Cognitive Decline, Limited Awareness, Imperfect Agency, and Financial Well-being

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Introduction

- Americans responsible for own financial well-being in late life.
- Big financial decisions faced at the end of life: Estate planning, care arrangements, etc. Hard to set complete contingency plans.
- Much concern with loss of financial capability due to cognitive decline at this crucial moment. (Langa et al., 2008; Chandra et al., 2020)

Introduction

- Transfer of control to an agent as a potential solution.
- Potential and limits hinge on:
  1. Quality of the agent
  2. How likely the agent will be available
  3. Timing of transfer of control to the agent

Introduction

What we do:

- Present survey evidence on factors shaping potential and limits of agency.
- Quantitative measures allow us to calculate expected welfare loss due to poor financial decisions.
- Construct a model of cognitive decline, awareness, and agency.

Introduction

Survey evidence shows:

- High confidence in the quality and availability of the agent
- But...

Introduction

The problem might be the timing of the transfer of control

- Some quotes (rephrased) from online chats after the Pilot survey:
  - My mom, who is very old, was refused renewal of her driver's license because she failed the vision test. Her response was to sue the DMV for incompetence. I sincerely hope for self-driving cars before I get to that stage.
  - I would hope that financial institutions would take a responsible approach to abnormal changes in behavior by a long-term client.
- Pilot survey also reveals concern about not noticing own cognitive decline.

Introduction

Timing of transfer and well-being:

- We use hypothetical survey questions to learn respondents' concerns about the timing of the transfer.
- Many believe that transfer of control at a sub-optimal time is likely.
- Transfer at the wrong time is perceived to have a large negative impact on financial well-being.
- We calibrate the model to capture the delayed transfer which many see as likely.

Introduction

- Financial literacy and mistakes late in life
  - Agarwal et al. (2009), Korniotis and Kumar (2011), Lusardi and Mitchell (2014), Lusardi, Mitchell, and Curto (2014), Angrisani and Lee (2018), Kim, Maurer, and Mitchell (2019)
- Financial frauds aiming older individuals
  - Choi, Kulick, and Mayer (2008), Egan, Matvos, and Seru (2019), DeLiema et al. (2020)
- Unnoticed cognitive decline
  - Gerontology: Okonkwo et al. (2008), Nicholas et al. (2021), Sunderaraman et al. (forthcoming)
  - Economics: Finke, Howe and Huston (2016), Gamble et al. (2015), and Mazzonna and Peracchi (2020)

Introduction

Remainder of the talk:

- Survey
- Model
- Welfare

Survey results

Implemented in two phases

- Pilot survey (December 2019, N=264)
  - Focuses more on the quality of agents
  - Follow-up chats with respondents to further explore their concerns
- Main survey (July 2020, N=2,489)
  - Focuses more on the timing of transfer of control

All the results are from the Main survey unless noted otherwise.

VRI sample roughly represents the top 50% in wealth distribution among older Americans (Ameriks et al., 2014).

Survey results

“Cognitive decline means a deterioration in your abilities in:

- Remembering things
- Learning new things in general
- Making decisions on everyday matters
- Handling financial matters (for example, your pension or dealing with the bank)
- Using your intelligence to reason things through"

Survey results

% Chance of having...	25-pctile	Median	75-pctile	Mean	N
Cognitive decline for $\geq$ 1 year	5	15	55	30	2,489
Cognitive decline for $\geq$ 5 years	5	15	45	29	2,489

Survey results

Likely agent:

- “Who do you think is most likely to make financial decisions on your behalf if you have significant cognitive decline?" (No spouse/partner available)
  - A child: 69.8%
  - A sibling: 9.7%
  - A trustee/an institution: 8.7%
  - A grandchild: 0.6%
  - Others: 9.2%
  - None: 1.8%

Survey results

Quality of the agent:

How good your agent would be at...	Excellent	Very good	Good	Fair or Poor
Understanding your needs & desires	44.1%	38.5%	13.8%	3.5%
Understanding your fin. situation	48.4%	33.3%	14.8%	3.5%
Understanding fin. matters in general	48.4%	32.4%	15.1%	4.1%
Pursuing your interest	56.7%	30.2%	10.2%	3.0%

Quantitative measures from the Pilot survey reveal that:

- Agents are almost as good as self without cognitive decline.

Detail

Survey results

% Chance of...	25-pctile	Median	75-pctile	Mean	N
The agent being available	55	85	100	76	2,489

Survey results

Key points of the hypothetical scenario on the timing of transfer:

- Last five years of life
- Have mild cognitive decline in the first year.
- Subjective progression of cognitive decline during the rest of the following five years.
- (If coupled) Outlived your spouse/partner.
- Have wealth of $W (the nearest multiple of $500K from to actual wealth). Following decisions need to be made:
  - How to spend (routine spending, non-routine spending, LTC, etc.)
  - Saving for future and managing investment
  - Giving to relatives, friends, or charities

Survey results

Responses on optimal timing of transfer:

- Immediately at the onset of cognitive decline: 8.0%
- During further decline, but before you completely lose the ability to manage your finances: 83.9%
- When you completely lose the ability to manage your finances: 8.1%

Survey results

It may happen at the wrong time:

% Chance of...	25-pctile	Median	75-pctile	Mean	N
Delayed transfer	15	25	55	35	2,293
Early transfer	5	25	35	24	2,295

Why at the wrong time?

Branching based on what they are more worried about:

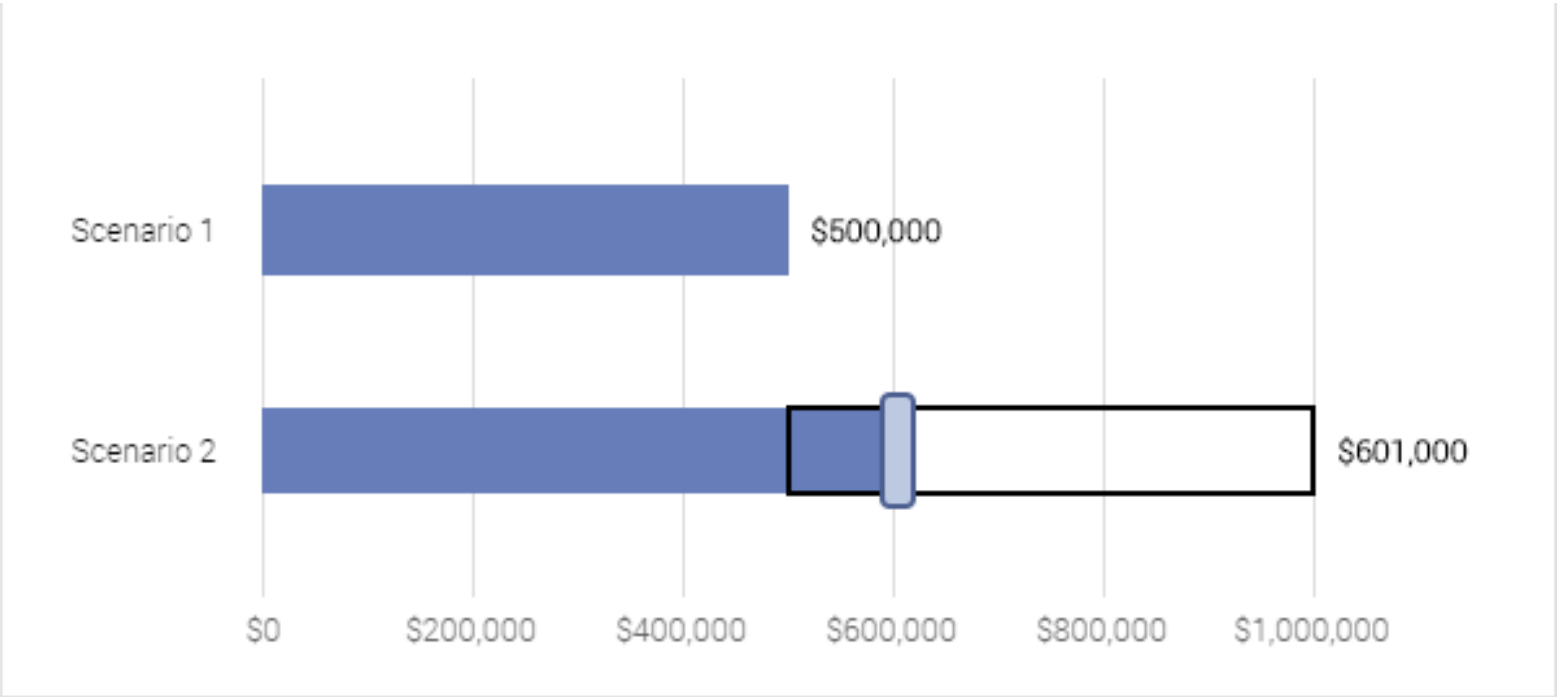
- Delayed transfer: 60.6%
- Early transfer: 36.0%

Survey results

Measuring compensating variation for transfer at the wrong time (in the delay branch):

- Scenario 1: Transfer at the ideal time
- Scenario 2: Delayed transfer

“At what level of resources would you be **just as well off** with the spending and saving decisions under **Scenario 2** as with those under **Scenario 1** with **$500,000**?"



Survey results

Measured compensating variation (in % of $W)
(i.e., $\bar{\nu}(W) = \hat{\nu}((1 + x)W)$).

Welfare cost (% of $W)	25-pctile	Median	75-pctile	Mean	N
Delayed transfer	0	19	34	18	1,465
Early transfer	0	13	27	10	859

In dollars | Cost times prob.

- Cf. Mazzona and Peracchi (2020): Unaware cognitive decline results in 10% loss of wealth among wealthy, stockholders.

Credibility

Model of cognitive decline, awareness, and agency

- Simple, stylized model of uncertainty about future cognitive state and awareness of it with imperfect agency.
- Model of big irreversible mistake that is more likely when more declined.
  - Captures the possibility of making big financial mistakes, being a victim of financial fraud, etc.
- Uncertainty about awareness of cognitive decline puts a significant limit on the role of agency.

Model of cognitive decline, awareness, and agency

- T-period model.
- Cognitive ability: $\theta_t \in \{\theta^1, \cdots, \theta^N\}$, with:
  - $1 > \theta^1 > \theta^2 > \cdots > \theta^N > 0$
  - $\theta_1 = \theta^1$ (mild CD in the first period)
- Cognitive ability evolves based on the non-increasing 1st-order Markov process, $\pi_{\theta'|\theta}$.

Model of cognitive decline, awareness, and agency

- Flow utility is given as $U(\cdot)$, which does not depend on θ.
- There are two options available in the choice set without the agent: $X = \{\bar{x}, \underline{x}\}$.
- Preference is such that: $U(\bar{x}) > U(\underline{x})$.

Model of cognitive decline, awareness, and agency

- Bad irreversible outcome triggered by a bad financial choice, with two options {G, B}.
- If B is chosen, then the choice set becomes $X_B = \{\underline{x}\}$ for the remaining periods.
  - Forced to choose the worst option from the next period.
- If G is chosen, then the choice set X is still intact in the next period.
- The chance of choosing B is $1 - \theta$.
  - Cognitive decline raises the chance of B.

Model of cognitive decline, awareness, and agency

- Can transfer to the agent at any time
  - No involuntary transfer even with cognitive decline.
- The agent will choose x^A from now on.
- $U(\bar{x}) > U(x^A) > U(\underline{x})$: the principal faces a trade-off.
- Utility cost of using the agent: $D(\theta) \geq 0$, with $D'(\theta) \geq 0$.

Model of cognitive decline, awareness, and agency

- At the beginning of each period, the principal learns about the true value of θ with the probability ζ (for simplicity, independent of θ).
- When no learning, Bayesian updating on θ.
- Principal may decline without noticing it.
- We solve the model and compare the timing of the transfer with optimal timing under full information ($\zeta = 1$).
- Calibration determined by the survey evidence.

Model results

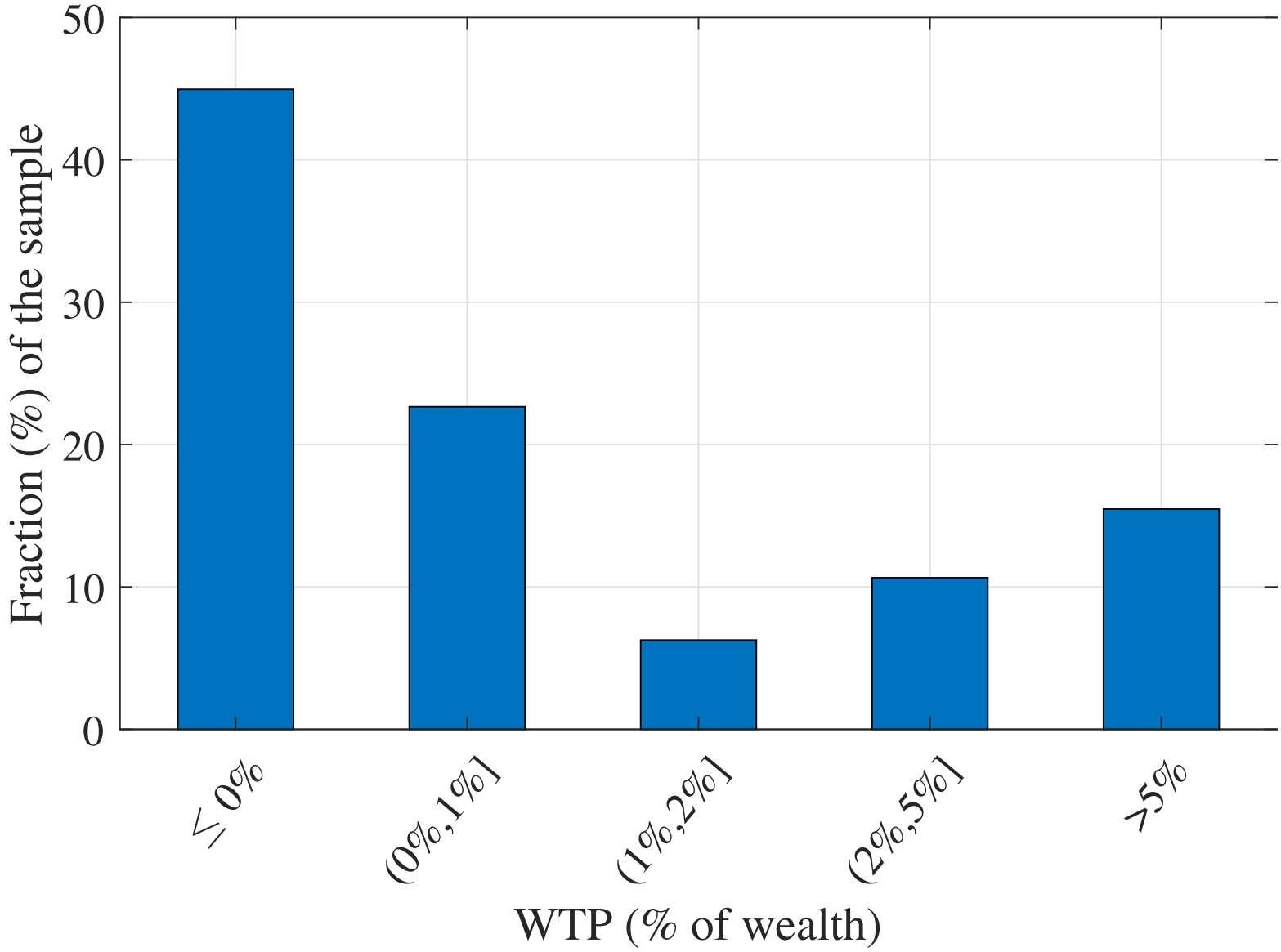
Our model calibrated based on the survey generates the following key observations: Calibration

- Model has four states: $\{\theta^1, \theta^2, \theta^3, \theta^4\}$.
- Optimal timing of transfer under full information is as soon as reach θ^2.
- 40% chance of failing to notice decline at the optimal timing of transfer.
  - 43% in the survey.
- 35% chance of delaying transfer compared to the optimal timing under full information.
  - 35% in the survey.
- Average welfare cost of a delayed transfer equivalent to 15% reduction in consumption
  - 18% in the survey.
- Key frictions: limited awareness of cognitive decline and utility cost of using the agent when capable

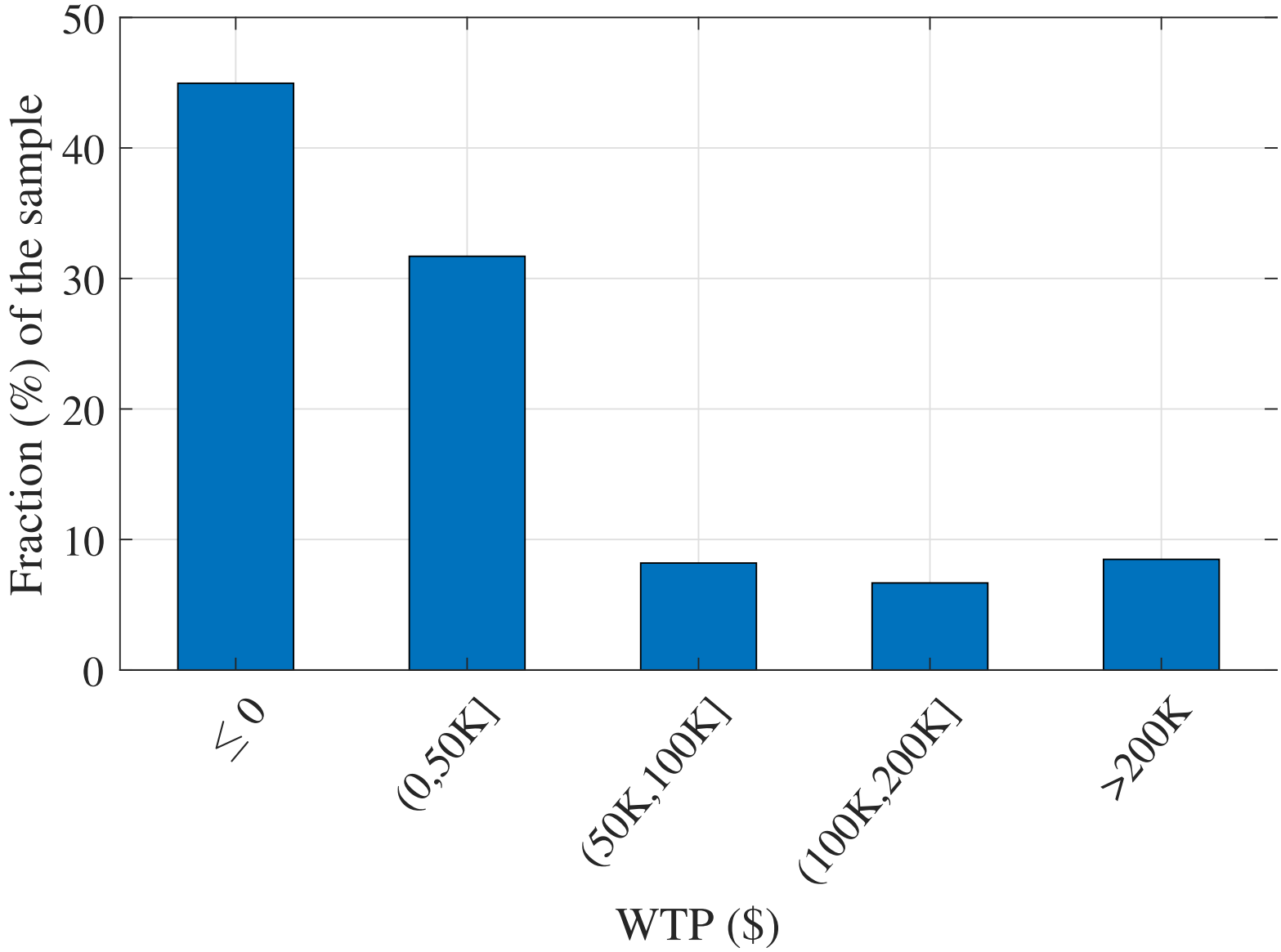
Welfare

- Conditional on having cognitive decline, transfer at the wrong time causes significant welfare loss.
- But how much do current respondents (unsure of future cognitive decline) care about this? The answer also depends on:
  - Welfare cost and chance of having transfer at the wrong time conditional on having cognitive decline
  - Chance of having cognitive decline (and outliving the spouse)
  - Marginal value of resources under cognitive decline
  - Formula
- We have measures of all these elements at the individual level. SSQ

Welfare



Welfare


50
40
30
20
10
0
Fraction (%) of the sample
≤ 0
(0,50K]
(50K,100K]
(100K,200K]
>200K
WTP ($)

Conclusion

- Late in life, households face risk of losing financial capability when they need to make big financial decisions.
- Agency is a potential solution for this problem ...
  - ... but there are real worries about failing to notice decline and transferring at the wrong time.
- There is a strong need for innovations that can improve the timing of the transfer.
  - Again, from the online chats: I would hope that financial institutions would take a responsible approach to abnormal changes in behavior by a long-term client.

Vanguard Research Initiative

- Collaboration of U Michigan, NYU, and Vanguard.
- Goal: Examine decisionmaking of older Americans with some financial wealth.
- Run (almost) annual surveys on a large sample of account holders at Vanguard.

Vanguard Research Initiative

Fielded seven surveys so far:

- Survey 1 (2013): Wealth and portfolio.
- Survey 2 (2013): Annuity and long-term care.
- Survey 3 (2014): Family, bequests, and transfers.
- Survey 4 (2015): Late-life work and transition to retirement.
- Survey 5 (2016): Wealth and portfolio revisited.
- Survey 6 (2018): Late-life work and transition to retirement revisited.
- Survey 7 (2020): Cognitive decline.

Back

Calibration: model parameters

- T: number of years
  - Set to 5 based on the scenario in the survey.
- $\{\theta^1, \cdots, \theta^N\}$: cognitive state space
  - $\{\theta^1, \cdots, \theta^4\} = \{0.99, 0.95, 0.90, 0.80\}$. Start with θ^1 (mild cognitive decline).
- $\pi_{\theta'|\theta}$: cognitive state transition matrix
  - $\pi_{\theta^j|\theta^j} = 0.7$, $\pi_{\theta^{j+1}|\theta^j} = 0.3$, and the transition probability is zero for other case. In other words, it deteriorate by one grid with 30% chance.
  - This probability is disciplined by the chance of a delayed transfer.

Calibration: model parameters

- $\bar{x}$, $\underline{x}$, x^A: quality of decisions
  - $\bar{x} = 1$, $\underline{x} = 0.04$, $x^A = 0.87$
  - Consistent with $\bar{x} > x^A >> \underline{x}$ from the pilot survey.
  - $U(x^\star) = 1, U(\tilde{x}) = -25, U(x^A) = 0.85$ under the CRRA utility function.
- ζ: learning probability (Calvo parameter)
  - $\zeta = 0.3$.
  - Disciplined by the chance of not noticing own decline at the ideal timing of transfer.
- $D(\theta)$: utility cost of using the agent
  - $D(\theta_1) = 1.5$, $D(\theta_2) = 0.7$, and $D(\theta_3) = D(\theta_4) = 0$.
  - Equivalent to reducing x^A from 0.87 to 0.38 and to 0.54.

Back

Quality of the decision-makers

Welfare cost of DM being:

1. Your likely agent
2. Yourself with cognitive decline

... compared to yourself without cognitive decline (i.e., $\nu(W) = \nu_{DM}([1 + x_W]W)$).

Welfare cost (% of \$W)	25-pctile	Median	75-pctile	Mean	N
Likely agent	0	3	25	13	268
Yourself with cog. decline	21	67	123	132	268

Back

Why at a wrong timing?

A. For a delayed transfer

% Chance of...	25-pctile	Median	75-pctile	Mean	N
You not noticing your cognitive decline	25	45	55	42	2,293
You not wanting to give up control	25	45	65	44	2,293
Agent not noticing your cognitive decline	15	25	55	33	2,293
Agent not being available	5	15	35	23	2,293

B. For an early transfer

% Chance of...	25-pctile	Median	75-pctile	Mean	N
Agent taking control against respondent's preference	5	25	35	26	2,294

Back

Cost of a wrong timing

Welfare cost of transfer at a wrong timing: Measured as compensating variation (in $)
(i.e., $V_O(W) = V_W(W + x)$):

Welfare cost (in $1,000)	25-pctile	Median	75-pctile	Mean	N
Delayed transfer	0	299	646	432	1,465
Early transfer	0	188	520	245	859

Back

Cost of a wrong timing

Welfare cost of a wrong timing $\times$ probability of a wrong timing.

In % of $W	25-pctile	Median	75-pctile	Mean	N
Delayed transfer	0	4.2	11.5	6.7	1,465
Early transfer	0	1.1	5.9	2.1	859

In $1,000	25-pctile	Median	75-pctile	Mean	N
Delayed transfer	0	78	242	173	1,177
Early transfer	0	25	125	59	859

Back

Survey results

Comprehension test results (full score: 6)

	25-pctile	Median	75-pctile	Mean	N
Score after 1st round	3	4	5	3.9	2,489
Score after 2nd round	5	6	6	5.5	2,489

Survey results

Slightly larger welfare cost among those who understand better:

A. Welfare cost of a delayed transfer (in % of $W)

	25-pctile	Median	75-pctile	Mean	N
Got full score	1	20	34	20	1,101
Didn't get full score	0	12	31	12	364

B. Welfare cost of an early transfer (in % of $W)

	25-pctile	Median	75-pctile	Mean	N
Got full score	0	17	29	12	570
Didn't get full score	-2	7	24	7	289

Survey results

The share of “more concerned about an early transfer" (as opposed to a delayed transfer) increases if ...

- The agent is of lower quality (34% for $\geq$ median quality vs. 41% for $<$ median quality)
- The agent is not a child (35% for a child vs. 41% for a non-child)

Survey results

A transfer earlier than the ideal would be costlier if...

- the quality of agents is lower
- the agent is less close

A. Welfare cost of an early transfer by quality of agent (in % of $W)

	25-pctile	Median	75-pctile	Mean	N
Quality $\geq$ median	-10	7	25	6	394
Quality $<$ median	0	17	29	13	465

B. Welfare cost of an early transfer by type of agent (in % of $W)

	25-pctile	Median	75-pctile	Mean	N
Agent $=$ child	-4	11	25	6	570
Agent $\neq$ child	0	18	34	17	289

Back

SSQ to measure preference under cognitive decline

Based on the approach used in Ameriks, Briggs, Caplin, Shapiro, and Tonetti (2020).

Hypothetical situation:

- At the beginning of last five years of life.
- May have cognitive decline (25%).
- Otherwise, similar to the situation assumed in the WTP question.

Respondents are asked to allocate resources between two lockbxes:

- Plan A: Pays $1 for $1 investment if do not experience a cognitive decline.
- Plan B: Pays $4 for $1 investment if experience a cognitive decline.

Back

Ex-ante WTP calculation formula

We are looking for x such that:

$$(1-\pi_{CD})V(W)+\pi_{CD}(1-\pi_{wt})V_{opt}^{CD}(W)+\pi_{CD}\pi_{wt}V_{wt}^{CD}(W)$$
$$=(1-\pi_{CD})V((1-x)W)+\pi_{CD}V_{opt}^{CD}((1-x)W).$$

Under a first-order Taylor approximation, we get:

$$x=\frac{\tilde{x}\pi_{CD}\pi_{wt}(V_{opt}^{CD'}(W)/V'(W))}{(1-\pi_{CD})+\pi_{CD}(V_{opt'}^{CD}(W)/V'(W))},$$

where $\tilde{x}$ is the ex-post WTP. Back