Health Persistence and the Ex Ante Value of Medicaid as a Safety Net

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Overview

- Typical starting point for estimating insurance value of public health insurance:
  1. Identify treatment or eligibility threshold, with locally (quasi-) random assignment to treatment
  2. Collect data on out-of-pocket financial risk for treated enrollees relative to control group defined locally to threshold
  3. Combine data with utility assumptions to estimate local willingness to pay (WTP) for insurance value
  4. Sum WTP over treated to estimate aggregate insurance value
- This approach omits the insurance value of safety net to all non-recipients

Overview

- What is the insurance value of Medicaid as a safety net to non-recipients?
  - WTP to protect against lost consumption in the event of crossing insurance eligibility threshold in the future
  - Getting Medicaid is itself risky—value is increasing in:
    1. Likelihood of ever crossing threshold
    2. Net benefit of Medicaid conditional on ever becoming eligible
    3. Factors that affect WTP for insurance generally (income, risk aversion, etc)
  - Empirical question: what are the health & insurance pathways that precede Medicaid enrollment?
- Estimated aggregate WTP may be too low if non-recipients have meaningful WTP

Overview

- Even including WTP of non-recipients at a point in time omits some of the insurance value of Medicaid: insurance against consumption losses from initial endowments
  - Reclassification risk—insurance against risks in the evolution of health conditional on current state
  - Ex ante risk protection—existence of a safety net provides (partial) insurance against being born predisposed to sickness
    - Aversion to risk over initial endowments implies (Hirshleifer 1971):

$$\sum_i WTP_{i,ExAnte} > \sum_i WTP_{i,ExPost}$$

- Aggregate ex ante WTP for medicaid exceeds the aggregate ex post WTP
- Literature focuses on one component of the latter term (recipients)

Objectives of This Paper

1. Estimate WTP for insurance value of Medicaid in a full population
    - Novel database from Utah links insurance coverage and claims for full population
    - Long panel to identify reclassification risk, including pathways that lead to Medicaid enrollment
    - Finding: many people who do not appear to be at high risk of needing Medicaid end up enrolling
    - Largely driven by new diagnoses of certain chronic conditions

Objectives of This Paper

2. Show how using cross-sectional or short panel understates this WTP by failing to fully capture health persistence
    - Estimate persistence of health status and health insurance
    - Once enrolled, use of Medicaid tends to be very persistent
    - Autocorrelation increases net benefit of Medicaid conditional on enrolling, increasing WTP for Medicaid
    - This within-person correlation is not fully observed in short panels
3. Evaluate sensitivity of WTP to assumptions about the social value of insurance
    - Does inequality in health risks affect social welfare?

Background

- Literature on the value of risk protection from public health insurance
  - Barcellos and Jacobson 2014: Medicare treatment pre/post age 65
  - Finkelstein and McKnight 2008: Medicare pre/post 1965
  - Engelhardt and Gruber 2011: Part D pre/post 2006
  - Finkelstein, Hendren, Luttmer 2014: Oregon medicaid lottery winners/losers
  - Mahoney 2015: Bankruptcy before/after law changes
- General conclusion is risk protection alone represents modest share of the cost of public health insurance ($\approx$ 20-40%)
  - Most of the benefit from transfers (as opposed to budget-neutral relaxation of liquidity constraint)
- We focus on insurance value, do not study causal health effects of Medicaid not captured in spending (eg quality of life)

Reclassification Risk

- Empirical question: What are the health status and insurance dynamics of individuals prior to enrolling in Medicaid?
  - Do people who are not near the margin of eligibility ever enroll in Medicaid?
- Difficult to answer this question
  - Few data sources allow tracking individuals long enough to observe full health dynamics
  - Need to observe insurance status, comprehensive utilization, and out-of-pocket spending in a long panel
  - Large N required to estimate low-probability transitions
  - Main available data are MEPS (2-3 years, 30-35k people, difficult to get state identifiers to evaluate Medicaid thresholds)

Utah Administrative Health Database

- New longitudinal health database containing:
  - All-payer claims data for nearly entire commercially insured population 2008-2015
    - Every medical, drug, and dental claim
    - Diagnosis and billing codes
    - Negotiated prices, deductibles, cost-sharing amounts
    - Part 1 covers 2008-2012, 8 largest insurers
    - Part 2 covers 2013-2015, even richer data, full population (3.2 million unique people)
    - Includes all privately-delivered public insurance
  - Hospital discharge records 1995-2015
    - Inpatient, ED, and ambulatory discharge records for the complete population of hospital visits in Utah
    - Insurance status and source, including uninsured
    - Charged amounts
  - Similar inpatient discharge records from NY (1995-2011) for across-state comparison

Utah Administrative Health Database

- Utah Administrative Medicaid records 1996-2015
  - Every application for Medicaid/PCN
  - Begin/end dates of every enrollment spell
  - Household structure, ages, FPL at application and quarterly while enrolled
- Social Security date of death records
- All of these (Utah) files are linked over time and across sources by individual identifier

Insurance Statistics

Table 1: Summary Statistics, Insurance Coverage

	Full Sample	Analysis Sample
Male	0.42	0.44
Age	36.86	39.11
Age 0-18	0.07	0
Age 19-34	0.38	0.42
Age 35-49	0.33	0.36
Age 50-64	0.21	0.23
Age 65+	0.00	0
Urban CBSA	0.82	0.81
Total Annual Spending	3037	3218
Private Insurance	0.92	0.91
Public Insurance	0.04	0.05
Uninsured	0.04	0.04
Ever Publicly Insured	0.13	0.14
Alive End of Samp	0.97	0.97
N	2,307,735	2,146,811

State estimates 2007, non-elderly adults: public insurance 6.6%, uninsured 10.6%

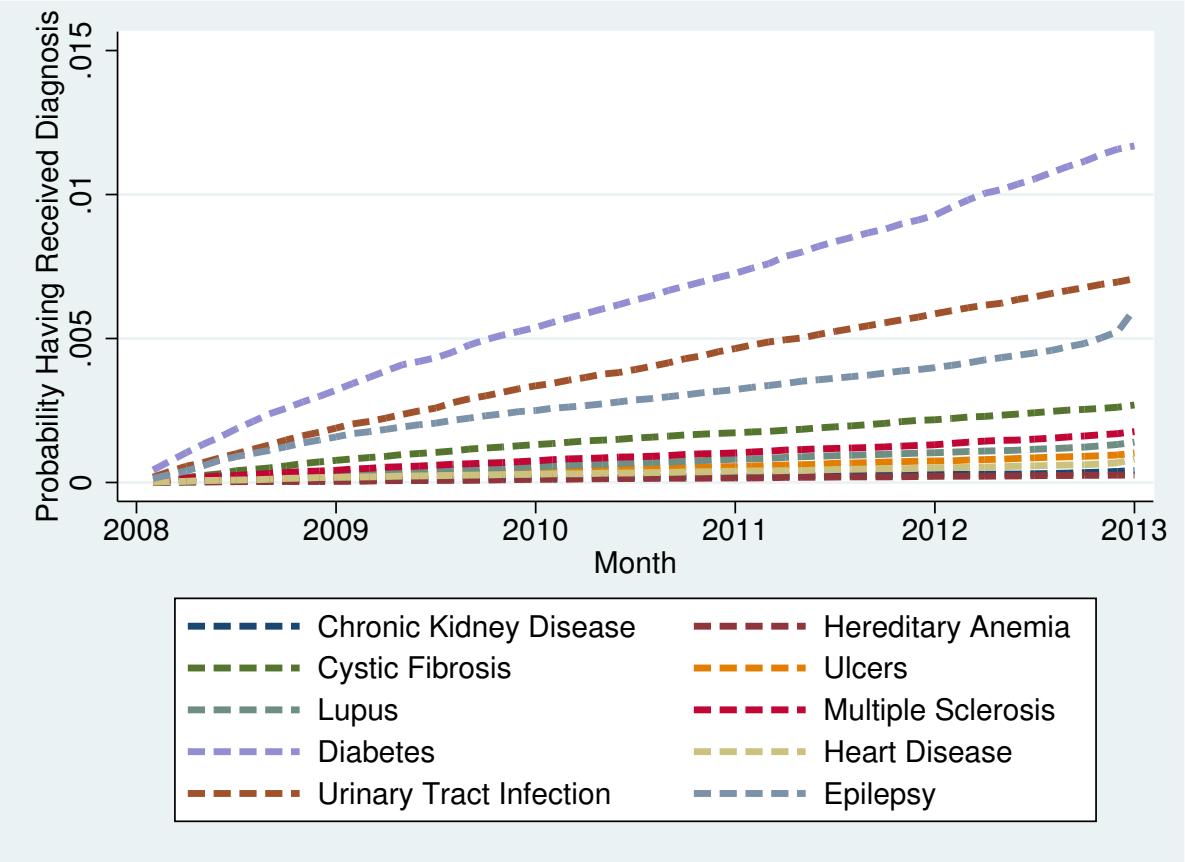
New Evidence on Reclassification Risk

- Do people who do not appear to be near the margin of eligibility ever enroll in Medicaid?
- As suggestive evidence, look at a population unlikely to enroll, track them over time
  - Young adults, age 25-34 on 1/1/2008
  - Have never *applied* for public insurance in prior 12 years
  - Have never been diagnosed with a chronic illness as of 1/1/2008
  - Have private health insurance
- Estimate which medical diagnoses are most likely to lead to an inpatient stay (excluding pregnancy)

New Evidence on Reclassification Risk

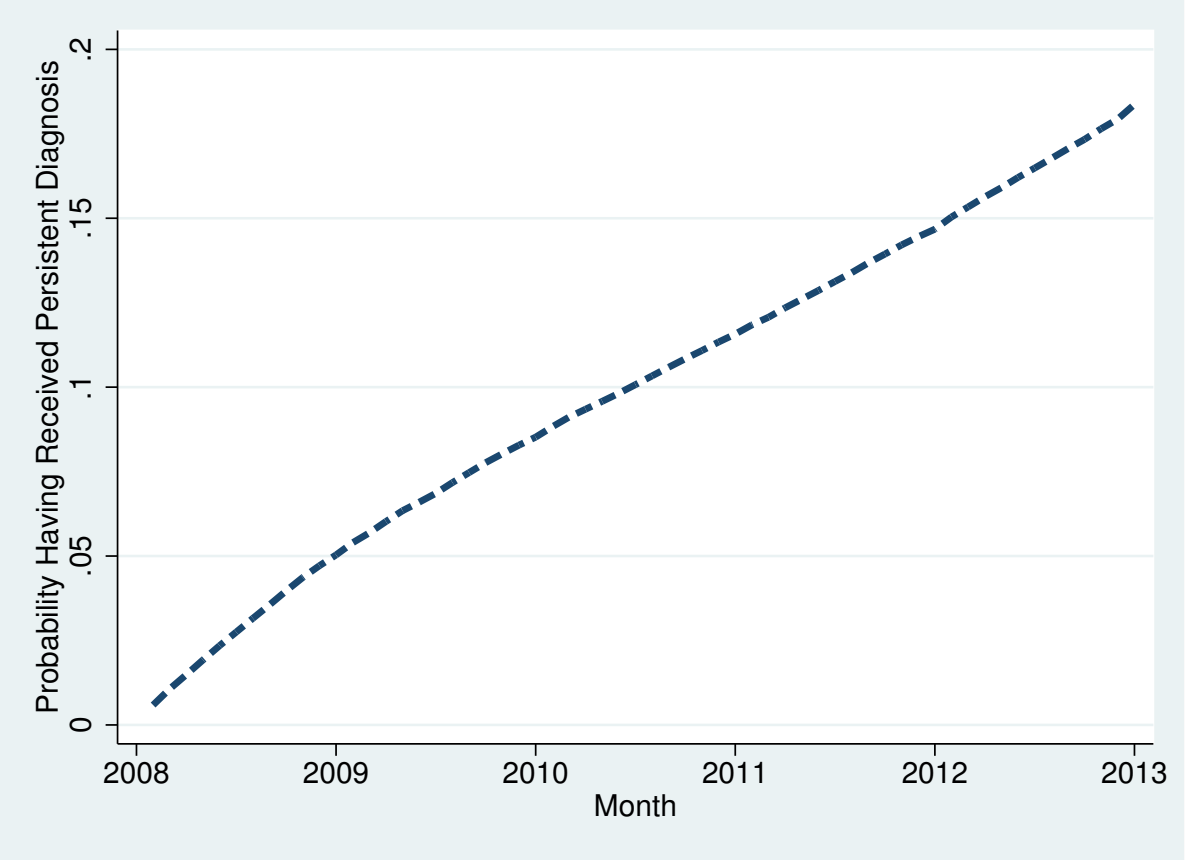
- Within this young, healthy population, what is probability of receiving a new diagnosis for one of these conditions?

Figure 1: Probability of Diagnosis by Condition



New Evidence on Reclassification Risk

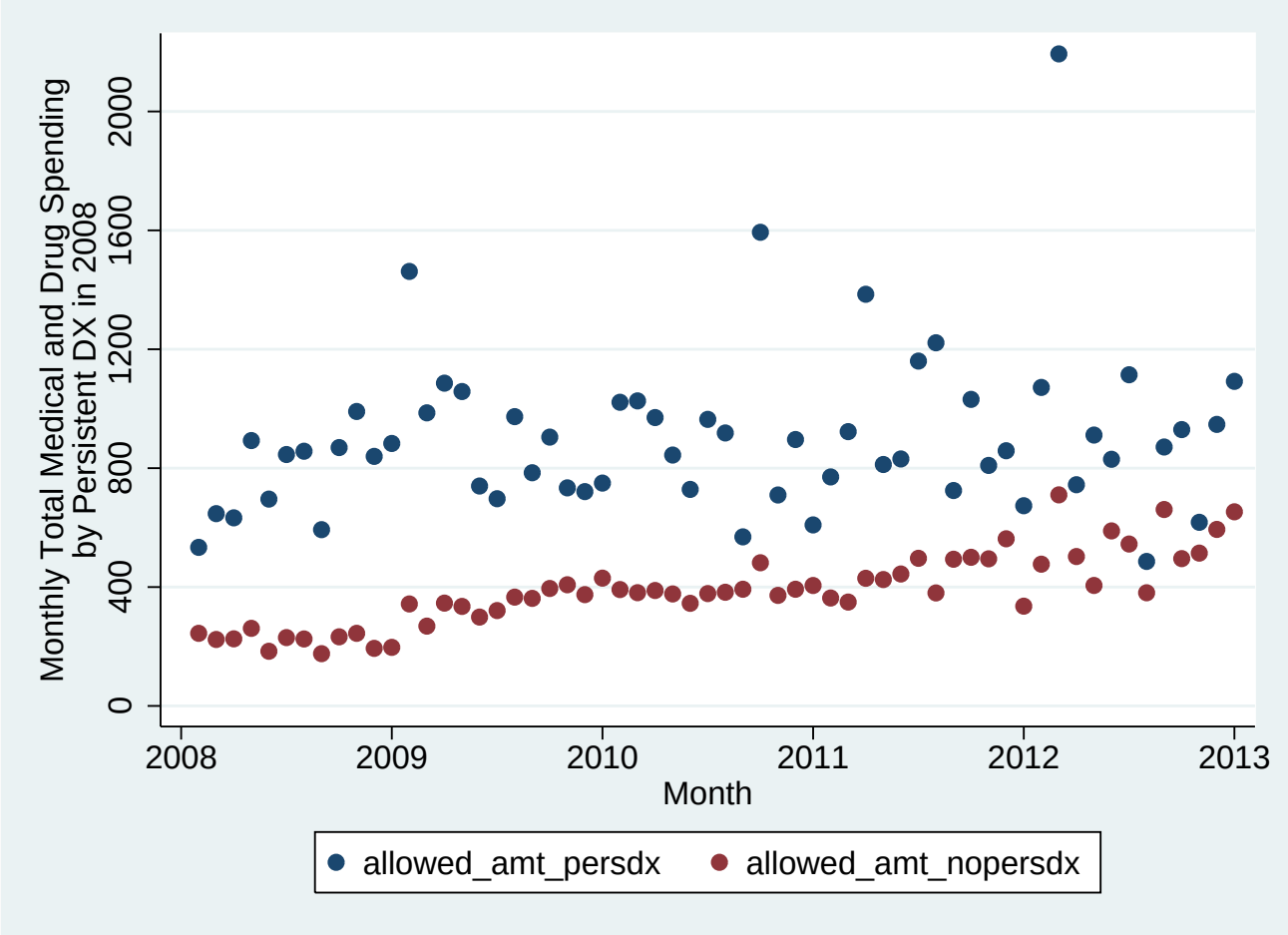
Figure 2: Aggregate Probability of Receiving New Diagnosis After Jan 1 2008



Includes top 35 conditions that are most likely to be associated with an inpatient stay

New Evidence on Reclassification Risk

Figure 3: Monthly Average Total Medical and Drug Spending, Conditional on New Diagnosis during 2008



Health Persistence

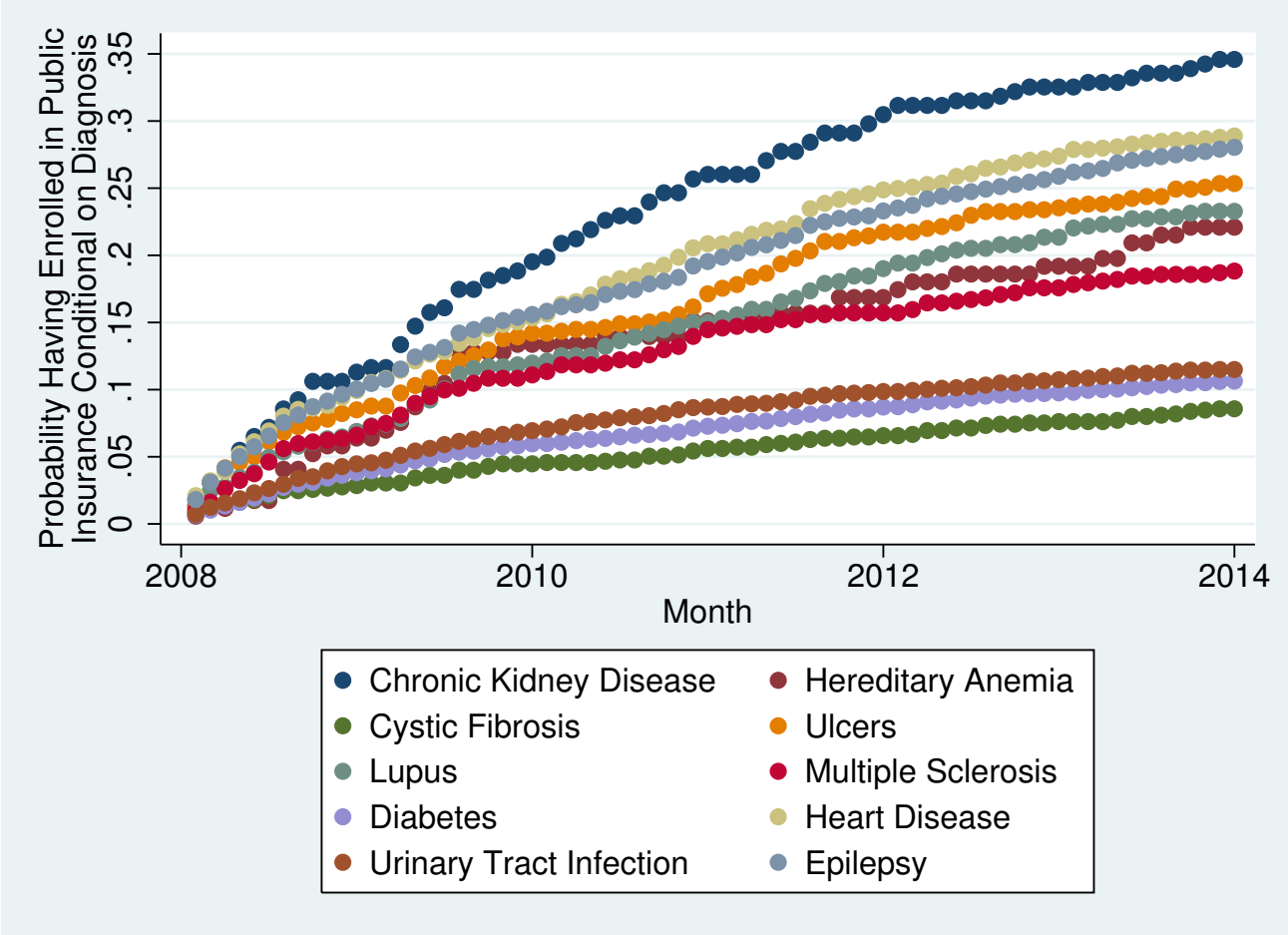
Table 2: 1-Year Risk Score Probability Transition Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1 (Healthiest)	0.60	0.18	0.09	0.05	0.03	0.02	0.02
2	0.22	0.35	0.18	0.10	0.07	0.04	0.03
3	0.09	0.18	0.32	0.19	0.11	0.07	0.04
4	0.05	0.10	0.20	0.29	0.19	0.11	0.06
5	0.04	0.06	0.10	0.21	0.30	0.20	0.10
6	0.03	0.05	0.07	0.11	0.21	0.35	0.19
7 (Sickest)	0.02	0.03	0.04	0.06	0.09	0.20	0.56

- Rows: Septiles of year t risk scores
- Columns: Septiles of year $t+1$ risk scores

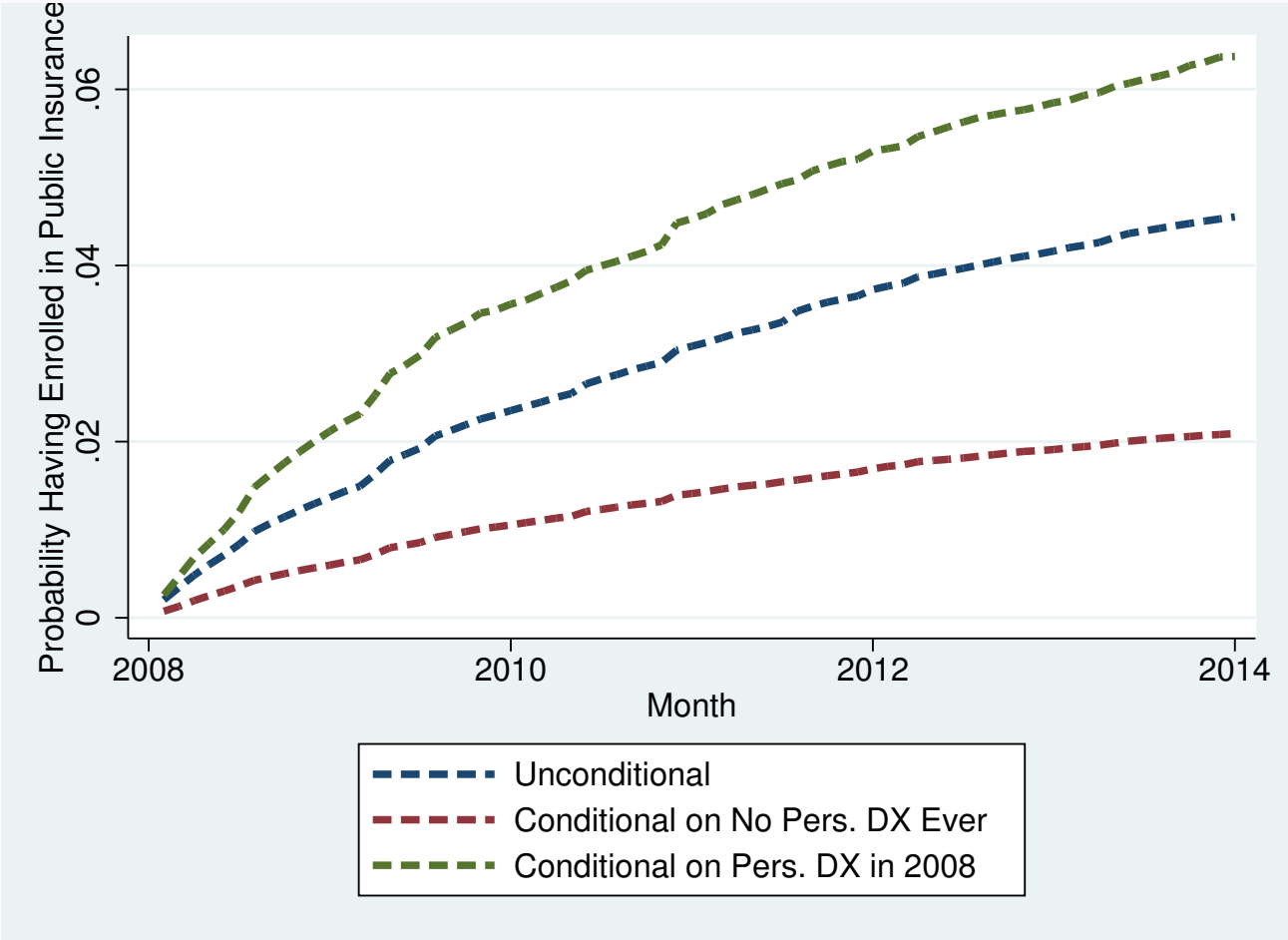
New Evidence on Reclassification Risk

Figure 4: Probability of Having Enrolled in Medicaid for the First Time, Conditional on New Diagnosis



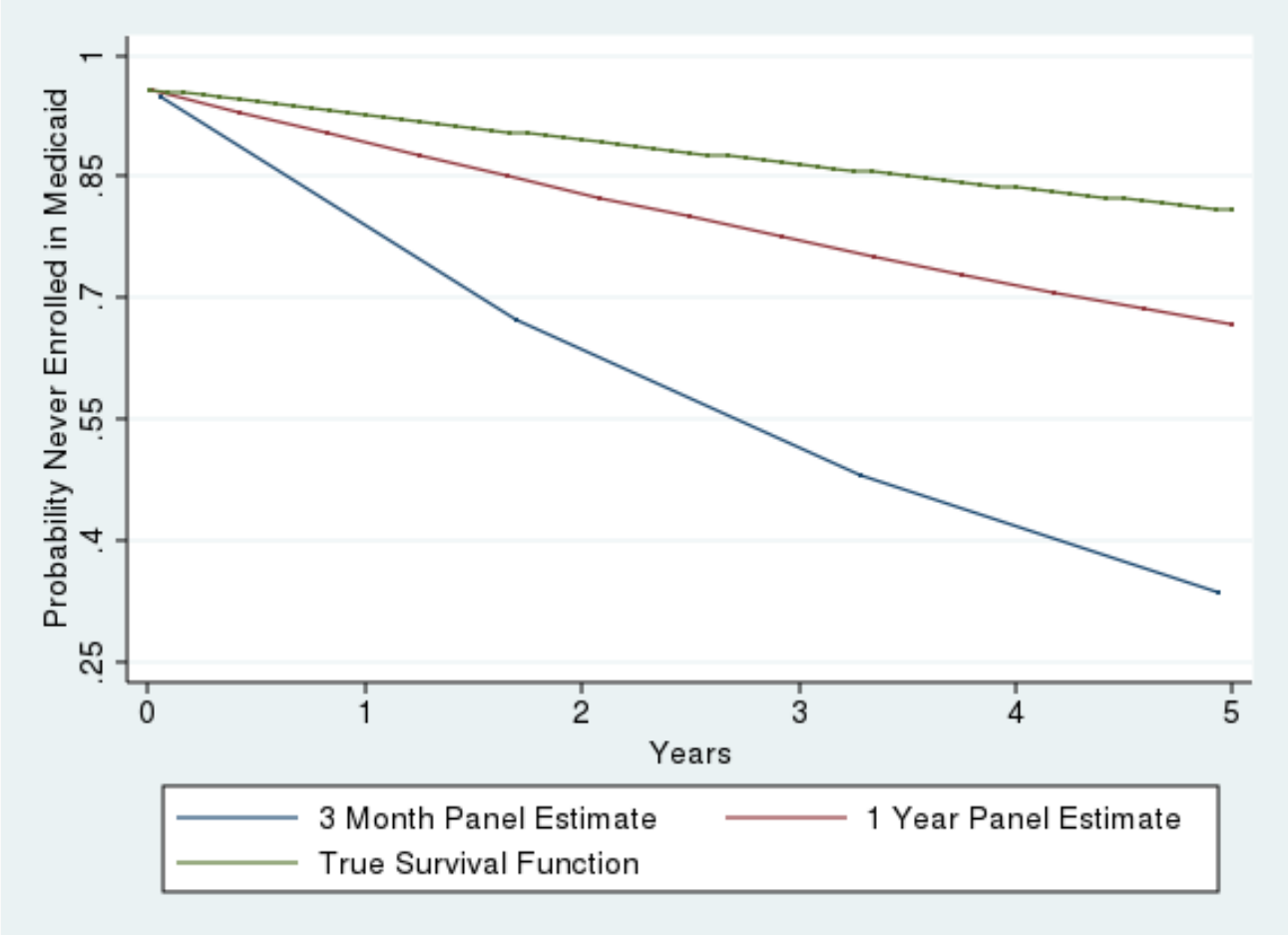
New Evidence on Reclassification Risk

Figure 5: Overall Probability of Having Enrolled in Medicaid for the First Time



Survival Function

Figure 6: Estimated Probability of Having Never Enrolled in Medicaid by Panel Length, All Non-Elderly Adults in Utah



Estimating WTP for Insurance Value of Medicaid

- Even young, healthy, privately insured people have moderate chance of enrolling in Medicaid
- Suggests safety net provides meaningful insurance value to non-enrollees
- Next step: estimate WTP for insurance value of Medicaid in the non-elderly adult population in Utah
- Focus of the model is to show how using cross-sectional or short panel understates this WTP by failing to fully capture reclassification risk
    - Primary object of interest: ratio of longitudinal WTP divided by cross-sectional WTP
    - Captures the extent to which failing to incorporate correlated risks in a panel can lead to underestimate of WTP

Canonical Model Framework

Canonical framework for estimating WTP for representative agent:

$$\sum_{t=0}^{T} \beta^t \int u(c_t - m_t - \rho) dm_t = \sum_{t=0}^{T} \beta^t \int u(c_t - m_t') dm_t'$$

$$s.t. \quad A_t = A_{t-1}(1+r) + I_t - c_t - m_t$$

$$c_t \geq \text{Subsistence Consumption}$$

c_t Consumption

m_t OOP Medical Costs with Safety Net

m_t' OOP Medical Costs without Safety Net

ρ Insurance Value of Safety Net

- Consumption constraint could be interpreted as borrowing/lending constraints, the minimum value of public transfers, or the impact of bankruptcy protection laws
- Aggregate WTP equals the sum of individual WTPs

Estimation

- Specify utility as CARA

$$u(c) = -e^{-\alpha(c-m-\rho)}$$

  - Advantage: ρ does not depend on income (unobserved)
  - Evaluate sensitivity to range of α from prior literature
- m_{it} comes from the empirical joint distribution of insurance type and out-of-pocket costs
- m'_{it} estimated by multinomial logit to predict distribution of insurance coverage if Medicaid did not exist
  - Counterfactual distribution of insurance states, with actual empirical out-of-pocket costs for each state
  - Predicted insurance states depend on age, gender, county

Estimation

3 Insurance states:

1. Uninsured
    - m estimated by scaling charged amounts in hospital discharge records by cost-to-charge ratios from AHA
    - Assume cap on amount actually paid, estimated sensitivity to this cap amount (eg bankruptcy protection)
    - Only captures hospital-based spending (which attenuates insurance value of safety net)
2. Medicaid
    - m is approximately zero, don't need utilization data
3. Privately Insured
    - m from actual out-of-pocket costs from all-payer claims
    - Captures all medical and drug spending
    - Premiums estimated as average total insured spending plus unpaid bills from uninsured
        - Future work: evaluate sensitivity to risk-pooling

Results: Canonical Model with Consumption Constraint

Table 3: Estimated $\widehat{\rho}$ (per person per year)

Panel Length	Longitudinal Estimate	Pooled Cross-Sectional Estimate
2 Years	\$138	\$138
3 Years	\$143	\$143
4 Years	\$158	\$157
5 Years	\$178	\$176

- $\widehat{\rho}$ increases as panel length increases from 2 to 5 years
- Accounting for the persistence of health status increases $\widehat{\rho}$ by 1%

Intuition: A Motivating Example

Table 4: Preferences over the Persistence in Health Risks

	World 1	World 2
Person 1:	L, L, L, L	L, H, L, H
Person 2:	H, H, H, H	H, L, H, L

L = Sick $\rightarrow$ low disposable income

H = Healthy $\rightarrow$ high disposable income

- If you had a 50/50 chance of being born as person 1/2, which world would you prefer to be born in?

Intuition: A Motivating Example

Table 5: Preferences over the Persistence in Health Risks

	World 1	World 2
Person 1:	L, L, L, L	L, H, L, H
Person 2:	H, H, H, H	H, L, H, L

The canonical model of social welfare in economics says that aggregate welfare is the same in these two worlds:

$$\sum_{i=1}^{N}\sum_{t=0}^{T} U_{it} = U(4L) + U(4H) = 4 * U(L) + 4 * U(H) = 2 * U(2L + 2H)$$

- Suggests there is no social value to insuring correlation in risks
- May fail to capture actual preferences

Alternative Model: Non-Separable Utility over Lifetime Consumption

Replace additive separability assumption with utility over lifetime consumption:

$$\sum_{i=1}^{N} \int u\left(\sum_{t=0}^{T} \beta^t \left[c_{it} - m_{it}\right] - \rho\right) dm_{it} = \sum_{i=1}^{N} \int u\left(\sum_{t=0}^{T} \beta^t \left[c_{it} - m'_{it}\right]\right) dm'_{it}$$

$$s.t. \quad \sum_{t=0}^{T} \beta^t \left[I_t - c_t - m_t\right] - \rho \geq 0 \quad \forall i$$

$$c_t \geq \text{Subsistence Consumption}$$

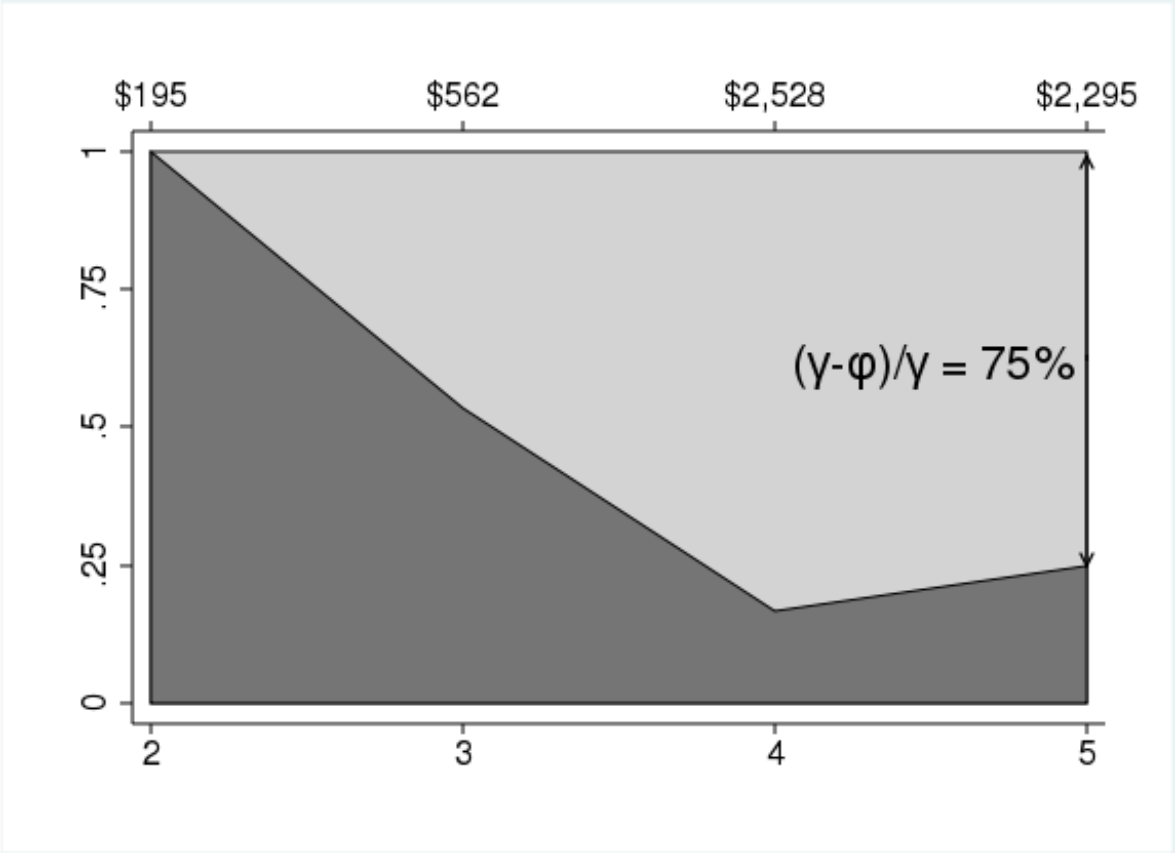
- This welfare function captures aversion to within-person correlation in health risks
- Similar in spirit to canonical model, but captures aversion to lifetime inequality through utility instead of budget constraint
- Consistent with perfect information, frictionless saving/borrowing

Alternative Model: Non-Separable Utility over Lifetime Consumption

- CARA assumption allows closed-form solution for ρ in this model

$$\rho = \frac{ln\left(\frac{\sum_{i=1}^{N}\int e^{\alpha\sum_{t=0}^{T}\beta^t\left[c_{it}-m'_{it}\right]}dm'_{it}}{\sum_{i=1}^{N}\int e^{\alpha\sum_{t=0}^{T}\beta^t\left[c_{it}-m_{it}\right]}dm_{it}}\right)}{\alpha}$$

Results: Non-Separable Utility over Lifetime Consumption



- $\widehat{\rho}$ increases to \$459 per year
- Using cross-sectional data understates $\widehat{\rho}$ by about 75% by failing to capture effect of health persistence on insurance value

Figure 7: Length of Panel T

Results: Non-Separable Utility over Lifetime Consumption

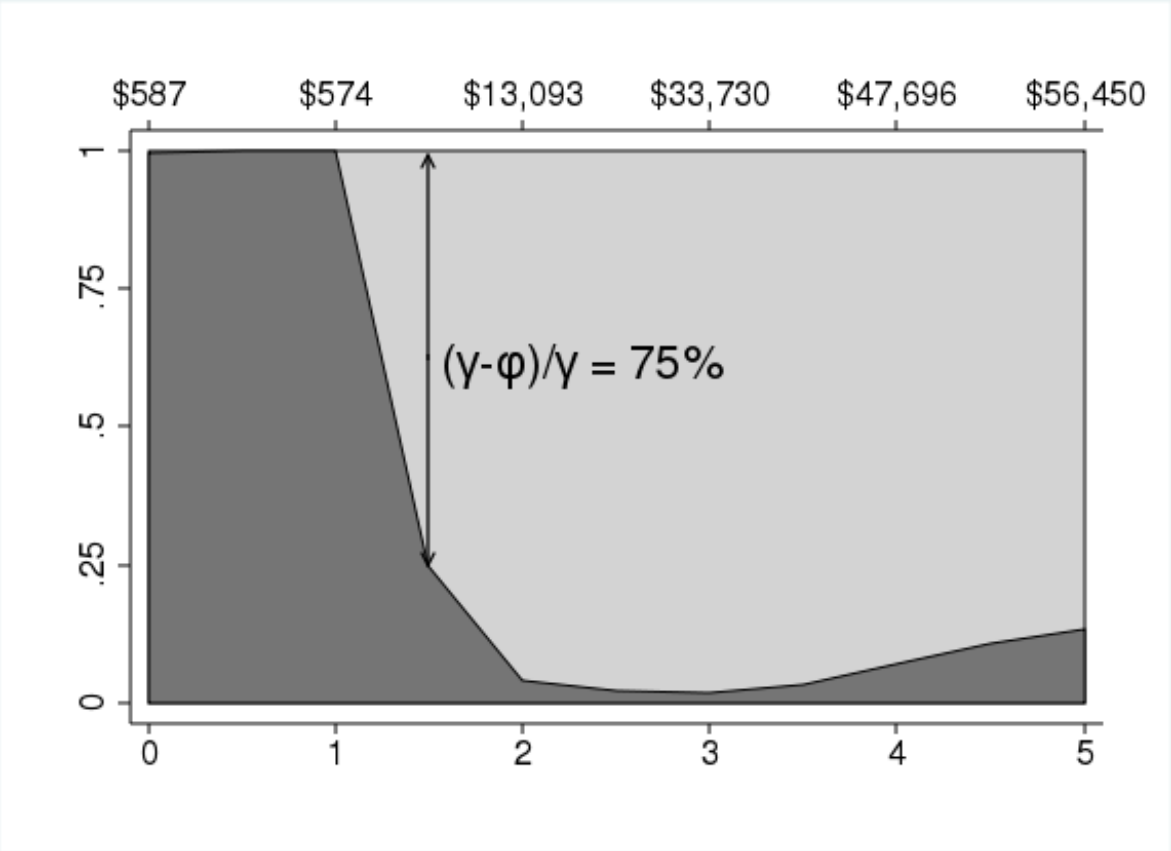


Figure 8: Risk Aversion Parameter, $\alpha * 10^5$

- $\widehat{\rho}$ increases sharply with risk aversion
- For typical risk-aversion parameters in the literature, cross-sectional estimates are 75%-90% too low

Results: Non-Separable Utility over Lifetime Consumption

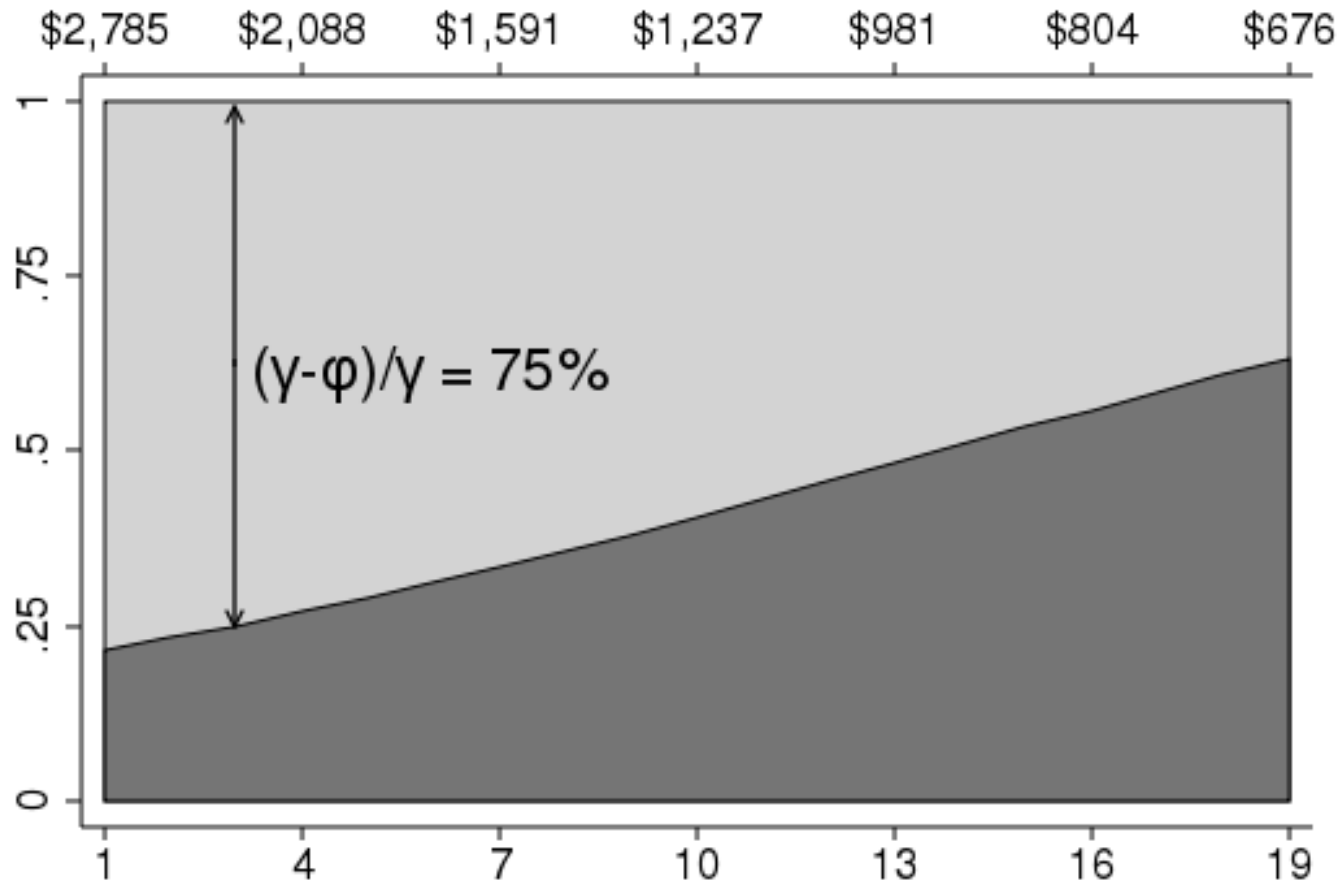
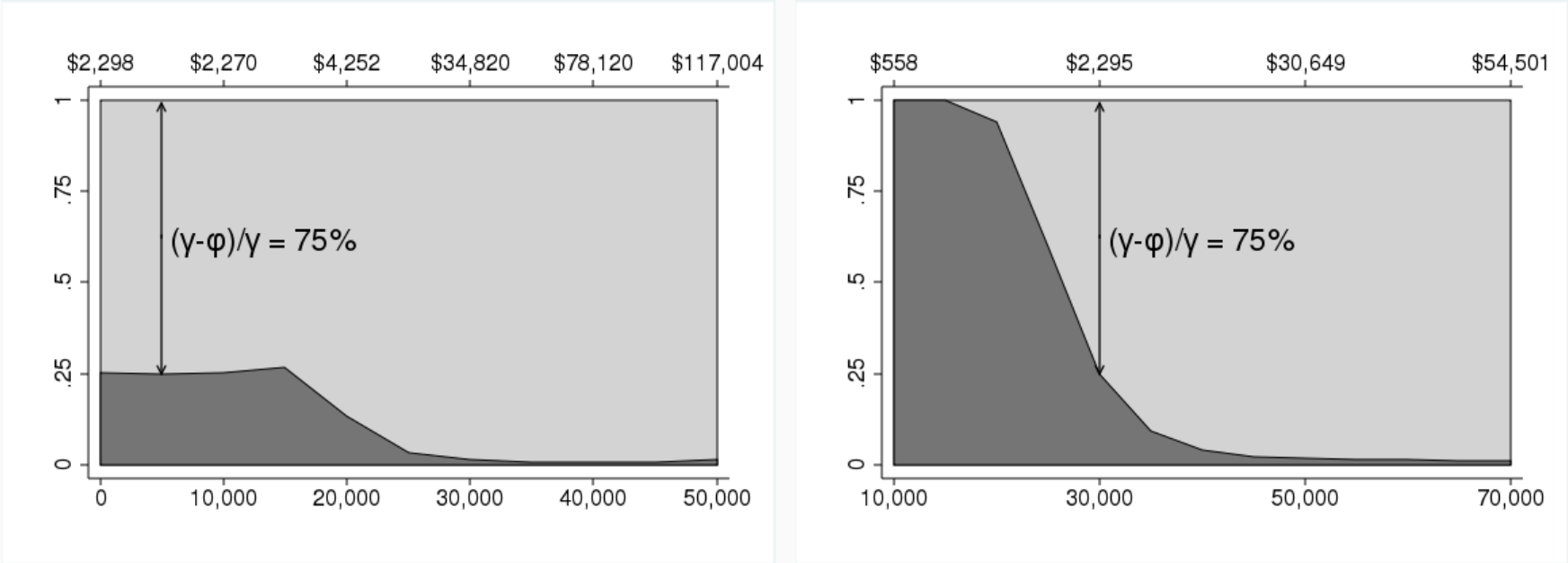


Figure 9: Interest Rate $\frac{1}{\beta} - 1$

Results: Non-Separable Utility over Lifetime Consumption

Figure 10: Uninsured Maximum OOP Spending

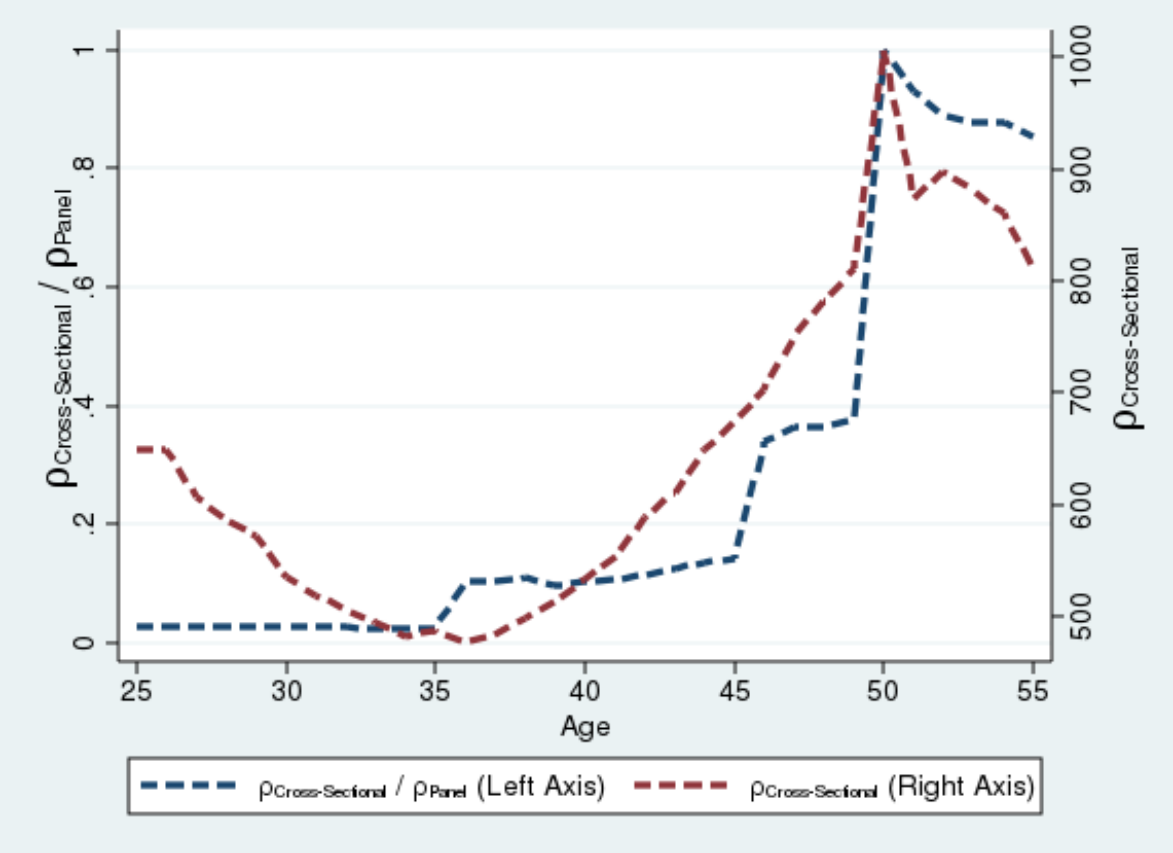


(a) 95% Chance of Low OOP

(b) 5% Chance of High OOP

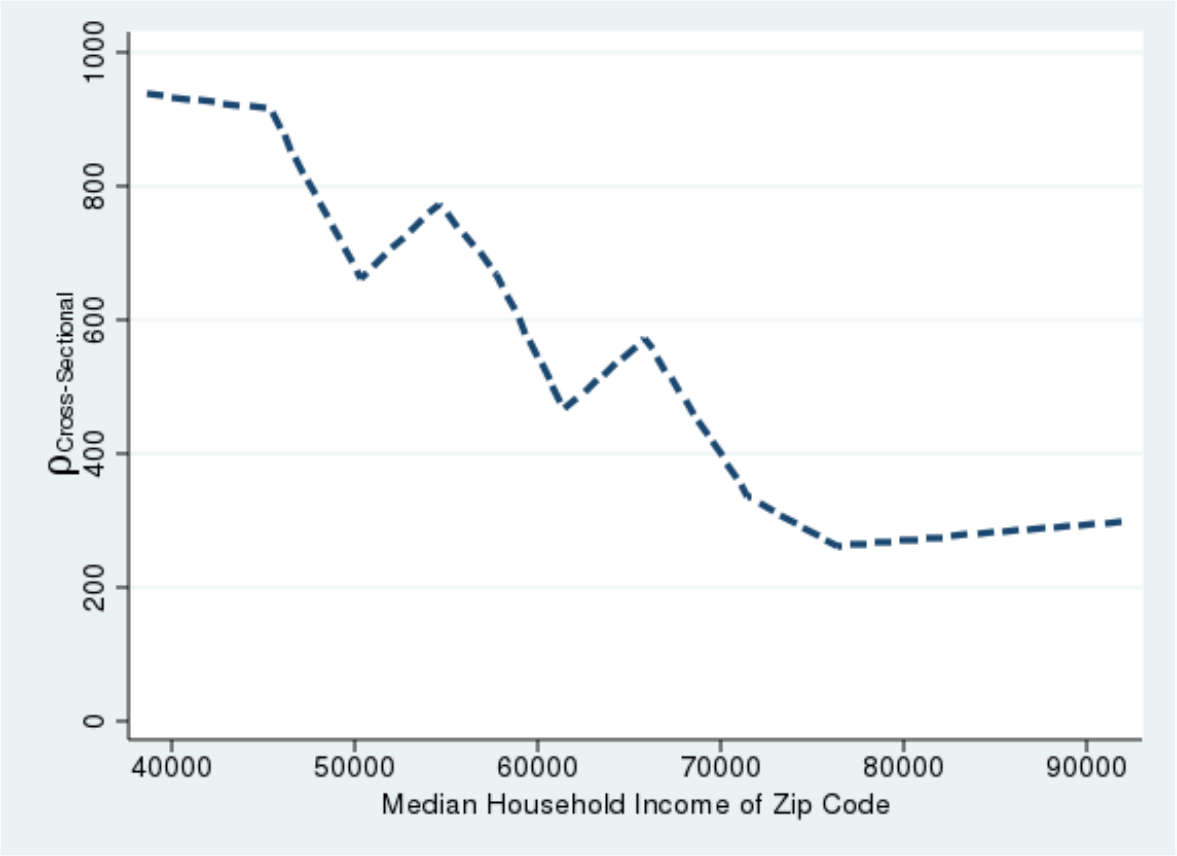
- Sensitivity to assumptions about how much uninsured people actually pay
- Magnitudes increase if uninsurance is less of a free lunch

Heterogeneity in Insurance Value by Age



- Autocorrelated risks have larger effect on insurance value for younger people
- More likely to be uninsured, longer uninsurance spells
- Average spending is lower, but conditional on high spending the relative loss is larger

Heterogeneity in Insurance Value by Zip Code Median Income



- Even ignoring correlated and ex ante risks, moderate WTP in high-income zip codes

Ex Ante WTP: Inequality Aversion

We can include ex ante benefits of Medicaid by incorporating risk aversion over inequality in life-cycle health status:

$$\sum_{i=1}^{N} G\left(\sum_{t=0}^{T} \beta^t \int u(c_{it} - m_{it} - \rho) dm_{it}\right) = \sum_{i=1}^{N} G\left(\sum_{t=0}^{T} \beta^t \int u(c_{it} - m'_{it}) dm'_{it}\right)$$

$$s.t. \quad A_t = A_{t-1}(1+r) + I_t - c_t - m_t - \rho \quad \forall i$$

- $u()$ captures standard risk aversion due to uncertainty about m, conditional on initial health status
- $G()$ captures aversion to the risk of being born as person 1 or person 2 (inequality aversion)
- ρ estimated by iterating value function to solve optimal consumption and savings paths with and without safety net
- Little evidence in literature on CARA parameter for $G()$, assume equal to risk aversion

Results: Canonical Model Plus Inequality Aversion

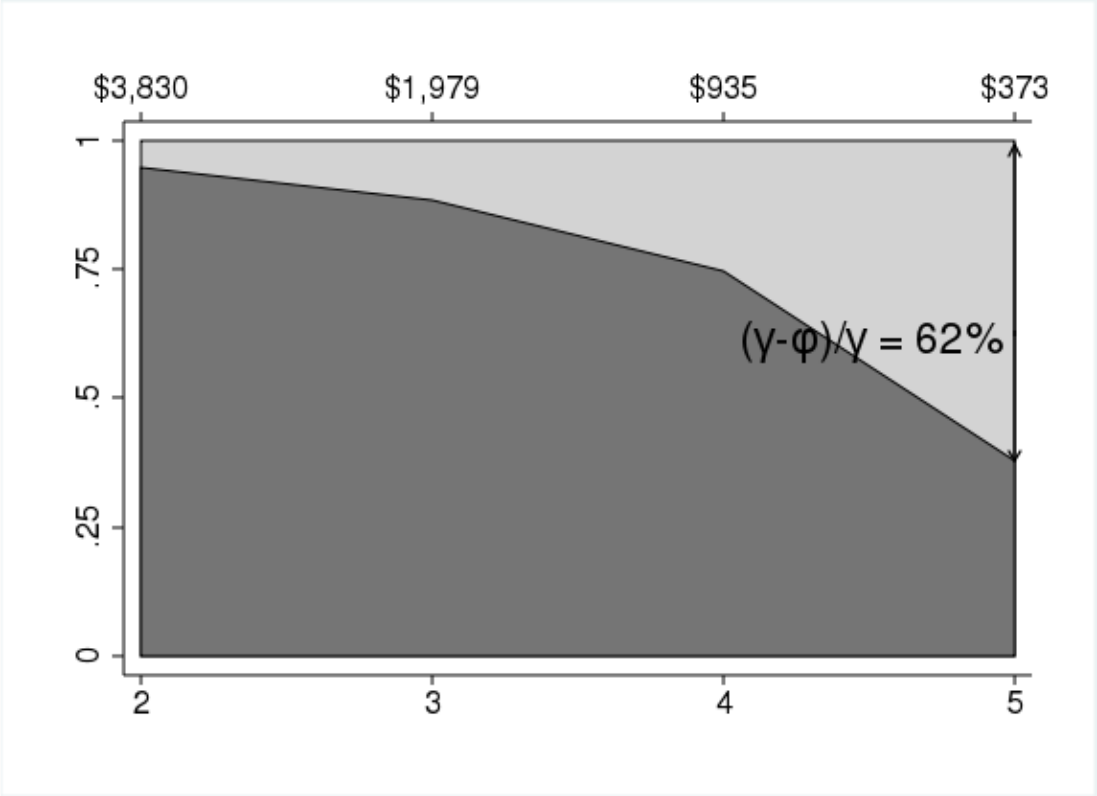


Figure 12: Length of Panel T

- Basic canonical model estimates: ρ=\$178, $\rho_{cross-sec} = 0.99\rho_{panel}$
- Incorporating ex-ante inequality aversion increases ρ to \$373
- Omitting autocorrelation reduces WTP by 62%
- Differences between models due purely to ex ante vs ex post WTP

Approach

- Consider 3 different alternative social welfare functions
- For each welfare function, estimate aggregate WTP and impact of persistence in health spending on insurance value of safety net
- Research Framework:
  - Document that health persistence can have potentially large effects on the insurance value of safety net, depending on how social welfare is defined
  - There is no 'correct' welfare function
  - Are assumptions imposed by welfare functions consistent with preferences for social insurance? Beyond scope of this paper

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Summary: Sensitivity of WTP to Welfare Assumptions

Table 6: Summary of WTP Estimates

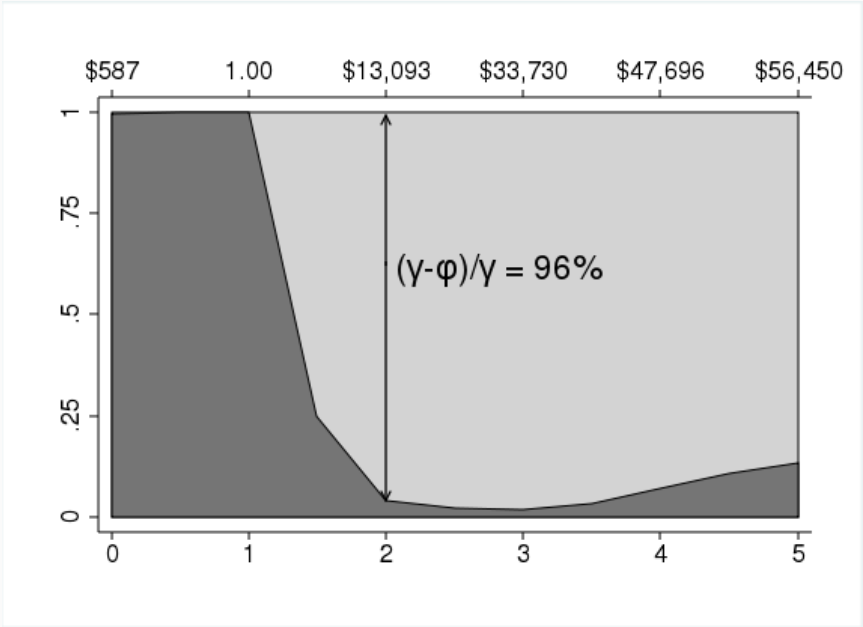
	$\widehat{\rho}$ Level	$\frac{\widehat{\rho_{Cross-Sec}}}{\widehat{\rho}}$
1: Canonical Model with self-insurance	\$178	99%
2: Utility over Lifetime Earnings	\$459	25%
3: Model 1 plus Ex Ante WTP	\$373	38%

Results: Comparing UT and NY

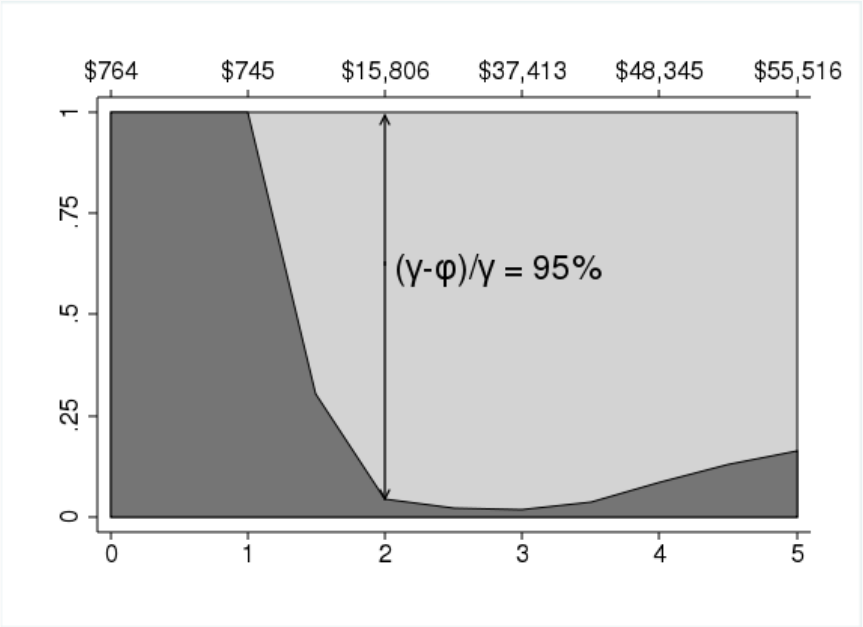
- Utah Medicaid has relatively strict eligibility rules
  - On 1/1/2008 Utah income-based eligibility limit was 47% of FPL for adults
  - NY limit was 150% of FPL
  - Estimate how results change across states with narrow/broad Medicaid eligibility rules
- Limitation: NY data only include hospital discharge records
- Re-estimate Model 2 in Utah using only hospital discharge files for comparability
- Validate hospital comparison internally within Utah, then compare to NY

Results: Non-Separable Utility over Lifetime Consumption

Figure 13: Impact of Restricting to Hospital Data, α Plot



(a) APCD and Hospital

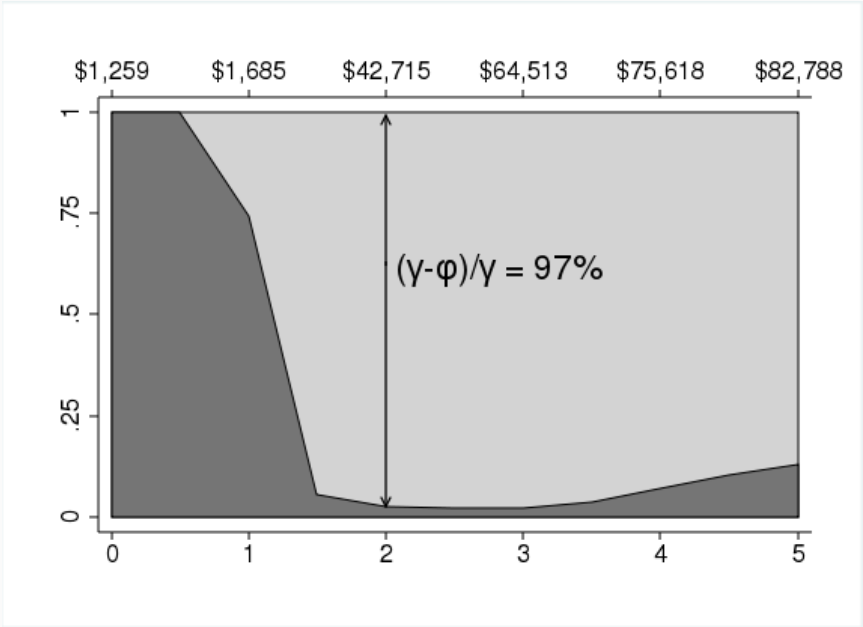


(b) Hospital Only

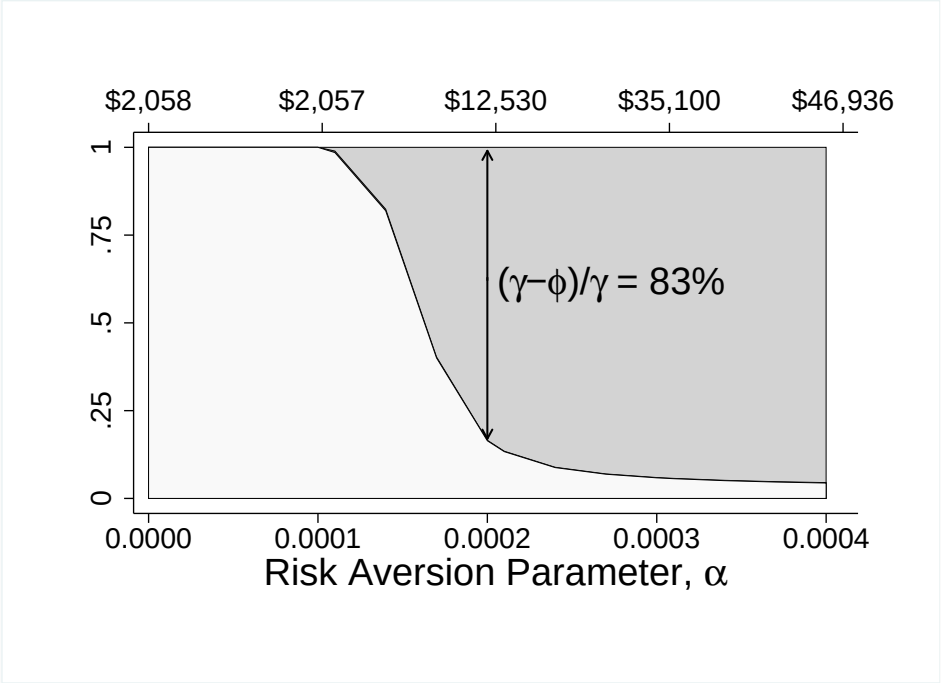
- Restricting to hospital data gives similar patterns in every sensitivity analysis

Across State Comparison: UT vs NY

Figure 15: ρ vs α



(a) Utah, 2003-2012

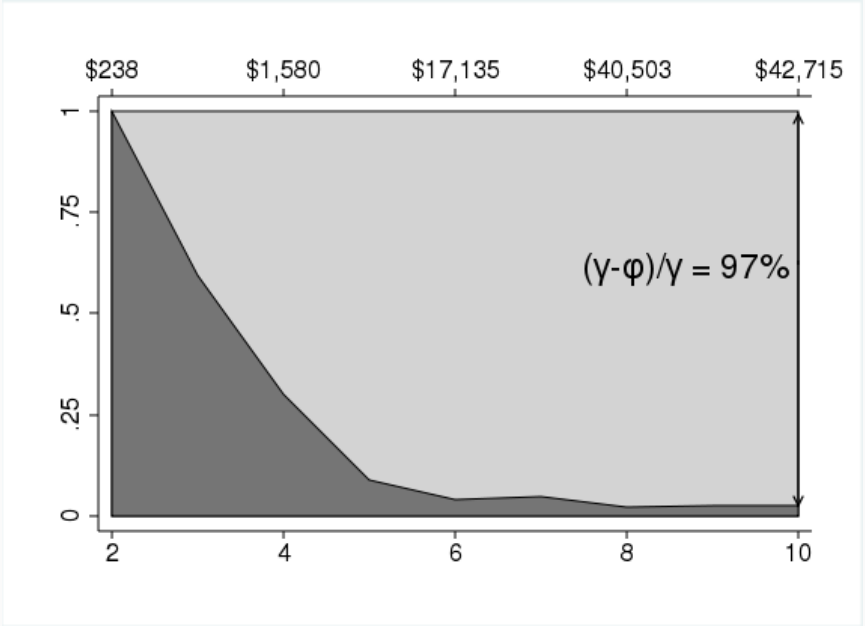


(b) NY, 1995-2011

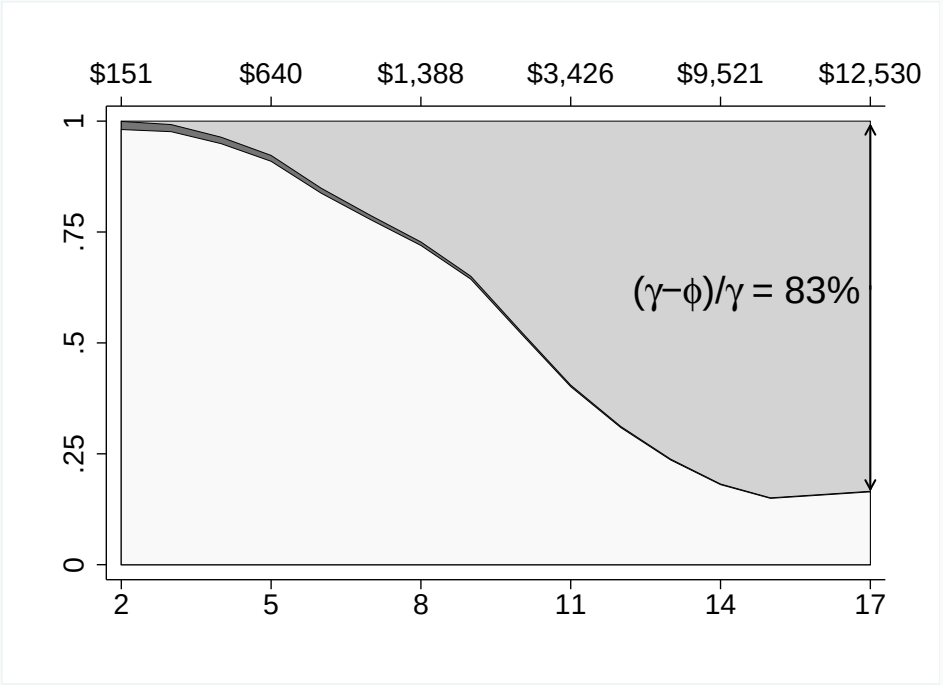
- Average insurance value is higher in Utah
- In both states, cross sectional estimates miss 83%-97% of ρ by failing to capture impacts of health persistence

Across State Comparison: UT vs NY

Figure 17: ρ vs Panel Length (T)



(a) Utah, 2003-2012



(b) NY, 1995-2011

- Utah data suggest WTP flattens after about 5-6 yr panel length
- NY data suggest 12+ years may be necessary
- Potentially related to Utah being much healthier (25% below national avg spending)

Summary

- Previous studies on the value of health insurance safety net focus on current enrollees
- Tracing pathways that precede Medicaid enrollment suggests many non-enrollees benefit from insurance value of Medicaid safety net
- Full-population estimate of WTP in Utah is \$178-\$459 (depending on welfare assumptions)
- A range of potential welfare models suggest ex ante component of WTP could be as large as ex post component
- Missing information on the persistence of health status in cross-sectional data can lead to underestimate of WTP by up to 75-97%