Intertemporal Lecture

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Intertemporal Economics

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- But so much of human behavior is lifecycle/dynamic
- We'll give a crash course on dynamic econ

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- We'll give a crash course on dynamic econ
- We'll do even less theory because it's far outside scope of course

Intertemporal Economics

- We'll think just about consumption $u(c_1, c_2)$
- It's possible happiness between the two is connected ("habit formation") but mostly we model it as:

$$u(c_1, c_2) = u(c_1) + \beta u(c_2)$$

- Where β is some "impatience" factor ("discount rate")
- Budget constraint(s) (endowment I) becomes:

$$I_1 = c_1 + s_{1\to 2}$$

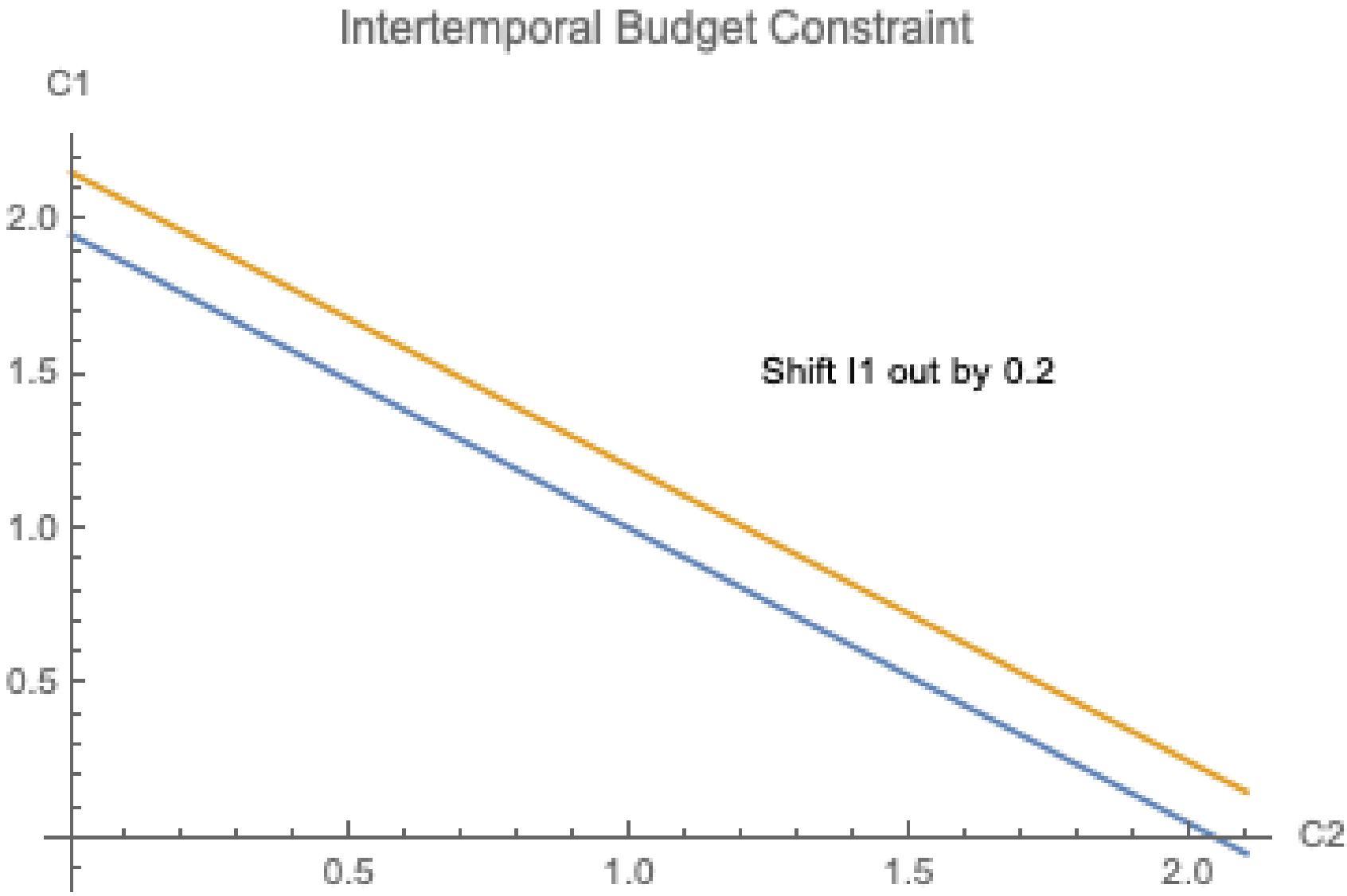
$$I_2 + (1 + r)s_{1\to 2} = c_2$$

- Combining the two by cancelling savings to get the "net present value" budget constraint:

$$I_1 + \frac{I_2}{1 + r} = c_1 + \frac{c_2}{1 + r}$$

- What does BC look like?

Intertemporal Economics



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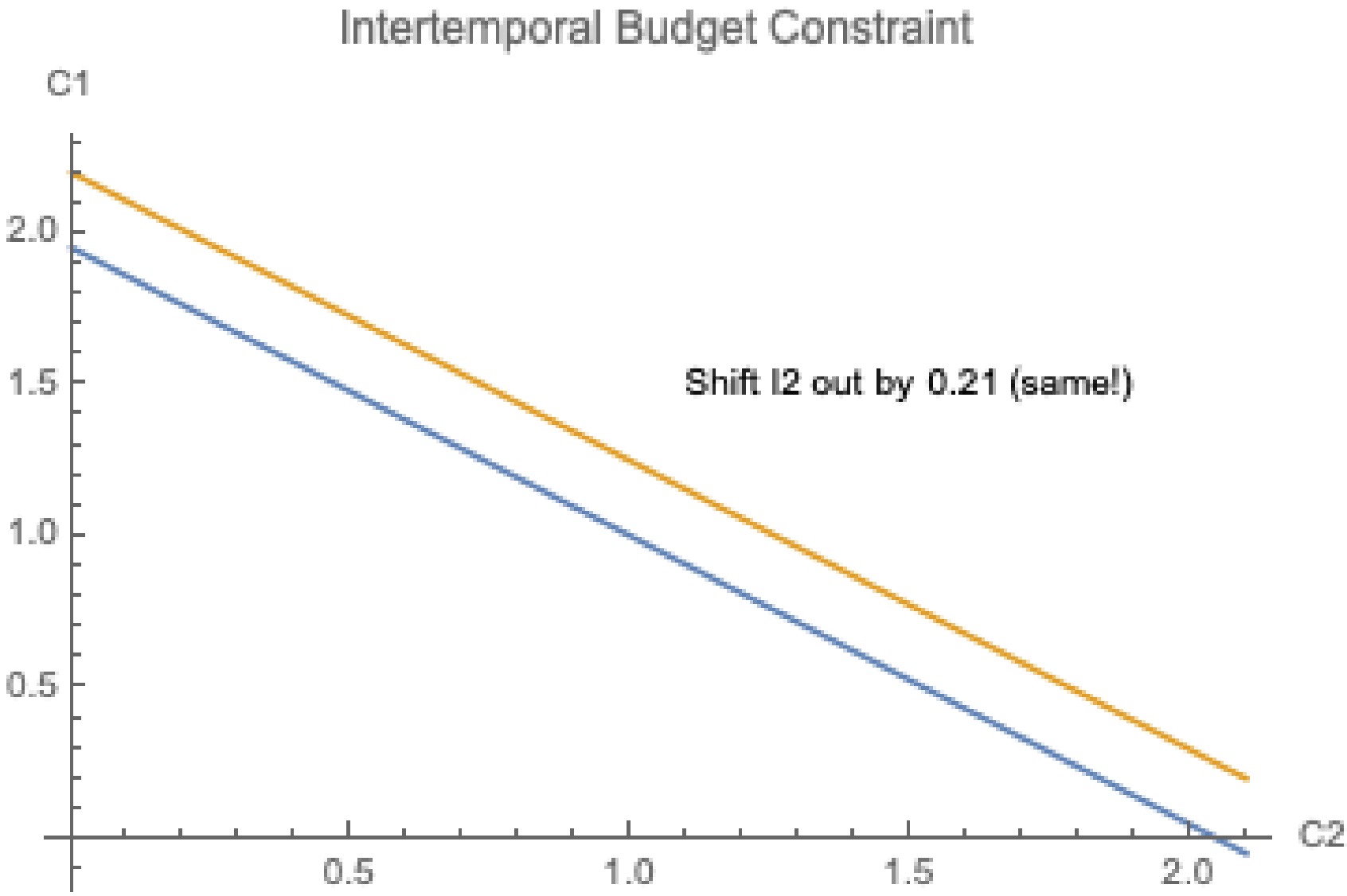

Testable Predictions

- Important implication and predictions (science!)
- Let's say Trevor earned \$100 today and next year (then died). How much should he consume in each period?

- What if you give Trevor \$50 extra today? How much more consume today vs tomorrow?
- If he likes to smooth, \$125.61 today and \$125.61 tomorrow

$$\underbrace{126.61}_{\text{Consumption tomorrow}} = \underbrace{100}_{\text{Income tomorrow}} + \underbrace{(150 - 125.61)}_{\text{Inc today-consumption}} * \underbrace{1.05}_{\text{Interest rate}})$$

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- **Prediction 2**: Your "marginal propensity to consume" should be far below 1
- **Prediction 3**: Anticipated income will be smoothed

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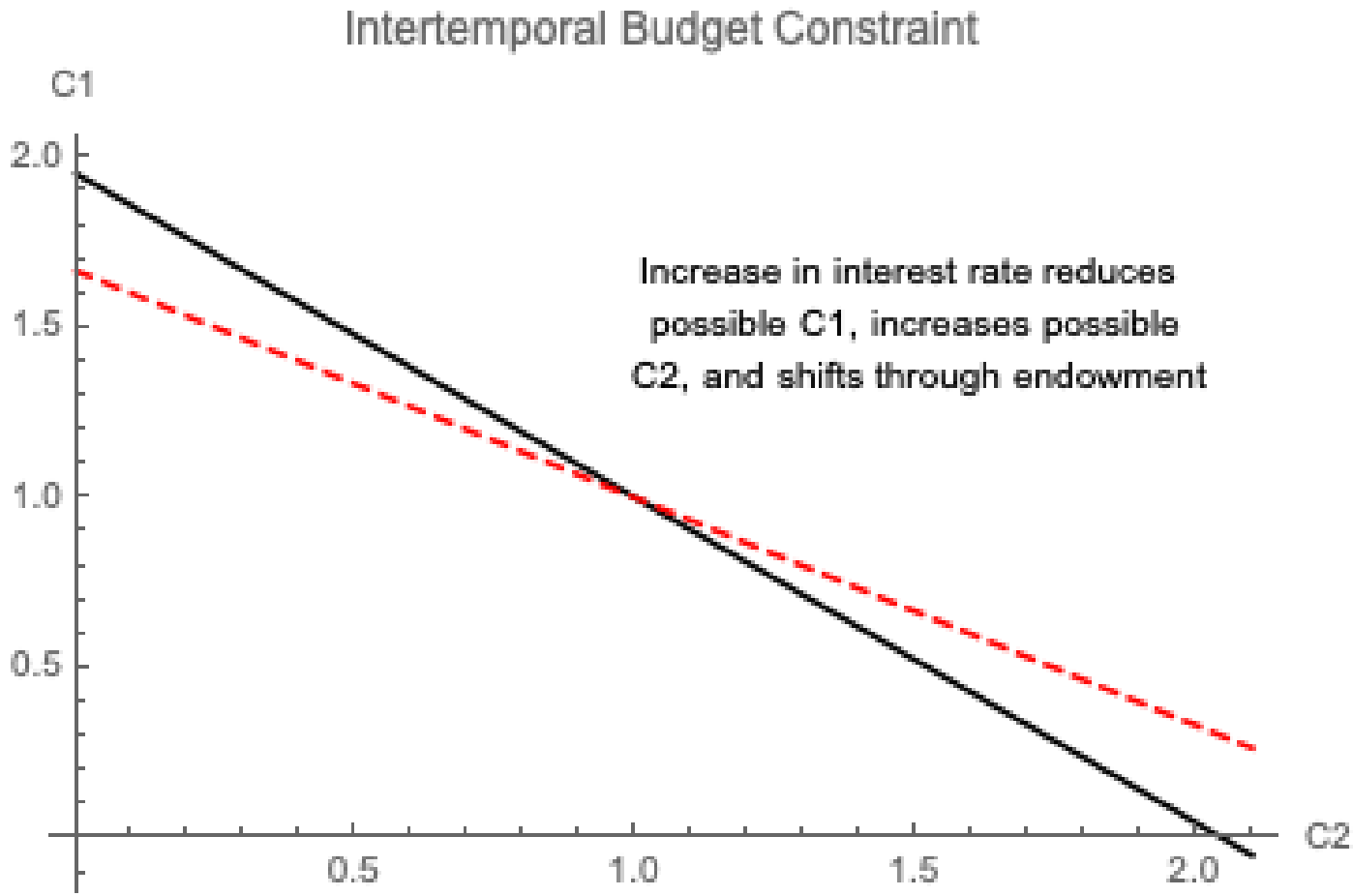
Testable Predictions-II

- What if Trevor got lump-sum higher income tomorrow?
- Prediction 2: Smooth and increase consumption today!
- What if Trevor got \$100 every period from today to tomorrow?
- Prediction 3: Consume \$100 more in every period
- What about interest rates?

Testable Predictions-II



How should consumption respond to a change in the interest rate?

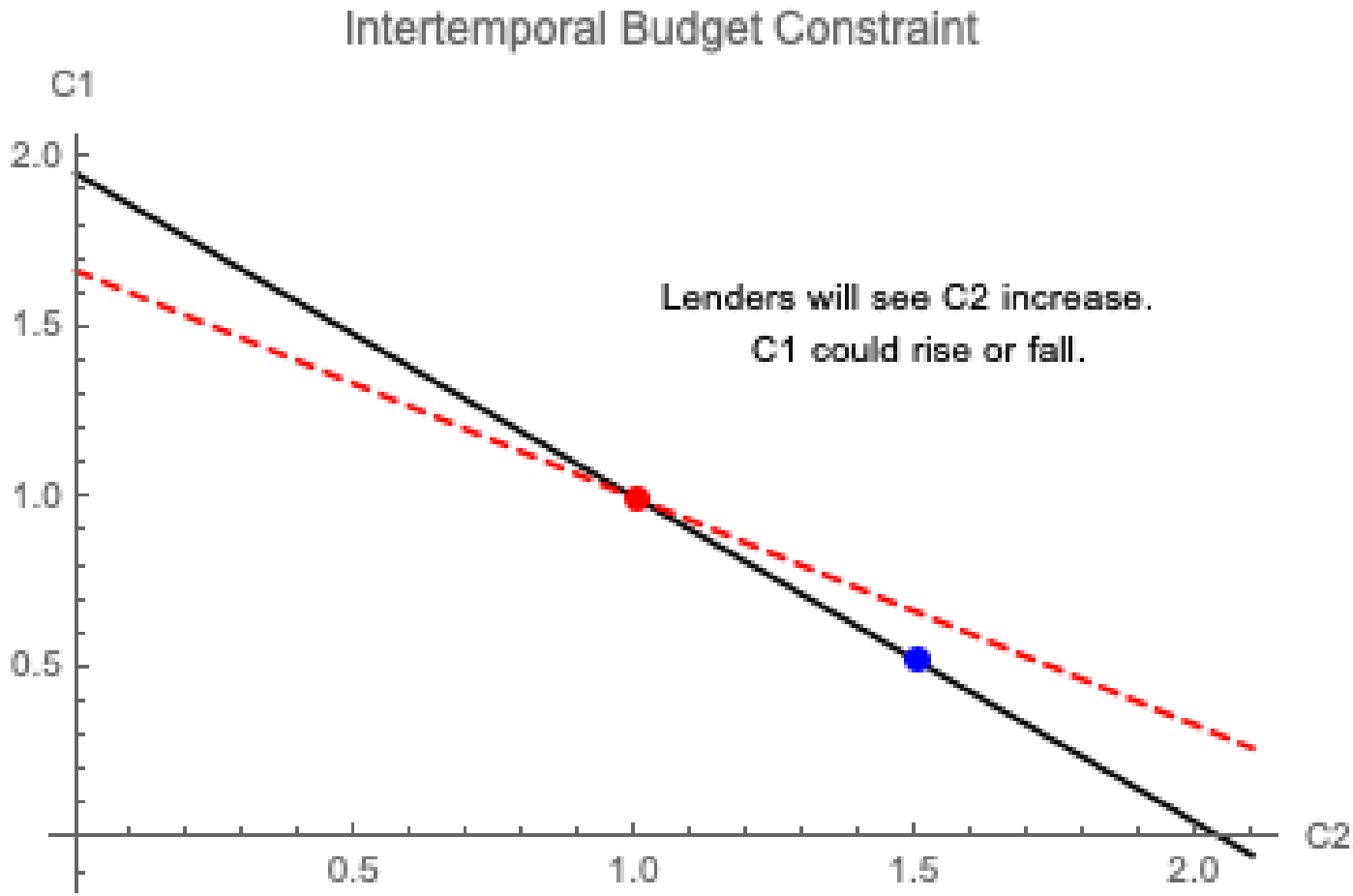
Intertemporal Consumption

- How should consumption respond to an increase in the interest rate?

- It depends on if you were a borrower or a saver!

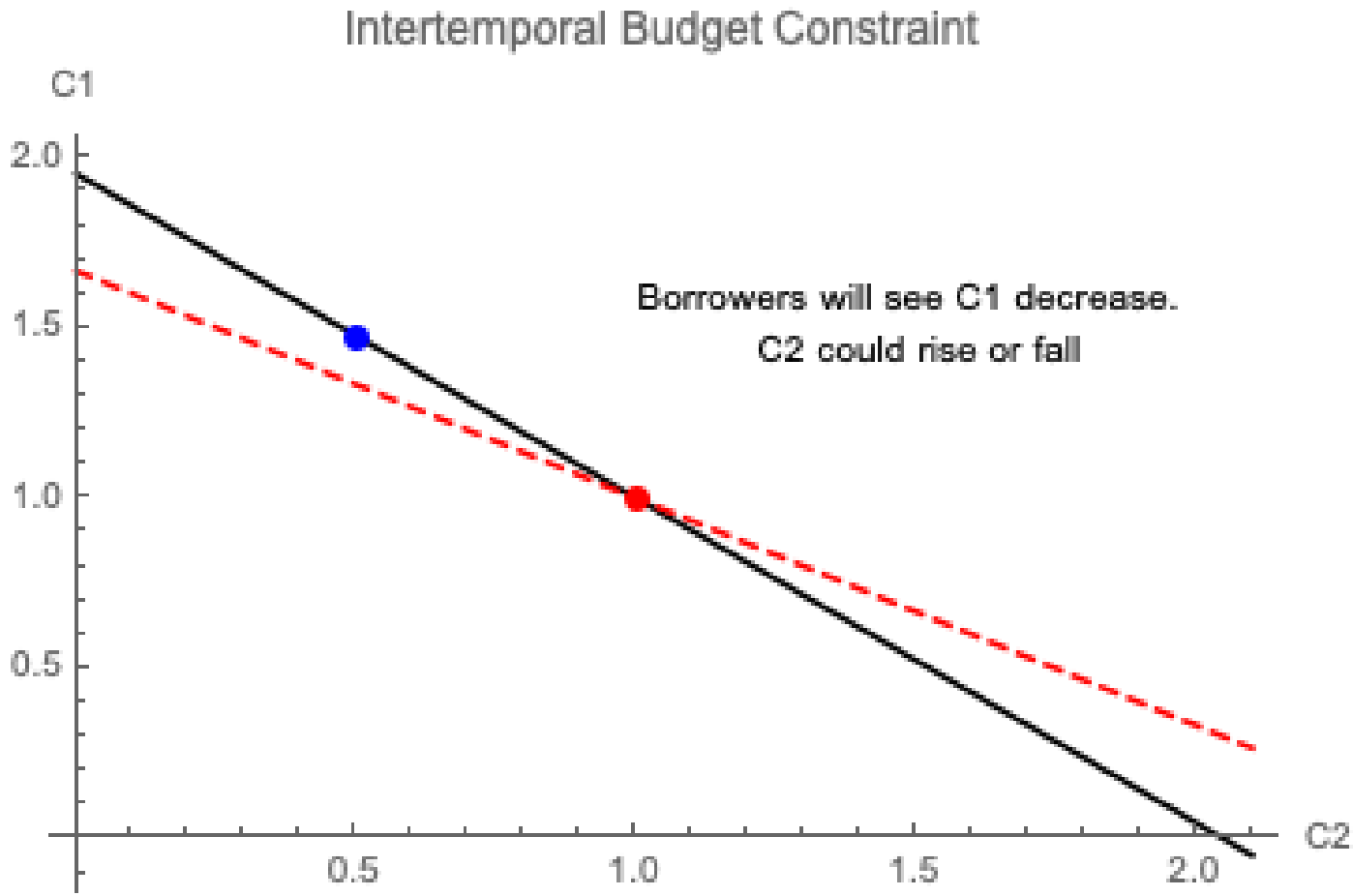
- Idea for borrowers
  - Interest rate increase has substitution effect: $c_1 \downarrow,\ c_2 \uparrow$
  - Interest rate increase has negative income effect: $c_1 \downarrow,\ c_2 \downarrow$
  - Sum effect is $c_1(\downarrow)$, $c_2(?)$
- Idea for lenders
  - Interest rate increase has substitution effect: $c_1 \downarrow,\ c_2 \uparrow$
  - Interest rate increase has positive income effect: $c_1 \uparrow,\ c_2 \uparrow$
  - Sum effect is $c_1(?)$, $c_2(\uparrow)$
- Note that for everyone, we expect $c_2/c_1 \uparrow$ (Prediction 4: c_2/c_1 should increase when interest rates increase)
- Let's see these ideas graphically

Testable Predictions-II



In general probably expect both to go down

Testable Predictions-II



In general probably expect both to go up

Other predictions of the smoothing framework: labor

- What are other predictions?
- We know if your wage goes up forever, probably don't work *much* more or less (income and substitution effects cancel or mostly cancel)
- But what if your wage goes up this period?
- Let's look at evidence/tests for some of these hypotheses!

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Prediction 1: Income Timing

- The first prediction is that it doesn't matter when in our lives we get our income. If we get it all now, we save it. If we get it all in the future, we go into debt then pay it off when we get the income.
- Data/Experiment: Alaskans get (or used to get) \$8000/person each year in fourth quarter
- Result: Alaskan households had smooth consumptions throughout the year: debt three quarters, save last quarter.
- Data/Experiment: Households get sometimes large or surprise tax refunds in U.S.
- Result: Households do not see large increases in consumption.

Prediction 2: Marginal Propensity to Consume

- Prediction: a large one-time increase in income should not be spent today, but instead smoothed over many periods
- Data/Experiment: Restitution payments to Israeli citizens from Germany ($\approx$ 1 years income).
- Result: Total expenditure increased by 20% of amount (mostly in durable goods, which are savings)
- Data/Experiment: WWII veterans got a one-time life-insurance dividend of \$175 (4% annual income)
- Result: Expenditure rose by 35% of the amount, but again mostly in durable goods.
- Additional fact: a large **permanent** increase in income is met with approximately the same size increase in consumption.

Prediction 3: Anticipated Income Changes

- Prediction: consumption should not change when income is predicted to change
- Data/Experiment: Alaskan example (they don't): 10% increase in household income increases consumption by 0.2%(!)
- Data/Experiment: Income tax refunds: consumption only increases by 10% of amount

Prediction 4: Interest Rates

- Another prediction we have is that a higher interest rate reduces current consumption **compared to** future consumption c_2/c_1.
- Also, Higher interest rates mean households should work now
- Data/Experiment: Longitudinal data on U.S. household purchases
- Result: A 1 percentage point increase in the interest rate increases c_2/c_1 by about 0.5 percentage points/year.
- Data/Experiment: Aggregate economy
- Result: A 1 percentage point increase in the interest rate increases c_2/c_1 by about 0.3 percentage points/year.
- Data/Experiment: Data on annual interest rates
- Result: A 1 percentage point increase in the interest rate increases L_2/L_1 by about 0.2-0.6 percentage points/year.

Prediction 5: Permanent wages changes

- When households get permanently higher wages, it's unclear what they should do, income and substitution effects offset
- Data/Experiment: Long-run wage increases in U.S.
- Result: Little change in long-run labor

Prediction 6: Temporary wage changes

- When households get temporarily higher wages, income effects are small but substitution effects are big: work more
- When wages will be higher in the future, move labor to the future

- Data/Experiment: Data on employee expectations about wages

- Result: An increase in expectations about w_2/w_1 by 1 percentage point increased L_2/L_1 by 1 percentage point.

- Data/Experiment: Exxon Valdez spill

- Result: A temporary increase in real wage rates by 1% increased hours worked per week by 2%

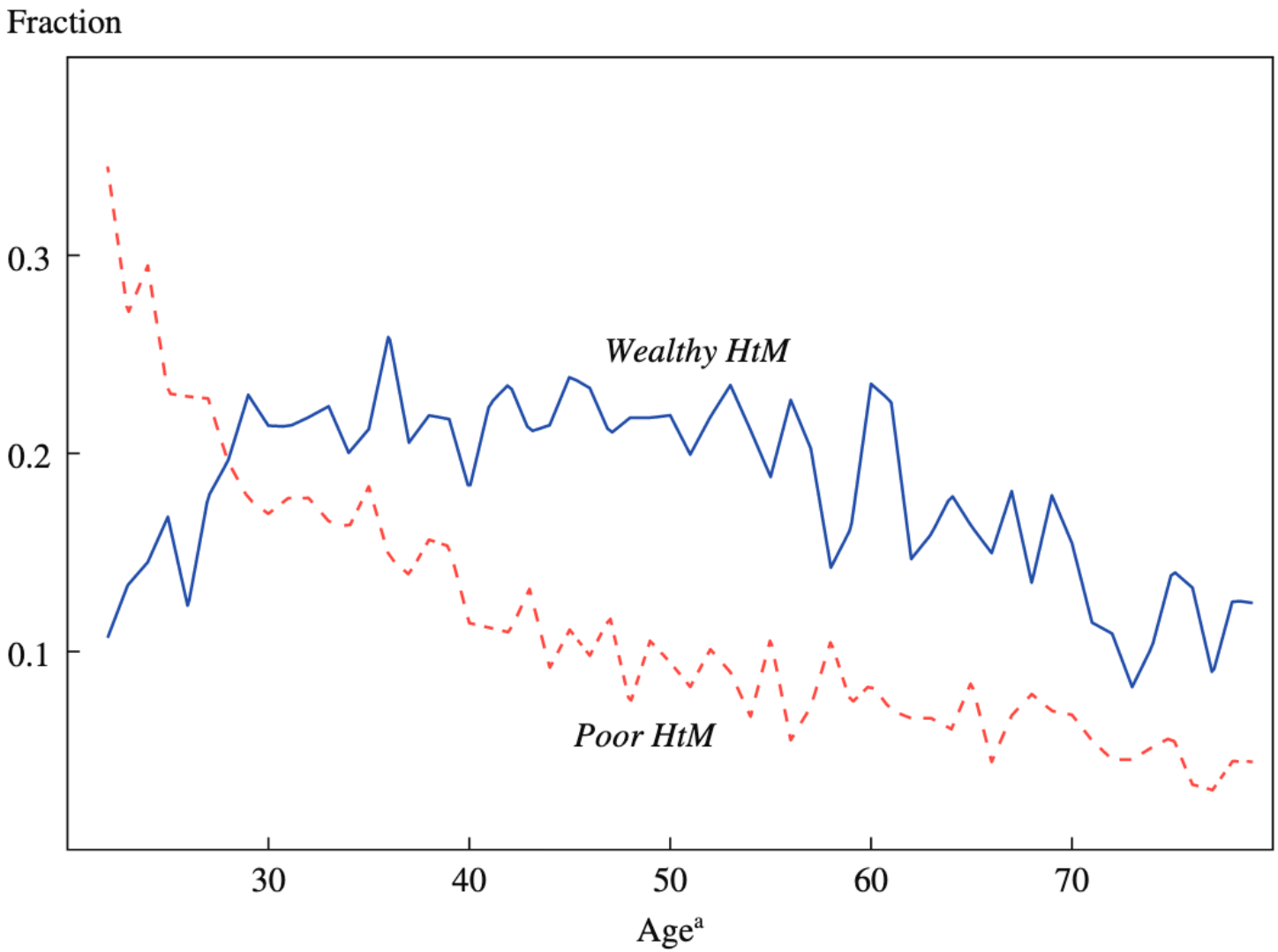
Frontier of research

- The important lesson for public policy is people aren't dumb animals, they intertemporally maximize to a significant degree
- However, reason to think that there are some households that are "hand-to-mouth" liquidity constrained. No intertemporal budget constraint for them, because they can't borrow (s can't be negative).
- For these guys, reason to think that lump-sum transfers will be spent mostly today
- Some evidence that it's roughly 50% of population (Mankiw et al. 1982, structural model)

Wealthy hand to mouth

- Weidner, Kaplan, and Violante look carefully at marginal propensity to consume
- Examine illiquid assets and liquid assets separately
- Wealthy hand-to-mouth have high MPC but illiquid assets above \$1 (or \$1000)
- Shockingly, 31% of all U.S. household "hand-to-mouth"
- Even more shockingly, 61% of them are "wealthy" hand to mouth
- Put another way: 12% poor hand-to-mouth, 19% rich hand-to-mouth, 69% not hand to mouth.
- **If** want to increase consumption, not clear only tagging poor is effective!

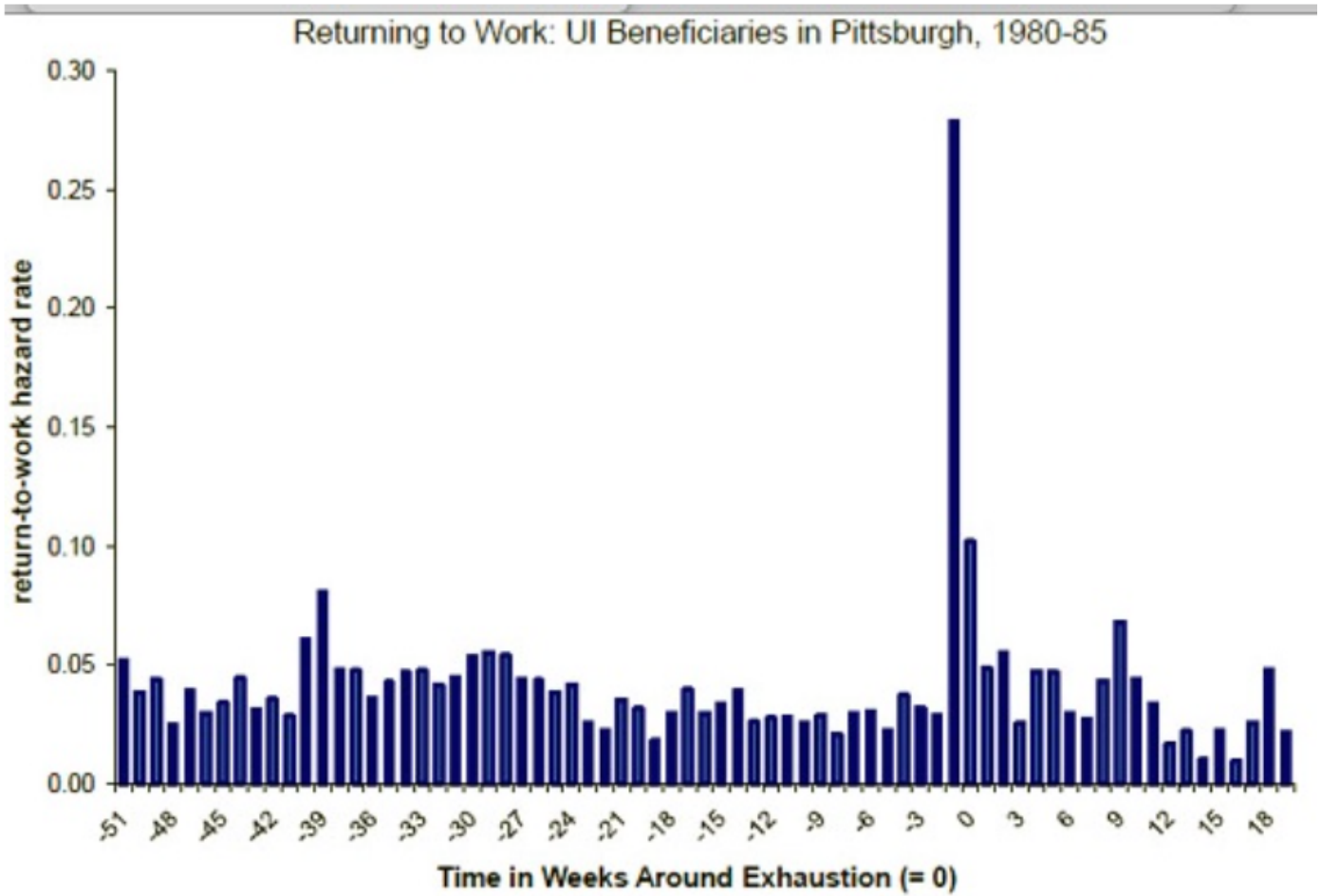
Testable Predictions-II



Another test: Unemployment insurance

- A clear prediction of our labor and intertemporal studies regards unemployment insurance
- How should people respond to the presence of unemployment insurance?
- Small income effect, but big substitution effect! If replaces 50% of my wage gains then looks like a 50% tax to me on the extensive margin!
- Prediction: UI benefits should strongly dissuade labor (reduce by 37.5%, if Frisch is 0.75 and tax is 50% extra)
- Let's look at the data

Probability of Finding Job Conditional on UI Weeks Left



Jurajda and Tannery, 2003

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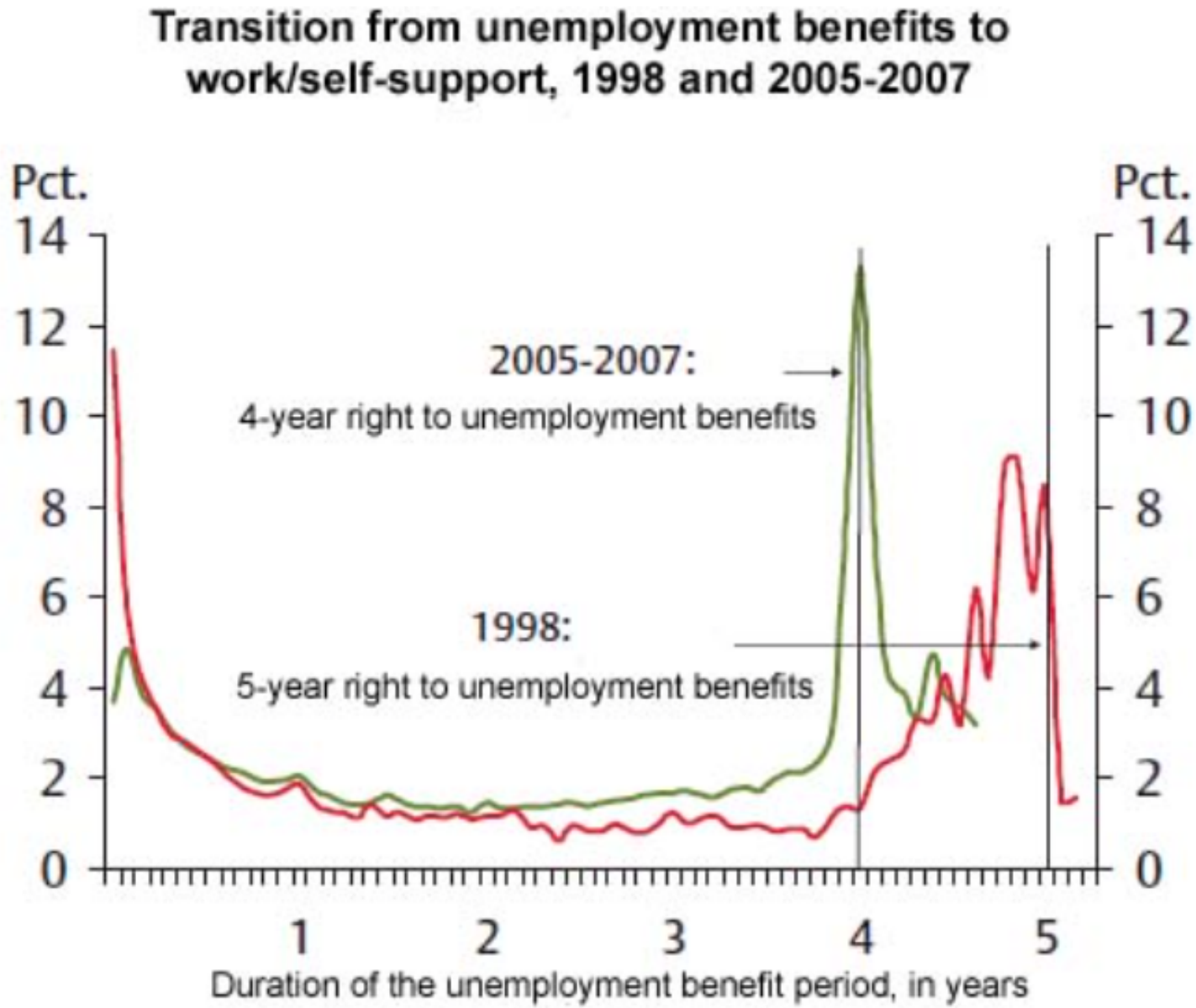

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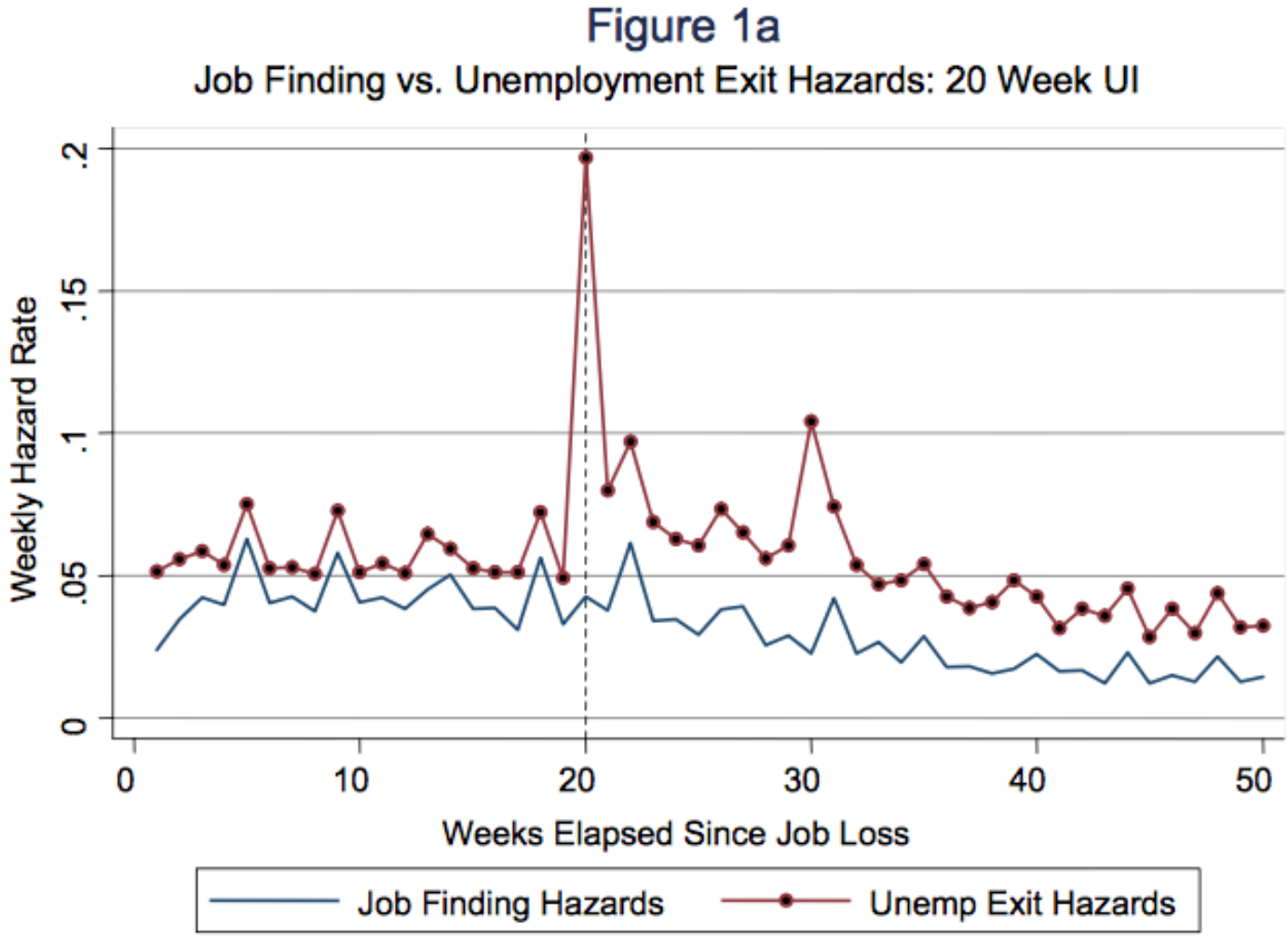

Card, Chetty, Weber

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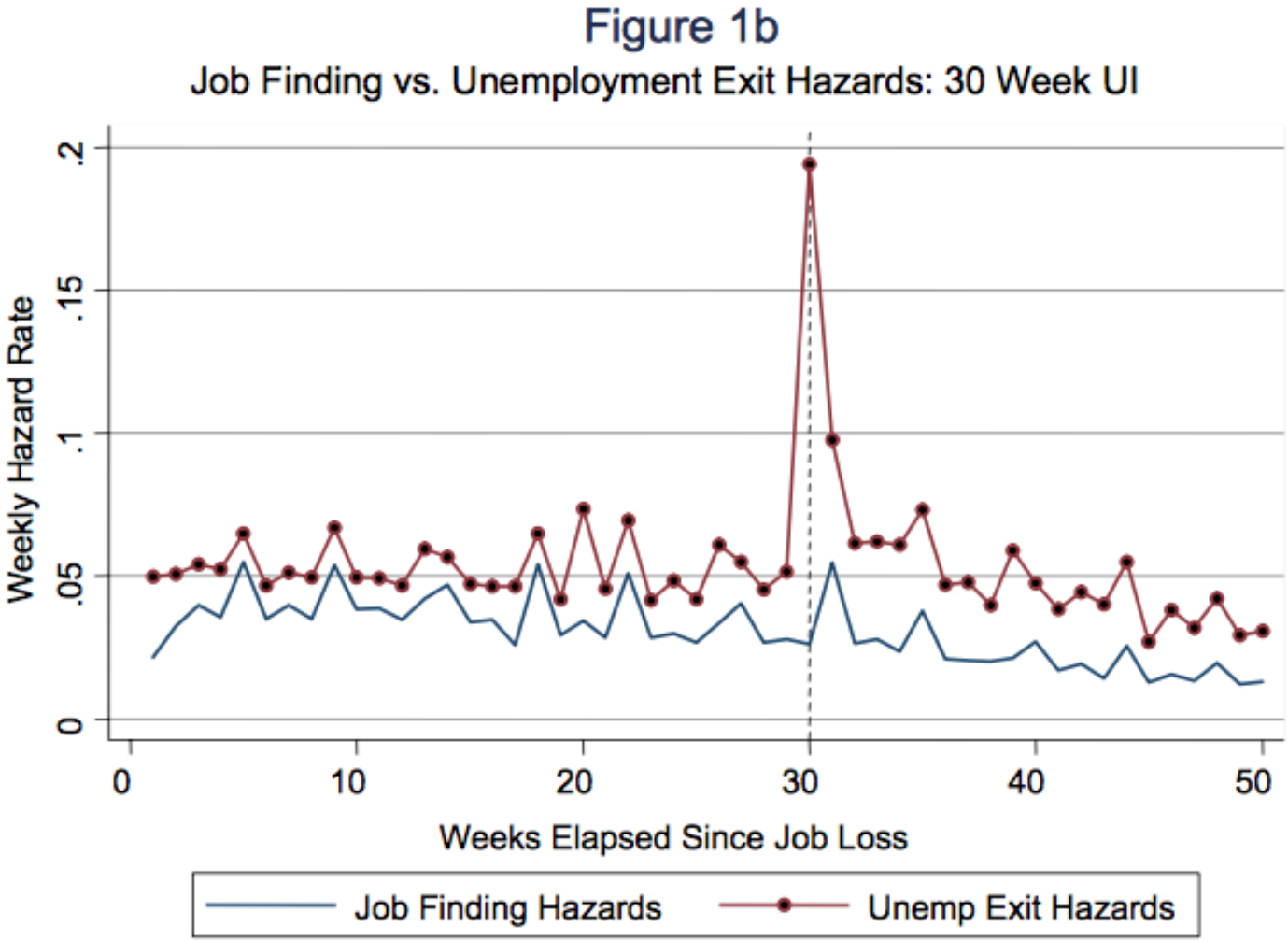


Card, Chetty, Weber

Liquidity or Moral Hazard?

- This isn't necessarily evidence people respond to incentives!
- Could just be that people are forced to get bad jobs when they run out of money
- One possible test: benefits top out...if higher benefits mean longer search, then should see kink in duration at same place as kink in

UI Benefits Suddenly Kink

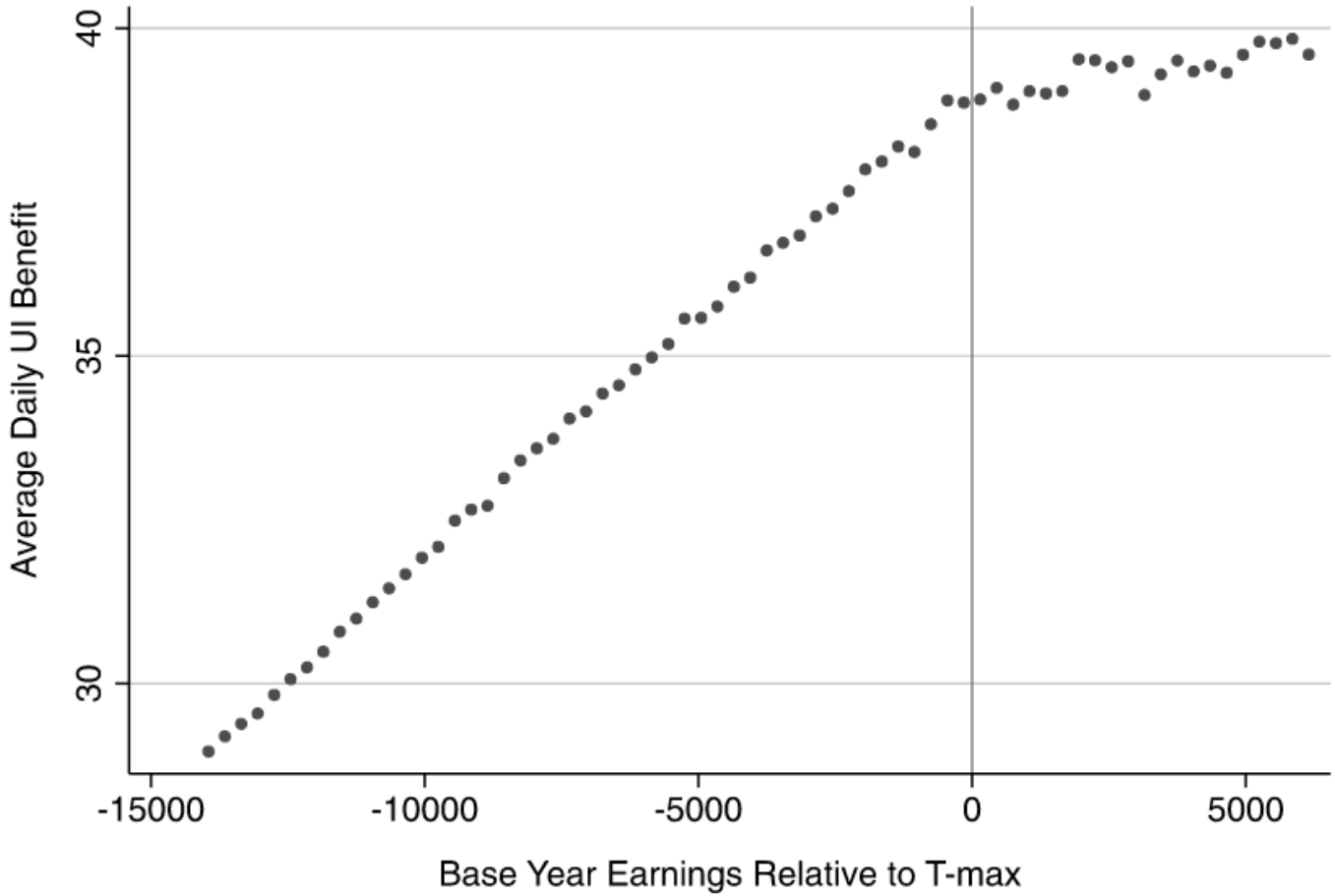
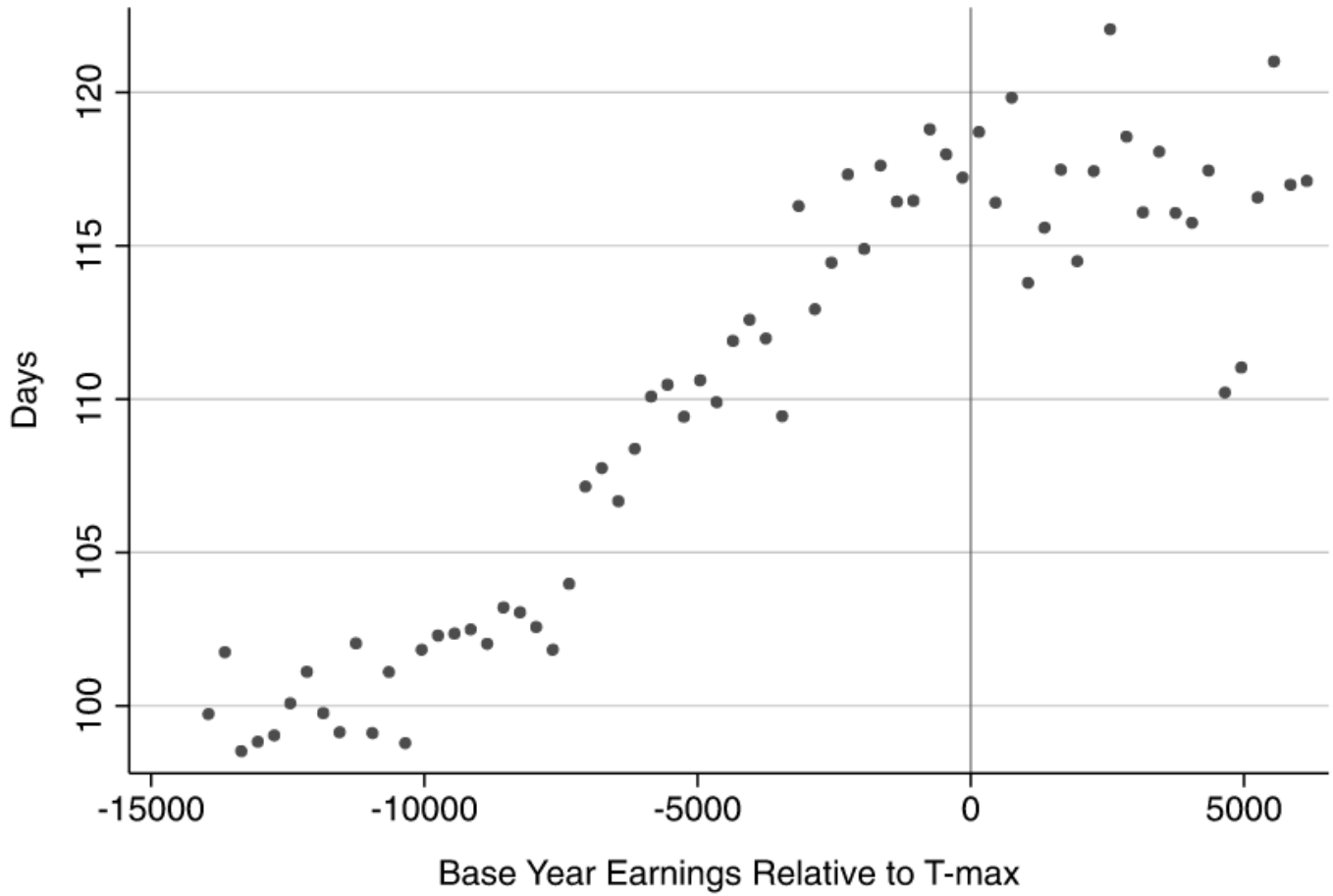


FIGURE 2.—Daily UI benefits.

Card, Lee, Pei, Weber (2015)

Job Search Follows Kink!

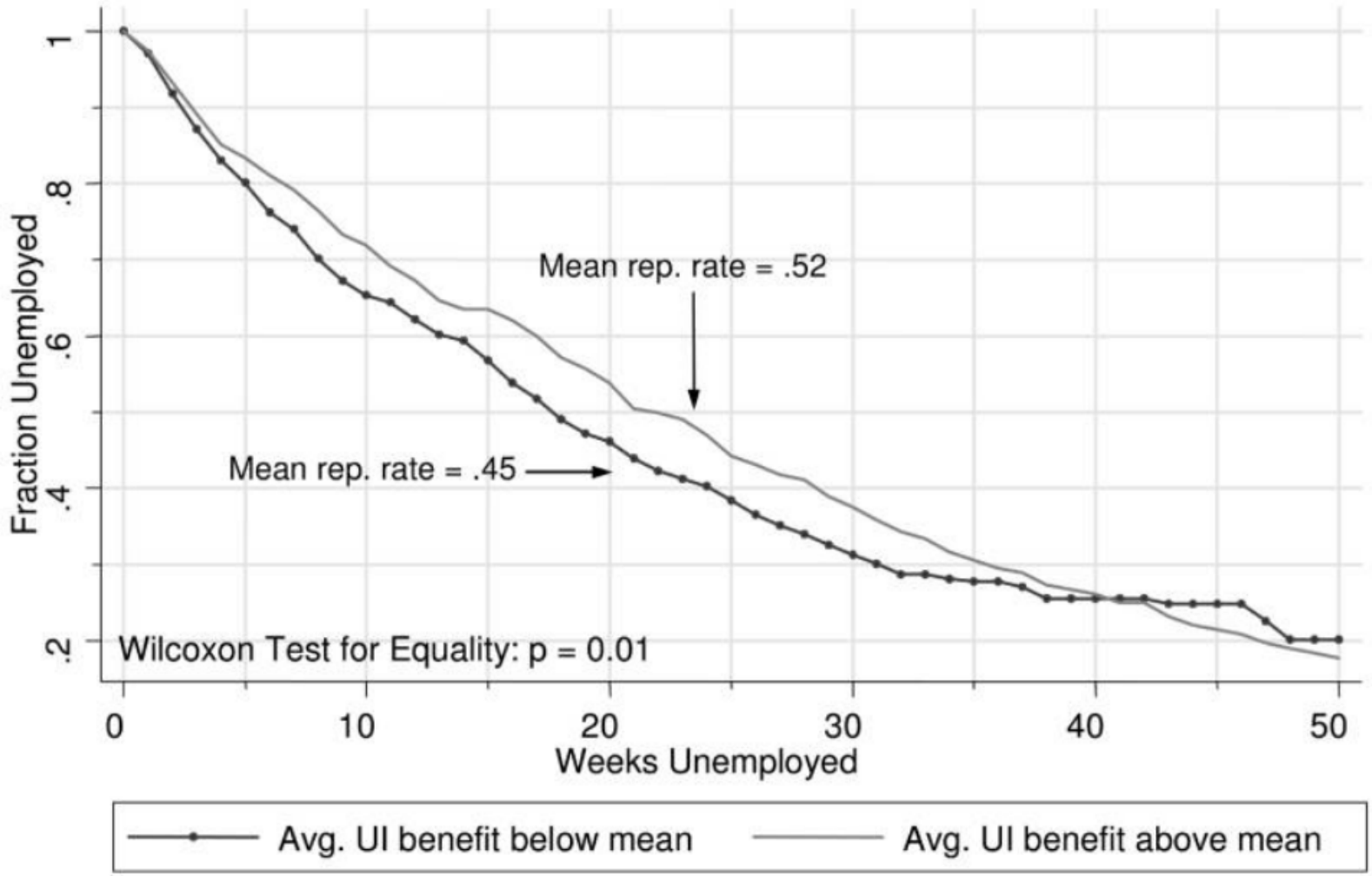


Card, Lee, Pei, Weber (2015)

Rejoinder

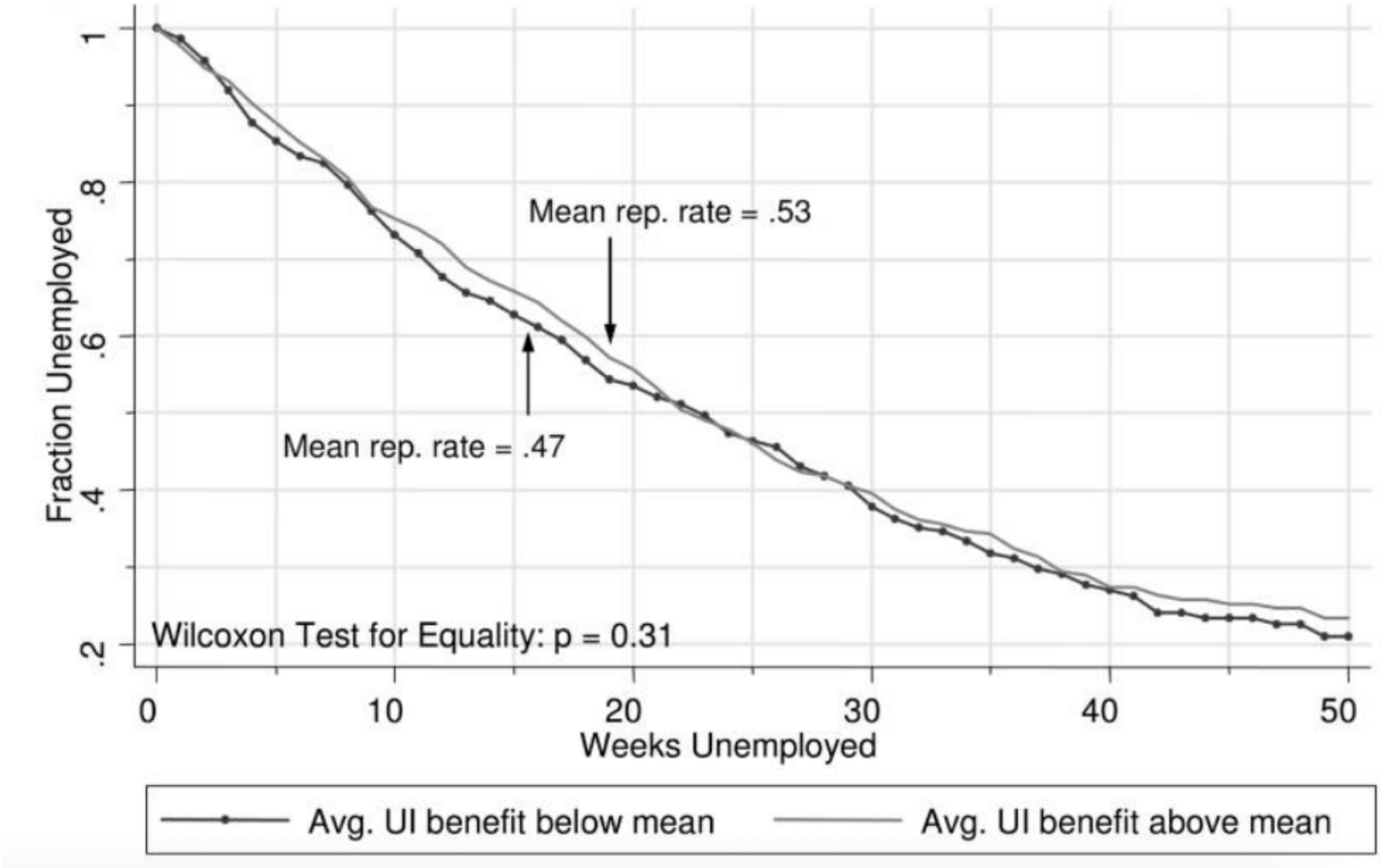
- Other tests?
- Chetty 2008: do households that get severances take a long time? (if so, liquidity, not moral hazard)
- Do increases in benefits affect liquidity-constrained households more (if so, liquidity, not moral hazard)
- Evidence: yes to both! Estimate: 40% of $\frac{\Delta duration}{\Delta benefits}$ due to incentives

Households with Mortgages React to Benefits



Chetty 2008

Households without Mortgages Don't React to Benefits



Chetty 2008

Summary

- The labor and consumption of households respond strongly to intertemporal incentives
- Many testable predictions that come out well for theory
- Unemployment insurance a particularly fruitful example
- Clear that UI duration and benefits strongly effect probability of finding a job
- Some of that comes from liquidity (break in intertemporal BC) but much comes from static labor incentives