

14.472 Public Finance II

Topic II_d: Adverse Selection: Welfare analysis without revealed preference

Amy Finkelstein

Fall 2022

- Both EFC (QJE 2010) and EFS (EMA 2010) rely on observing demand and using revealed preference
- Two additional topics to consider in welfare analysis of insurance markets
 - [Up next] What if we want to abandon revealed preference / “go behavioral”?
 - What if market doesn't exist / has completely unraveled. How do we recover preferences / estimate demand?

Revealed preference

- Why might demand not reveal value / willingness to pay for insurance?
 - Economic constraints: Liquidity constraints (NO!)
 - Timing of measurement of demand - after information revealed / risk resolved
 - Behavioral constraints: misperception, inattention, inertia, cognitive limitations
- Two nice conceptual papers emphasize these points:
 - Hendren (2021): timing of measuring demand
 - Spinnewijn (2017) model of misperception of risk (applies more generally to behavioral frictions)

Revealed preference

- Does demand reveal value in the presence of liquidity constraints?
- What are liquidity constraints?
 - inability to borrow against future income at market rate of interest
- Insurance products often have a temporal dimension (Casaburi and Willis AER 2018)
 - pay premiums up front; therefore transfers income across time as well as states
- This means that in terms of PDV lifetime budget might want to purchase insurance at existing price but do not want to purchase insurance out of current income
 - Cost of borrowing is higher than market interest rate
- Liquidity constraints not relevant for normative analysis
 - If WTP for health insurance is low because individuals have a high value of current cash due to liquidity constraints, this means they prefer other consumption to health insurance

Hendren (2020) Measuring ex ante welfare

- Key idea: observed demand does not capture value of insurance prior to when demand is measured
- By time demand is measured may have already learned something about your type (that generates adverse selection) which destroys some of the insurance value
- EFC (2010) may systematically under-state welfare cost of adverse selection!
- Consider extreme example: if demand is measured at the point where individuals know their costs, demand equals cost and private market would unravel
 - If use observed demand and cost curves to measure welfare loss, would find no loss - willingness to pay does not exceed costs for anyone
 - But what about individuals' willingness to pay prior to learning their costs?

Extreme example

- Individuals have \$30 and face a uniformly distributed risk of losing between \$0 and \$10. How much would they be willing to pay ($D^{ex-ante}$)?

$$u(30 - D^{ex-ante}) = \int_0^{10} u(30 - x) dx$$

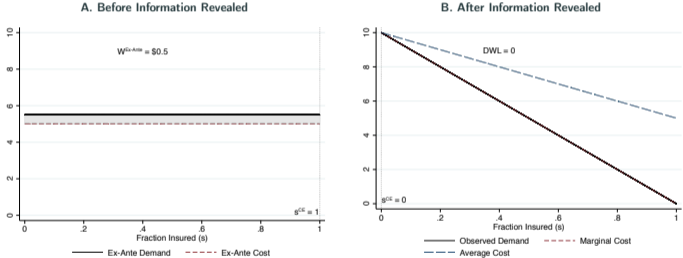
- Assuming coefficient of relative risk aversion of 3, $D^{ex-ante} \sim \$5.50$, so indifferent between \$24.50 with certainty or a uniformly distributed consumption between \$20 and \$30
- Expected cost to insurer of insuring everyone is \$5, so insurance delivers a surplus of $W^{ex-ante} = \$0.50$

Extreme example (con't)

- But if demand is observed after individuals have learned their loss m with certainty
 - Then WTP will equal cost: $D(s) = m(s)$
 - Given uniform distribution of risk this generates a linear demand curve falling from \$10 at $s = 0$ to \$0 at $s = 1$ (where $s \in [0, 1]$ denotes fraction insured)
 - demand always equals marginal cost (not willing to pay above MC because no uncertainty)
 - Insurance would completely unravel because average cost of insuring fraction s in market always exceeds demand
- Using observed demand would not measure any welfare loss (0 DWL bc $D=MC$)
 - But recall from ex-ante perspective, welfare loss from not having insurance was \$.50

Extreme example

Figure 1: Example Demand and Cost Curves



How do we measure ex ante welfare?

- Need to know
 - Extent of ex ante heterogeneity - i.e. distribution of risk types before information is revealed ("behind the veil of ignorance")
 - How risk averse are individuals (curvature of utility function)
- Key insight: slope of the *observed* demand and cost curves reveal extent of ex ante heterogeneity
 - If ex ante everyone were same, demand and cost curves would be flat
 - Ex-post cross-sectional heterogeneity (slope of demand and cost curves) is ex ante risk heterogeneity
- Where do we get risk aversion?
 - Calibrate (i.e. assume) it from other estimates - very standard (but problematic)
 - Or back it out from difference between observed demand and cost curve (requires assumptions like e.g. no moral hazard)

Aside: Reclassification risk

- Ex-ante perspective related to issue of reclassification risk ("premium risk")
- In dynamic (multi-period) context, individuals benefit not only from period-by-period "event" insurance but also from insurance against becoming a bad risk and being reclassified into a higher risk group with a higher premium
- Problem is one of *symmetric* information:
 - How to "insure" information that is known at time of contracting (but from an earlier perspective one faced ex-ante risk)
 - e.g. risk of being (or becoming) a bad driver
- Will discuss as an extra topic if we have time
 - For those interested, two great references are Hendal and Lizzeri (QJE 2003) and Handel, Hendel and Whinston (EMA 2015)

- Imagine there is some “non-welfarist constraint” that affects insurance demand but not insurance value
- Example. Discrepancy between perceived and actual risks
- Key: Creates a wedge between *actual value* of insurance and value of insurance *revealed* by individual demand
- In this setting, revealed preference approach likely *systematically understates the welfare cost of adverse selection*

Key selection effect

- If there is discrepancy between perceived and actual risks, on average those who select insurance will tend to over-estimate value of insurance and those who don't buy will under-estimate it
 - Note: can get this even if beliefs are accurate *on average* as long as there is some distribution of gap between perceived and actual risk
- As a result, demand curve overstates surplus for insured and understates potential surplus for uninsured
- If we treat demand curve as value curve (i.e. use revealed preference) get unambiguous sign to bias
 - Under-estimate welfare cost of selection; under-estimate welfare gain from mandate
- EFC (2010) may systematically under-state welfare cost of adverse selection!

Perceived vs “true” value

- Individuals differ on a vector of characteristics ζ
- $v(\zeta)$: *true* value of insurance (relevant for welfare)
- $\hat{v}(\zeta)$: *perceived* value of insurance (Determines demand)
- noise term ϵ drives wedge between true and perceived value

$$\hat{v}(\zeta) = v(\zeta) + \epsilon(\zeta) \text{ with } E_{\zeta}(\epsilon) = 0$$

- e.g. Noise term is positive if over-estimate risk, negative if under-estimate risk
- Key insight: even if noise cancels out across entire population (so true and perceived value are equal on average), since demand for insurance depends only on perceived value, true and perceived value may differ substantially conditional on insurance decision

Demand curve vs. value curve

- Demand: Buy if perceived value exceeds price: $\hat{v}(\zeta) \geq p$

$$D(p) = 1 - F_{\hat{v}}(p)$$

- Demand curve reveals WTP of marginal buyers at different prices. Price reveals perceived value for marginal buyer at that price:

$$p = E_{\zeta}(\hat{v} | \hat{v} = p)$$

- For welfare, what is relevant is expected true value of marginal buyers

$$MV(p) \equiv E_{\zeta}(v | \hat{v} = p)$$

Demand curve vs. value curve

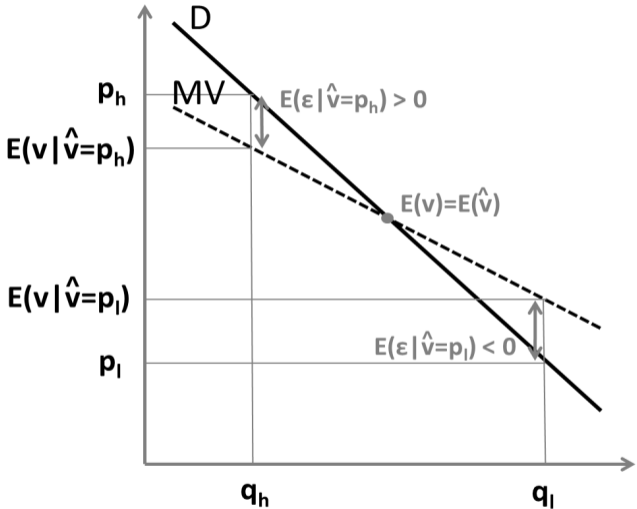


Figure 1: The Demand Curve and the Value Curve.

Implications for inferring insurance value

- (Proposition 1): If true value v and noise term ε are independent, demand curve overestimates insurance value for insured and underestimates the insurance value for the uninsured
- Simple selection effect: those who buy are selected for positive ε (and those who do not for negative ε):

$$E_{\zeta}(\varepsilon|\hat{v} \geq p) \geq 0 \geq E_{\zeta}(\varepsilon|\hat{v} < p) \quad \text{for any } p$$

- What if noise is not independent of true value?
 - (Proposition 2) If true and perceived value are normally distributed, sign of bias remains same as long as the correlation between noise term and true value is not “too negative”.
- Naive policy maker (using demand curve) will overestimate insurance value for insured and underestimate insurance value for uninsured when true value changes less than one for one with perceived value

Implications for cost of adverse selection

- Assume Adversely selected equilibrium generates too little insurance, measured wrt the marginal value (MV) curve
- Welfare cost of under-insurance depends on difference between MV curve and MC curve for those not insured in equilibrium (demand below AC) but efficient to insure (MV above MC)
- If instead use demand curve to estimate welfare cost of adverse selection estimate welfare cost of adverse selection as difference between *demand* and MC for those not insured in equilibrium (demand below AC) but efficient to insure (*demand* above MC)
- Two causes of under-estimating welfare loss from under-insurance (from using Demand curve instead of MV curve):
 - Misidentify set whom it is efficient to insure
 - Misidentify the welfare loss for those inefficiently uninsured

Under-estimating cost of AS using revealed preference

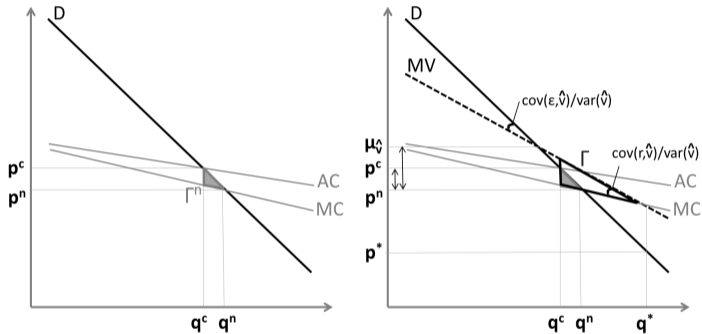


Figure 2: Adverse Selection: the naively estimated cost Γ^n vs. the actual cost Γ .

- Nice, and likely important insight
- What are the sources of “noise” (ε)
 - Uses example of perceived vs actual risk
 - Other behavioral constraints: inattention, cognitive inability, inertia
- Welfare can become trickier. Why is $v(p)$ relevant for welfare instead of $\hat{v}(p)$?
Welfare from whose perspective?

Key challenge: how implement empirically?

- In addition to the demand and cost curves needed for EFC (2010), need one additional statistic:
 - share of the variation in insurance demand - left unexplained by heterogeneity in risks
 - that is driven by non-welfarist constraints rather than by heterogeneous preferences
- Need additional data to disaggregate revealed value of insurance into true value and constraints
- Two components
 - Testing: How do we identify these “behavioral” constraints empirically? Will now discuss. There has been progress but scope for more.
 - Quantifying: How do we estimate the value curve - i.e. what the demand curve would be in absence of all behavioral frictions?
 - A key - and ongoing – challenge

Behavioral models of insurance demand

1. Version 1.0: Joint Tests of Economic and Statistical Model
 - 1.1 e.g. Abaluck and Gruber AER 2011
2. The challenge (and the frontier) I : Testing - Using the data to identify the behavioral model
 - 2.1 Dominated Choices / Switching costs (Handel AER 2013; Bhargava et al. 2017 QJE)
3. The challenge (and the frontier) II: Estimating the "value curve" - i.e. demand curve in absence of any (!) behavioral frictions
 - 3.1 Handel, Kolstad and Spinnewijn (forthcoming, ReStat)

Key theme

- Key role of modeling assumptions to identify departures from neoclassical model (or to estimate the rational model in non-behavioral work)
 - Fundamental identification problem: observe risk realization not underlying risk, so can rationalize all choices with flexible enough distributions of risk type and risk preferences
 - Is the individual making a mistake when he looks healthy and is buying very comprehensive insurance.
 - Or is he very risk averse?
 - Or has private information he's higher risk than we (the econometrician) think?
 - Difficult enough to jointly identify risk type and risk preferences and now introducing another degree of freedom (mistakes!)
 - So almost always going to come down to assumptions (rational expectations, particular mistakes model etc)

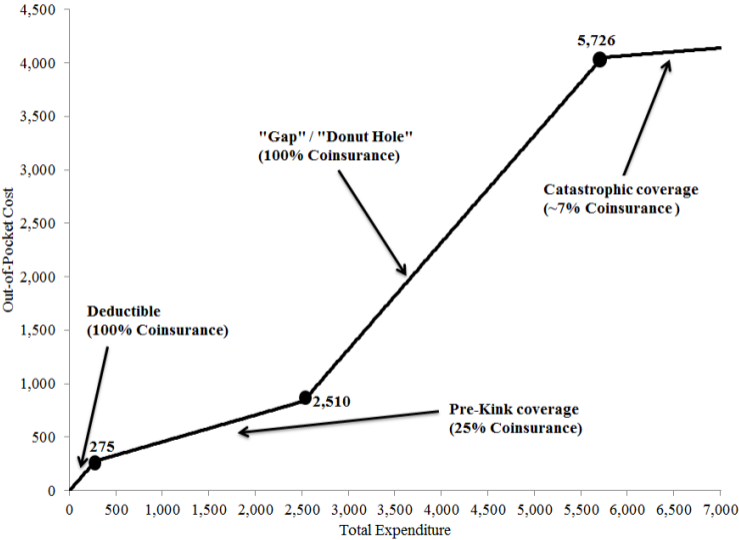
Key theme (con't)

- The current frontier: trying to find ways to get the data to identify departures from neoclassical model with as few assumptions as possible
- One very nice model for empirical papers:
 - Start with descriptive/“model free” results
 - Add more assumptions as needed (so consumer can decide what is the data and what is the model)

Choice inconsistencies in Part D: Abaluck and Gruber (AER 2011)

- Medicare Part D introduced 2006
 - Adds prescription drug coverage for elderly to Medicare
 - Key novel feature: Private insurers offer a range of products with varying prices and cost-sharing, and consumers pick (vs uniform benefits in Part A and B)
- Typical elder faces choice of over 40 plans.
 - Plans vary in cost sharing features like deductible, coverage in “donut hole”, cost sharing for branded vs generic drugs etc
- Neoclassical economics: more choice is better
 - Competition / productive efficiency
 - Preference heterogeneity / allocative efficiency
 - [What about adverse selection?!]
- But what if individuals “make mistakes”?
- They study choices elderly make in first year of program (2006)

Primer: Deductibles and Donut Holes



- Use data on individual Part D choices and subsequent claims to test 3 predictions of the neoclassical model:
- Prediction 1: Individuals should value a \$ of premiums the same as a \$ of expected out of pocket costs
- Prediction 2: Conditional on premium and distribution of out of pocket costs, individuals should not care about other financial characteristics of the plan like the deductible or donut hole coverage
 - These should matter only by affecting distribution of out of pocket costs
- Prediction 3: All else equal, individuals should prefer plans that have a lower variance of out of pocket costs

Are these robust predictions of the neoclassical model?

- Prediction 1: Individuals should value a \$ of premiums the same as a \$ of expected out of pocket costs
 - What if there is state-dependent utility?
 - or state dependent prices (e.g. family lends money to cover oop costs but not premiums)?
 - What if there are liquidity constraints? Then timing / lumpiness of expected out of pocket payment stream matters (Ericson and Sydnor, 2018)
- Prediction 2: Conditional on premium and distribution of (annual) out of pocket costs, individuals should not care about other financial characteristics of the plan like the deductible or donut hole coverage
 - What if there are liquidity constraints?
- Prediction 3: All else equal, individuals should prefer plans that have a lower variance of out of pocket costs

Empirical approach

- Very similar in spirit (if not in details) to Cohen and Einav 2007
- Observe data on insurance options, choices and claims
- Make key assumptions regarding: information set of consumer about risk type, distribution of risk type, no moral hazard
- If don't make distribution of risk type and risk aversion sufficiently (infinitely?!) flexible, can't rationalize all choices with standard model

Model of plan choice

- Conditional logit model of plan choice

$$u_{ij} = \pi_j \beta_0 + \mu_{ij}^* \beta_1 + \sigma_{ij}^2 \beta_2 + \mathbf{x}_j \lambda + \mathbf{q}_{b(j)} \delta + \varepsilon_{ij}$$

where π_j is premium of option j

μ_{ij}^* is mean oop costs for individual i in plan j (estimated)

σ_{ij}^2 is variance of oop costs for individual i in plan j (estimated)

$\mathbf{q}_{b(j)}$ are vector of non financial characteristics of plan (vary across brand)

\mathbf{x}_j : other plan financial features (deductible, whether covers donut hole etc)

Model of plan choice

$$u_{ij} = \pi_j \beta_0 + \mu_{ij}^* \beta_1 + \sigma_{ij}^2 \beta_2 + \mathbf{x}_j \lambda + \mathbf{q}_{b(j)} \delta + \varepsilon_{ij}$$

- Estimate model using construction of choice sets, observed choices and claims
- Test three predictions:
 - $\beta_0 = \beta_1$ (value premium and expected out of pocket costs the same)
 - $\lambda = 0$ (conditional on mean and variance of oop costs, don't care about other plan characteristics)
 - $\beta_2 < 0$ (dislike variance; individuals are risk averse)

$$u_{ij} = \pi_j \beta_0 + \mu_{ij}^* \beta_1 + \sigma_{ij}^2 \beta_2 + \mathbf{x}_j \lambda + \mathbf{q}_{b(j)} \delta + \varepsilon_{ij}$$

- Observe single realized (ex post) claims but not ex ante risk type from which they are drawn
- Need to estimate μ_{ij}^* and σ_{ij}^2
- Common theme - see prior papers!

Constructing risk type

- Assume no moral hazard
- Construct cells of “identical” individuals, “identical” in terms of decile of drug expenditures, days supply of branded drugs and days supply of generic drugs from year prior to the choice year studied (=2005, before introduction of Part D)
- 1,000 cells (interaction of deciles of three measures)
- Sample realized (2006) claims from 200 people within the cell. Use these to construct μ_{ij}^* and σ_{ij}^2
 - i.e. this is the individual's information set about his risk type when selecting a plan

Findings: reject all three “neoclassical” predictions

$$u_{ij} = \pi_j \beta_0 + \mu_{ij}^* \beta_1 + \sigma_{ij}^2 \beta_2 + \mathbf{x}_j \lambda + \mathbf{q}_{b(j)} \delta + \varepsilon_{ij}$$

- $\beta_0 > \beta_1$ people place more weight on premiums than expected out of pocket expenses
- $\lambda \neq 0$. Conditional on (modeled) distribution of out of pocket costs, other financial features of plan affect choices
 - dislike deductibles, value donut coverage etc
- Cannot reject $\beta_2 = 0$. Cannot reject that (supposedly risk averse) individuals don't care about variance

Comment: implications of mistakes?

- Cannot reject $\beta_2 = 0$. Cannot reject that (supposedly risk averse) individuals don't care about variance
- Why then do we care about mistakes? Aren't they just a transfer?

Joint test of “choice consistency” and model

$$u_{ij} = \pi_j \beta_0 + \mu_{ij}^* \beta_1 + \sigma_{ij}^2 \beta_2 + \mathbf{x}_j \lambda + \mathbf{q}_{b(j)} \delta + \varepsilon_{ij}$$

- Some key assumptions include
 - Modeling of risk type μ_{ij}^* and σ_{ij}^2
 - Homogeneous risk aversion across individuals
 - Quadratic utility (only care about mean and variance)
- Can (and they do) probe robustness on many dimensions
- But fundamentally robustness tests of limited
 - Can rationalize the data if we want to (is it credible though?! How to formally assess?)

Joint test of “choice consistency” and model

- Fundamental identification problem: observe risk realization not underlying risk
 - can rationalize all choices with flexible enough distributions of risk type and risk preferences
 - Is the guy making mistake when he looks healthy based on “cell” and buying really expensive plan? Or is he very risk averse? Or has private information he’s higher risk than we think?
 - Difficult enough to jointly identify risk type and risk preferences and now introducing another degree of freedom (mistakes!)

Comment: Naming the error term

$$u_{ij} = \pi_j \beta_0 + \mu_{ij}^* \beta_1 + \sigma_{ij}^2 \beta_2 + \mathbf{x}_j \lambda + \mathbf{q}_{b(j)} \delta + \varepsilon_{ij}$$

- If model correctly specified, only distribution of oop costs should affect choices.
 - That's the key insight behind the test of whether plan features like deductible etc affect choices (they should not)
- logit error term ε_{ij} represents “mistakes” – nothing else should matter
- So in their normative welfare analysis in paper, choices other than what is predicted (w/o error term) is a “mistake”
 - Contrast with “standard” neoclassical approach which interprets the error term as unmodeled preference heterogeneity
 - Neither particularly palatable.
- Has welfare economics come down to what we choose to call the error term?

- Observed demand may systematically understate welfare cost of selection
 - Hendren (2017)
 - Spinnewijn (2017)
- [Up next]: The challenge (and the frontier) I: Using data (vs. assumptions) to identify "behavioral" departures
 - Dominated choices / switching costs (Handel AER 2013)
- [Then] The challenge (and the frontier) II: What does value curve look like?

Switching costs - Handel (2013)

- Standard economic theory: choice is good
 - Competition / productive efficiency
 - Preference heterogeneity / allocative efficiency
- Thus far, have considered two separate factors that can mitigate against value of choice
 - Adverse selection (potential welfare improving role for mandates)
 - “Mistakes” / choice inconsistencies
- Handel (2013) now combines them
 - Investigates consumer inertia in health insurance markets where adverse selection is a potential concern

Setting and Data

- Employee menu of health insurance options, choices, and claims over several years in a large firm
- Very similar set up to Alcoa data
- Key features: Changes in menu
 - Firm significantly altered menu of plans, forced employees out of old plans (no longer offered) and required them to make an active choice from new menu (no stated default)
 - In subsequent years, options remain same but premiums changed a lot and if no active choice, defaulted into prior year's choice
- Key identifying feature for inertia: when employees join firm relative to when menu or price changes occur

Overview of Approach

- Descriptive evidence of inertia
 - e.g. Comparison of choices made by different cohorts of new employees (very different choice environment; otherwise appear quite similar)
- Model (a la Cohen and Einav) to recover distribution of risk type, risk preferences and switching costs. Can be used to
 - Quantify the extent of switching costs
 - Model plan choice and welfare under counterfactual policies (such as forced active choice / no inertia by construction)
- NB: Very nice pairing
 - Descriptive evidence on key feature of model (relatively model free)
 - Additional modeling assumptions allow him to ask questions (counterfactual choice; welfare) that you can't get from the reduced form

Overview of findings

- Substantial inertia from descriptive evidence
 - As plan prices and choice environment change over time, incoming cohorts of new employees make active choices that reflect updated setting while prior cohorts make very different choices that reflect past setup (cohorts look otherwise similar)
 - Some options become *dominated* and yet most consumers stay with them (NB: strict dominance doesn't require modeling assumptions about e.g. risk type or preferences)
- Counterfactual results from model: inertia ameliorates adverse selection and improves welfare
 - Reduces adverse selection pressure (i.e. healthiest dropping out)
 - Application of theory of the second best

Descriptive Part I: New employees

- Key idea: new employees forced to make active choices (vs prior cohorts)
- Compare how choices vary for new employees vs old (confirming that demographics don't vary across cohorts)
- Notation:
 - t_0 = year of menu change (everyone has to make an active choice)
 - t_1 : menus don't change (so can be passive) but large price changes
- Examines: how do t_1 choices vary for those who enter at t_1 (active choices) vs. those already in at t_0 (potentially passive)

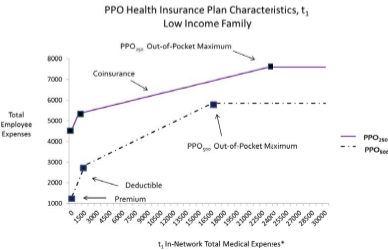
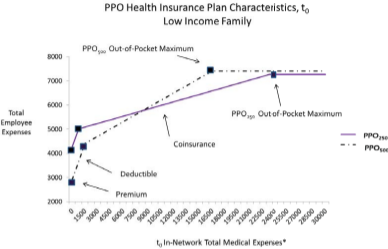
Table 2

New Enrollee Analysis			
	New Enrollee t_{-1}	New Enrollee t_0	New Enrollee t_1
N, t_0	1056	1377	-
N, t_1	784	1267	1305
t_0 Choices			
<i>PPO</i> ₂₅₀	259 (25%)	287 (21%)	-
<i>PPO</i> ₅₀₀	205 (19%)	306 (23%)	-
<i>PPO</i> ₁₂₀₀	155 (15%)	236 (17%)	-
<i>HMO</i> ₁	238 (23%)	278 (20%)	-
<i>HMO</i> ₂	199 (18%)	270 (19%)	-
t_1 Choices			
<i>PPO</i> ₂₅₀	182 (23%)	253 (20%)	142 (11%)
<i>PPO</i> ₅₀₀	201 (26%)	324 (26%)	562 (43%)
<i>PPO</i> ₁₂₀₀	95 (12%)	194 (15%)	188 (14%)
<i>HMO</i> ₁	171 (22%)	257 (20%)	262 (20%)
<i>HMO</i> ₂	135 (17%)	239 (19%)	151 (12%)
Demographics			
Mean Age	33	33	32
Median Age	31	31	31
Female %	56%	54%	53%
Manager %	20%	18%	19%
FSA Enroll %	15%	12%	14%
Dental Enroll %	88%	86%	86%
Median (Mean) Expense t_1	844 (4758)	899 (5723)	-
Income Tier 1	48%	50%	47%
Income Tier 2	33%	31%	32%
Income Tier 3	10%	10%	12%
Income Tier 4	5%	4%	4%
Income Tier 5	4%	5%	5%

Descriptive Part II: Dominated choices

- Look at what happens when one option becomes dominated due to a price change over time
- In t_1 firm increased the premium for the (more comprehensive) \$250 deductible plan (PPO_{250}) and decreased the premium for the (less comprehensive) \$500 deductible plan (PPO_{500})
 - For some combinations of family size and income (which determine employee premium contributions) PPO_{250} became *strictly dominated* by PPO_{500} .
 - Strict dominance: for any level and type of total medical expenditures, PPO_{500} leads to lower employee expenditures (premium plus out-of-pocket) than PPO_{250}
- Attraction of strict dominance: don't have to model individual's risk type

Strict dominance: illustration



Dominated choices: Findings

- Many people remain in dominated choices
- Of those whose choice becomes dominated in t_1 , only 11% switch. Even by t_2 only 25% total have switched out of dominated option.
- Interesting question: How common is it for firms to offer dominated choices? Which firms tend to? And why?

More on dominated choices

- Bhargava et al. (QJE 2017) present evidence from a large firm that majority of employees (and particularly lower income ones) choosing dominated plans
- Non-trivial consequence: estimate dominated choice results in excess spending equal to about 25% of chosen plan premium
- Conduct choice experiments that suggest
 - simplifying and shortening menu doesn't have much effect
 - clarifying economic consequences of plan choice does reduce dominated choices substantially
- Conclude: reflects fundamental lack of understanding of health insurance
- "Our findings challenge the standard practice of inferring risk preferences from insurance choices, and raise doubts about the welfare benefits of reforms that give consumers more choice"

More on dominated plans

- Why do firms offer dominated plans (Liu and Sydnor NBER WP 2018)
 - Provide descriptive evidence that dominated plan offerings are common
 - High deductible plan often dominates lower deductible plan
 - They propose it's due to selection: high deductible attracts better risks and lower costs are then passed onto enrollees
- Are dominated plans actually dominated (Ericson and Sydnor NBER WP 2018)?
 - In presence of liquidity constraints, individuals may rationally prefer "dominated" plan
 - Compare low vs high deductible plan where premiums + oop for low plan exceed high for any realization of health care spending
 - But liquidity constrained individual may prefer a series of small payments to one large lumpy expenditure

Handel (2013): Moving past the descriptive

- Descriptive evidence of inertia is compelling.
- Model useful if want to quantify in a meaningful way and/or perform counterfactuals: how would choices (and welfare) change if we reduce inertia?

- Model: essentially Cohen and Einav (2007) + inertia
 - Three dimensions of heterogeneity: risk type, risk preference, inertia
 - Same sort of modeling choices with respect to risk type and risk preferences that we have discussed
- Inertia modeled as an incremental (monetary) cost η that is paid to switch plans (structural interpretation is that of a switching cost). Has direct negative impact on utility

$$U_{kjt} = \int_0^{\infty} f_{kjt}(OOP) u_k(W_k, OOP, P_{kjt}, \mathbf{1}_{kj,t-1}) dOOP$$

- k is family unit, j is plan choice, and t is one of three years (t_0 to t_2)
 - t_0 everyone forced to make new, "active" choice
 - t_1 large relative price changes
- 3 plan choices: PPO_{250} , PPO_{500} , PPO_{1200}
 - differ only in financial aspects (premiums and cost sharing)
 - PPO_{1200} includes *HSA* (save tax-free for later medical expenses)
- OOP is realization of medical expenses from $F_{kjt}(\cdot)$
- W_k denotes family-specific wealth
- P_{kjt} is family x time specific premium contribution for plan j
- $\mathbf{1}_{kj,t-1}$ is an indicator for whether family was enrolled in plan j in previous time period

Choice model

- CARA assumption
 - for a given ex-post consumption level x :

$$u_k(x) = -\frac{1}{\gamma_k(X_k^A)} e^{-\gamma(X_k^A)x}$$

- γ_k is a family-specific risk preference parameter (known to family; unobserved to econometrician)
 - γ_k is a random coefficient, assumed to be normally distributed (truncated just above zero) with a mean that is linearly related to observable characteristics X_k^A (employee age and income)
 - $\gamma_k(X_k^A) \sim N(\mu_\gamma(X_k^A), \sigma_\gamma^2)$
 - $\mu_\gamma(X_k^A) = \mu + \beta(X_k^A)$
- Note: CARA assumption means don't need to observe wealth because level of absolute risk aversion $-\frac{u''}{u'} = \gamma$ which is constant with respect to level of x

- family's consumption x , conditional on a draw OOP from $F_{kjt}(\cdot)$ is given by:

$$x = W_k - P_{kjt} - OOP + \eta(X_{kt}^B, Y_k)\mathbf{1}_{kj,t-1} + \delta_k(Y_k)\mathbf{1}_{1200} + \alpha H_{k,t-1}\mathbf{1}_{250} + \epsilon_{kjt}(Y_k)$$

- Inertia (η) modeled as an implied monetary cost / reduction in consumption (structural interpretation similar to a tangible switching cost)
 - depends on linked choice ($\mathbf{1}_{kj,t-1}$) and on demographic variables (X_{kt}^B and Y_k)
 - $\eta(X_{kt}^B, Y_k) = \eta_0 + \eta_1 X_{kt}^B + \eta_2 Y_k$
 - X_{kt}^B contains potentially time varying variables that may affect inertia (e.g. income, health status, change in predicted medical expenditures etc)
 - Y_k is family status (single vs dependents)

Choice model: inside the sausage factory

- family's consumption x , conditional on a draw OOP from $F_{kjt}(\cdot)$ is given by:

$$x = W_k - P_{kjt} - OOP + \eta(X_{kt}^B, Y_k)\mathbf{1}_{kj,t-1} + \delta_k(Y_k)\mathbf{1}_{1200} + \alpha H_{k,t-1}\mathbf{1}_{250} + \epsilon_{kjt}(Y_k)$$

- δ_k is an unobserved family-specific intercept for $PP0_{1200}$
 - expect non-zero δ_k because HSA in $PP0_{1200}$ is horizontally differentiated
 - so makes sense (and i'm guessing also helps fit the data better)
- $H_{k,t-1}$ is a binary variable for family above 90th pctile of cost distribution last year
 - α measures an intrinsic preference of a high cost family for PPO_{250}
 - "Intended to proxy for empirical fact that almost all families with very high expenses choose PPO_{250} whether or not it is the best plan for them".

Choice model: inside the sausage factory

- family's consumption x , conditional on a draw OOP from $F_{kjt}(\cdot)$ is given by:

$$x = W_k - P_{kjt} - OOP + \eta(X_{kt}^B, Y_k)\mathbf{1}_{kj,t-1} + \delta_k(Y_k)\mathbf{1}_{1200} + \alpha H_{k,t-1}\mathbf{1}_{250} + \epsilon_{kjt}(Y_k)$$

- ϵ_{kjt} is a family-plan-time specific idiosyncratic preference shock
 - assume probit error term, distributed *i.i.d* for each j with zero mean and variable $\sigma_{e_j}(Y_k)$
- Standard thing to do (makes it a lot easier to rationalize the data) but kind of strange when choices differ purely on financial characteristics (conditional on the modeled PPO_{1200} differentiation)
 - Particularly unappealing if heterogeneity in preferences (or joint distribution of unobserved heterogeneities) is a focus
 - Einav et al. (2013 AER, selection on moral hazard) are focused on joint distribution of unobserved preferences, risk type and moral hazard type
 - Do not include this additional error term / "preference shock"
 - And incur much pain and suffering as a result

Cost model (for distribution of OOP)

- Model individual's (ex-ante - i.e. at time of insurance choice) expected future spending at time of plan choice using past diagnostic, demographic and cost information
 - generate ex-ante distribution faced by individual by grouping individuals into bins based on mean predicted future spending and estimate spending distribution for upcoming year based on ex-post observed cost realizations
 - similar to Abaluck and Gruber (2011)
- Impose two restrictions:
 - No moral hazard (total expenditures do not vary with j)
 - No private information about health conditional on model above
 - Question to class: so how can he estimate / study adverse selection?

Identification (loosely)

- Risk type modeled directly from (rich) information not only on claims but on “risk score” (past spending and diagnoses) which is used to group individuals into cells for whom spending distribution is computed (v. similar to Abaluck and Gruber).
 - No additional unobserved heterogeneity (or moral hazard).
- Risk aversion identified by choice between PPO_{500} and PPO_{250}
 - Identified by active choices at t_0
- Inertia identified by choice movement (or lack thereof) over time as plan values change due to changes in price or health status
- Of course requires (some) parametric assumptions
 - Described specific choices above
 - Explores robustness

Identification (con't)

- Central (pervasive) challenge in many applications: separating path-dependence from serial correlation / persistence of types
 - e.g. argument over whether welfare "creates dependency" / reduces labor market potential. How separate path-dependence from persistence of types (does welfare erode human capital or do people with low human capital end up on welfare?)
- Here, fundamental challenge is to separately identify "inertia" from persistent, unobserved preference heterogeneity
 - inertia = state-dependence. if you randomly assigned someone to a plan they would be more likely to still be in it the subsequent year.
- Key to their approach: Changes in prices and health status over time identify inertia separately from risk preference levels and risk preference heterogeneity

Findings

- Large (and heterogeneous) inertia
 - Average employee to forgo ~ \$2,000 annually (sd is \$446)
 - Relative to average family spending of ~\$4,500
- Counterfactual policies that “reduce inertia” (from η_k to $Z\eta_k$) where Z is some fraction
 - As Z goes to 0, eliminate inertia
 - Considers welfare as the certainty equivalent that equates expected utility under a health plan choice with a certain monetary payment such that individual indifferent between losing that amount for sure and obtaining the risky payoff from enrolling in the plan

Model findings (con't)

- How to think about η
 - Do you count reduction in η as “direct” welfare benefit. Depends on underlying source of inertia (e.g. real tangible switching cost vs. some abstract psychic force causing delay?)
 - Tries allowing for various fractions of η reduction to “count” in welfare
- Two main counterfactuals as reduce inertia
 - Partial equilibrium / naive: Changes in plans and welfare, holding premiums fixed
 - Allow supply side response: prices adjust as people move across policies (need model of supply side)

Model findings (con't)

- Counterfactual: Reducing inertia by three-quarters (not counting η directly in welfare)
- Partial equilibrium
 - 44% increase in fraction enrolling in PPO_{500} at t_1 (recall big decrease in relative premium)
 - Increase in welfare of about 5% of premiums
- Allowing supply side response of premiums:
 - Still improves plan choices conditional on prices (recall too few were choosing PPO_{500} at t_1) but now exacerbates adverse selection leading to a *reduction* in welfare.

Model findings (con't)

- Why does reducing inertia reduce welfare once account for supply side response of premiums?
- Reduced inertia / choice frictions causes more people to re-optimize
 - leads to more enrollment in PPO_{500} when relative price decreases
 - On the margin it is the healthier ones who choose this lower coverage plan (PPO_{500})
 - So this drives up the price in PPO_{250} as it becomes more adversely selected
 - Over time, counterfactuals suggest PPO_{250} could experience a death spiral (a la Cutler and Reber 1998)

- Two reasons now in insurance markets that greater choice may not improve welfare
 - Selection
 - “Behavioral” issues / “bad choices”
- But what is “inertia”?
 - Matters crucially for welfare analysis (as paper realizes)
 - Modeled as a real switching cost (but baseline welfare analysis assumes it’s not directly affecting utility)
 - Are search costs “behavioral”?

Comments (con't)

- Handel (2013) finds that inertia ameliorates adverse selection in this setting once one accounts for supply side premium response
- But there is no general theorem. (e.g. "Anything that gums up choices ameliorates adverse selection").
 - although paper is often (mis-) interpreted this way
- Polyakova (2016) finds for Medicare Part D switching costs **help** sustain an adversely selected equilibrium.
- Depends crucially on "where you start"
 - In Handel setting, inertial consumers respond little to the relative premium decrease for the low coverage (PPO_{500}) plan (even though it made PPO_{250} dominated in some cases).
 - Recall adverse selection creates problem of too little insurance / above MC pricing in higher coverage plans
 - If the price change had been relative premium decrease for high coverage (PPO_{250}) plan, inertia would have exacerbated adverse selection

Polyakova (2016): "Active" choices when enter at 65

Table 3: Evidence of switching costs: choice patterns in 2006-2009 tracked for cohorts entering in different years

Cohorts of 65 year olds whose incumbent plans were not re-classified into a different type by the insurer										
	65 y.o. in 2006				65 y.o. in 2007			65 y.o. in 2008		65 y.o. in 2009
A. Enrollment shares	2006	2007	2008	2009	2007	2008	2009	2008	2009	2009
Contracts of type 1	22 %	22 %	19 %	17 %	17 %	15 %	14 %	10 %	11 %	12 %
Contracts of type 2	73 %	73 %	77 %	79 %	72 %	75 %	77 %	82 %	82 %	82 %
Contracts of type 3	4 %	5 %	5 %	4 %	11 %	11 %	10 %	7 %	7 %	5 %
<i>N</i>	37,500	37,500	37,500	37,500	35,759	35,759	35,759	40,960	40,960	43, 520
B. Incremental premium	in year 2006				in year 2007			in year 2008		in year 2009
Contracts of type 2	\$138				\$125			\$54		\$37
Contracts of type 3	\$375				\$360			\$410		\$469

Shows up in differential price elasticities

Table 4: Evidence of switching costs: price sensitivity estimates for individuals with and without incumbent plans

Price coefficient [p-value]	Age of beneficiaries					
	65	66	67	68	69	70
	Baseline	Interaction	Interaction	Interaction	Interaction	Interaction
2006	-0.003 [0.000]	0.0001 [0.809]	0.0002 [0.683]	0.0006 [0.386]	-0.0001 [0.876]	0.0006 [0.321]
2007	-0.003 [0.000]	0.0018 [0.002]	0.0012 [0.035]	0.0011 [0.031]	0.0013 [0.002]	0.0010 [0.040]
2008	-0.003 [0.000]	0.0022 [0.000]	0.0023 [0.000]	0.0021 [0.000]	0.0019 [0.001]	0.0020 [0.001]
2009	-0.010 [0.000]	0.0072 [0.000]	0.0085 [0.000]	0.0090 [0.000]	0.0085 [0.000]	0.0084 [0.000]

The price coefficients are estimated using the following random utility specification:

$$\begin{aligned}
 u_{ij} = & -\alpha_{65}p_{ij} + \alpha_{66}p_{ij}\mathbf{1}\{Age = 66\} + \alpha_{67}p_{ij}\mathbf{1}\{Age = 67\} + \\
 & + \alpha_{68}p_{ij}\mathbf{1}\{Age = 68\} + \alpha_{69}p_{ij}\mathbf{1}\{Age = 69\} + \alpha_{70}p_{ij}\mathbf{1}\{Age = 70\} + brand_j + \epsilon_{ij}
 \end{aligned}$$

Other interesting aspects of inertia / switching costs I

- How does it affect firm pricing?
- Ho, Hogan and Morton (2017 RAND) "Impact of consumer inattention on insurer pricing"
 - Theoretically unclear whether equilibrium prices higher or lower with strategic (dynamic) pricing behavior
 - Competing goals: invest (lower prices) vs harvest (raise prices)
 - Descriptive evidence that firm pricing reflects strategic response to inertia (e.g. increasing over time)
 - Explore implications for counterfactual pricing and welfare with non-strategic (static) pricing
- See also: bonuses for credit card switching or signing up for bank accounts..

Other interesting aspects of inertia / switching costs II

- Distributional consequences
 - Inertia redistributes from those with high inertia to low inertia
 - Under what social welfare functions is this desirable or undesirable?
 - Assume that social welfare function weights low income more highly and that inertia costs are *not* real (simplest case)
 - If market wage is positively (negatively) correlated with inertia cost then relative to a no inertia benchmark welfare is higher (lower)
 - This will come up again when we think about take-up of transfer programs

The challenge (and frontier) II: Estimating the value curve

- Thus far we have talked about more or less data driven ways to identify behavioral frictions in health insurance markets
 - More work certainly needed!
- Key open question: When behavioral frictions exist, when and why are they quantitatively important for welfare? for policy?
 - Can imagine that depending on correlation between behavioral friction, costs, and willingness to pay, could get any type of rotation of demand curve relative to value curve
 - Similar point in intellectual history in the adverse selection literature. Now need to move beyond testing.

Estimating the value curve: a few initial thoughts

- I am not sure how to do this!
- Handel, Kolstad and Spinnewijn (2019)
 - Take frictions estimates from H&K "Health Insurance for Humans" + modeling assumptions to try to estimate Spinnewijn's value curve (vs demand curve)
- Presumably a key object is how the "value" curve varies with price
 - i.e. in addition to cost and demand curve, also want to know how "behavioral stuff" (e.g. choice of dominated plan) varies with price
 - If behavioral factors are flat with respect price then less consequential for welfare analysis using demand vs value curve?
- Do you have to take a stand on the behavioral model?

Recap: key challenges (and opportunities!)

- Detecting departures from neoclassical model: data vs. modeling assumptions
- Welfare analysis: what do we call the error term?
 - Preference heterogeneity vs. mistakes?
 - How do we get away from ad hoc decisions / make it more data driven?
- Thus far we have seen work exploiting:
 - Changes in menus for different cohorts ("inertia")
 - Dominated choices
 - Consistency of choices across deductible options
 - Ripe for additional work!
- Key challenge: how do we identify the value curve (i.e. the demand curve in the absence of any behavioral frictions)?

The behavioral public “cookbook”

- Approach 1: Specify a behavioral model (e.g. Handel’s inertia cost + $H_{k,t-1}$)
- Approach 2: Measure preferences using undistorted choices
 - Active choice (Handel 2013, Chetty, Looney and Kroft 2016)
 - Unbiased group (popular group is experts: Dube, Gentzkow and Shapiro’s “Do Pharmacists Buy Bayer?”)
 - Connected to the sufficient statistics approach in EFC (2010).
 - Researcher does not need a fully-specified model of biases, which enables model structure like the ζ ’s for unobserved heterogeneity in EFC.
- Discussion q – why is approach 2 more challenging *for insurance?*