Why does consumption fluctuate in old age and how should the government insure it?

Richard Blundell[1], Margherita Borella[2],
Jeanne Commault[3], and Mariacristina De Nardi[4]

September 2023

[1]University College London, IFS, and CEPR
[2]University of Torino, and CeRP-Collegio Carlo Alberto
[3]Sciences Po
[4]University of Minnesota, Federal Reserve of Minneapolis, CEPR, and NBER

Motivation

- Population is aging in many countries
- Aging associated with more frequent and severe health problems
- Income in old age still comes from volatile sources (pensions, capital income, lump-sum, remaining earnings)

$\Rightarrow$ Older households can face **both income and health shocks**

How important are these shocks and to what extent are people able to insure against their economic consequences?

- Health shocks :
  - Change in **resources** (medical spending, earning capacity)
  - Change in **ability to derive utility** from consumption

  $\Rightarrow$ Changes in utility **should be passed on to consumption**
  $\Rightarrow$ Whether the response of consumption reflects lack of insurance depends on **why consumption responds**

Contributions

1. Measure **transitory income and health risk** in old age
   - Variance of transitory shocks **significant** and explains **more than half** of variance of income growth and health growth
2. Estimate **pass-through of transitory shocks to consumption**
   - Consumption **responds significantly** to both
   - Some heterogeneity across goods and across households
3. Determine the share of the response to health shocks **reflecting change in income and medical expenses** vs. **shift in utility**
   - Most of the response comes from a **shift in utility**
   - Modest effect of health shocks on available resources

Literature Review

1. **Impact of health shocks on economic outcomes**: Dobkin, Finkelstein, Kluender, and Notowidigdo (2018), Morrison, Gupta, Olson, Mstat, and Keenan (2013); Meyer and Mok (2016), Poterba, Venti, and Wise (2017)
2. **Dependence between utility of consumption and health**: Viscusi and Evans (1990), Evans and Viscusi (1991), Finkelstein, Luttmer, and Notowidigdo (2009), Finkelstein, Luttmer, and Notowidigdo (2013)
3. **Consumption insurance**: Cochrane (1991), Attanasio and Davis (1996); Krueger and Perri (2005, 2006), Blundell and Preston (1998), Blundell, Low, and Preston (2013), Blundell, Pistaferri, and Preston (2008)
4. **Savings and risk during retirement**: Love, Palumbo, and Smith (2009), De Nardi, French, and Jones (2010), Blundell, Crawford, French, and Tetlow (2016), Poterba, Venti, and Wise (2018); Kopecky and Koreshkova (2014); Braun, Kopecky, and Koreshkova (2016)

Plan

A model of the response to income and health shocks

Data: HRS and CAMS

Measure of risk and pass-through to consumption

Decomposition between the effects of resources and utility

Conclusion

Household's maximization problem

$$\max_{\{c_t,m_t\}_{t=0}^{T}} \quad E_0 \sum_{t=0}^{T} \beta^t \left\{ s_t\left(\{\pi^h\}_t\right)\left[u\left(c_t,\tilde{m}(m_t),h_t\right)\right]\right\}$$

subject to:

$$p_{t+1}a_{t+1} = (1+r_t)p_t a_t + p_t y_t - p_t^c c_t - p_t^m m_t \qquad \forall 0 \le t \le T$$
$$a_T \ge 0$$
$$ln(y_t) = \pi_t^y + \varepsilon_t^y, \quad \pi_t^y = \pi_{t-1}^y + \eta_t^y$$
$$h_t = \pi_t^h + \varepsilon_t^h, \quad \pi_t^h = \pi_{t-1}^h + \eta_t^h$$
$$\text{with } cov(\eta_t^y, \eta_t^h) \neq 0, cov(\varepsilon_t^y, \varepsilon_t^h) = 0,$$

Discussion of income and health modeling

Income shocks after age 65:

- transitory-permanent process standard for modeling earnings
- **no evidence of different moments** when including pensions, capital, other income: Moments
- similar overall results when **excluding capital income**

Health shocks after age 65:

- **No significant effect of health insurance**: Black, Espin-Sanchez, French, and Litvak (2017)
- **No significant effect of past medical expenses**: Brook et al. (1983), Fisher et al. (2003), Finkelstein and McKnight (2008)

Channels of transmission

- Policy functions

$$c_t = c_t(a_t, \pi_t^y, \pi_t^h, \varepsilon_t^y, \varepsilon_t^h)$$
$$m_t = m_t(a_t, \pi_t^y, \pi_t^h, \varepsilon_t^y, \varepsilon_t^h).$$

- Euler equation

$$u_1(c_t, \tilde{m}(m_t), h_t) \geq E_t[u_1(c_{t+1}, \tilde{m}(m_{t+1}), h_{t+1})\tilde{s}_{t+1}(\pi_{t+1}^h)R_{t+1}].$$

Channels of transmission

- Four channels of transmission

$$
\begin{aligned}
& u_1(c_t, \tilde{m}(m_t), h_t) \\
& \quad \geq E_t \Bigg[u_1 \Bigg(c_{t+1}\big(\big((1+r_t)p_t a_t + p_t y_t - p_t^m m_t - p_t^c c_t\big)/p_{t+1}, \\
& \quad \pi_t^y + \eta_{t+1}^y, \varepsilon_{t+1}^y, \pi_t^h + \eta_{t+1}^h, \varepsilon_{t+1}^h\big), \\
& \quad \tilde{m}\big(m_{t+1}\big(\big((1+r_t)p_t a_t + p_t y_t - p_t^m m_t - p_t^c c_t\big)/p_{t+1}, \\
& \quad \pi_t^y + \eta_{t+1}^y, \varepsilon_{t+1}^y, \pi_t^h + \eta_{t+1}^h, \varepsilon_{t+1}^h\big)\big), \\
& \quad \pi_t^h + \eta_{t+1}^h + \varepsilon_{t+1}^h \Bigg) \tilde{s}_{t+1}(\pi_t^h + \eta_{t+1}^h) R_{t+1} \Bigg].
\end{aligned}
$$

- This optimality condition implies

$$
ln(c_t) = f^c(\underbrace{m_t, \quad h_t}_{\text{affect marginal utility}}, \underbrace{(1+r_t)p_t a_t + p_t y_t - p_t^m m_t}_{\text{affect available resources for } c_t \text{ and } a_{t+1}}, \underbrace{\pi_t^y, \quad \pi_t^h}_{\text{affect expected distribution of } y_{t+1} \text{ and } h_{t+1}}, \underbrace{\pi_t^h}_{\text{affect survival prob.}})
$$

The response to transitory shocks

- Derive f^c with respect to the transitory shocks ε
  $\rightarrow$ only the **first two channels** are affected

$$\frac{dln(c_t)}{d\varepsilon_t^y} = \underbrace{f_1^c \frac{dm_t}{d\varepsilon_t^y}}_{\text{Marginal utility}} + \underbrace{f_3^c \left\{ \frac{dy_t}{d\varepsilon_t^y} p_t - \frac{dm_t}{d\varepsilon_t^y} p_t^m \right\}}_{\text{Resources}}$$

$$\frac{dln(c_t)}{d\varepsilon_t^h} = \underbrace{f_1^c \frac{dm_t}{d\varepsilon_t^h} + f_2^c \frac{dh_t}{d\varepsilon_t^h}}_{\text{Marginal utility}} - \underbrace{f_3^c \frac{dm_t}{d\varepsilon_t^h} p_t^m}_{\text{Resources}}$$

The response to transitory shocks

- Using our empirical finding that $\frac{dm_t}{d\varepsilon_t^y} \approx 0$ and substituting with $\frac{\partial y_t}{\partial \varepsilon_t^y} = \frac{\partial ln(y_t)}{\partial \varepsilon_t^y} y_t = y_t$, $\frac{\partial h_t}{\partial \varepsilon_t^h} = 1$ and $\frac{dm_t}{d\varepsilon_t^h} = \frac{dln(m_t)}{d\varepsilon_t^h} m_t$

$$\frac{dln(c_t)}{d\varepsilon_t^y} = \underbrace{\overbrace{f_3^c}^{\text{Multiplier}} \; y_t p_t}_{\text{Resources}}$$

$$\frac{dln(c_t)}{d\varepsilon_t^h} = \underbrace{f_1^c \frac{dm_t}{d\varepsilon_t^h} + f_2^c}_{\text{Marginal utility}} - \underbrace{\overbrace{f_3^c}^{\text{Multiplier}} \; \frac{dln(m_t)}{d\varepsilon_t^h} m_t p_t^m}_{\text{Resources}}$$

Identification

- Variance of the transitory shocks and their covariance

$$cov(\Delta ln(y_t), -\Delta ln(y_{t+1})) = var(\varepsilon_t^y)$$
$$cov(\Delta h_t, -\Delta h_{t+1}) = var(\varepsilon_t^h)$$
$$cov(\Delta h_t, -\Delta ln(y_{t+1})) = cov(\Delta ln(y_{t+1}), -\Delta h_t) = cov(\varepsilon_t^y, \varepsilon_t^h)$$

- Covariance between consumption and the transitory shocks

$$cov(\Delta ln(c_t), -\Delta ln(y_{t+1})) = cov(\Delta ln(c_t), \varepsilon_t^y)$$
$$cov(\Delta ln(c_t), -\Delta h_{t+1}) = cov(\Delta ln(c_t), \varepsilon_t^h)$$

- Pass-through of the transitory shocks to consumption

$$\phi_c^y = \frac{cov(\Delta ln(c_t), \varepsilon_t^y)}{var(\varepsilon_t^y)} = \frac{cov(ln(c_t), \varepsilon_t^y)}{var(\varepsilon_t^y)} \approx \frac{dln(c_t)}{d\varepsilon_t^y}|_0$$
$$\phi_c^h = \frac{cov(\Delta ln(c_t), \varepsilon_t^h)}{var(\varepsilon_t^h)} = \frac{cov(ln(c_t), \varepsilon_t^h)}{var(\varepsilon_t^h)} \approx \frac{dln(c_t)}{d\varepsilon_t^h}|_0$$

Intuition

Identification

- Decomposition

$$\phi_c^y = \frac{dln(c_t)}{d\varepsilon_t^y}|_0 = \overbrace{f_3^c|0}^{\text{Multiplier}} \underbrace{y|_0}_{E[y_t]} p_t$$

$$\phi_c^h = \frac{dln(c_t)}{d\varepsilon_t^h}|_0 = \overbrace{f_1^c|_0 \frac{dm_t}{d\varepsilon_t^h}|_0 + f_2^c|_0}^{\text{Contribution of marginal utility}} - \overbrace{f_3^c|0}^{\text{Multiplier}} \underbrace{\frac{dln(m_t)}{d\varepsilon_t^h}|_0}_{\phi_m^h} \underbrace{m_t|_0}_{E[m_t]} p_t^m$$

$\Rightarrow$ Intuitively: recover the resources multiplier from the first eq. and use it to remove from the second eq. the part explained by changes in resources

Plan

A model of the response to income and health shocks

Data: HRS and CAMS

Measure of risk and pass-through to consumption

Decomposition between the effects of resources and utility

Conclusion

Data

- **Health and Retirement Survey** (HRS) - Rand version of data
  $\Rightarrow$ Income and health data
- **Consumption and Activities Mail Survey** (CAMS)
  $\Rightarrow$ Consumption and medical expenditures data
- Both collected biannually: a period is **two years**
- Observation period is **2001-2013**
- Keep households with head **age 65-90**
- Keep households with complete information
- Trim at top and bottom 1% in change of consumption, income, and medical expenditures

Income, health index, and consumption

- **Income**:
  - Net income (earnings, pensions, capital income, benefits, other income)
- **Health**:
  - Predicted value from regression of **self-reported health** (index on 1-5 scale) on **objective measures of health**
  - Avoids capturing fluctuations in self-reported health that are **not driven by objective fluctuations**
  - For households with two spouses, we use the average of the two
- **Consumption**:
  - Nondurables; Sum of necessities (food, utilities, and car-related expenses), plus expenses on leisure activities and on equipment; deflated using category specific CPI

Graphs | Detailed income | Detailed consumption and medical exp.

Plan

A model of the response to income and health shocks

Data: HRS and CAMS

Measure of risk and pass-through to consumption

Decomposition between the effects of resources and utility

Conclusion

Income risk

	All	Lower wealth	Higher wealth
$var(\Delta ln(y_t))$	.213***	.165***	.225***
	(.007)	(.013)	(.008)
$var(\varepsilon_t^y)$	.087***	.066***	.093***
	(.005)	(.009)	(.005)
Obs.	4999	970	4029
$var(\eta_t^y)$	.029***	.017*	.031***
	(.006)	(.01)	(.006)
Obs.	3401	623	2778

Standard errors in parentheses. * at 10%, ** at 5%, *** at 1%

- Transitory risk **larger than** permanent risk

  Still when assuming large measurement error

- What are these shocks? Not just capital income

  Income risk excluding capital income

Health risk

	All	Lower wealth	Higher wealth
$var(\Delta h_t)$	.064***	.098***	.056***
	(.002)	(.006)	(.002)
$var(\varepsilon_t^h)$	.02***	.033***	.017***
	(.001)	(.004)	(.001)
$cov(\varepsilon_t^y, \varepsilon_t^h)$	.002	.003	.002
	(.001)	(.003)	(.001)
Obs.	4999	970	4029
$var(\eta_t^h)$	.02***	.026***	.018***
	(.002)	(.005)	(.002)
$cov(\eta_t^y, \eta_t^h)$	.002	-.003	.004*
	(.002)	(.004)	(.002)
Obs.	3401	623	2778

Standard errors in parentheses. * at 10%, ** at 5%, *** at 1%

- Transitory risk **as large as** permanent risk

  Similar when assuming large measurement error

- S.d. of $\varepsilon_{i,t}^h = 0.14$ (change in ability to carry 10 lb = 0.15)

Pass-through to consumption and med. exp.

	Income shock			Health shock		
	Total	Lower w.	Higher w.	Total	Lower w.	Higher w.
Cons.	.127***	.202**	.115***	.173**	.306**	.112
	(.036)	(.1)	(.038)	(.088)	(.132)	(.114)
Med.	.132	.234	.114	-.493**	-1.171***	-.177
	(.102)	(.288)	(.107)	(.232)	(.364)	(.286)
Obs.	4999	970	4029	4999	970	4029

Standard errors in parentheses. * at 10%, ** at 5%, *** at 1%

- Significant response to a transitory income shock
- Significant response to a transitory health shock (but not proportional income)
- No effect of transitory income on medical expenses
- Significant response of medical expenses to a health shock but modest level change (equivalent to $ 1,118 for a 1 unit change in health)

Large measurement error | Excluding capital income | With AR1 permanent income | Excluding institutionalized

Pass-through with low and high liquid wealth

	Income shock			Health shock		
	Higher w.	Low liq.	High liq.	Higher w.	Low liq.	High liq.
Cons.	.115***	.232***	.07*	.112	.022	.197
	(.038)	(.076)	(.042)	(.114)	(.15)	(.169)
Med.	.114	.034	.144	-.177	.101	-.442
	(.107)	(.2)	(.124)	(.286)	(.41)	(.394)
Obs.	4029	1354	2675	4029	1354	2675

Standard errors in parentheses. * at 10%, ** at 5%, *** at 1%

$\Rightarrow$ The Wealthy Hand-to-Mouth are driving the response of high wealth households to a transitory income shock

Pass-through by marital status

	Income shock			Health shock		
	Total	Lower w.	Higher w.	Total	Lower w.	Higher w.
Singles						
Cons.	.143***	.184	.133***	.183	.3*	.119
	(.052)	(.129)	(.055)	(.121)	(.179)	(.161)
Med.	.147	.516	.049	-.342	-1.318***	.193
	(.14)	(.351)	(.146)	(.306)	(.46)	(.394)
Obs.	2255	639	1616	2255	639	1616
Standard errors in parentheses. * at 10%, ** at 5%, *** at 1%						
Couples						
Cons.	.113**	.238	.101*	.16	.317*	.103
	(.049)	(.153)	(.051)	(.127)	(.177)	(.159)
Med.	.118	-.329	.163	-.704**	-.899	-.634
	(.146)	(.451)	(.153)	(.352)	(.605)	(.412)
Obs.	2744	331	2413	2744	331	2413
Standard errors in parentheses. * at 10%, ** at 5%, *** at 1%						

Pass-through by finer categories of consumption

	Income shock			Health shock		
	All	Low w.	High w.	All	Low w.	High w.
Necessities	.109***	.314***	.075*	.076	.344***	-.046
	(.038)	(.111)	(.04)	(.09)	(.141)	(.112)
Food	.09	.425**	.033	.045	.697***	-.259
	(.062)	(.183)	(.065)	(.152)	(.266)	(.183)
Utilities	.099*	.223*	.077	.044	-.127	.125
	(.053)	(.128)	(.057)	(.128)	(.191)	(.165)
Car	.098**	.248**	.073	.285***	.58***	.147
	(.046)	(.125)	(.05)	(.117)	(.184)	(.148)
Luxuries	.11*	-.186	.16**	.366***	.206	.438**
	(.063)	(.178)	(.066)	(.15)	(.22)	(.193)
Leisure	.219***	-.19	.29***	.426*	.18	.536*
	(.091)	(.333)	(.086)	(.231)	(.372)	(.282)
Equipment	.023	-.297*	.077	.401***	.115	.536***
	(.068)	(.175)	(.073)	(.159)	(.228)	(.203)
Obs.	4994	966	4028	4994	966	4028

Pass-through by finer categories of medical expenses

	Income shock			Health shock		
	All	Low w.	High w.	All	Low w.	High w.
Med.	.132	.234	.114	-.493**	-1.171***	-.177
	(.102)	(.288)	(.107)	(.232)	(.364)	(.286)
Drugs	.063	.134	.05	-.619***	-.936**	-.472
	(.109)	(.285)	(.117)	(.248)	(.409)	(.304)
Med. serv. & supplies	-.021	-.024	-.022	.098	-.173	.222
	(.144)	(.403)	(.152)	(.343)	(.524)	(.433)
Obs.	4994	966	4028	4994	966	4028

- Response driven by drugs

Plan

A model of the response to income and health shocks

Data: HRS and CAMS

Measure of risk and pass-through to consumption

Decomposition between the effects of resources and utility

Conclusion

Decomposition results

	All	Lower wealth	Higher wealth
Cons.	.173**	.306**	.112
	(.088)	(.132)	(.114)
Resources channel	.003*	.018*	.001
	(.002)	(.011)	(.002)
Change in med. exp.	-1117.91**	-2137.017***	-420.397
	(528.194)	(690.707)	(679.599)
Multiplier (10^{-6})	3.093***	8.382**	2.53***
	(.874)	(4.12)	(.84)
Marginal utility channel	.17*	.288**	.111
	(.088)	(.132)	(.114)
Obs.	4999	970	4029

Standard errors in parentheses. * at 10%, ** at 5%, *** at 1%

Effect larger with measurement error

Effect of shift in utility is **not necessarily homogeneous** by wealth Graph

Effect of resources stronger for necessities By goods

Going from positive to normative implications

Consider a utilitarian social planner (equalizing marginal utilities)

- Pure **income shocks** should be completely compensated
- But not necessarily **health shocks**, which come with two risks:
  - Risk of **reduced resources**
  - Risk of **mismatch** between one's marginal utility and one's resources
    $\Rightarrow$ Resembles uncertain lifespan risk
- Insuring the former requires transferring consumption to those experiencing a negative health shock, insuring the latter requires the opposite

With a social planner putting larger weights on those with low utility: effect of health shocks on utility modifies optimal transfers

Plan

A model of the response to income and health shocks

Data: HRS and CAMS

Measure of risk and pass-through to consumption

Decomposition between the effects of resources and utility

Conclusion

Conclusion

- **Substantial transitory** income and health **risk** in old age
- **Significant** consumption response to transitory **income** shocks especially among low wealth and low liquid wealth people
- **Significant** consumption response to transitory **health** shocks
- Yet, transitory health shocks have **relatively modest resource consequences**, but **substantial effect on the utility** of consumption
- This should be taken into account in the design of insurance against health shocks

Sample selection

- All households with complete information, interviewed in regular interview year in the HRS
- Trim at top and bottom 1% in change of log consumption, income, and medical expenditures
- Demographic controls for: year of birth, year, education, race, region, number of household members, marital status, labor force status (both husband and wife, if present), year interactions.

$\Rightarrow$ **4,999 observations**

Back

Sample selection

Sample Selection	Selected out	Selected in
Answering to CAMS & HRS		24,981
Interview in subsequent year	1,014	23,967
Head's age less than 50 or more than 90	695	23,272
Missing demographic variables	100	23,172
Inc., cons., wealth or med exp outliers	1,596	21,576
Missing health	228	21,348
Head's age less than 65	8,256	13,092
First differencing data		8,941
Future health and income changes not obs.	3,942	4,999

Back

Equivalized consumption, by age (left panel) and wealth decile (right panel)

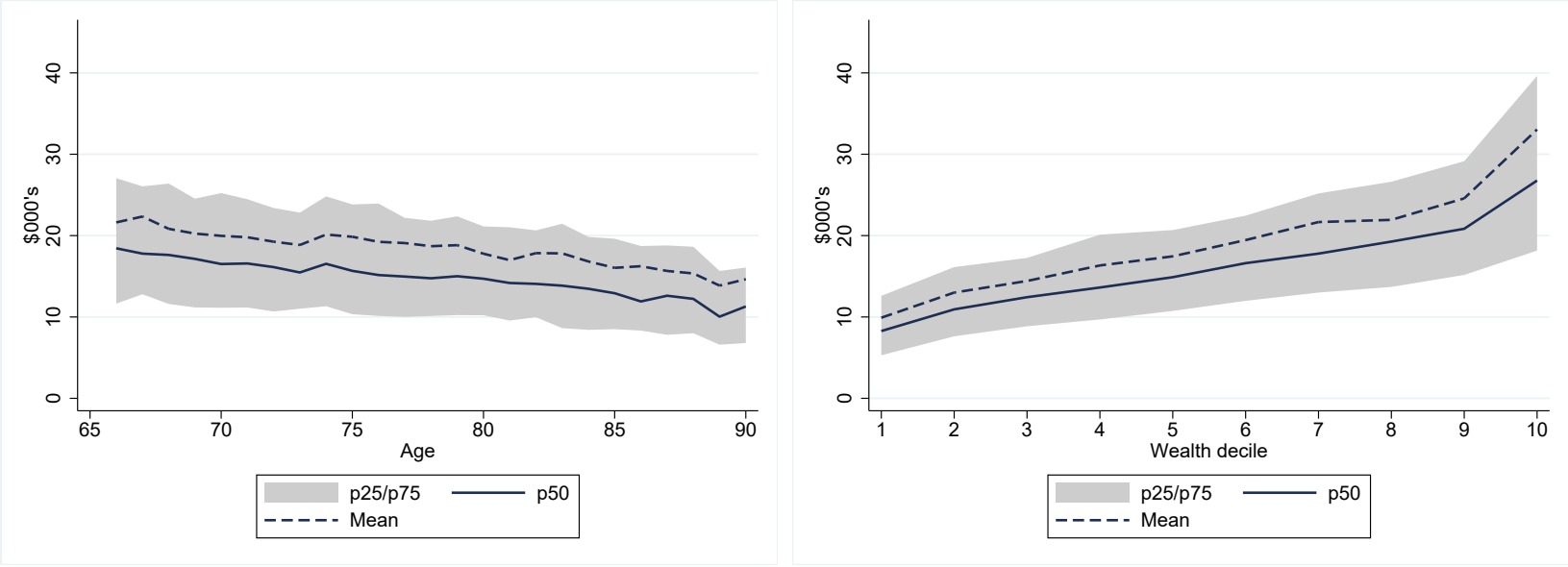


Figure: Mean, 25th, 50th and 75th percentiles of equivalized consumption, by age (left panel) and wealth decile (right panel). In 2015 dollars, cohort born in 1940-1949.

Back

Out-of-pocket medical expenditure, by age (left panel) and wealth decile (right panel)

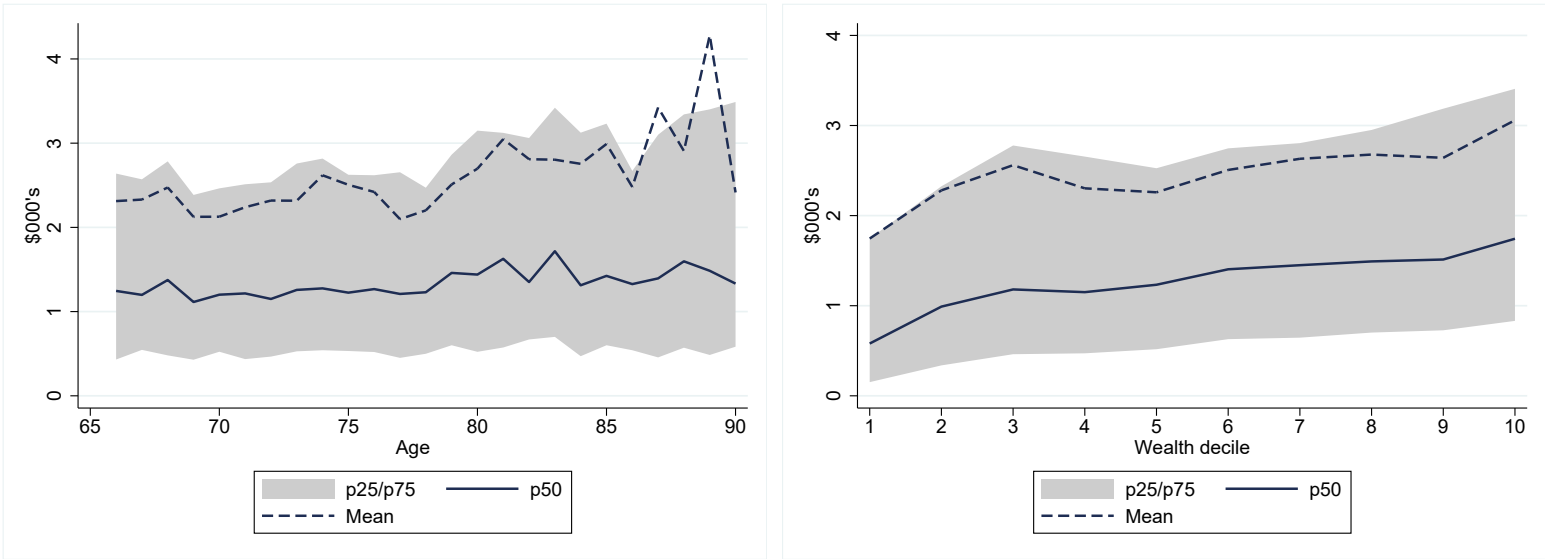


Figure: Mean, 25th, 50th and 75th percentiles of out-of-pocket medical expenditure by age (left panel) and wealth (right panel). In 2015 dollars, cohort born in 1940-1949.

Back

Health index, by age (left panel) and wealth decile (right panel)

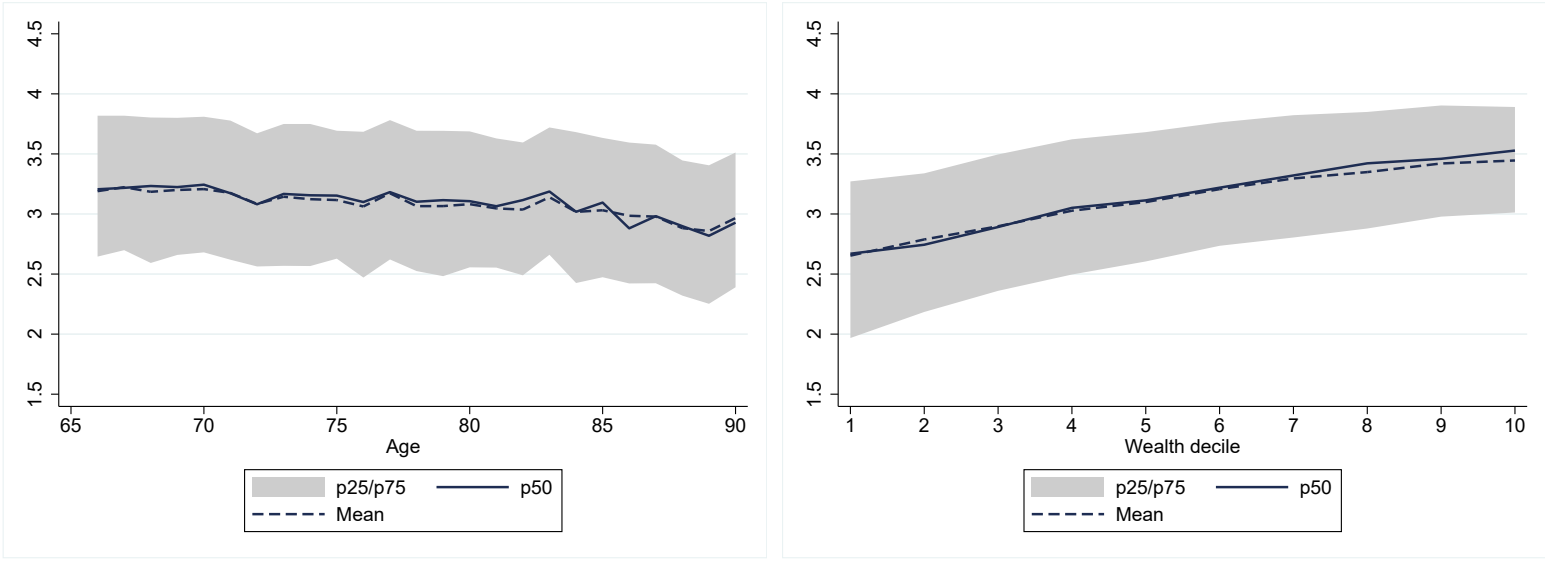


Figure: Mean, 25th, 50th and 75th percentiles of health index by age (left panel) and wealth (right panel). Cohort born in 1940-1949

Back

Equivalized net income, by age (left panel) and wealth decile (right panel)

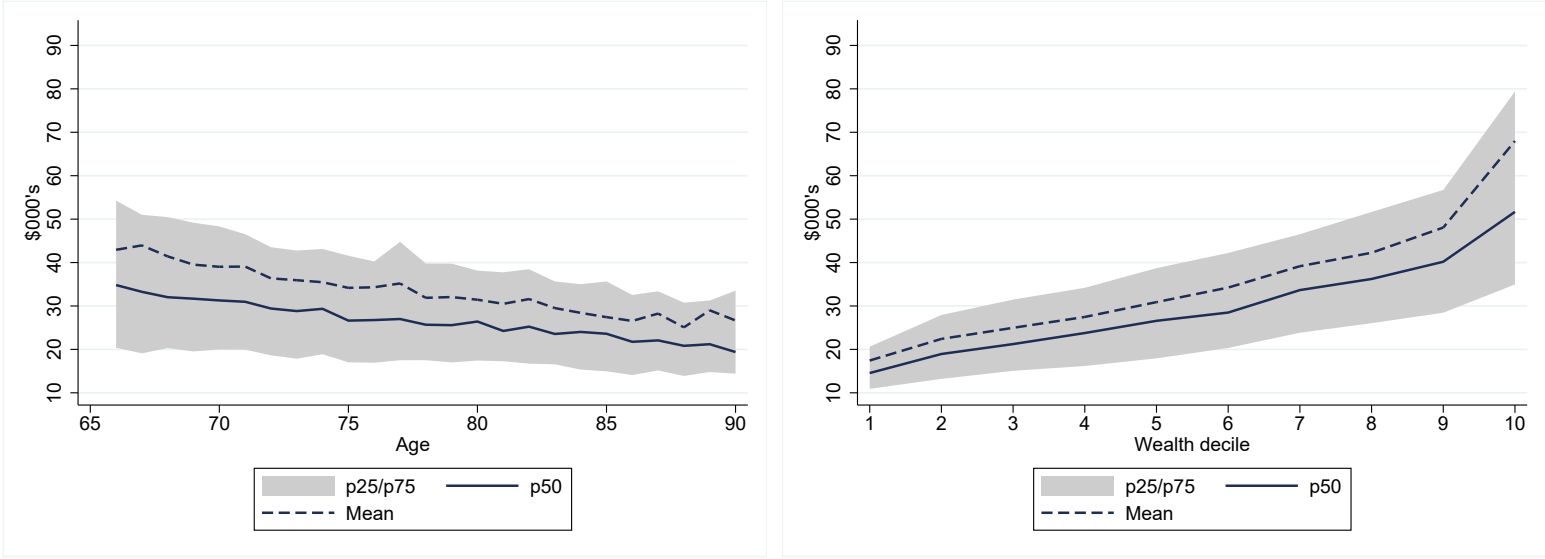


Figure: Mean, 25th, 50th and 75th percentiles of equivalized net income by age (left panel) and wealth (right panel). In 2015 dollars, cohort born in 1940-1949

Back

Income categories

Income includes:

- earnings (wage/salary income, bonuses/overtime pay/commissions/tips, 2nd job or military reserve earnings, professional practice or trade income)
- capital income (business or farm income, self-employment earnings, business income, gross rent, dividend and interest income, trust funds or royalties, and other asset income)
- pensions (income from all pensions and annuities)
- income from Social Security disability and Supplemental Security income
- income from Social Security retirement and widow benefits
- unemployment benefits and worker's compensation
- veterans benefits, welfare, and food stamps
- alimony, other income, and lump sums from insurance, pension, and inheritance

Back

Consumption categories

Consumption		
Necessities	Food	Food at home, food away from home
	Utilities	Electricity, water, heat, phone and internet
	Car-related	Car insurance, car repairs, gasoline
Luxuries	Leisure	Trips and vacations, tickets, sport equipment, hobbies equipment, contributions to charities, gifts
	Equipment	House supplies, house services, yard/garden supplies, yard/garden services, clothing, personal care equipment and services
Medical exp.		
	Drugs	Drugs
	Serv. and sup.	Medical services, medical supplies

Back

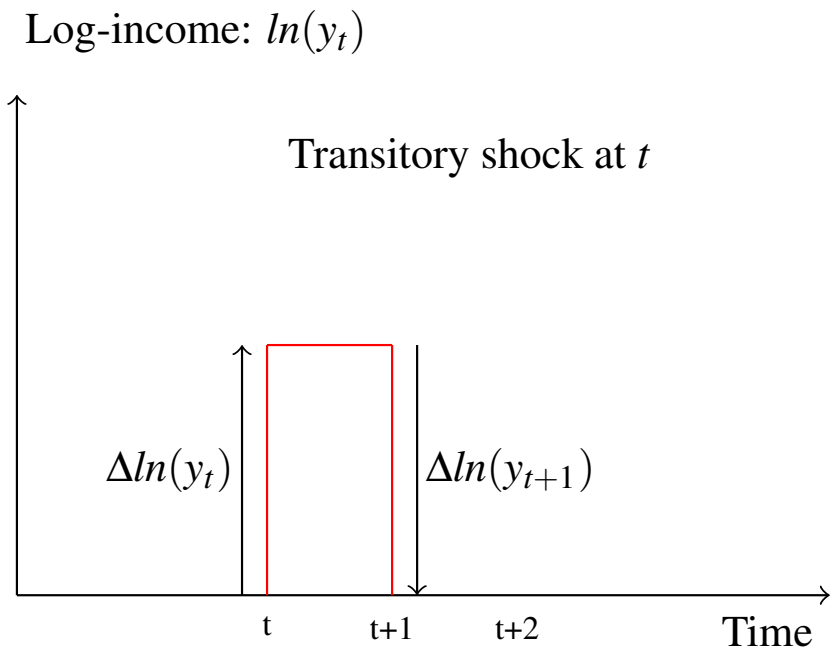
Moments

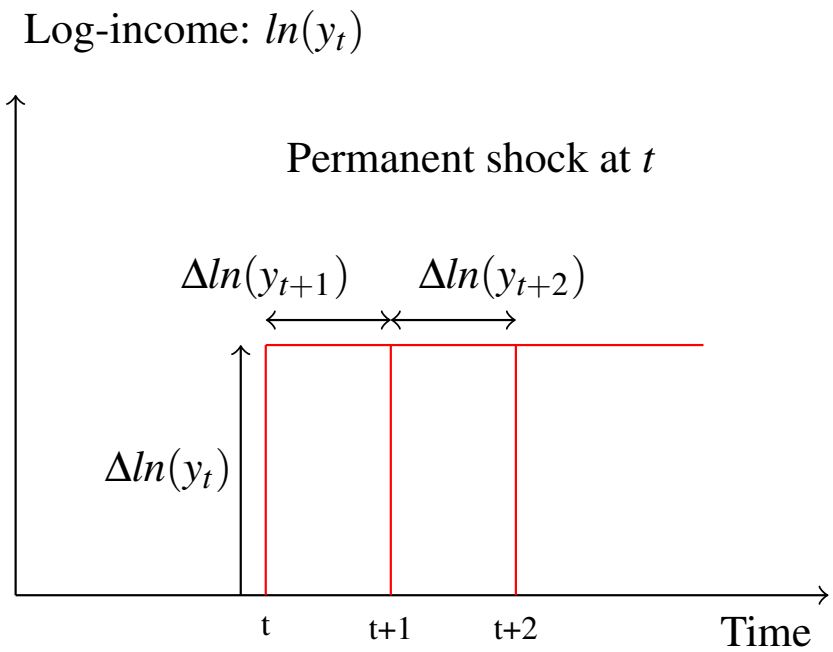
	$\Delta ln(y_t)$	$\Delta ln(y_{t+1})$	$\Delta ln(y_{t+2})$	$\Delta ln(y_{t+3})$
$cov(\Delta ln(y_t),.)$	.213***	-.087***	-.008	-.002
	(.007)	(.005)	(.005)	(.006)
$cov(\Delta ln(c_t),.)$	.017***	-.011***	-.001	.005
	(.003)	(.003)	(.004)	(.006)
Obs.	4,999	4,999	3,094	1,915
	Δh_t	Δh_{t+1}	Δh_{t+2}	Δh_{t+3}
$cov(\Delta h_t,.)$	.064***	-.020***	-.003	.002
	(.002)	(.001)	(.002)	(.002)
$cov(\Delta ln(c_t),.)$	.005***	-.003*	.004**	-.004
	(.002)	(.002)	(.002)	(.003)
Obs.	4,999	4,999	3,045	1,882

Standard errors in parentheses. * at 10%, ** at 5%, *** at 1%

Back

Identification: instrumenting with future growth





Back

Estimating restrictions for income and health risk

- Variance of temporary health shocks:

$$var(\varepsilon^h_{i,t}) = cov(\Delta h_{i,t}, -\Delta h_{i,t+1})$$

- Variance of temporary income shocks:

$$var(\varepsilon^y_{i,t}) = cov(\Delta ln(y_{i,t}), -\Delta ln(y_{i,t+1}))$$

- Other parameters:
  - Variance of permanent income shocks:

$$var(\eta^y_t) = cov(\Delta\tilde{y}_t, \Delta\tilde{y}_{t-1} + \Delta\tilde{y}_t + \Delta\tilde{y}_{t+1}).$$

  - Variance of permanent health shocks:

$$var(\eta^h_t) = cov(\Delta\tilde{h}_t, \Delta\tilde{h}_{t-1} + \Delta\tilde{h}_t + \Delta\tilde{h}_{t+1}),$$

  - Covariance:

$$cov(\varepsilon^h_t, \varepsilon^y_t) = cov(\Delta\tilde{y}_t, -\Delta\tilde{h}_{t+1}),$$
$$cov(\varepsilon^h_t, \varepsilon^y_t) = cov(\Delta\tilde{h}_t, -\Delta\tilde{y}_{t+1}).$$

Back

Estimating restrictions for covariance with consumption and pass-through

- Again, use future growth as an instrument:

$$cov(\Delta ln(\tilde{c}_{i,t}), \varepsilon^h_{i,t}) = cov(\Delta ln(\tilde{c}_{i,t}), -\Delta \tilde{h}_{i,t+1})$$

$$cov(\Delta ln(\tilde{c}_{i,t}), \varepsilon^y_{i,t}) = cov(\Delta ln(\tilde{c}_{i,t}), -\Delta ln(\tilde{y}_{i,t+1}))$$

- Pass-through coefficients are identified from:

$$\widehat{\phi}_c^{\varepsilon^h} = \frac{cov(\Delta ln(\tilde{c}_{i,t}), -\Delta \tilde{h}_{i,t+1})}{cov(\Delta \tilde{h}_{i,t}, -\Delta \tilde{h}_{i,t+1})} = \phi_c^{\varepsilon^h}$$

$$\widehat{\phi}_c^{\varepsilon^y} = \frac{cov(\Delta ln(\tilde{c}_{i,t}), -\Delta ln(\tilde{y}_{i,t+1}))}{cov(\Delta ln(\tilde{y}_{i,t}), -\Delta ln(\tilde{y}_{i,t+1}))} = \phi_c^{\varepsilon^y}$$

- Not possible to estimate the pass-through to permanent shocks without more stringent restrictions

Back

Income risk assuming large measurement error

Assumption: variance of measurement error = 50% of variance of transitory shock

	All	Lower wealth	Higher wealth
$var(\Delta ln(y_t))$	.149***	.109***	.159***
	(.007)	(.013)	(.008)
$var(\varepsilon_t^h)$	.06***	.046***	.064***
	(.003)	(.006)	(.004)
Obs.	5150	1009	4141
$var(\eta_t^y)$	.029***	.017*	.031***
	(.005)	(.01)	(.006)
Obs.	3517	658	2859

Standard errors in parentheses. * at 10%, ** at 5%, *** at 1%

Back

Health risk assuming large measurement error

Assumption: variance of measurement error = 50% of variance of transitory

	All	Lower wealth	Higher wealth
$var(\Delta h_t)$	.048***	.030***	.043***
	(.002)	(.007)	(.002)
$var(\varepsilon_t^h)$	.015***	.024***	.013***
	(.001)	(.003)	(.001)
$cov(\varepsilon_t^y, \varepsilon_t^h)$	.002*	.002	.003*
	(.001)	(.003)	(.001)
Obs.	5150	1009	4141
$var(\eta_t^h)$	.018***	.025***	.017***
	(.002)	(.005)	(.002)
Obs.	3517	658	2859

Standard errors in parentheses. * at 10%, ** at 5%, *** at 1%

Back

Pass-through with measurement error

	Income shock			Health shock		
	Total	Lower w.	Higher w.	Total	Lower w.	Higher w.
Cons.	.186***	.295**	.167***	.253**	.447**	.163
	(.052)	(.146)	(.055)	(.129)	(.192)	(.166)
Med.	.192	.342	.166	-.719**	-1.71***	-.258
	(.149)	(.42)	(.157)	(.338)	(.532)	(.417)
Obs.	4999	970	4029	4999	970	4029

Standard errors in parentheses. * at 10%, ** at 5%, *** at 1%

Back

Income risk excluding capital income

	All	Low wealth	High wealth
$var(\varepsilon^y_{i,t})$	.097***	.075***	.103***
	(.006)	(.01)	(.006)
Obs.	5,052	998	4,054
$var(\eta^y_{i,t})$	.035***	.009	.041***
	(.007)	(.013)	(.008)
Obs.	3,447	654	,793

Standard errors in parentheses. * at 10%, ** at 5%, *** at 1%

Back

Pass-through excluding capital income

	Income shock			Health shock		
	Total	Low w.	High w.	Total	Low w.	High w.
Cons.	.095***	.186*	.078**	.172**	.325***	.093
	(.036)	(.101)	(.038)	(.085)	(.12)	(.112)
Necessities	.066*	.283***	.027	.082	.321***	-.041
	(.039)	(.105)	(.041)	(.089)	(.131)	(.114)
Leis. & eq.	.12**	-.182	.174***	.358***	.354*	.36*
	(.06)	(.173)	(.062)	(.147)	(.212)	(.191)
Obs.	5,052	998	4,054	5101	1000	4101

Standard errors in parentheses. * at 10%, ** at 5%, *** at 1%

Back

Pass-through excluding capital income

	Income shock			Health shock		
	Total	Lower w.	Higher w.	Total	Lower w.	Higher w.
Cons.	.127***	.201**	.114***	.173**	.306**	.112
	(.036)	(.101)	(.038)	(.088)	(.132)	(.114)
Med.	.133	.234	.116	-.493**	-1.171***	-.177
	(.103)	(.291)	(.109)	(.232)	(.364)	(.286)
Obs.	4999	970	4029	4999	970	4029

Standard errors in parentheses. * at 10%, ** at 5%, *** at 1%

Back

Pass-through with low and high liquid wealth

	Income shock			Health shock		
	Higher w.	Low liq.	High liq.	Higher w.	Low liq.	High liq.
Cons.	.115***	.232***	.07*	.112	.022	.197
	(.038)	(.076)	(.042)	(.114)	(.15)	(.169)
Med.	.114	.034	.144	-.177	.101	-.442
	(.107)	(.2)	(.124)	(.286)	(.41)	(.394)
Obs.	4029	1354	2675	4029	1354	2675

$\Rightarrow$ the Wealthy Hand-to-Mouth are driving the response of high wealth households to a transitory income shock

Back

Pass-through excluding long-term institutionalized

Excluding obs **if head or spouse spend more than 100 days in institution over two years** (drop 77 observations of first diff)

	Health shock		
	All	Low w.	High w.
Nondurables $\phi_c^{\varepsilon^h}$	.167*	.294***	.102
	(.086)	(.118)	(.113)
Necessities	.07	.272**	-.033
	(.089)	(.13)	(.114)
Luxuries	.382***	.389*	.378**
	(.147)	(.215)	(.191)
Obs.	5028	976	4052

Very similar results

Back

Decomposition results by goods

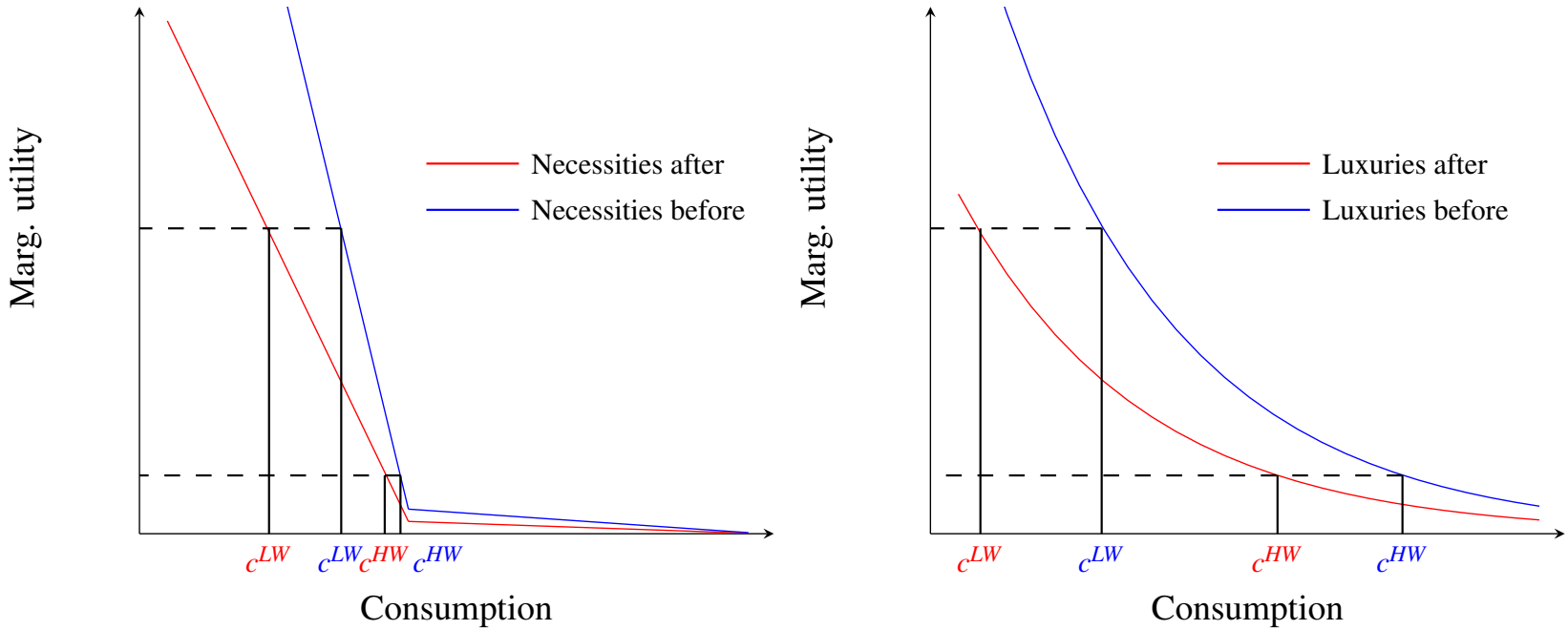


Figure: Effect of a shift in the weight put on utility for a linear and an exponential utility functions and for low-wealth and high-wealth households

Back

Decomposition results by goods

	All	Lower wealth	Higher wealth
Necessities	.076	.344***	-.046
	(.09)	(.141)	(.112)
Resources channel	-.005	.019	-.007
	(.004)	(.016)	(.005)
Marginal utility channel	.081	.326**	-.04
	(.091)	(.142)	(.113)
Luxuries	.366***	.206	.438**
	(.15)	(.22)	(.193)
Resources channel	0.001	.01	.004
	(.004)	(.017)	(.006)
Marginal utility channel	.365***	.196	.434***
	(.151)	(.218)	(.194)
Obs.	4994	966	4028

Standard errors in parentheses. * at 10%, ** at 5%, *** at 1%

Back