Consumption

Harvard Economics 1011B
Professor Gabriel Chodorow-Reich
Spring 2020

January 30 and February 4

Outline

OUTLINE

Why consumption matters

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4. Consumption directly enters into welfare.
5. Object of policy intervention.

Questions addressed by consumption models

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2. What caused the spending boom of the mid 2000s?
3. What explains differences in household saving rates across countries?
4. What explains differences in saving rates across households?
5. Policy: suppose the economy enters a recession. To try to boost spending, the government sends checks directly to households. Total "stimulus" is $100 billion. Does spending increase? By how much? What does economic theory predict?

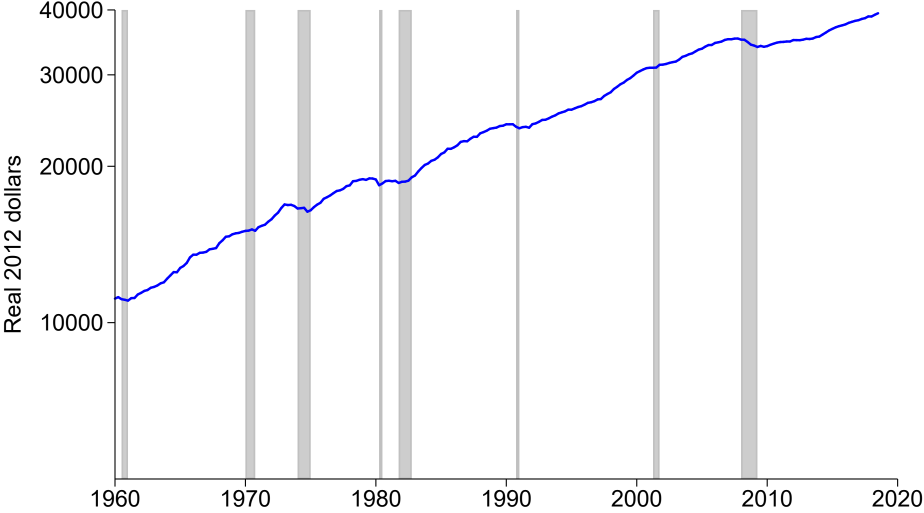
Consumption versus consumption expenditure

- Consumption expenditure refers to purchases of market goods and services used for consumption. This is what enters into GDP.
- Consumption is what enters into the utility function.
- Why are these different?

    1. Durable goods: purchase of a car generates consumption of transportation for many years.
    2. Home production: we consume goods and services (home cooked meals, cleaning your own house) which we produce ourselves rather than purchase on the market.

- Economists (myself included) often use the two terms interchangeably, but we shouldn't.

U.S. CONSUMPTION EXPENDITURE PER CAPITA



What counts in consumption expenditure?

1. Durable goods (average usable life of at least 3 years).
   - Example: car or couch.
   - Generate flow of consumption services over life of durable good.
   - Adjustment costs to change services flow (trade in your car).
   - Easy to substitute expenditure intertemporally.

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2. Nondurable goods.
   - Example: can of Coca Cola or tank of gas.
   - One-time or limited use.
3. Services.
   - Example: hair cut or airplane trip or restaurant meal or rent.
   - Not a tangible good.
   - Hard to substitute expenditure intertemporally.

Durable expenditure versus consumption flow

- Durable stock is accumulated purchases of durables net of depreciation.
- Depreciation is the decline in usability over time due to wear and tear, obselescence, accidental damage, and aging.
- Law of motion for durable stock:

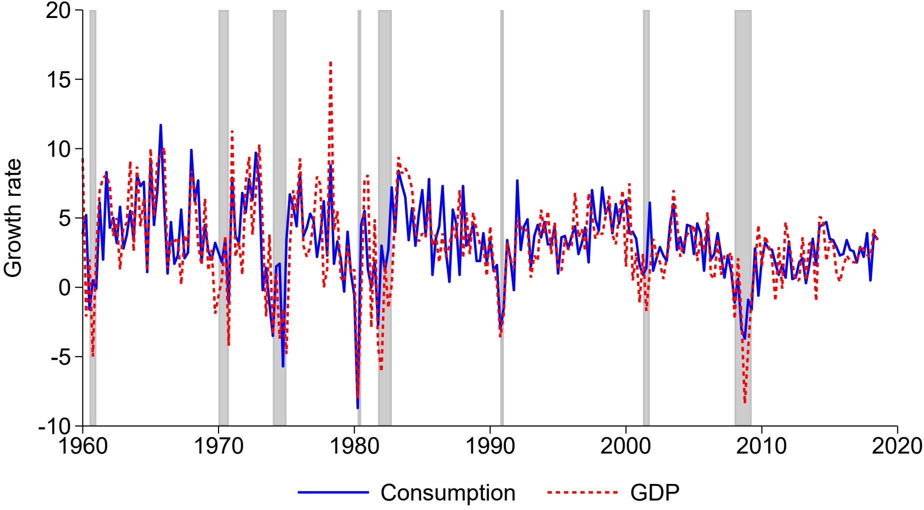
$$\underbrace{X_t}_{\text{Durable stock}} = (1 - \underbrace{\delta}_{\text{Depreciation}})X_{t-1} + \underbrace{C_t^D}_{\text{Durable expenditure}}.$$

- Durable exenditure enters into GDP (how much stuff has economy produced?).
- Durable stock enters into consumption (utility depends on existing stock of durables, not new purchases).

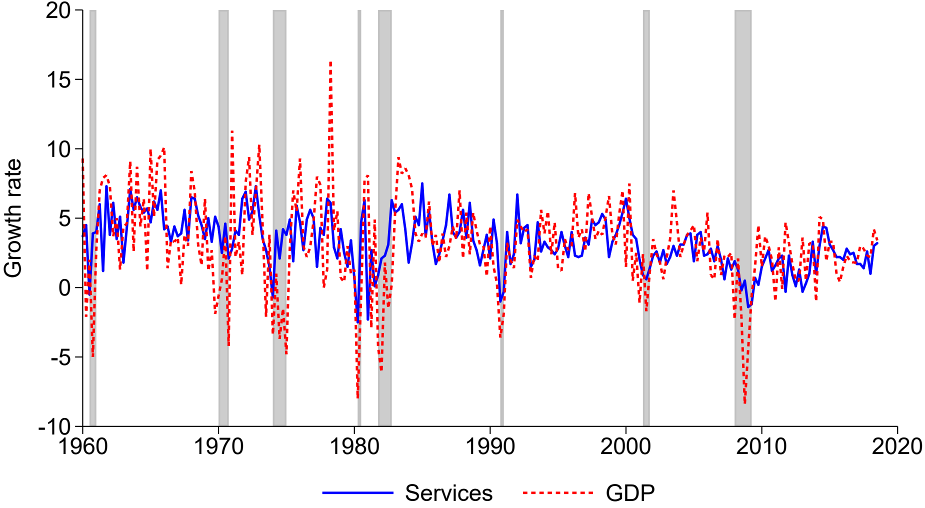
What counts in consumption expenditure?

Category	Billions of dollars	% of consumption	% of GDP
Personal consumption expenditures	12767	100.0	68.2
Goods	3996	31.3	21.4
Durable goods	1347	10.5	7.2
Motor vehicles and parts	484	3.8	2.6
Furnishings and household equipment	301	2.4	1.6
Recreational goods and vehicles	357	2.8	1.9
Other durable goods	204	1.6	1.1
Nondurable goods	2650	20.8	14.2
Food and beverages	944	7.4	5.0
Clothing and footwear	373	2.9	2.0
Gasoline and other energy goods	275	2.2	1.5
Other nondurable goods	1058	8.3	5.7
Services	8771	68.7	46.9
Housing and utilities	2353	18.4	12.6
Health care	2172	17.0	11.6
Transportation services	418	3.3	2.2
Recreation services	516	4.0	2.8
Food services and accommodations	873	6.8	4.7
Financial services and insurance	989	7.7	5.3

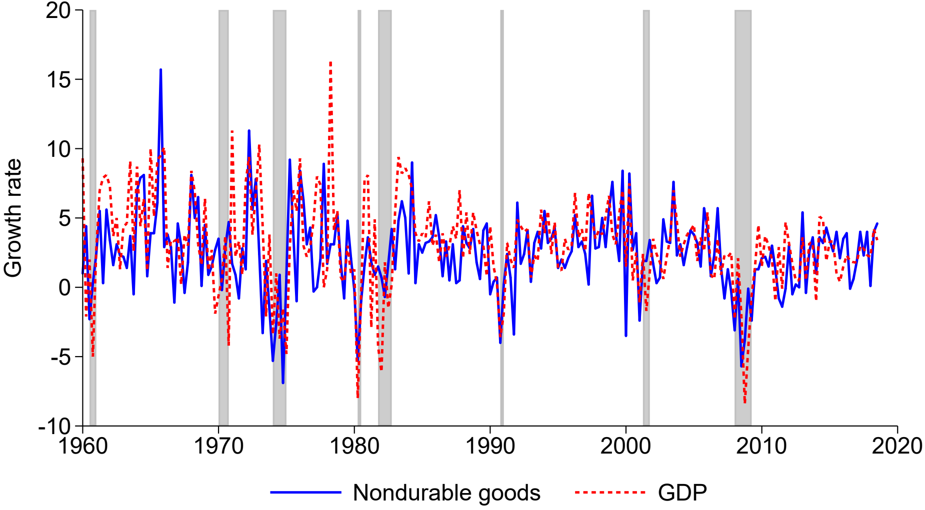
CONSUMPTION VERSUS GDP



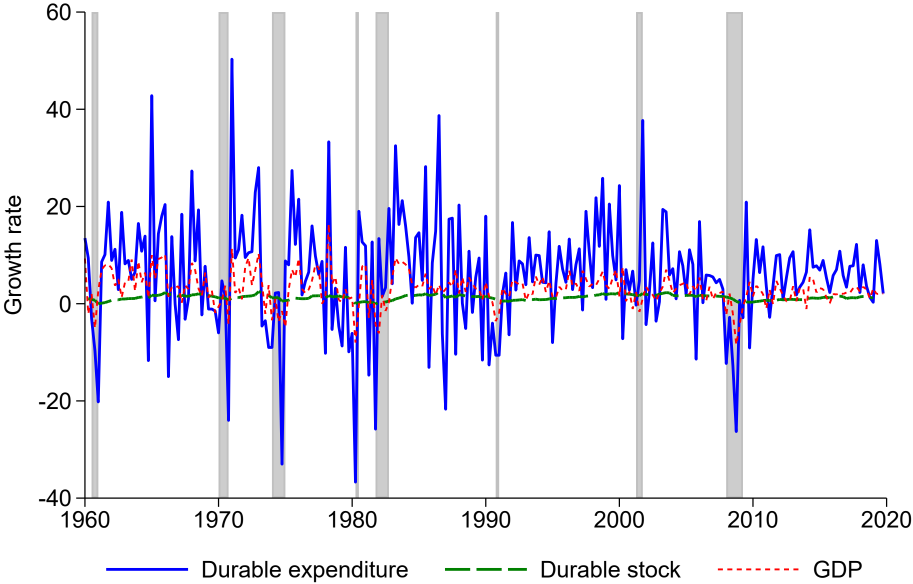
SERVICES VERSUS GDP



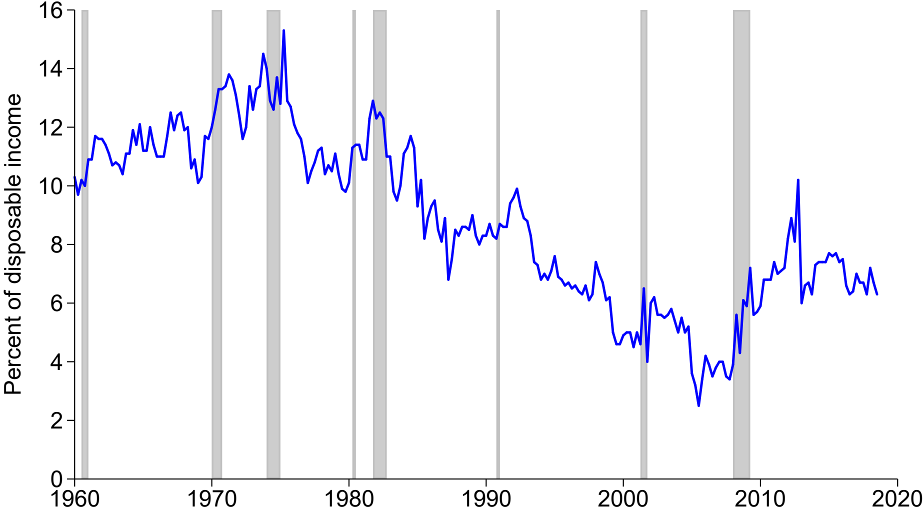
Nondurable goods versus GDP



Durables versus GDP



Household saving rate



Outline for this and next lecture

1. Start with intertermporal optimization problem.
    - MPC out of transitory income.
    - MPC out of permanent income.
    - Response of consumption to interest rate changes.
    - Precautionary saving.
    - Exponential impatience.
2. Other theories of consumption.
    - Financial constraints.
    - Hyperbolic discounting.
    - Myopia, habit formation, adjustment costs.
3. Empirical application: the 2008 Economic Stimulus Payments.

Outline

Notational hazards

My notation differs from Kurlat in some important respects you should keep in mind if you go back and forth between the sources. This slide summarizes:

Concept	Chodorow-Reich	Kurlat
Marginal utility	$u'(c) = c^{-1/\sigma}$	$u'(c) = c^{-\sigma}$
Two periods	$0, 1$	$1, 2$
Multi-period timing of saving choice:	a_t chosen in t and carried into $t+1$	a_t chosen in $t-1$ and carried into t

Assumptions

1. Study consumption/saving problem of single household.
2. Horizon: Household lives for $T+1$ periods, $t = 0, 1, 2, \ldots, T$.
3. Household receives income stream $y_0, y_1, y_2, \ldots, y_T$ and must finance consumption stream $c_0, c_1, c_2, \ldots, c_T$.
4. Impatient: Prefer consumption today to consumption next period.
5. Unconstrained: borrow or lend a_t at real interest rate r.
6. Perfect foresight: no uncertainty over path of future income.
7. Period utility $u(c_t) : u'(c_t) > 0, u''(c_t) < 0$.

Flow budget constraint

- Let $a_{-1} = a_T = 0$.
  - Interpretation?
- Each period sources of funds must equal uses of funds:

$$\text{Period 0:} \qquad y_0 = c_0 + a_0$$

- Note: $a_t > 0$ if positive net assets, $a_t < 0$ if negative net assets.

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- Note: flow savings $s_t = y_t + ra_{t-1} - c_t = a_t - a_{t-1}$.

Lifetime budget constraint

- Divide both sides of flow budget constraint by $(1+r)^t$:

$$\frac{y_t}{(1+r)^t} + \frac{(1+r)\,a_{t-1}}{(1+r)^t} = \frac{c_t}{(1+r)^t} + \frac{a_t}{(1+r)^t}.$$

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- How much time 0 wealth required to finance consumption stream?

$$c_0 + \frac{c_1}{1+r} + \frac{c_2}{(1+r)^2} + \ldots + \frac{c_T}{(1+r)^T} = \sum_{t=0}^{T} \frac{c_t}{(1+r)^t}.$$

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- What is present value of income stream $y_0, y_1, y_2, \ldots, y_T$?

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- Lifetime budget constraint: present value of consumption equals present value of income:

$$\sum_{t=0}^{T} \frac{c_t}{(1+r)^t} = \sum_{t=0}^{T} \frac{y_t}{(1+r)^t}.$$

Household's problem

- Problem is one of constrained optimization:

$$\max_{\{c_0,c_1,\dots,c_T\}} \sum_{t=0}^{T} \beta^t u(c_t)$$

s.t.

$$\sum_{t=0}^{T} \frac{c_t}{(1+r)^t} = \sum_{t=0}^{T} \frac{y_t}{(1+r)^t}.$$

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- Lagrangian:

$$\mathscr{L} = \sum_{t=0}^{T} \beta^t u(c_t) + \lambda \left[\sum_{t=0}^{T} \frac{y_t}{(1+r)^t} - \sum_{t=0}^{T} \frac{c_t}{(1+r)^t} \right].$$

FOC and Euler equation

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$$\beta u'(c_1) - \frac{\lambda}{1+r} = 0.$$

- Solve each equation for λ and equate:

$$u'(c_0) = \lambda, \quad \beta(1+r)u'(c_1) = \lambda,$$

$$\Longrightarrow u'(c_0) = \beta(1+r)u'(c_1).$$

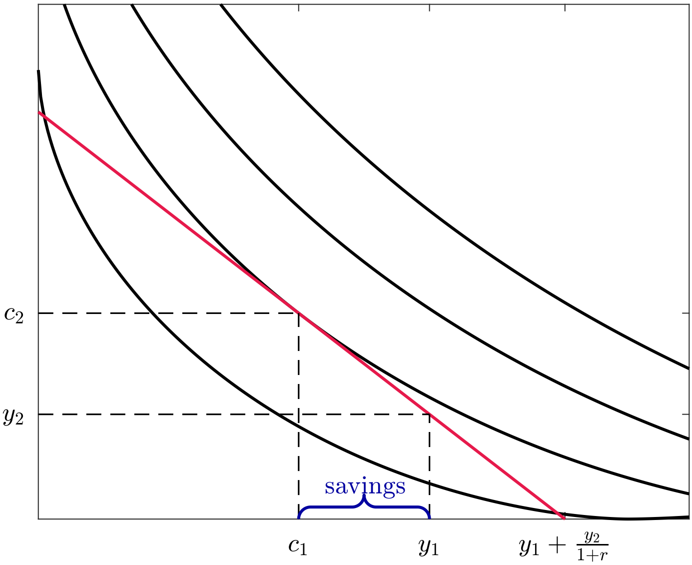
Euler equation

$$u'(c_0) = \beta(1+r)u'(c_1).$$

- Interpretation: how to allocate one last unit of consumption at time 0.
  - LHS: value of consuming additional unit at time 0.
  - RHS: instead, invest the unit, earn return $1+r$, consume at 1, which is valued at $\beta u'(c_1)$.
  - At optimum, agent must be indifferent between these two options.
- By same logic or derivation, for any t, $t+s$,

$$u'(c_t) = \beta^s(1+r)^s u'(c_{t+s}).$$

TWO-PERIOD GRAPHICAL ILLUSTRATION



USEFULNESS OF FRAMEWORK

- Policy question:
  - Will people spend out of temporary income?
  - Counterpart: spending out of permanent income.

- Leading example convenient for thinking through economics of these questions: $\beta(1+r)=1$.
- Then we will turn to what happens if interest rate changes.
- This lecture and next: partial equilibrium analysis. Always take income stream as given.

Outline

1. Consumption overview
2. Intertemporal optimization
   - MPC out of permanent and transitory income
   - Interest rate sensitivity
   - Precautionary saving
   - Impatience
3. Other theories of consumption
   - Constrained consumers
   - Time inconsistent preferences
   - Mental accounting
   - Other and summary
4. Empirical application

EXAMPLE: $\beta(1+r) = 1$

- From Euler equation, $\beta(1+r) = 1 \Longrightarrow u'(c_0) = u'(c_1) = \ldots = u'(c_T)$.
- Immediately: $c_0 = c_1 = \ldots = c_T$ (perfect consumption smoothing).
- Actual consumption is quite smooth, so maybe not bad benchmark.
- Interpretation: β is how much household discounts future. $1+r$ is how much financial markets discount future.

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- Actual consumption is quite smooth, so maybe not bad benchmark.
- Interpretation: β is how much household discounts future. $1+r$ is how much financial markets discount future.
- Substitute perfect consumption smoothing into budget constraint:

$$
\begin{aligned}
\sum_{t=0}^{T} \frac{c_t}{(1+r)^t} &= \sum_{t=0}^{T} \frac{y_t}{(1+r)^t} \\
\Longrightarrow c \sum_{t=0}^{T} \frac{1}{(1+r)^t} &= \sum_{t=0}^{T} \frac{y_t}{(1+r)^t} \\
\Longrightarrow c &= \left[\frac{r}{1+r-\frac{1}{(1+r)^T}}\right] \sum_{t=0}^{T} \frac{y_t}{(1+r)^t}.
\end{aligned}
$$

Mathematical aside

$$\begin{aligned}
\sum_{t=0}^{T} x^t &= 1+x+x^2+\ldots+x^T, \\
x\sum_{t=0}^{T} x^t &= x+x^2+\ldots+x^T+x^{T+1}, \\
\Longrightarrow (1-x)\sum_{t=0}^{T} x^t &= 1-x^{T+1}, \\
\Longrightarrow \sum_{t=0}^{T} x^t &= \frac{1-x^{T+1}}{1-x}.
\end{aligned}$$

If $x = 1/(1+r)$,

$$\begin{aligned}
\sum_{t=0}^{T} \frac{1}{(1+r)^t} &= \frac{1-\frac{1}{(1+r)^{T+1}}}{1-\frac{1}{1+r}} \\
&= \frac{1+r-\frac{1}{(1+r)^T}}{r}.
\end{aligned}$$

$\beta(1+r) = 1$, MPC, TRANSITORY INCOME

$$c = \left[\frac{r}{1 + r - \frac{1}{(1+r)^T}} \right] \sum_{t=0}^{T} \frac{y_t}{(1+r)^t}.$$

- Marginal propensity to consume out of $1 of disposable income, holding future income fixed:

$$\frac{\partial c_0}{\partial y_0} = \left[\frac{r}{1 + r - \frac{1}{(1+r)^T}} \right].$$

- Suppose T is large. In limit, $T \to \infty$ (interpretation?). Then:

$$\alpha_1 \equiv \left[\frac{r}{1 + r - \frac{1}{(1+r)^T}} \right] \xrightarrow{T \to \infty} \frac{r}{1+r}.$$

- Real interest rate $\approx 5\% \to r = 0.05 \to \alpha_1 = 0.048$.

$\beta(1+r)=1$, MPC, FUTURE TRANSITORY INCOME

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- Marginal propensity to consume out of \$1 of future disposable income:

$$\frac{\partial c_0}{\partial y_t} = \left[\frac{r}{1+r-\frac{1}{(1+r)^T}}\right]\frac{1}{(1+r)^t} = \frac{1}{(1+r)^t}\frac{\partial c_0}{\partial y_0}.$$

- MPC out of future transitory income is smaller than MPC out of current transitory income by factor $1/(1+r)^t$.
- But present value of \$1 of future transitory income is equal to $\$1/(1+r)^t$ of current transitory income.
- After converting to present value, timing of income is irrelevant.

$\beta(1+r) = 1$, MPC, PERMANENT INCOME

- Middle equation, slide 25:

$$c\sum_{t=0}^{T}\frac{1}{(1+r)^t} = \sum_{t=0}^{T}\frac{y_t}{(1+r)^t}.$$

- Suppose income rises by y^p in every period:

$$c\sum_{t=0}^{T}\frac{1}{(1+r)^t} = \sum_{t=0}^{T}\frac{y_t + y^p}{(1+r)^t} = \sum_{t=0}^{T}\frac{y_t}{(1+r)^t} + y^p\sum_{t=0}^{T}\frac{1}{(1+r)^t}.$$

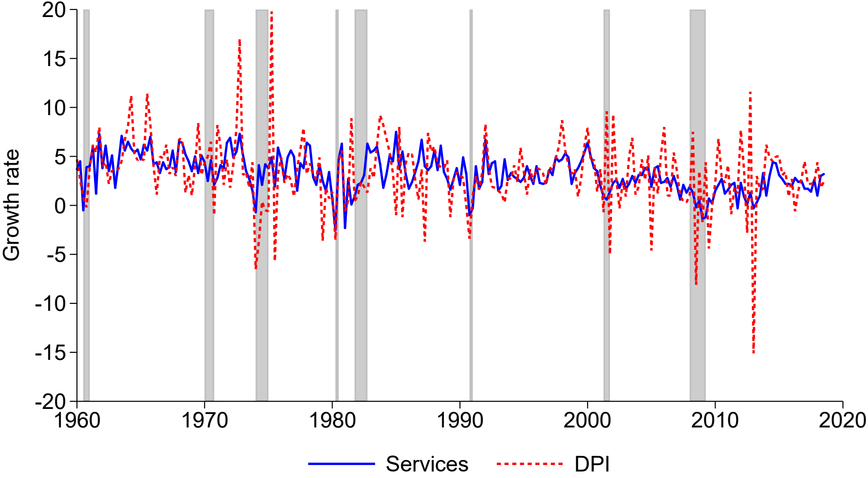
- What is increase in consumption?

$$\alpha_2 \equiv \frac{\partial c_0}{\partial y^p} = 1.$$

$\beta(1+r) = 1$, SUMMARY

- MPC out of transitory income $= \partial c_0 / \partial y_0 = \alpha_1 = r/(1+r) \approx 0.05$.
- MPC out of transitory income is independent of the timing of the additional income.
- MPC out of permanent income $= \partial c_0 / \partial y^p = \alpha_2 = 1$.
- We call this the permanent income hypothesis. Consumption rises one-for-one with permanent income, but only with the *annuity value* of transitory income.
- Intuition: \$1 of transitory income at time 0 is the same in present value as $\left[\frac{r}{1+r-\frac{1}{(1+r)^T}}\right]$ of permanent income.
- Implication: consumption smoother than income.

Smoothness of consumption



- Consumption smoother than income is a victory for PIH.

Ricardian equivalence

- Intertemporal optimization + dynastic considerations ($T \rightarrow \infty$) $\Longrightarrow$ temporary tax cuts can have zero effect on consumption.

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- No change in household budget constraint $\Longrightarrow$ no change in spending.

Outline

Interest rate sensitivity

- To think about interest rate sensitivity, need to relax assumption $\beta(1+r) = 1$ and return to general Euler equation:

$$u'(c_0) = \beta(1+r)u'(c_1).$$

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- Rearrange:

$$\ln c_1-\ln c_0=\sigma\left[\ln\beta+\ln(1+r)\right].$$

Interest rate sensitivity, growth

$$\ln c_1 - \ln c_0 = \sigma \left[\ln \beta + \ln(1+r)\right].$$

- Recall first order Taylor expansion: $\ln(1+x) \approx x$ for x small.
- LHS: $\ln c_1 - \ln c_0$ is approximately consumption growth.
- RHS: $\sigma \ln \beta$ is a constant.
- RHS: $\sigma \ln(1+r) \approx \sigma r$.
- Thus:

$$\ln c_1 - \ln c_0 \approx \sigma \ln \beta + \sigma r.$$

- So σ determines how consumption growth varies with r for Euler equation consumer.
- We call σ the *intertemporal elasticity of substitution* because it governs how willingly people adjust their consumption across time.

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- Continue with $u'(c_t) = c_t^{-\frac{1}{\sigma}}$.

Interest rate sensitivity, level

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- Euler equation:

$$
\begin{aligned}
c_0^{-\frac{1}{\sigma}} &= \beta(1+r)c_1^{-\frac{1}{\sigma}} \\
\Rightarrow c_0 &= [\beta(1+r)]^{-\sigma} c_1 \\
\Rightarrow c_1 &= [\beta(1+r)]^{\sigma} c_0.
\end{aligned}
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Interest rate sensitivity, level

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- Euler equation:

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$$\Rightarrow c_0 = [\beta(1+r)]^{-\sigma} c_1$$
$$\Rightarrow c_1 = [\beta(1+r)]^{\sigma} c_0.$$

- Set $T = 1$ (2 period model). Think of period 0 as working, and period 1 as retirement. Substitute the Euler equation result into the budget constraint:

$$y_0 + \frac{y_1}{1+r} == c_0 + \frac{c_1}{1+r}$$
$$= c_0 + \beta^{\sigma}(1+r)^{\sigma-1} c_0,$$
$$\Longrightarrow c_0 = \frac{1}{1+\beta^{\sigma}(1+r)^{\sigma-1}}\left(y_0 + \frac{y_1}{1+r}\right).$$

Interest rate sensitivity, comparative statics

$$c_0 = \frac{1}{1+\beta^\sigma(1+r)^{\sigma-1}}\left(y_0 + \frac{y_1}{1+r}\right).$$

- Leading example $\sigma = 1$ (ln utility), $y_1 = 0$ (work, retire): $c_0 = \frac{1}{1+\beta} y_0$.
  - Consumption is independent of the real interest rate.
  - $\beta = 1$ (no subjective discounting): $c_0 = y_0/2, c_1 = (1+r)(y_0/2)$.
  - $\beta < 1$ (agent discounts future consumption): consume more today.
  - Substitution effect: $r \uparrow$ makes consumption today more expensive relative to consumption next period, discouraging consumption today.
  - Income effect: $r \uparrow$ makes you richer if you are a saver, encouraging consumption today.
  - With log utility, effects exactly offset.

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  - With log utility, effects exactly offset.
- More generally, σ determines magnitude of substitution effect:

$$\ln c_1 - \ln c_0 \approx \sigma \ln \beta + \sigma r.$$

  - When $\sigma > 1$, substitution effect dominates, and $c_0 \downarrow$.
  - When $\sigma < 1$, income effect dominates, and $c_0 \uparrow$.

Outline

Most important reason people save

Reason	Share of respondents
Retirement/future	35.3
Children	13.2
Debt repayment/bills	3.7
Emergencies/in case of unemployment or illness	27.5
Durable goods	5.6
No money to save	4.1
Other	10.5

- Data from 2013 Survey of Consumer Finances.

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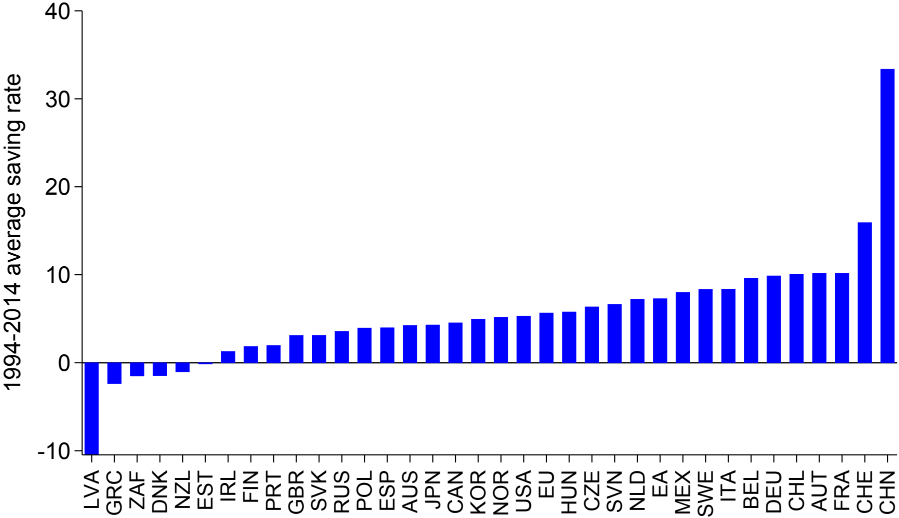
Saving rates around the world



Why does China save so much? (And why does it run a trade surplus?)

- Based on theory so far, high Chinese saving rate is a puzzle (why?).
- Rising income uncertainty and self-insurance for health care important.
  - See e.g. `http://voxeu.org/article/puzzle-china-s-rising-household-saving-rate`.
- International spillovers as Chinese exports savings abroad:

$$\begin{aligned} Y &= C + I + G + NX \\ \Rightarrow NX &= \underbrace{(Y - T - C)}_{\text{Private saving}} + \underbrace{(T - G)}_{\text{Government saving}} - I. \end{aligned}$$

- President Trump views China trade surplus as result of currency manipulation. But exchange rate doesn't (directly) show up on the right hand side of this expression.
- Alternative is to encourage China to improve social safety net to reduce precautionary saving motives.

Euler equation with uncertainty

- Straightforward to extend framework to allow for uncertain future income. Two periods for simplicity.
- Budget constraint still must hold ex post:

$$y_0 + \frac{y_1}{1+r} = c_0 + \frac{c_1}{1+r}.$$

- Budget constraint must hold in expectation ex ante:

$$y_0 + \frac{E_0[y_1]}{1+r} = c_0 + \frac{E_0[c_1]}{1+r}.$$

- You will derive the Euler equation with uncertainty in the problem set:

$$u'(c_0) = E_0\left[\beta(1+r)u'(c_1)\right].$$

- Using flow budget constraint:

$$u'(y_0 - a_0) = E_0\left[\beta(1+r)u'(a_0(1+r) + y_1)\right].$$

Special case

- Assume:

$$y_1 = \begin{cases} \bar{y}_1 - \Delta \text{ with probability } p, \\ \bar{y}_1 + \Delta \text{ with probability } 1-p. \end{cases}$$

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- FOC:

$$\begin{aligned} u'(c_0) &= \beta(1+r)\left[pu'\left(c_1^L\right) + (1-p)\,u'\left(c_1^H\right)\right] \\ &= \beta(1+r)\,E_0\left[u'(c_1)\right]. \end{aligned}$$

Precautionary saving

- Assume $\beta = 1, r = 0, p = 0.5$. Then:

$$u'\left(\underbrace{y_0 - a_0}_{c_0}\right) = \frac{1}{2}u'\left(\underbrace{a_0 + \bar{y}_1 - \Delta}_{c_1^L}\right) + \frac{1}{2}u'\left(\underbrace{a_0 + \bar{y}_1 + \Delta}_{c_1^H}\right).$$

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$$\Rightarrow \frac{\partial a_0}{\partial \Delta} = \frac{\frac{1}{2}\left[u''\left(c_1^L\right) - u''\left(c_1^H\right)\right]}{u''(c_0) + \frac{1}{2}\left[u''\left(c_1^L\right) + u''\left(c_1^H\right)\right]}.$$

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- Denominator is negative because $u''(.) < 0$. Numerator is negative if $u''\left(c_1^L\right) < u''\left(c_1^H\right) \Rightarrow u'''(.) > 0$. Verify for $u(c) = 1/(1-\theta)c^{1-\theta}$.

Precautionary saving

- Uncertainty reduces consumption today and increases savings.

- Previous math assumed uncertainty over income. But straightforward to extend to uncertainty over "required consumption" (e.g. health emergency). Just define y as income net of required expenditure.

Outline

Really impatient consumers

- Return to 2 period example:

$$c_0 = \frac{1}{1+\beta^\sigma(1+r)^{\sigma-1}}\left(y_0 + \frac{y_1}{1+r}\right).$$

- MPC out of transitory income:

$$\frac{\partial c_0}{\partial y_0} = \frac{1}{1+\beta^\sigma(1+r)^{\sigma-1}} \xrightarrow{\beta\to 0} 1.$$

- MPC out of future transitory income:

$$\frac{\partial c_0}{\partial y_1} = \frac{1}{1+\beta^\sigma(1+r)^{\sigma-1}}\frac{1}{1+r} \xrightarrow{\beta\to 0} \frac{1}{1+r}.$$

- MPC out of permanent income:

$$\frac{\partial c_0}{\partial y^p} = \frac{1}{1+\beta^\sigma(1+r)^{\sigma-1}}\left(1+\frac{1}{1+r}\right) \xrightarrow{\beta\to 0} \left(1+\frac{1}{1+r}\right).$$

Outline

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Evidence

- Survey evidence on whether respondents could come up with $2000 in 30 days (`http://www.brookings.edu/~/media/Projects/BPEA/Spring-2011/2011a_bpea_lusardi.PDF`):

	Certainly able	Probably able	Probably not able	Certainly not able
All respondents	24.9	25.1	22.1	27.9
Annual household income:				
Less than $20,000	9.3	14.6	19.2	56.8
$20,000 to $29,999	11.4	21.2	27.7	39.7
$30,000 to $39,999	17.5	27.5	23.6	31.4
$40,000 to $49,999	17.0	26.1	29.9	27.0
$50,000 to $59,999	21.9	24.7	26.1	27.3
$60,000 to $74,999	33.1	27.9	21.8	17.3
$75,000 to $99,999	40.7	33.7	15.4	10.2
$100,000 to $149,999	49.0	27.3	12.9	10.8
$150,000 or more	58.1	27.5	4.7	9.8

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  - Deviation is feasible since $r = 0$, $c_0 < y_0$.

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- In unconstrained allocation, $c_0 > y_0 \Rightarrow a_0 < 0$.
- Suppose the agent cannot borrow. Formally, the problem has an additional constraint: $a_0 \geq 0 \Leftrightarrow c_0 \leq y_0$.
- Suppose $c_0 < y_0$. Consider the deviation of moving some arbitrarily small amount of consumption from period 1 to period 0. Call it dc.
    - Deviation is feasible since $r = 0$, $c_0 < y_0$.
    - Utility in period 0 rises by $u'(c_0)dc$.

CONSTRAINED CONSUMERS

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    - Since $c_1 > c_0$ (why?), $u'(c_1)dc < u'(c_0)dc$ (why?).
    - But then $c_0 < y_0$ cannot have been the optimal allocation.
- We just proved the agent will get as close to the flat c as possible and set $c_0 = y_0$.

Constrained consumers implications

$$c_0 = y_0$$

- MPC out of transitory income:

$$\frac{\partial c_0}{\partial y_0} = 1.$$

- MPC out of future transitory income:

$$\frac{\partial c_0}{\partial y_t} = 0, t > 0.$$

- MPC out of permanent income:

$$\frac{\partial c_0}{\partial y^p} = 1.$$

Variants of constraints

- Return to multi-period setup, $T > 1$.
- Borrowing constraint: $a_t \geq 0 \ \forall t$. (Notation?)
- Suppose not constrained today ($a_0 > 0$) and income process uncertain.
- Possibility of being constrained in the future affects current consumption/savings.
- Interacts with precautionary behavior: really bad to be constrained ($c_t = y_t$) when y_t is low.
- Formalization in Bewley-Huggett-Aigari framework beyond scope of this class.

Outline

Motivating evidence

- Choose today to receive next week:

Motivating evidence

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Motivating evidence

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- Choose today to receive today:

- Would you choose $80 today or $100 in one year?

Motivating evidence

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Motivating evidence

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74%

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MOTIVATING EVIDENCE

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74%

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70%

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Formalization (Laibson 1997)

$$
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=&\max_{\{c_0,c_1,\ldots,c_T\}} u(c_0)+\beta\delta u(c_1)+\beta\delta^2 u(c_2)+\ldots+\beta\delta^T u(c_T).
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  - Analog: why people say they'll start saving tomorrow.

Paying Not to Go to the Gym

By STEFANO DELLAVIGNA AND ULRIKE MALMENDIER*

How do consumers choose from a menu of contracts? We analyze a novel dataset from three U.S. health clubs with information on both the contractual choice and the day-to-day attendance decisions of 7,752 members over three years. The observed consumer behavior is difficult to reconcile with standard preferences and beliefs. First, members who choose a contract with a flat monthly fee of over $70 attend on average 4.3 times per month. They pay a price per expected visit of more than $17, even though they could pay $10 per visit using a 10-visit pass. On average, these users forgo savings of $600 during their membership. Second, consumers who choose a monthly contract are 17 percent more likely to stay enrolled beyond one year than users committing for a year. This is surprising because monthly members pay higher fees for the option to cancel each month. We also document cancellation delays and attendance expectations, among other findings. Leading explanations for our findings are overconfidence about future self-control or about future efficiency. Overconfident agents overestimate attendance as well as the cancellation probability of automatically renewed contracts. Our results suggest that making inferences from observed contract choice under the rational expectation hypothesis can lead to biases in the estimation of consumer preferences. (*JEL* D00, D12, D91)

Outline

IDEA (THALER AND SUNSTEIN (2008, *Nudge*))

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[Gene] Hackman and [Dustin] Hoffman were friends back in their starving artist days, and Hackman tells the story of visiting Hoffman's apartment and having his host ask him for a loan. Hackman agreed to the loan, but then they went into Hoffman's kitchen, where several mason jars were lined up on the counter, each containing money. One jar was labelled 'rent', another 'utilities', and so forth. Hackman asked why, if Hoffman had so much money in jars, he could possibly need a loan, whereupon Hoffman pointed to the food jar, which was empty.

Current, asset, future accounts

- Idea is households have separate targets:

    1. Current account: *Am I saving enough today?*
    2. Wealth account: *Do I have enough wealth accumulated for the future?*
    3. Future account: *Are my future earnings high enough?*

- Target current savings level $\Rightarrow$ MPC out of additional current income is high.

Outline

Other types of behavior

- Rule-of-thumb: consume fraction α of income.
  - Rational inattention justification: time and mental cost required to optimize greater than gains from optimization.

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  - Time and fixed costs to change consumption of housing services.
- Not all mutually exclusive.

Summary

	MPC out of:			Response to:	
Type	y_0	$y_h,\ h > 0$	$y_t,\ \forall t$	$r \uparrow$	Uncertainty $\uparrow$
Intertemporal optimizer:					
Patient					
Impatient					
Constrained					
Rule-of-thumb					
Mental accounts					

- Many types of consumption behavior possible.
- Different predictions.

Summary

	MPC out of:			Response to:	
Type	y_0	$y_h,\ h>0$	$y_t,\ \forall t$	$r\uparrow$	Uncertainty
Intertemporal optimizer:					
Patient	$\frac{r}{1+r}$	$\frac{1}{(1+r)^h}\frac{r}{1+r}$	1	$\downarrow$ if $\sigma>1$	$\downarrow$
Impatient	1	$\frac{1}{(1+r)^h}$	$\sum_{t=0}^{T}\frac{1}{(1+r)^t}$	$\downarrow$ if $\sigma>1$	$\downarrow$
Constrained	1	0	1	0	0
Rule-of-thumb	α	0	α	a_0	0
Mental accounts	1	0	1	?	?

- Many types of consumption behavior possible.
- Different predictions.

Outline

1. Consumption overview
2. Intertemporal optimization
3. Other theories of consumption
4. Empirical application

2008 ECONOMIC STIMULUS PAYMENTS

- 2008 Economic Stimulus Act provided Economic Stimulus Payments (ESPs) to 85% of U.S. tax units.
- \$300-600 for single, \$600-1200 for couple, \$100 billion in total.
- Economic theory: response could be 0 (Ricardian equivalence) or 1 (impatient or constrained households).

Parker, Souleles, Johnson, McClelland AER 2013

- For administrative reasons, IRS staggered issuance of payments.
- Timing of receipt depended on last digit of SSN, which is randomly assigned.

Table 1—The Timing of the Economic Stimulus Payments of 2008

Payments by electronic funds transfer		*Payments by mailed check*	
Last two digits of taxpayer SSN	Date ESP funds transferred to account by	Last two digits of taxpayer SSN	Date check to be received by
00–20	May 2	00–09	May 16
21–75	May 9	10–18	May 23
76–99	May 16	19–25	May 30
		26–38	June 6
		39–51	June 13
		52–63	June 20
		64–75	June 27
		76–87	July 4
		88–99	July 11

Source: Internal Revenue Service (http://www.irs.gov/newsroom/article/0,,id=180247,00.html).

Table 3—The Response to ESP Receipt among Households Receiving Payments

	Dollar change in		Percent change in		Dollar change in	
	Nondurable spending	All CE goods and services	Nondurable spending	All CE goods and services	Nondurable spending	All CE goods and services
	OLS	OLS	OLS	OLS	2SLS	2SLS
Panel A. Sample of all households ($N = 17{,}478$)						
ESP	0.117	0.507			0.123	0.509
	(0.060)	(0.196)			(0.081)	(0.253)
$I(ESP)$			2.63	3.97		
			(1.07)	(1.34)		
$I(ESP_{i,t} > 0 \text{ for any } t)_i$	9.58	21.21	−0.88	−1.17	8.23	20.77
	(36.07)	(104.00)	(0.50)	(0.63)	(38.79)	(112.18)
Panel B. Sample of households receiving ESPs ($N = 11{,}239$)						
ESP	0.185	0.683			0.252	0.866
	(0.066)	(0.219)			(0.103)	(0.329)
$I(ESP)$			3.91	5.63		
			(1.33)	(1.69)		
Panel C. Sample of households receiving only on-time ESPs ($N = 10{,}488$)						
ESP	0.214	0.590			0.308	0.911
	(0.070)	(0.217)			(0.112)	(0.342)
$I(ESP)$			4.52	6.05		
			(1.50)	(1.89)		

Table 6—The Propensity to Spend across Different Households

Interaction:	*Panel A. By age*		*Panel B. By income*		*Panel C. By liquid assets*		*Panel D. By housing status*	
Dependent variable:	Dollar change in		Dollar change in		Dollar change in		Dollar change in	
	Non-durable spending	All CE goods and services	Non-durable spending	All CE goods and services	Non-durable spending	All CE goods and services	Non-durable spending	All CE goods and services
	Age Low: $\leq$ 40 High: $>$ 58		Income Low: $\leq$ 32,000 High: $>$ 74,677		Liquid assets Low: $\leq$ 500 High: $>$ 7,000		Housing status Low: own with mortgage High: own without	
ESP	0.345	0.952	0.215	0.568	0.275	0.851	0.213	0.431
	(0.133)	(0.398)	(0.124)	(0.442)	(0.164)	(0.558)	(0.153)	(0.455)
ESP × *Low*	−0.150	−0.461	0.024	0.715	−0.253	−0.844	0.043	0.543
(group difference)	(0.124)	(0.399)	(0.155)	(0.500)	(0.184)	(0.527)	(0.131)	(0.394)
ESP × *High*	0.044	0.414	−0.009	0.205	−0.075	0.083	0.260	0.800
(group difference)	(0.151)	(0.472)	(0.139)	(0.466)	(0.186)	(0.631)	(0.169)	(0.514)
Observations	10,488	10,488	8,592	8,592	5,071	5,071	10,380	10,380
Implied total spending								
Low group	0.195	0.491	0.239	1.283	0.022	0.007	0.256	0.974
	(0.114)	(0.394)	(0.180)	(0.564)	(0.205)	(0.566)	(0.112)	(0.364)
High group	0.389	1.366	0.206	0.773	0.200	0.934	0.473	1.231
	(0.168)	(0.498)	(0.133)	(0.463)	(0.202)	(0.677)	(0.175)	(0.508)

Table 7—The Propensity to Spend on Subcategories of Expenditures

	Panel A. Food			*Panel B. Additional categories in strictly nondurables*			
Dependent variable:	Food at home	Food away from home	Alcoholic beverages	Utilities, household operations	Personal care and misc.	Gas, motor fuel, public transportation	Tobacco products
Coefficient on ESP	0.050	0.025	0.011	0.059	0.083	0.027	0.007
Standard error	(0.032)	(0.033)	(0.007)	(0.027)	(0.049)	(0.039)	(0.009)
Implied share of increase in nondurable spending	0.16	0.08	0.04	0.19	0.27	0.09	0.02
Share of avg. spending on subcategory	0.23	0.11	0.01	0.23	0.04	0.16	0.01

	Panel C. Additional categories in nondurables			*Panel D. Additional categories in total CE spending*			
Dollar change in spending on:	Apparel	Health	Reading	Housing (incl. furnishings)	Entertainment	Education	Transportation
Coefficient on ESP	0.022	0.025	–0.001	0.099	0.077	–0.100	0.527
Standard error	(0.021)	(0.048)	(0.003)	(0.092)	(0.099)	(0.042)	(0.269)
Implied share of increase in:							
Nondurable spending	0.07	0.08	0.00				
Durable spending				0.16	0.13	–0.17	0.87
Avg. spending on subcategory:							
Share of nondurable	0.06	0.15	0.01				
Share of durable				0.56	0.13	0.04	0.27

Macroeconomic importance

- Rejects PIH and Ricardian equivalence.
- Applying estimated MPCs to total payouts, effect on PCE of:
  - 1.3-2.3% in 2008Q2.
  - 0.6-1.0% in 2008Q3.
- Multiplier effects?
- Temporal substitution?

2009 MAKING WORK PAY

- 2009 American Recovery and Reinvestment Act ("Obama stimulus") provided wage credit up to $400 per individual ($800 per couple).
- Implemented through lower tax withholding from paychecks starting April 2009.
- Why through withholding? *If you want people to spend the money, you don't want to give them one big check, because that makes it more likely that they'll think of it as an increase in their wealth and save it. Instead, you want to give them small amounts over time. And you want the rebate to show up as an increase in people's take-home pay, because an increase in steady income is more likely to translate into an increase in spending. What can accomplish both of these goals? Reducing people's withholding payments.* James Surowiecki, *New Yorker*, January 2009 (`https://www.newyorker.com/magazine/2009/01/26/a-smarter-stimulus`).

Awareness (Sahm, Shapiro, Slemrod, AEJ: Policy 2012)

Table 2—Already Lower Withholding?

	Survey Month in 2009		
	May/July	May	July
Percent of stimulus recipients			
Employer already changed	38	40	35
Employer did not change	45	42	48
Don't know if changed	12	12	11
Self-employed (volunteered)	6	6	6

Note: Authors' weighted tabulations of 590 individuals in the May and July 2009 Surveys of Consumers who reported a use for the lower withholding.

Survey questions

1. *Under this year's economic stimulus program, most workers will receive an income tax credit. The tax credit will, in most cases, be four hundred dollars to eight hundred dollars per household this year and next. The tax credit will reduce the amount of taxes withheld from paychecks. As a result, take-home pay may increase as much as sixty-seven dollars per month for married workers or forty-four dollars per month for single workers. Thinking about your (family's) financial situation this year, will this income tax credit lead you mostly to increase spending, mostly to increase saving, or mostly to pay off debt?*
2. *Under last year's economic stimulus program, many households received tax rebates that amounted to six hundred dollars for individuals and twelve hundred dollars for married couples. Those with dependent children received an additional three hundred dollars per child. The tax rebates were paid by check or direct deposit. Did you (or your family) receive a tax rebate last year? Did last year's tax rebate lead you mostly to increase spending, mostly to increase saving, or mostly to pay off debt?*

Survey evidence

Table 1—Distribution of Responses to Stimulus

	2008 Tax rebate			2009 Policies: Lower withholding	2009 Policies: Hypothetical payment	2009 Policies: Retiree payment
Survey date	May/June 2008	Nov./Dec. 2008	May/July 2009	May/July 2009		
Percent of stimulus recipients						
Mostly spend	19	22	25	13	23	30
Mostly save	27	23	25	33	31	29
Mostly pay debt	53	55	50	54	46	41
Percent of all respondents						
Did not receive	9	19	20	34	34	66
Did not know use/receipt	2	3	3	3	1	1

Notes: Authors' weighted tabulations of the Thomson Reuters/University of Michigan Surveys of Consumers. All tabulations and regressions in the paper use the household head weight, which is nonzero for household heads or their spouses. This is the same weight used in the Index of Consumer Sentiment that is published monthly from the survey results. There were 982 adult-household heads or spouses who participated in the May/July 2009 surveys, 990 in the November/December 2008 surveys, and 980 in the May/June 2008. Tabulations of stimulus recipients in the top panel exclude individuals who did not report a planned use for the stimulus payment.

Evidence (Sahm, Shapiro, Slemrod, AEJ: Policy 2012)

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Don't know if changed	12	12	11
Self-employed (volunteered)	6	6	6

Note: Authors' weighted tabulations of 590 individuals in the May and July 2009 Surveys of Consumers who reported a use for the lower withholding.

Lecture summary

- Many types of consumers possible in theory.
- A little math can help to think rigorously about the diversity of possibilities.
- Evidence for many types of consumers in the data.