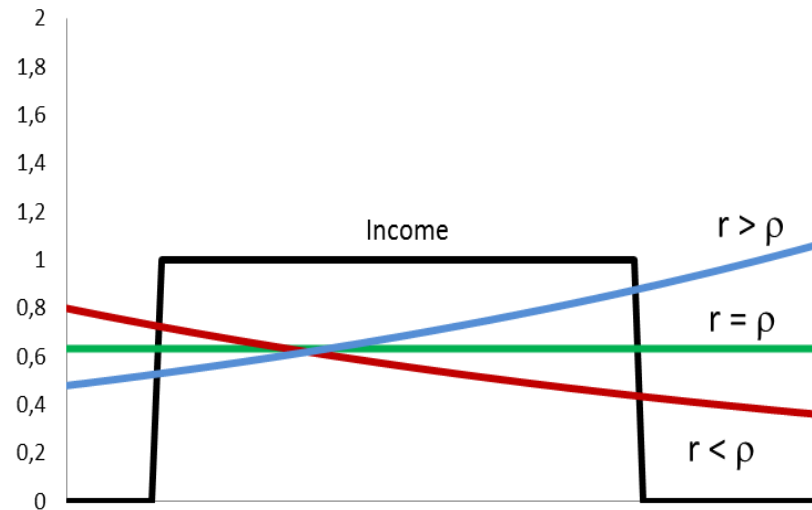
| Dep. var.: Wealth | (1) Rank | (2) Rank | (3) DKK |
|---|--------------------|--------------------|---------------------------|
| Patience, high | 7.71*** (1.54) | 3.24* (1.51) | 111500.56* (44864.69) |
| Patience, medium | 3.49** (1.34) | 1.54 (1.30) | 55350.96 (57706.25) |
| Year dummies for educational attainment | No | Yes | Yes |
| Gross income decile dummies | No | Yes | Yes |
| Wealth decile dummies, 1983 | No | Yes | Yes |
| Demographic controls | No | Yes | Yes |
| Constant | 46.23*** (1.04) | 25.69*** (2.89) | -120010.35 (216098.58) |
| Observations | 2546 | 2546 | 2546 |
| Adj. R-squared | 0.01 | 0.13 | 0.03 |

Savings Theory

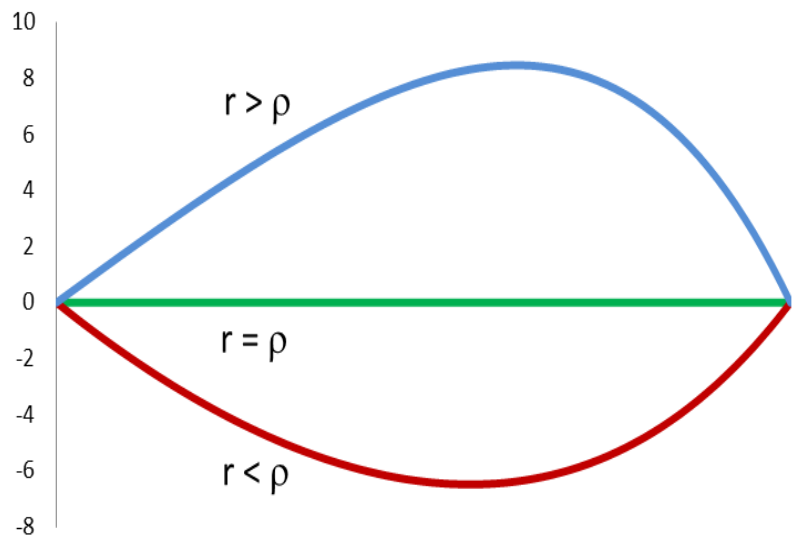
Income/consumption over the lifecycle



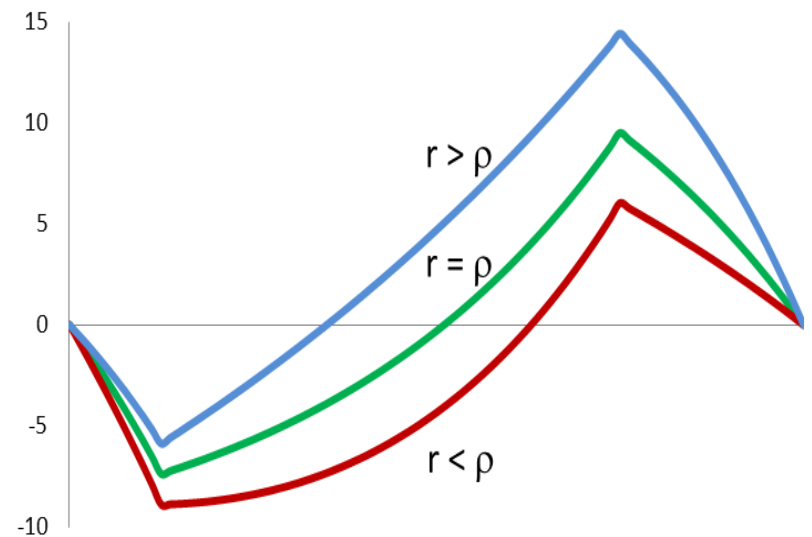
Income/consumption over the lifecycle



Wealth over the lifecycle



Wealth over the lifecycle



Some open issues

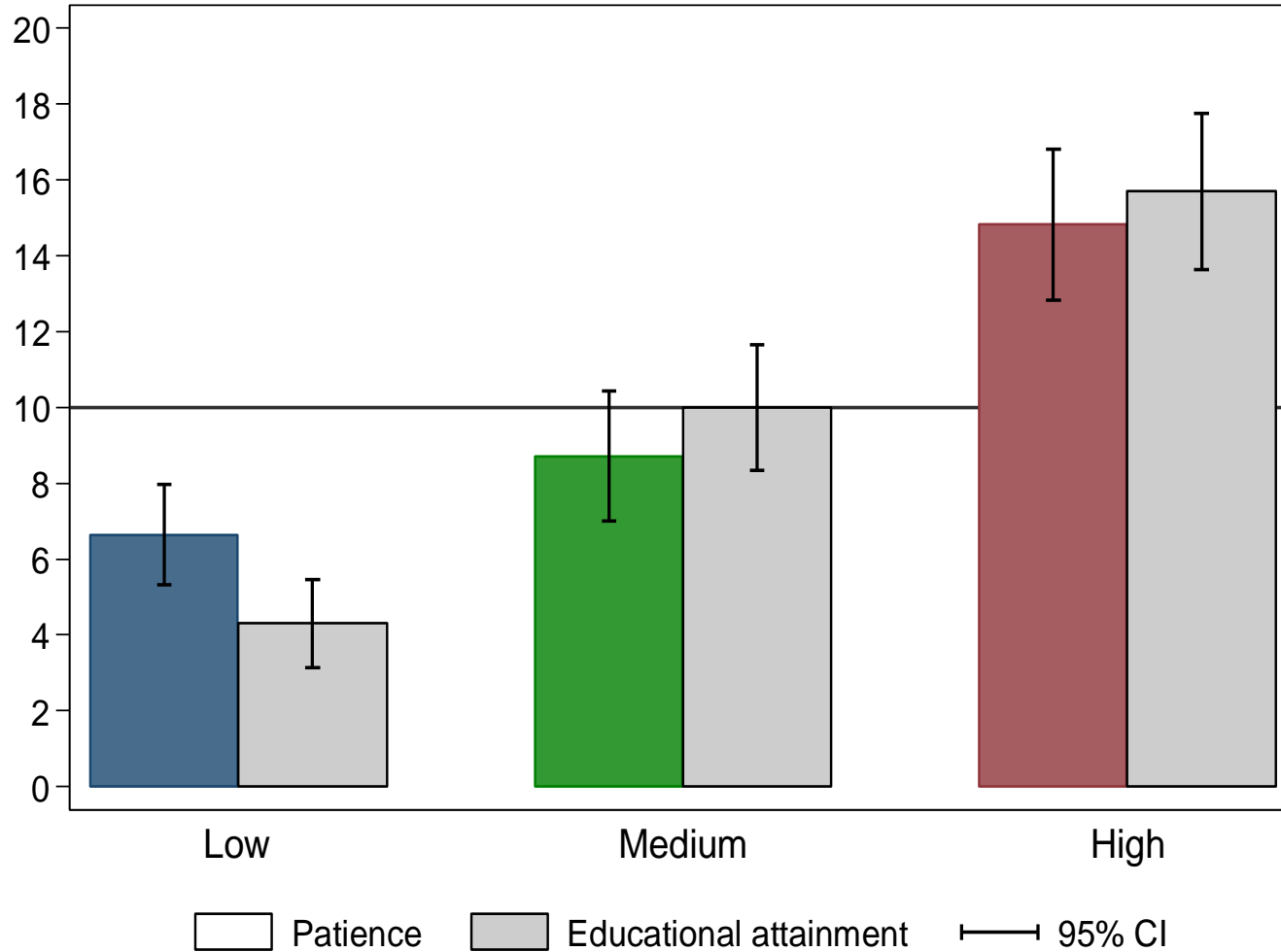
Closer link between experimental literature and Macro?

- Making a direct link between experimentally elicited discounting behavior and discount rates entering models of aggregate savings behavior would be a natural next step, but a challenge in practice...
- Elicited discount rates in small-stake experiments much higher than what is implied by aggregate models of discounting (our results rely only on the ordering of patience across individuals)

Normative implications?

- Differences in patience generate wealth inequality for individuals having similar life-time consumption possibilities (equal opportunities) \Rightarrow does not call for redistribution policy
- High degree of impatience may reflect behavioral biases, which might call for policies that reduce wealth inequality, e.g. forced pensions savings schemes (Chetty et al 2014)

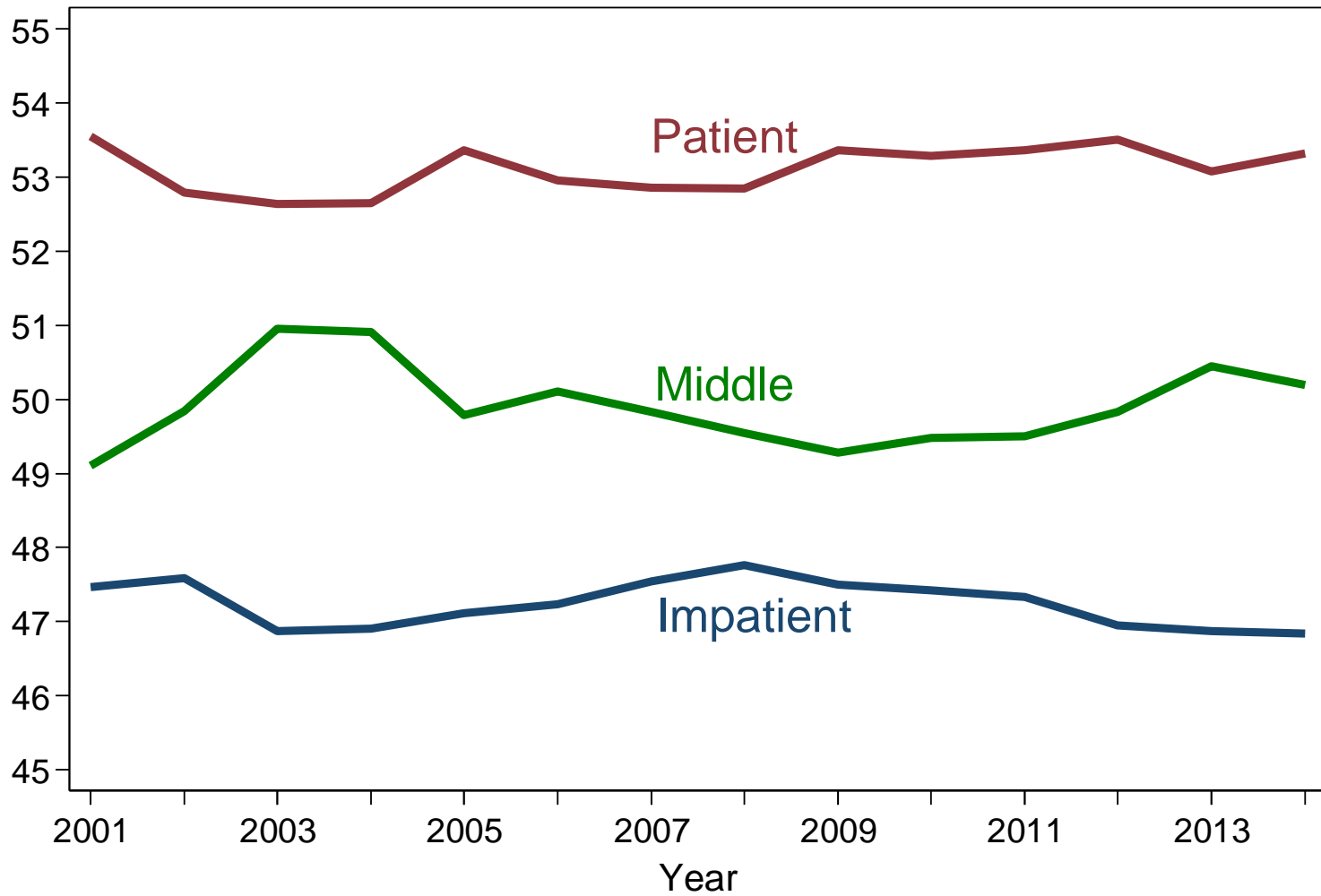
Results: Top 10% wealthiest



APPENDIX I

FURTHER SENSITIVITY ANALYSES

Results: Rank based on wealth to permanent income



Note: Dependent variable is the percentile rank of net wealth/average income (avg 2012-2014)

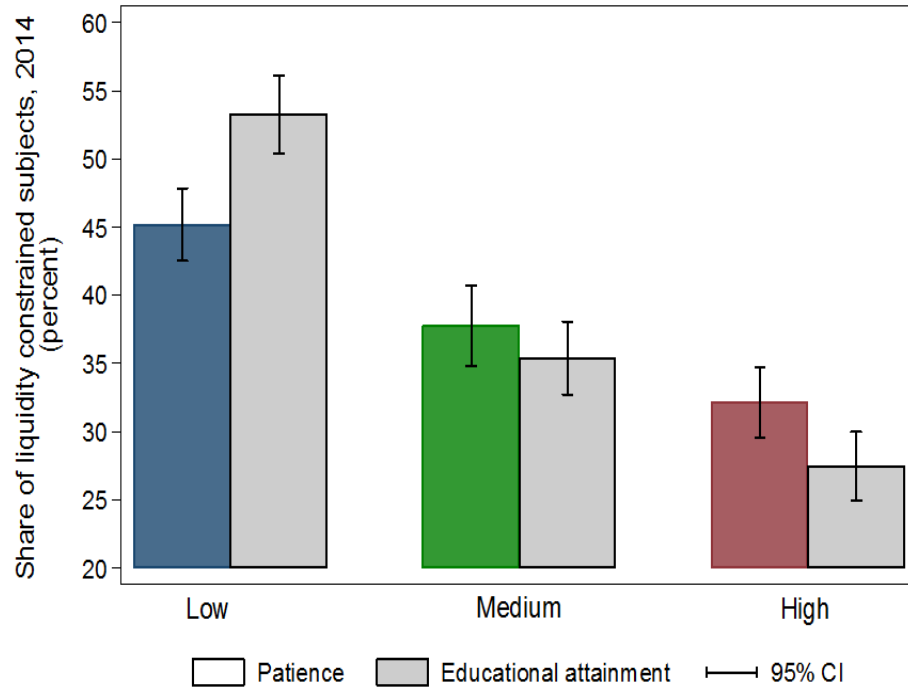
Robustness analyses: Regressions with savings rates

| Dep. var.: Savings rate percentile rank | (1) (W_t - W_{t-1})/Y_t | (2) (W_14 - W_04)/Y_14 |
|--|----------------------------|---------------------------|
| Patience | 1.67*** (0.45) | 5.29*** (1.54) |
| Risk aversion | 1.25* (0.57) | 4.39* (1.96) |
| Year dummies for educational attainment | Yes | Yes |
| Gross income decile dummies | Yes | Yes |
| Self-reported school grades decile dummies | Yes | Yes |
| Parental wealth decile dummies | Yes | Yes |
| Demographic controls | Yes | Yes |
| Year dummies | Yes | No |
| Constant | 34.02*** (1.49) | 38.24*** (3.44) |
| Observations | 36320 | 3352 |
| Adj. R-squared | 0.03 | 0.03 |

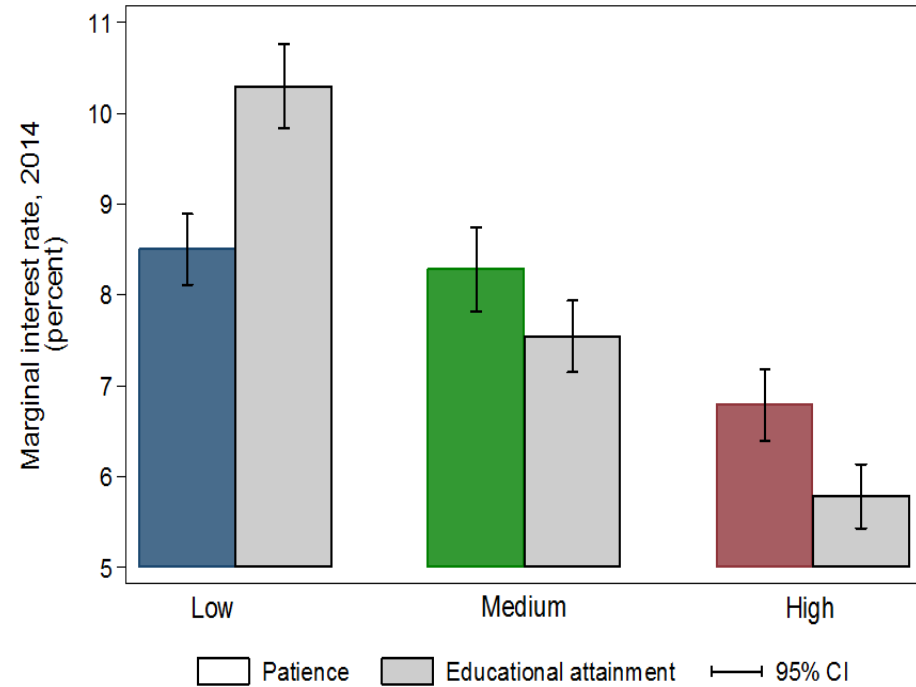
Results:

Credit constraints, market interest rates, asset returns

Hard credit constraints

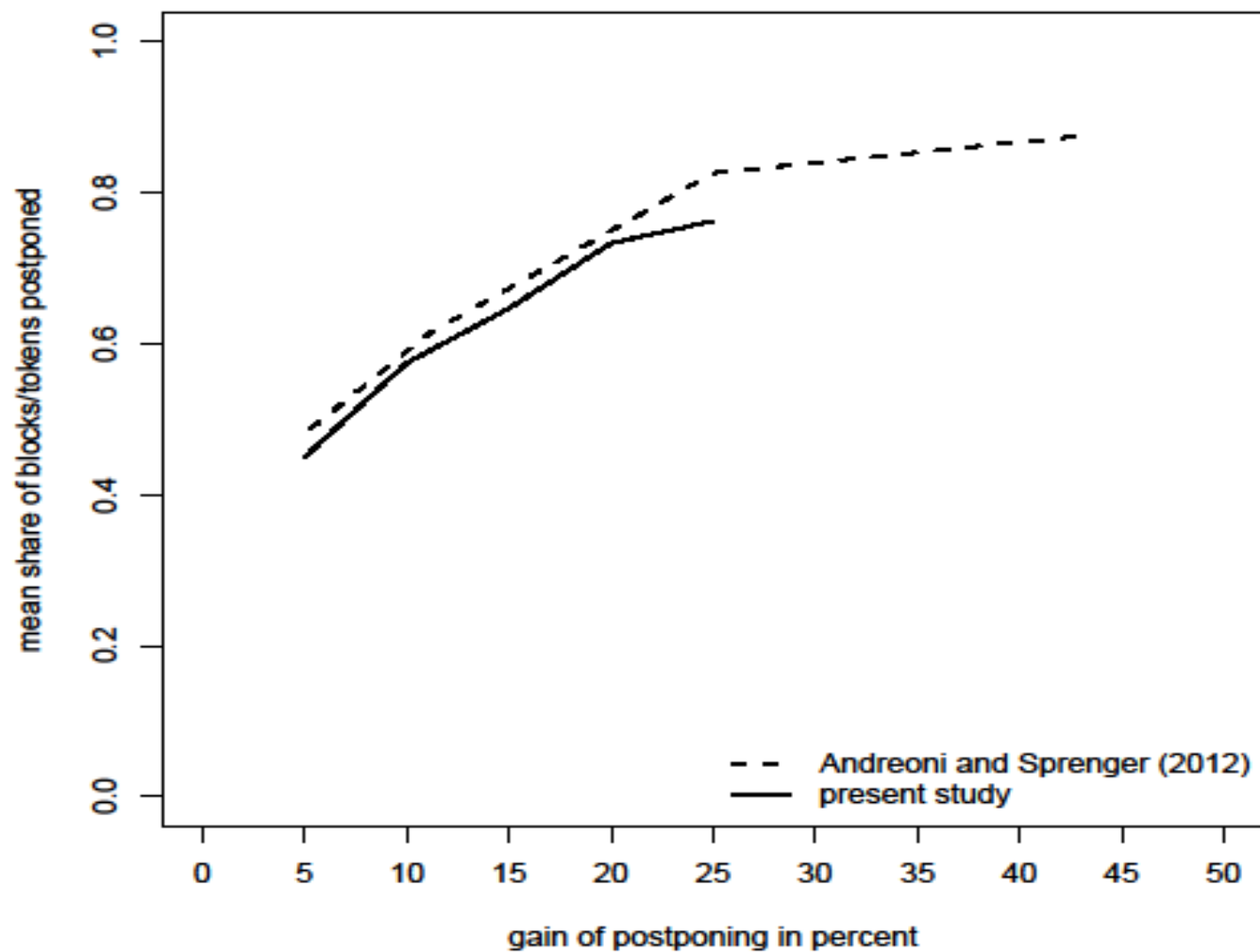


Soft credit constraints



APPENDIX II
COMPARISON TO PREVIOUS EXPERIMENTAL STUDIES
ESTIMATION OF DISCOUNT RATES

Comparison of distribution of choices



Structural estimation of time discounting

RUM with discount rate + linear utility + additive choice noise

Mean discount rate: 0.52

Nonparametric impatience index and estimated discount rates highly correlated : Spearman's rho = 0.92; p = 0.0000

Main table with patience rank based on estimated discount rates

| Dep. var.: Wealth percentile rank | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|--|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Rank of estimated discount rate | 8.85*** (1.80) | 7.54*** (1.81) | 7.45*** (1.81) | 7.85*** (1.89) | 7.22*** (1.86) | 6.03** (1.84) | 6.24*** (1.86) | 6.26*** (1.87) |
| Risk aversion | | | | | | | 2.10 (2.12) | 2.12 (2.13) |
| Year dummies for educational attainment | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Gross income decile dummies | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Self-reported school grades decile dummies | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Wealth at age 18 decile dummies | No | No | No | No | Yes | Yes | Yes | Yes |
| Parental wealth decile dummies | No | No | No | No | No | Yes | Yes | Yes |
| Demographic controls | No | No | No | No | No | No | No | Yes |
| Constant | 54.72*** (1.06) | 51.27*** (1.78) | 52.18*** (2.08) | 51.51*** (2.59) | 44.99*** (2.80) | 41.51*** (3.24) | 40.60*** (3.36) | 40.95*** (3.51) |
| Observations | 3097 | 3097 | 3097 | 2871 | 2871 | 2871 | 2871 | 2871 |
| Adj. R-squared | 0.01 | 0.02 | 0.03 | 0.03 | 0.05 | 0.07 | 0.07 | 0.07 |

Structural estimation of time discounting

Quasi-hyperbolic discount function + utility curvature + error term

No evidence of present bias (i.e. choices in 0-2 and 2-4 tradeoffs do not differ significantly)

Only very weak concavity (consistent with most choices being at the boundaries)

Mean discount rate: 0.58

Positive correlation between nonparametric impatience and estimated discount rate (specification 2): Spearman's $\rho = 0.75$; $p = 0.0000$

Structural estimation

- **Specification 1: Discount rate + const. MU of income + error term**

- Discount function: exponential

$$d(t, \rho) = e^{-\rho \frac{t}{12}}$$

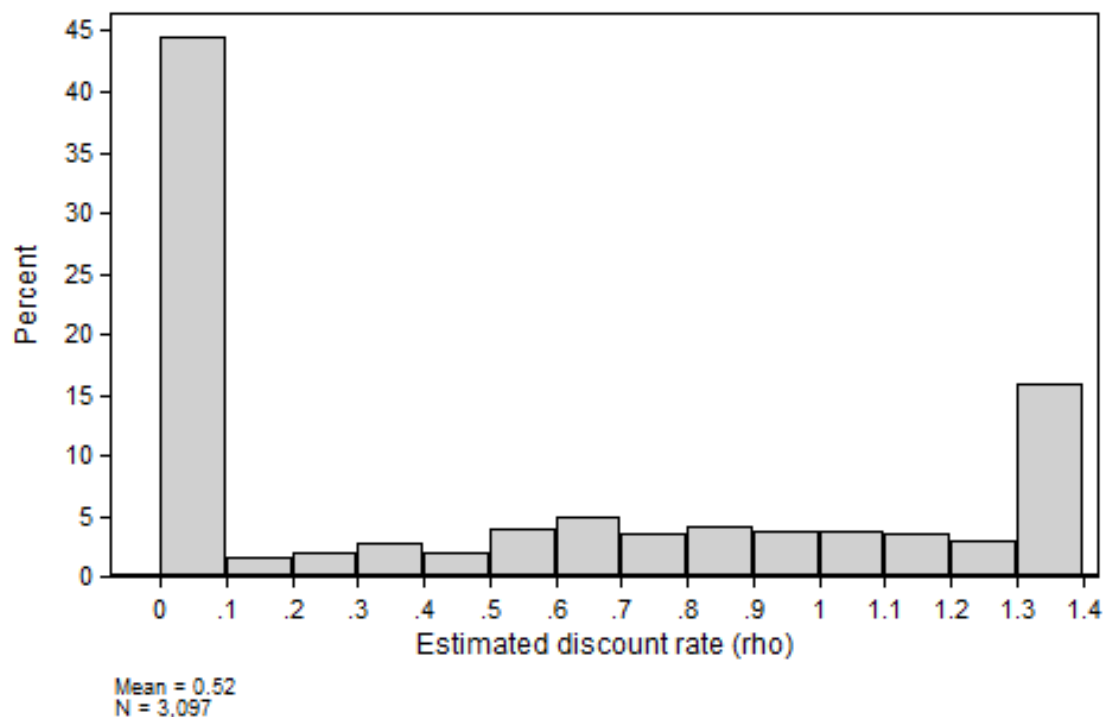
- Stochastic choice: Random Utility Model with additive choice noise => choice probabilities

$$pr(S_j) = pr(U(S_j) - U(S_{-j}) > \varepsilon_{-j} - \varepsilon_j) = \frac{e^{\lambda V(S_j)}}{\sum_{k \in J} e^{\lambda V(S_k)}}$$

- For comparability with our nonparametric measure, we take only the 2-4 mt choice situations
- Maximum likelihood estimation

Results: Specification 1

- Assign maximum discount rate (1.40) to subjects who always keep all blocks
- Assign minimum discount rate (0.00) to subjects who always save all blocks



- Positive correlation between nonparametric impatience and estimated discount rate (specification 1): Spearman's rho = 0.92; $p = 0.0000$

Structural estimation

- **Specification 2: More flexible discount function + utility curvature + error term**

- Discount function: quasi-hyperbolic

$$d(t = 0, \psi, \rho) = 1$$

$$d(t > 0, \psi, \rho) = (1 - \psi)e^{\frac{-\rho t}{12}}$$

- Utility function: isoelastic

$$u(x, \mu = 1) = \ln x$$

$$u(x, \mu \neq 1) = \frac{x^{1-\mu}}{1-\mu}$$

- Stochastic choice: random utility model with additive choice noise
 - Including all choice situations

APPENDIX III

FURTHER INFORMATION ABOUT EXPERIMENT

Overview over time choice tasks

- X1 (X2) is value of block allocated to t1 (t2)
- Rate is the implied annual rate of return

| choiceId | x1 | x2 | t1 | t2 | delay | rate | |
|----------|-----|-----|----|----|-------|-------|--------|
| 1 | 100 | 105 | 0 | 2 | 2 | 0.340 | |
| 2 | 100 | 110 | 0 | 2 | 2 | 0.772 | |
| 3 | 100 | 115 | 0 | 2 | 2 | 1.313 | |
| 4 | 100 | 120 | 0 | 2 | 2 | 1.986 | |
| 5 | 100 | 125 | 0 | 2 | 2 | 2.815 | |
| 6 | 100 | 105 | 0 | 4 | 4 | 0.158 | |
| 7 | 100 | 115 | 0 | 4 | 4 | 0.521 | |
| 8 | 100 | 125 | 0 | 4 | 4 | 0.953 | |
| 9 | 100 | 135 | 0 | 4 | 4 | 1.460 | |
| 10 | 100 | 145 | 0 | 4 | 4 | 2.049 | |
| 11 | 100 | 105 | 2 | 4 | 2 | 0.340 | |
| 12 | 100 | 110 | 2 | 4 | 2 | 0.772 | |
| 13 | 100 | 115 | 2 | 4 | 2 | 1.313 | ----- |
| 14 | 100 | 120 | 2 | 4 | 2 | 1.986 | -1.200 |
| 15 | 100 | 125 | 2 | 4 | 2 | 2.815 | -1.250 |

Alternative patience measures: Overview over time choice tasks

| | choiceId | x1 | x2 | t1 | t2 | delay | rate |
|---------|----------|-----|-----|----|----|-------|-------|
| ■ X1 (X | 1 | 100 | 105 | 0 | 2 | 2 | 0.340 |
| ■ Rate | 2 | 100 | 110 | 0 | 2 | 2 | 0.772 |
| | 3 | 100 | 115 | 0 | 2 | 2 | 1.313 |
| | 4 | 100 | 120 | 0 | 2 | 2 | 1.986 |
| | 5 | 100 | 125 | 0 | 2 | 2 | 2.815 |
| | 6 | 100 | 105 | 0 | 4 | 4 | 0.158 |
| | 7 | 100 | 115 | 0 | 4 | 4 | 0.521 |
| | 8 | 100 | 125 | 0 | 4 | 4 | 0.953 |
| | 9 | 100 | 135 | 0 | 4 | 4 | 1.460 |
| | 10 | 100 | 145 | 0 | 4 | 4 | 2.049 |
| | 11 | 100 | 105 | 2 | 4 | 2 | 0.340 |
| | 12 | 100 | 110 | 2 | 4 | 2 | 0.772 |
| | 13 | 100 | 115 | 2 | 4 | 2 | 1.313 |
| | 14 | 100 | 120 | 2 | 4 | 2 | 1.986 |
| | 15 | 100 | 125 | 2 | 4 | 2 | 2.815 |

2 vs 4 months

Alternative patience measures: Overview over time choice tasks

- X1 (X
- Rate

| choiceId | x1 | x2 | t1 | t2 | delay | rate |
|----------|-----|-----|----|----|-------|-------|
| 1 | 100 | 105 | 0 | 2 | 2 | 0.340 |
| 2 | 100 | 110 | 0 | 2 | 2 | 0.772 |
| 3 | 100 | 115 | 0 | 2 | 2 | 1.313 |
| 4 | 100 | 120 | 0 | 2 | 2 | 1.986 |
| 5 | 100 | 125 | 0 | 2 | 2 | 2.815 |
| 6 | 100 | 105 | 0 | 4 | 4 | 0.158 |
| 7 | 100 | 115 | 0 | 4 | 4 | 0.521 |
| 8 | 100 | 125 | 0 | 4 | 4 | 0.953 |
| 9 | 100 | 135 | 0 | 4 | 4 | 1.460 |
| 10 | 100 | 145 | 0 | 4 | 4 | 2.049 |
| 11 | 100 | 105 | 2 | 4 | 2 | 0.340 |
| 12 | 100 | 110 | 2 | 4 | 2 | 0.772 |
| 13 | 100 | 115 | 2 | 4 | 2 | 1.313 |
| 14 | 100 | 120 | 2 | 4 | 2 | 1.986 |
| 15 | 100 | 125 | 2 | 4 | 2 | 2.815 |

0 vs 4 months

Alternative patience measures: Overview over time choice tasks

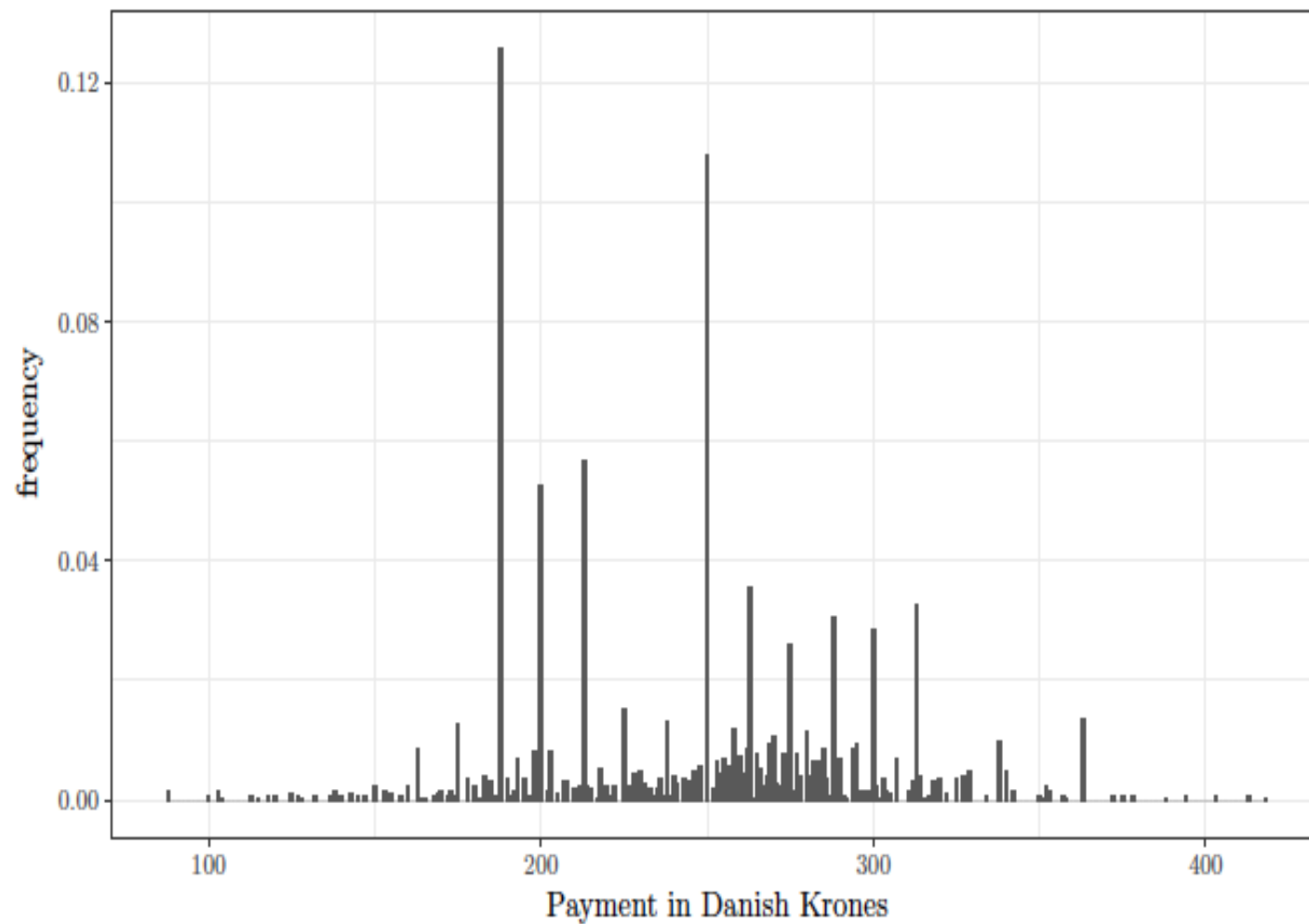
■ X1 (X

■ Rate

0 vs 2 months

| choiceId | x1 | x2 | t1 | t2 | delay | rate |
|----------|-----|-----|----|----|-------|-------|
| 1 | 100 | 105 | 0 | 2 | 2 | 0.340 |
| 2 | 100 | 110 | 0 | 2 | 2 | 0.772 |
| 3 | 100 | 115 | 0 | 2 | 2 | 1.313 |
| 4 | 100 | 120 | 0 | 2 | 2 | 1.986 |
| 5 | 100 | 125 | 0 | 2 | 2 | 2.815 |
| 6 | 100 | 105 | 0 | 4 | 4 | 0.158 |
| 7 | 100 | 115 | 0 | 4 | 4 | 0.521 |
| 8 | 100 | 125 | 0 | 4 | 4 | 0.953 |
| 9 | 100 | 135 | 0 | 4 | 4 | 1.460 |
| 10 | 100 | 145 | 0 | 4 | 4 | 2.049 |
| 11 | 100 | 105 | 2 | 4 | 2 | 0.340 |
| 12 | 100 | 110 | 2 | 4 | 2 | 0.772 |
| 13 | 100 | 115 | 2 | 4 | 2 | 1.313 |
| 14 | 100 | 120 | 2 | 4 | 2 | 1.986 |
| 15 | 100 | 125 | 2 | 4 | 2 | 2.815 |

Distribution of payments from the experiment



Risk Task

invest more +

invest less -



40%

60%

in 40 of 100 cases
you receive a total
of 760

in 60 of 100 cases
you receive a total
of 1240

| | | | |
|---------------------|-----------------------|------------------------|-------------------------|
| 100 | | 70 | 130 |
| 100 | | 70 | 130 |
| you keep 200 | you invest 800 | you receive 560 | you receive 1040 |
| 100 | | 70 | 130 |
| 100 | | 70 | 130 |
| 100 | | 70 | 130 |
| 100 | | 70 | 130 |
| 100 | | 70 | 130 |
| 100 | | 70 | 130 |
| 100 | | 70 | 130 |
| 100 | | 70 | 130 |
| 100 | | 70 | 130 |

Confirm

Risk Choice Situations

| choiceId | vb | m1 | m2 | p |
|----------|-----|------|------|-----|
| 1 | 100 | 1.21 | 0.81 | 0.5 |
| 2 | 100 | 1.41 | 0.91 | 0.2 |
| 3 | 100 | 1.11 | 0.61 | 0.8 |
| 4 | 100 | 1.31 | 0.71 | 0.5 |
| 5 | 100 | 1.61 | 0.86 | 0.2 |
| 6 | 100 | 1.16 | 0.41 | 0.8 |
| 7 | 100 | 1.35 | 0.75 | 0.5 |
| 8 | 100 | 1.65 | 0.90 | 0.2 |
| 9 | 100 | 1.20 | 0.45 | 0.8 |
| 10 | 100 | 1.50 | 0.40 | 0.6 |
| 11 | 100 | 1.72 | 0.62 | 0.4 |
| 12 | 100 | 1.45 | 0.35 | 0.6 |
| 13 | 100 | 1.67 | 0.57 | 0.4 |
| 14 | 100 | 1.51 | 0.50 | 0.5 |
| 15 | 100 | 1.61 | 0.60 | 0.5 |

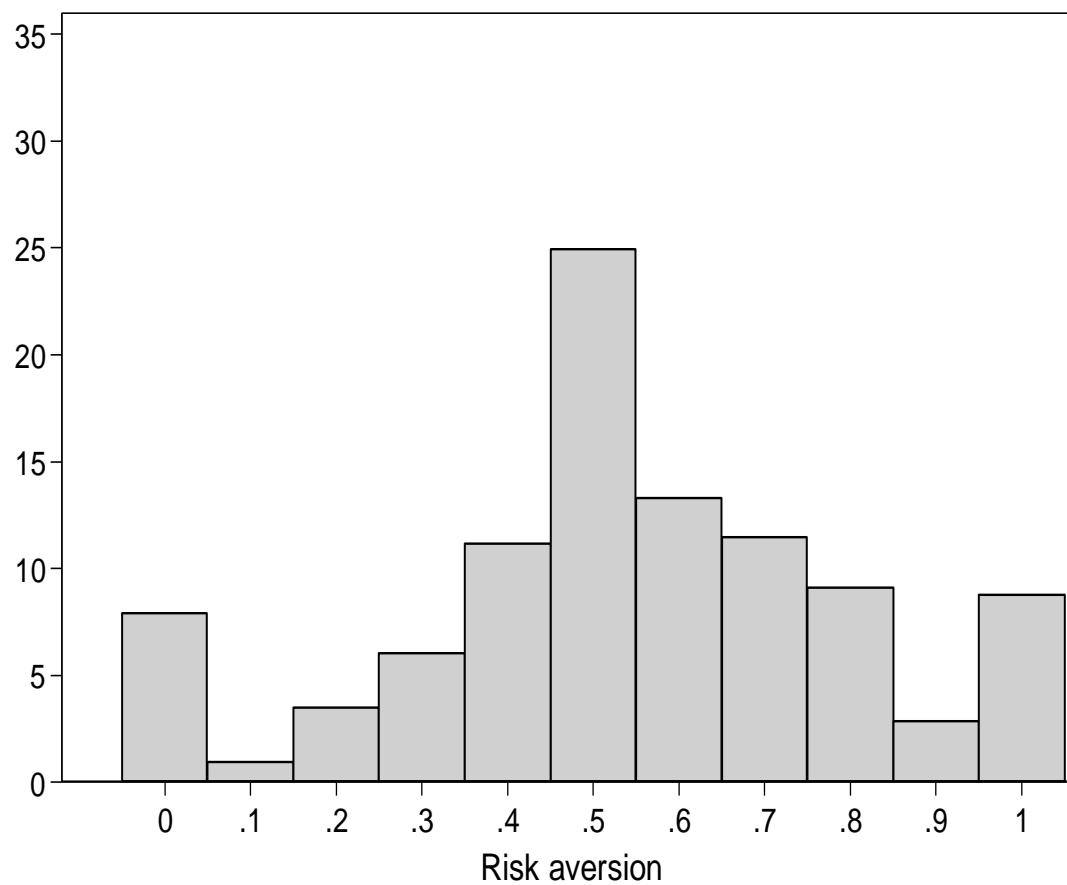
Risk aversion index

- Focus on choice tasks involving $p = 0.5$
- Risk aversion index:

$$\phi_{riskaversion} = average\left(\frac{z}{10}\right)$$

- z is the number of blocks kept in the safe account in each choice situation
- $\phi_{riskaversion} \in [0,1]$. High values indicate greater risk aversion

Distribution of risk aversion measure

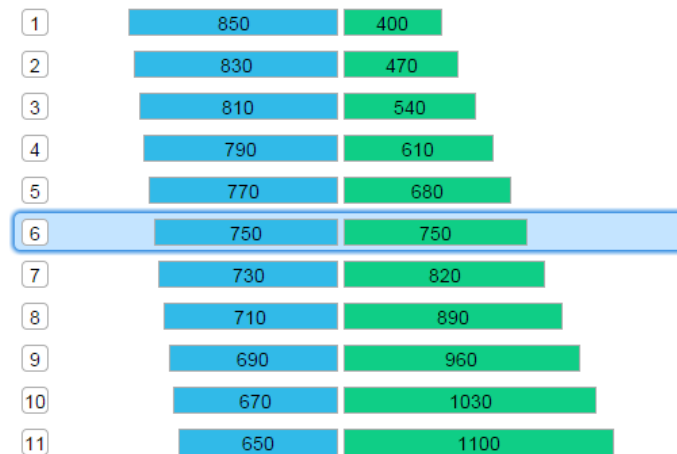


DELING AF PENGEBELØB IMELLEM DIG OG EN ANDEN PERSON

Hjælp

Beslutningssituation 1 af 12

Du får ■ | ■ Anden person får



Bekræft

Altruism index: $\phi_{Altruism} = average\left(\frac{z}{11}\right)$

CRRA

- CRRA has ambiguous effect on wealth depending on the relative size of the rate of time preference and the real interest rate on savings
- $\frac{\partial w}{\partial \theta} \leq 0$ if $r > \rho$ and $\frac{\partial w}{\partial \theta} \geq 0$ if $r < \rho$, and $\frac{\partial w}{\partial \theta} = 0$ if $r = \rho$

| | Low patience (1) | Medium patience (2) | High patience (3) | Low patience (4) | Medium patience (5) |
|----------------|---------------------|------------------------|----------------------|---------------------|------------------------|
| Risk aversion | 6.06+ (3.16) | 5.00 (4.10) | 0.46 (2.82) | 6.45* (3.14) | 5.15 (4.09) |
| Patience | | | | 8.54* (3.82) | 9.22 (8.21) |
| Constant | 43.58*** (1.97) | 47.85*** (2.28) | 52.62*** (1.74) | 40.90*** (2.31) | 41.14*** (6.40) |
| Observations | 1355 | 1044 | 1235 | 1355 | 1044 |
| Adj. R-squared | 0.00 | 0.00 | -0.00 | 0.00 | 0.00 |

Notes: OLS regressions. Dep. var.: Within-cohort average net asset percentile rank, 2012-2014. Robust standard errors in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Columns 4 and 5 control for variation in the patience measure within the 'Low' and 'Medium' patience groups, respectively. In the 'High' patience group, there is no variation in the patience measure (=1 for all).

APPENDIX IV
INVITATION LETTER

Invitation letter (original in Danish)

ØKONOMISK INSTITUT
KØBENHAVNS UNIVERSITET



Kære [redacted]

FEBRUAR 2015

Københavns Universitet inviterer dig til at deltage i en undersøgelse på internettet. Undersøgelsen er en del af et forskningsprojekt, der handler om at forstå grundlaget for danskernes økonomiske beslutninger. Vi ved allerede meget mere om folks privatøkonomiske beslutninger, end vi gjorde før den finansielle krise, men der er stadig meget, vi mangler at forstå – og det er derfor, vi spørger om din hjælp.

ØKONOMISK INSTITUT

ØSTER FARIMAGSGADE 5,
BYGNING 26
1353 KØBENHAVN K

TLF 35 33 02 77

analyse@econ.ku.dk

Det tager ca. 30-50 minutter at gennemføre undersøgelsen. Når du er færdig, vil du typisk modtage et præmiebeløb, og det vil automatisk blive overført til din NemKonto. Beløbets størrelse afhænger bl.a. af de valg, som du træffer i undersøgelsen og vil i gennemsnit svare til en god timeløn.

Undersøgelsen foregår på internettet. Du vil bl.a. blive bedt om at tage stilling til spørgsmål om opsparing og investering. Reglerne bliver forklaret, når du har logget ind. Undersøgelsen er åben for deltagelse til og med fredag d. 27. februar 2015.

Datatilsynet har godkendt forskningsprojektet, hvilket betyder, at vores procedurer opfylder persondatalovens krav til behandling af data. En vigtig del af Datatilsynets krav er, at dine svar bliver behandlet anonymt. For at sikre dig anonymitet har vi dannet et tilfældigt brugernavn til dig. For at deltage skal du logge ind på hjemmesiden: analyse.econ.ku.dk.

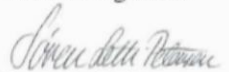
Dataansvarlig: Søren Leth-Petersen,
Professor

Brugernavn: deltager5795

Password: n4mw9!uay

Invitationen er personlig, og vi beder derfor om, at du ikke videregiver brugernavn og password til andre. Du er velkommen til at kontakte os, hvis du har problemer med at logge ind eller har yderligere spørgsmål. Du kan ringe til projektkoordinator Gregers Nytoft Rasmussen på telefonnummer 35 33 02 77 mandag-torsdag kl. 14.00-17.30 eller skrive til adressen analyse@econ.ku.dk.

Med venlig hilsen


Søren Leth-Petersen
Projektleder, professor

Invitation letter (translated into English)

Dear «name»,

University of Copenhagen invites you to participate in a study on the Internet. The study is part of a research project about understanding the basis for the Danes' financial decisions. We already know a lot more about people's personal financial decisions than we did before the financial crisis, but there is still much we need to understand - and that is why we are asking for your help.

It takes about 30-50 minutes to complete the study. When you are finished, you will typically receive prize money and it will be automatically transferred to your NemKonto. The amount depends, i.a., on the choices that you make during the study and will on average correspond to a decent hourly wage.

The study is conducted on the Internet. You will consider questions concerning savings and investments, among other things. The rules will be explained once you have logged in. The study is open for participation through «date».

The Data Protection Agency has approved the research project, which means that our procedures comply with the Act on Processing of Personal Data. An important part of the Data Protection Agency's requirements is that your answers will be treated anonymously. To ensure anonymity, we have formed a random username for you. To participate, please log in at the following website: **analyse.econ.ku.dk**.

Username: «username» Password: «password»

The invitation is personal and we therefore ask you not to pass on username and password to others. Please feel free to contact us if you are having trouble logging in or have any further questions. You can call project coordinator Gregers Nytoft Rasmussen at phone number 35 33 02 77 Monday-Thursday 2:00 p.m. - 5:30 p.m. or write to the address analyse@econ.ku.dk.

Sincerely yours,
Søren Leth-Petersen
Project manager, professor