Topic 9: Welfare Analysis of Health Insurance

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[1] Thanks to Raj Chetty and Amy Finkelstein for generously providing their lecture notes, some of which are reproduced here

Welfare Analysis of Health Insurance

- Significant evidence of adverse selection in health insurance markets
- How does this affect welfare analysis?
  - What are the optimal subsidies or mandates (if any)?
- Begin with static model of Einav, Finkelstein, and Cullen (2010)
- Extend to ex-ante welfare analysis (Hendren, 2018)
- Extend to dynamic models of insurance (Cochrane (1996); Hendel and Lizzeri (2003); Handel, Hendel, and Whinston (2015)
- **Key issue: Realization of information over time $\Longrightarrow$ Conceptual question of how to define welfare**

Setup

- Individuals experience utility given by

$$u\left(c, m; \theta\right)$$

where c is consumption, m is medical expenditure, and θ is a health shock

- After learning θ, individuals choose c and m subject to a budget constraint
  - Budget constraint depends on whether they are insured
  - Insured budget constraint

$$c^I\left(\theta\right) + x\left(m^I\left(\theta\right); \theta\right) + p_I \leq y\left(\theta\right)$$

  - Uninsured budget constraint

$$c^U\left(\theta\right) + m^U\left(\theta\right) + p_U \leq y\left(\theta\right)$$

    - p_U and p_I are the price of being uninsured and insured respectively
    - $y\left(\theta\right)$ is income (which might be affected by the shock)
    - x is out-of-pocket medical expenses

Insurance Demand

- Individuals choose whether or not to purchase insurance after learning a signal, $s \in [0,1]$, about their risk
  - WLOG s orders demand so that $s = 0$ is the highest WTP type

- Demand given by $D(s)$, which solves

$$E\left[u\left(y(\theta) - x\left(m^I(\theta);\theta\right) - D(\tilde{s}) - p_U, m^I(\theta);\theta\right)|\tilde{s}\right]$$

$$=$$

$$E\left[u\left(y(\theta) - m^U(\theta) - p_U, m^U(\theta);\theta\right)|\tilde{s}\right]$$

  - Assume does not vary with p_U (only relative price matters)
    - True if CARA utility (exercise to show this!)
  - Fraction of the market purchasing insurance, s, solves $D(s) = p_I - p_U$

Cost Curves

- Following Einav, Finkelstein, and Cullen (2010), define marginal and average cost curves
  - Average cost of enrollees when fraction s of the market is enrolled:

$$AC(s) = E\left[m^I(\theta) - x\left(m^I(\theta);\theta\right)|\tilde{s} \leq s\right]$$

  - Marginal cost of additional enrollees brought in by lowering prices. Note that total cost is $sAC(s)$, so that marginal cost is given by:

$$\begin{aligned} MC(s) &= \frac{d}{ds}\left[sAC(s)\right] \\ &= \frac{d}{ds}\int_{\tilde{s}\leq s} E\left[m^I(\theta) - x\left(m^I(\theta);\theta\right)|\tilde{s} \leq s\right] d\tilde{s} \\ &= E\left[m^I(\theta) - x\left(m^I(\theta);\theta\right)|\tilde{s} = s\right] \end{aligned}$$

  where the last line assumes m^I is not affected by insurance purchase
    - e.g. no Becker and Ehrlich (1972) effects

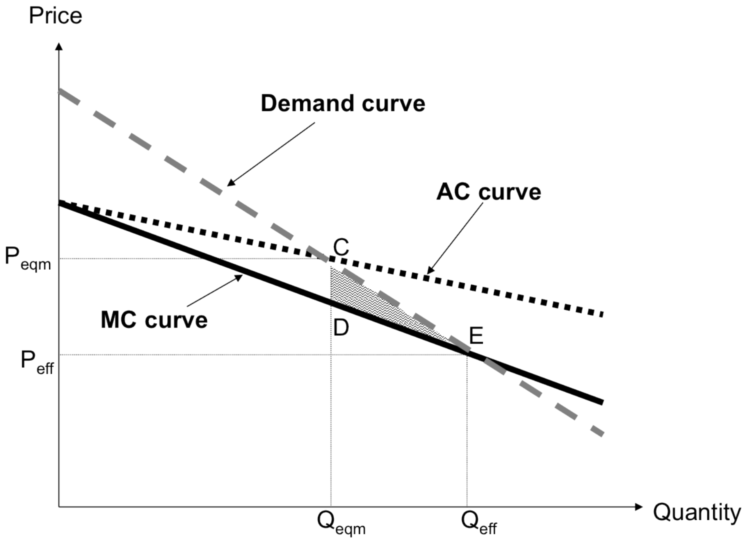
Competitive Equilibrium

- Suppose there are at least two firms that compete over relative price for H versus L plan
  - Weyl and Viega (2016) discuss issues with multiple plan prices
- Competitive equilibrium from 2-stage game
  - Insurers post prices
  - Individuals choose insurance contracts
- Competitive equilibrium characterized by

$$s^{CE} = max \left\{ s \middle| D(s) = AC(s) \right\}$$

with price $p^{CE} = D\left(s^{CE}\right)$
  - Why the maximum market size?
- Smetters and Scheuer (2016): minimum price not reached (ACA website?)

Competitive Equilibrium with Adverse Selection

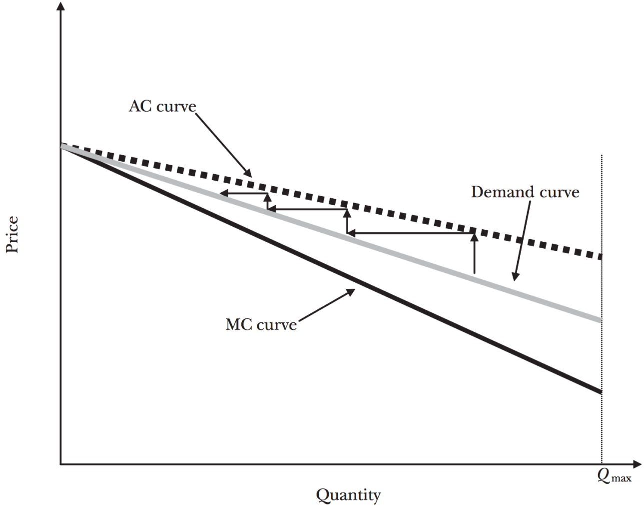


Source: Einav, Finkelstein, and Cullen (2010)

Competitive Equilibrium with Adverse Selection

Figure 2 (continued)

B: Adverse Selection with Complete Unraveling



Welfare Loss in Competitive Equilibrium

- If prices must reflect average costs, EFC2010 and Akerlof (1970) note that this can lead to some efficient trades not taking place
  - Those with $D(s) \in (MC(s), AC(s))$ are willing to pay their marginal cost of insurance but remain uninsured in a competitive equilibrium
  - "Efficient" for all those with $D(s) \geq MC(s)$ to purchase insurance

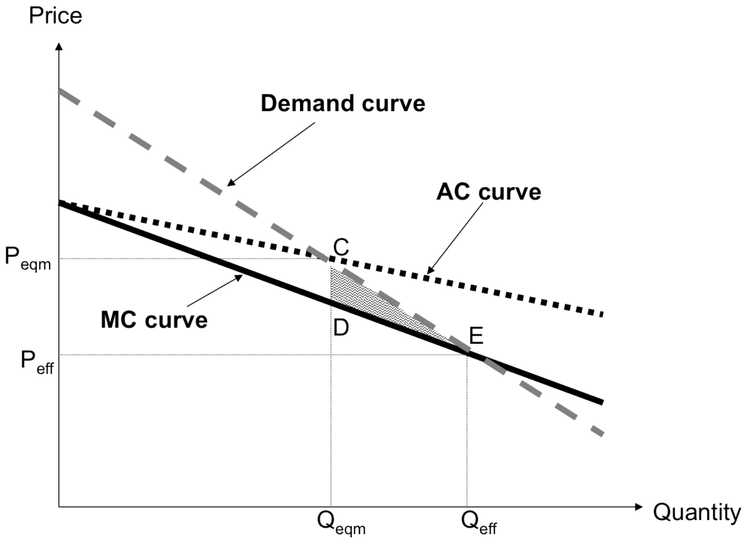
$$D\left(s^{eff}\right) = MC\left(s^{eff}\right)$$

- Can quantify the size of this "deadweight loss" from foregone trades

$$DWL = \int_{s \in [s^{CE}, s^{eff}]} [D(s) - MC(s)]\, ds$$

  - What is the aggregate willingness to pay above costs for trades that go unmet in a competitive equilibrium?

Competitive Equilibrium with Adverse Selection



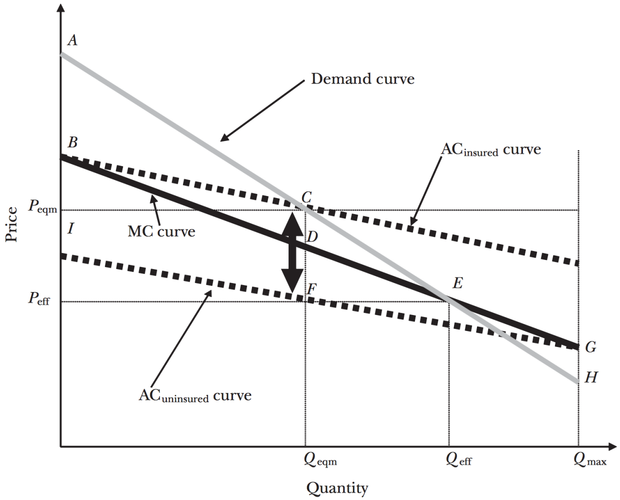
Source: Einav, Finkelstein, and Cullen (2010)

Separating Moral Hazard from Adverse Selection

- How does the modeling approach deal with moral hazard?
  - Impact of insurance on m: $m^I > m^U$
- Can define cost of s type as if they are insured and uninsured
- Cost relevant for the insurer is the cost they pay, $E\left[m^I - x\left(m^I\right)|s\right]$
- But, this could be higher than the costs they would pay if the individual consumed care as if she were uninsured, $E\left[m^U - x\left(m^U\right)|s\right]$
  - Moral hazard of s type is given by $E\left[m^I - x\left(m^I\right)|s\right] - E\left[m^U - x\left(m^U\right)|s\right]$
    - Requires identifying $E\left[m^U - x\left(m^U\right)|s\right]$
    - Tough if x is nonlinear, but if linear (or full insurance) just need to identify cost curve of the uninsured, $E\left[m^U|s\right]$

Competitive Equilibrium with Adverse Selection

Figure 5
The "Positive Correlation" Test for Selection



Einav, Finkelstein, and Cullen (2010 QJE)

- Einav, Finkelstein, and Cullen (2010 QJE) note that one can estimate these costs using exogenous variation in prices
    - Can estimate BOTH demand and cost curve
        - Demand = fraction that buy at posted price
        - Cost = added cost on policy H versus L for those who purchase at posted price
        - Rarely does price variation identify both supply + demand!
- But need some institutional structure that randomly varies prices...
    - Alcoa! (they make aluminum)
    - Business unit heads choose price charged for high versus low coverage plans

Results

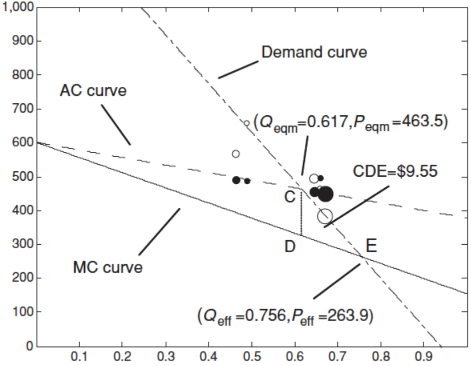


FIGURE V
Efficiency Cost of Adverse Selection—Empirical Analog

Source: Einav, Finkelstein, and Cullen (2010)

Results (II)

- Results suggest welfare loss is "small"
  - \$9.55/employee ($\sim$2% of the average price)
- Beautiful paper - starts with theoretical graph and maps empirical objects directly onto this graph
- But a few limitations:
  - Paper takes contracts as given
    - Perhaps the contracts were inefficient? (Rothschild and Stiglitz 1976)
    - Multiple insurance contracts: Equilibrium existence problems (Azavedo and Gottlieb, 2016; Weyl and Viega, 2016)
  - Would competition on other dimensions unravel the market in practice?
- Main question: does the welfare cost of foregone trades correspond to maximizing utilitarian welfare?

Ex-Ante versus Ex-Post Welfare

- Insurance demand depends on knowledge/beliefs of risk
- Individuals often have some knowledge about risk when measuring demand, generating adverse selection
- Value of foregone trades is unstable measure of welfare (Hirshleifer, 1971)
  - Hendren (2017): Can be misleading for optimal policy analysis

Motivating Example (Hendren, 2017)

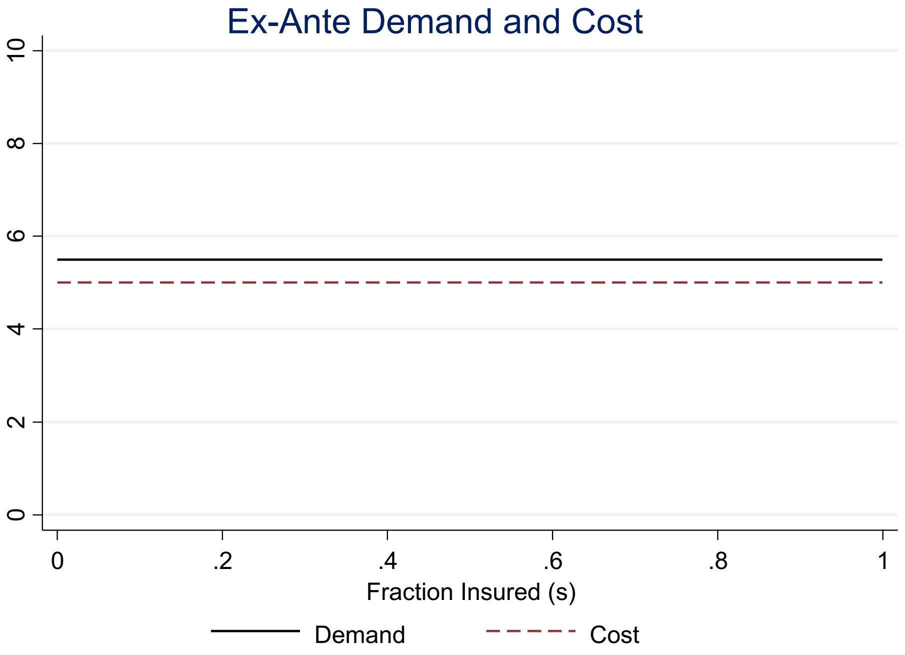
- Begin with simple example to illustrate issue and a solution

- Individuals have \$30

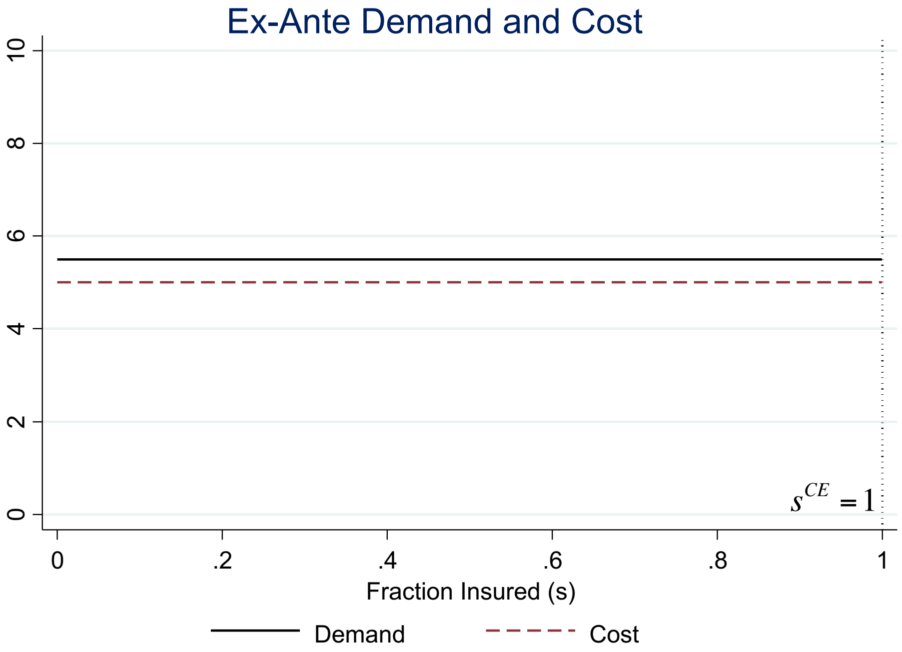
- Face a risk of losing \$m, uniformly distributed between 0 and 10

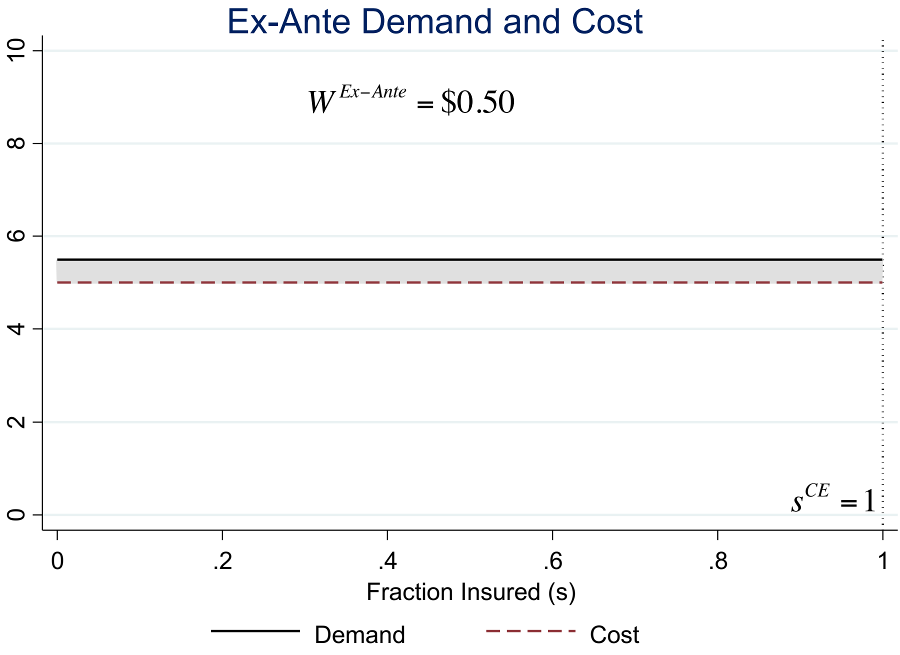
- Willing to pay \$0.50 markup for full insurance if CRRA is 3
  - Indifferent between roughly \$24.50 versus uniformly distributed consumption on [20 , 30]
  - Would be “efficient” for everyone to have \$25 with certainty
    - Value of insurance market is \$0.50

- How does this map to demand and cost curves?



Ex-Ante Demand and Cost
0
2
4
6
8
10
0
.2
.4
.6
.8
1
Fraction Insured (s)
Demand
Cost


Ex-Ante Demand and Cost
0
2
4
6
8
10
0
.2
.4
.6
.8
1
Fraction Insured (s)
$s^{CE} = 1$
Demand
Cost



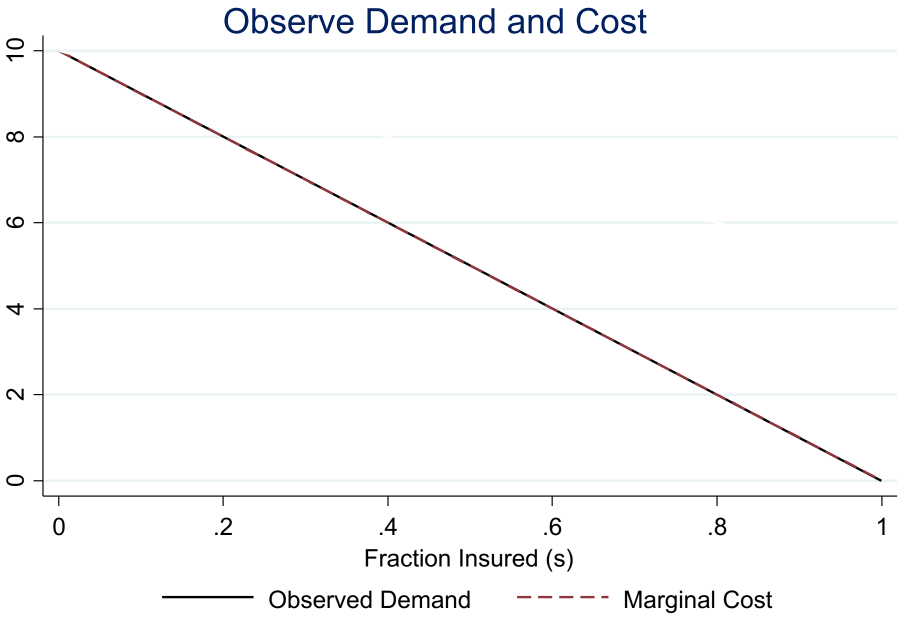
Ex-Ante Demand and Cost
$W^{Ex-Ante} = \$0.50$
$s^{CE} = 1$
0
2
4
6
8
10
0
.2
.4
.6
.8
1
Fraction Insured (s)
Demand
Cost

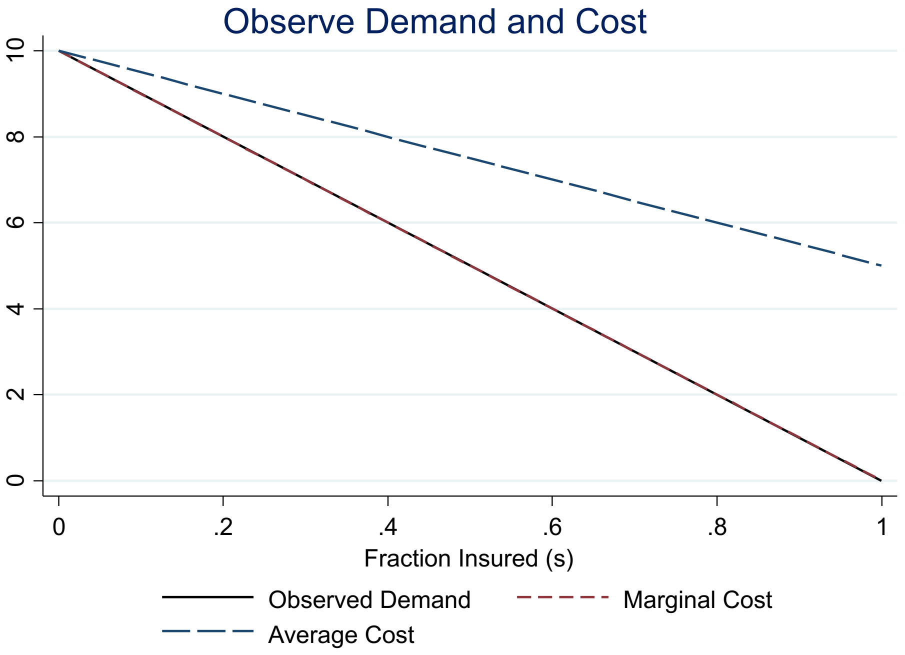
Motivating Example

- What if people have information about their risk when we measure demand?

- Begin with extreme case: suppose individuals learn their loss

  – Willingness to pay equals cost, $D(s)=m(s)$


Observe Demand and Cost
10
8
6
4
2
0
0
.2
.4
.6
.8
1
Fraction Insured (s)
Observed Demand
Marginal Cost



Observe Demand and Cost
10
8
6
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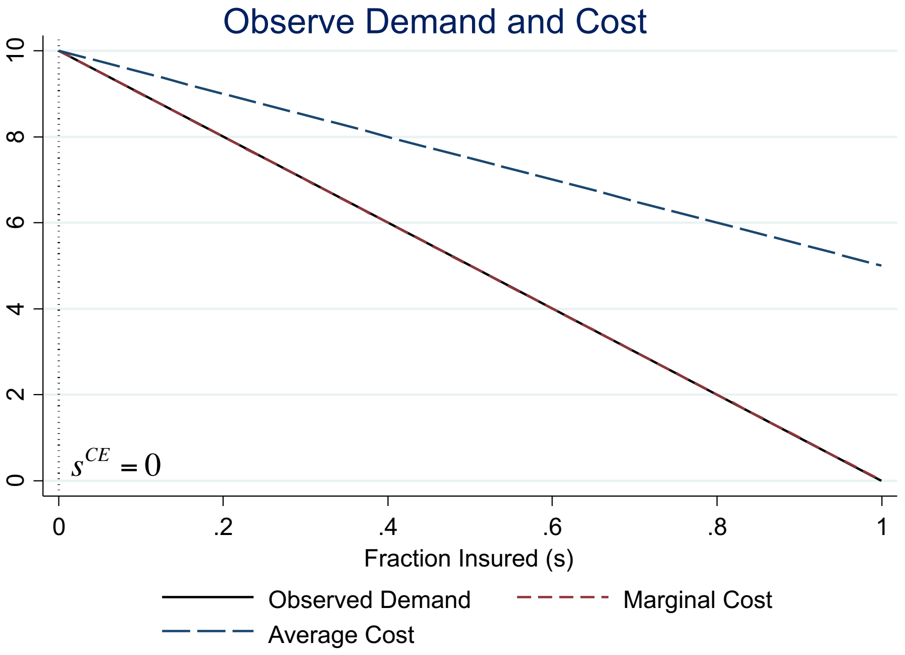
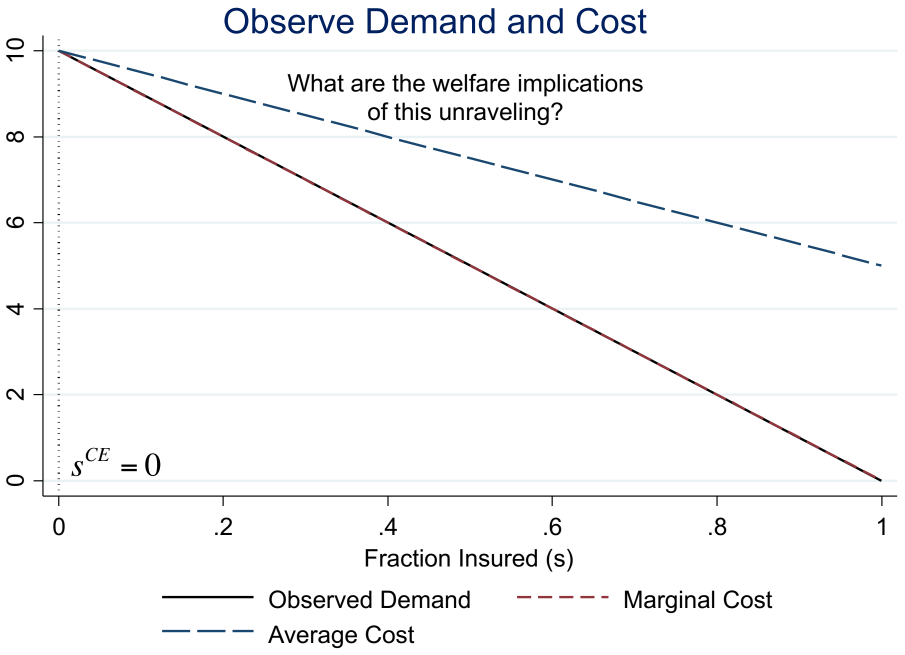
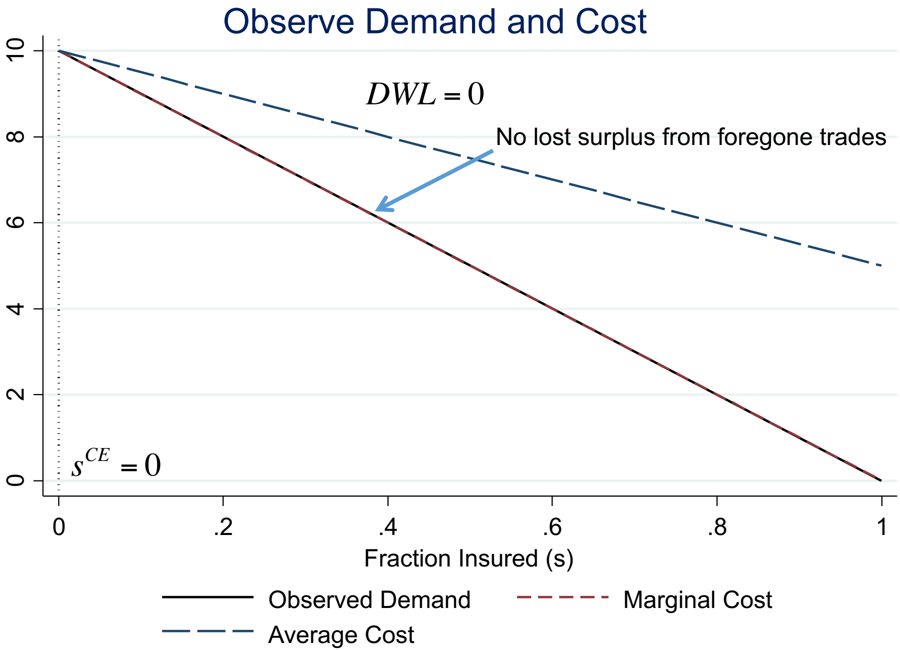
.6
.8
1
Fraction Insured (s)
Observed Demand
Marginal Cost
Average Cost



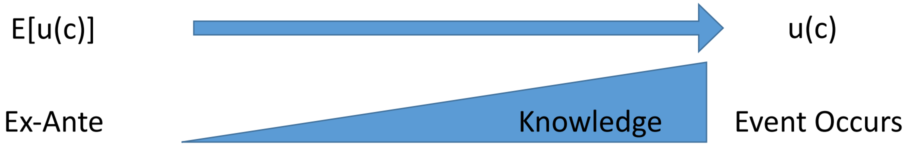
Observe Demand and Cost
10
8
6
4
2
0
$s^{CE} = 0$
0
.2
.4
.6
.8
1
Fraction Insured (s)
Observed Demand
Marginal Cost
Average Cost


Observe Demand and Cost
What are the welfare implications
of this unraveling?
$s^{CE} = 0$
10
8
6
4
2
0
0
.2
.4
.6
.8
1
Fraction Insured (s)
Observed Demand
Marginal Cost
Average Cost



Observe Demand and Cost
DWL = 0
No lost surplus from foregone trades
s^CE = 0
0
2
4
6
8
10
0
.2
.4
.6
.8
1
Fraction Insured (s)
Observed Demand
Marginal Cost
Average Cost

Timeline of Information Revelation and Insurance Purchase



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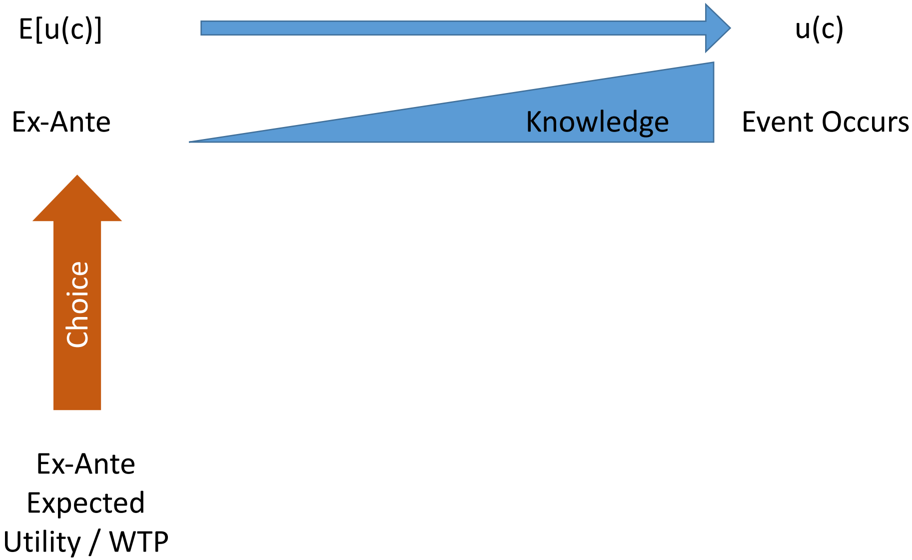
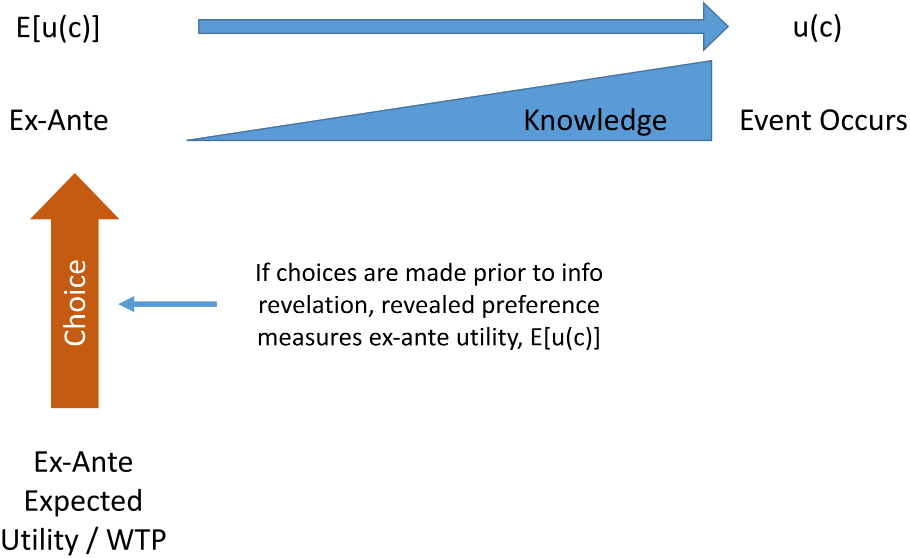


Timeline of Information Revelation and Insurance Purchase



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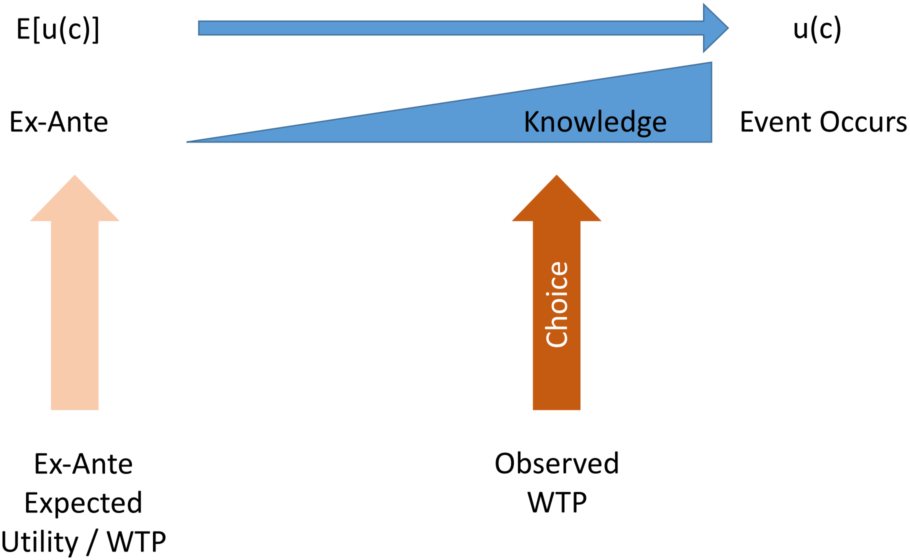

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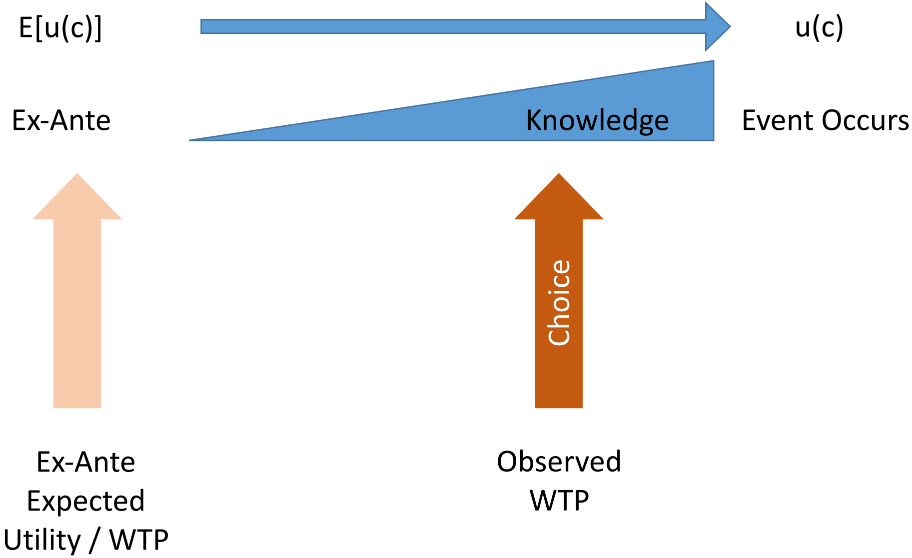

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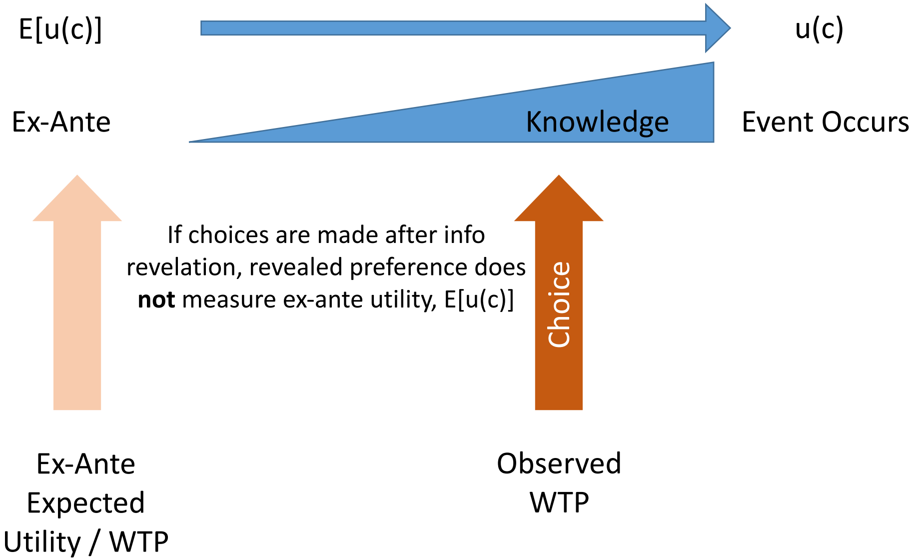
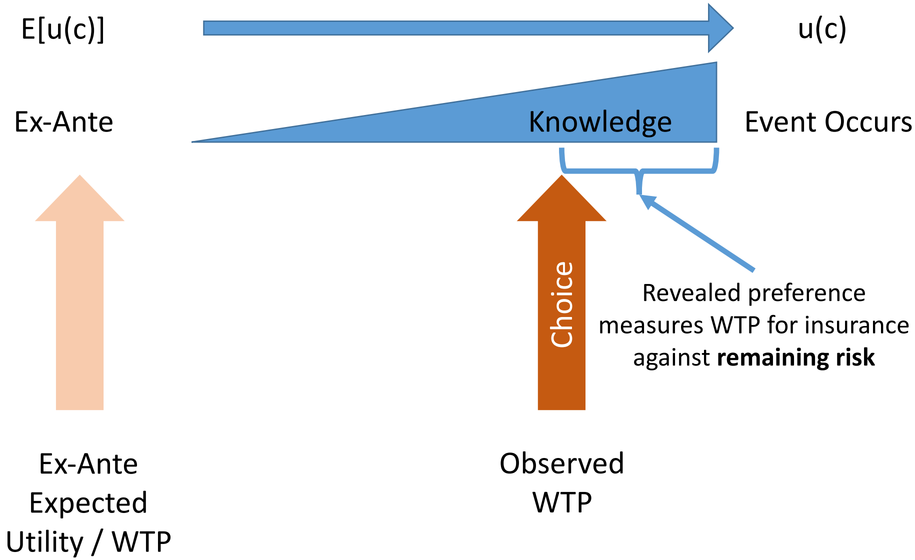
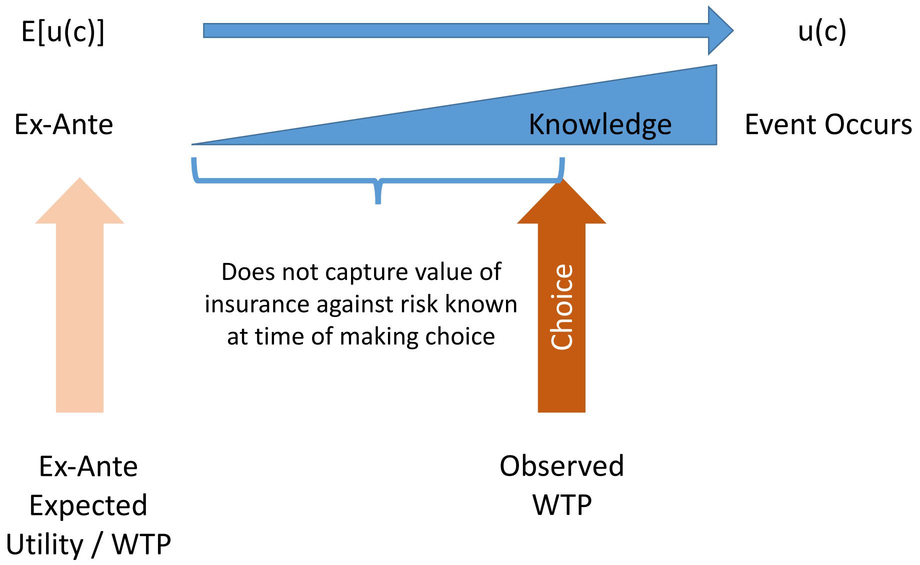


Timeline of Information Revelation and Insurance Purchase



Timeline of Information Revelation and Insurance Purchase



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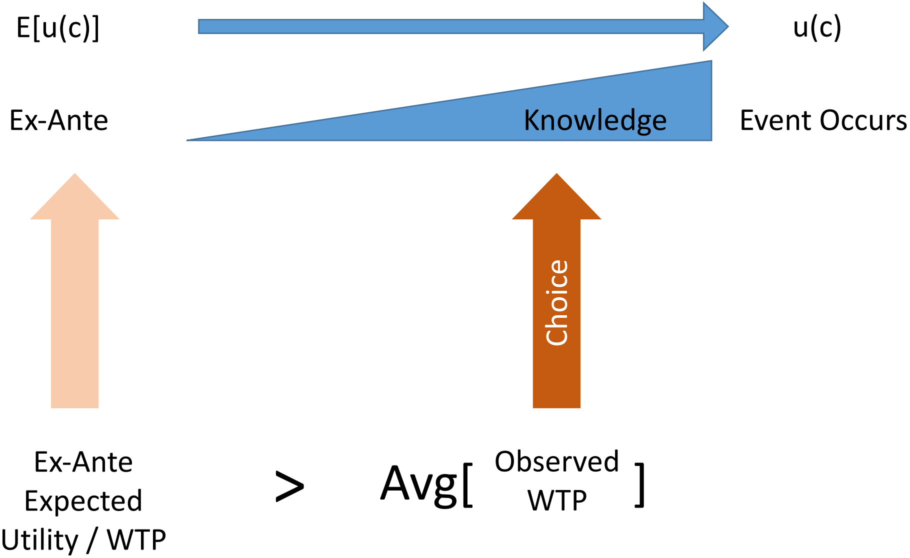
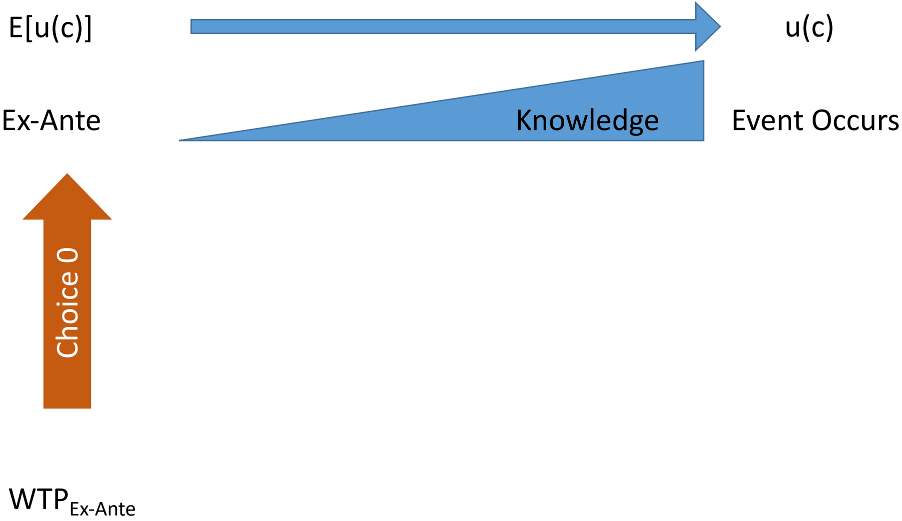
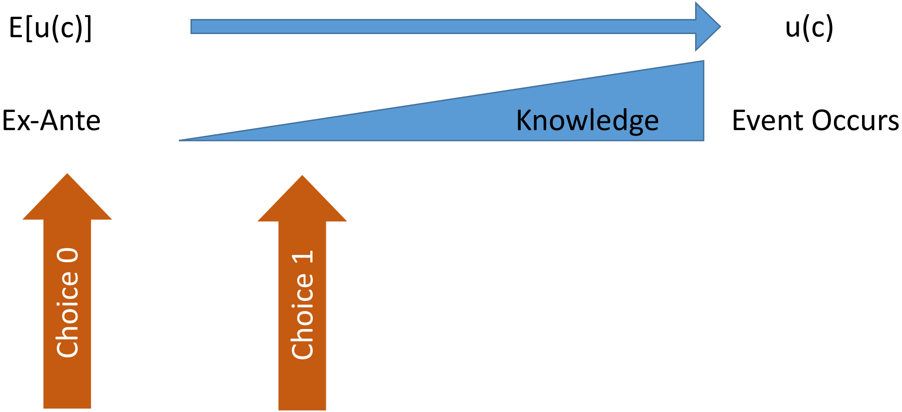


Market Surplus is Unstable Measure of Welfare

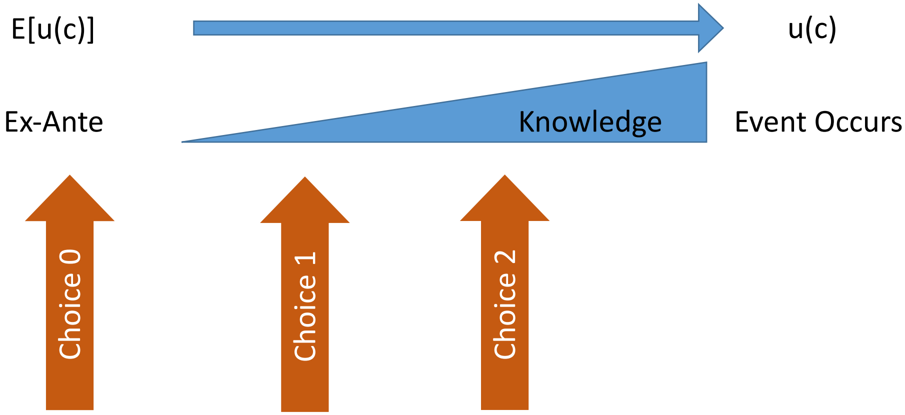


Market Surplus is Unstable Measure of Welfare



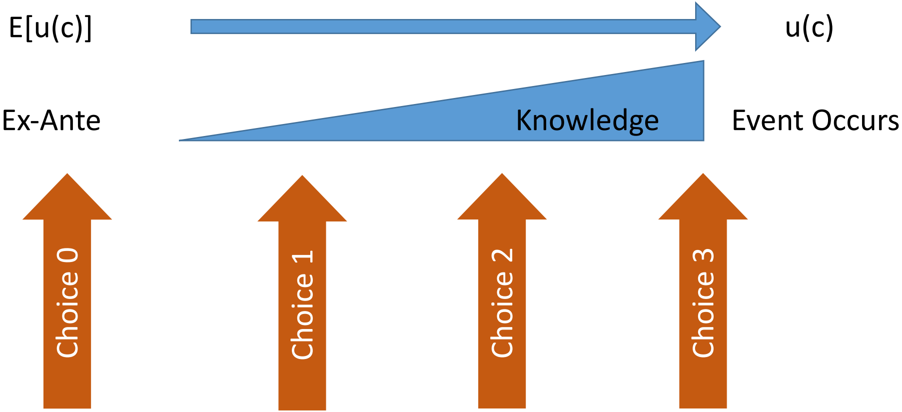
$$WTP_{Ex\text{-}Ante} \geq E[WTP_1]$$

Market Surplus is Unstable Measure of Welfare



$$WTP_{\text{Ex-Ante}} \geq E[WTP_1] \geq E[WTP_2]$$

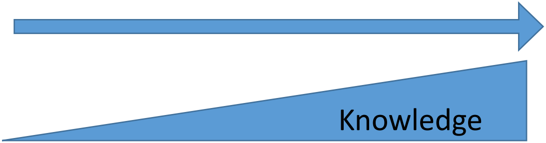
Market Surplus is Unstable Measure of Welfare



$$WTP_{Ex\text{-}Ante} \geq E[WTP_1] \geq E[WTP_2] \geq E[WTP_3] = Cost$$

Measuring Ex-Ante Welfare in Insurance Markets

E[u(c)]



u(c)

Ex-Ante

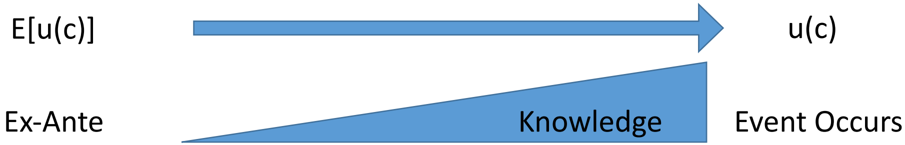
Event Occurs

Problem: Revealed preference does not deliver a stable welfare metric corresponding to expected utility

- Depends on amount of information that happens to be revealed when insurance choices are made

- Same insurance policies (e.g. value of a mandate) may have different welfare properties simply because of when the econometrician chooses to measure WTP!

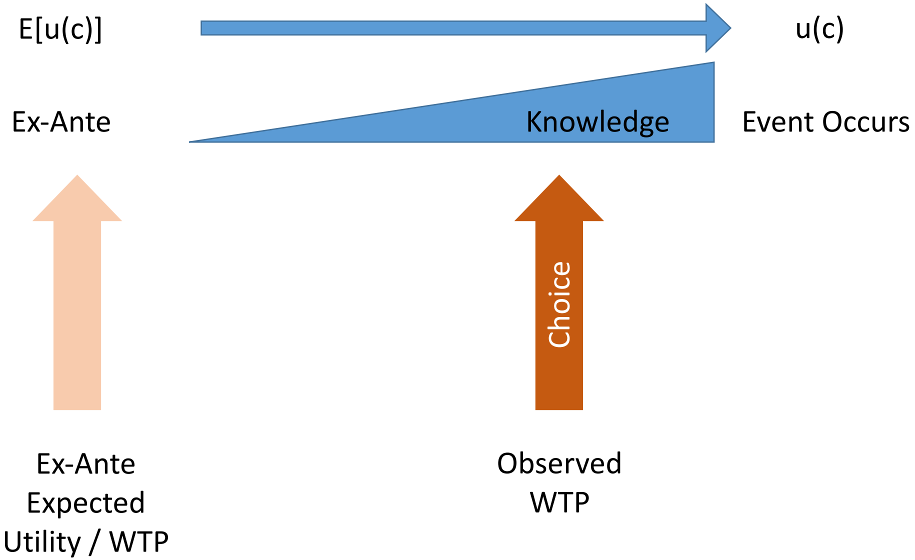
Measuring Ex-Ante Welfare in Insurance Markets



Hendren (2017): Evaluate policies in markets where information has been revealed when measuring WTP (i.e. adverse selection)

- Use stable welfare criteria corresponding to ex-ante expected utility
  - Condition on observables (e.g. income) to isolate redistribution

Timeline of Information Revelation and Insurance Purchase



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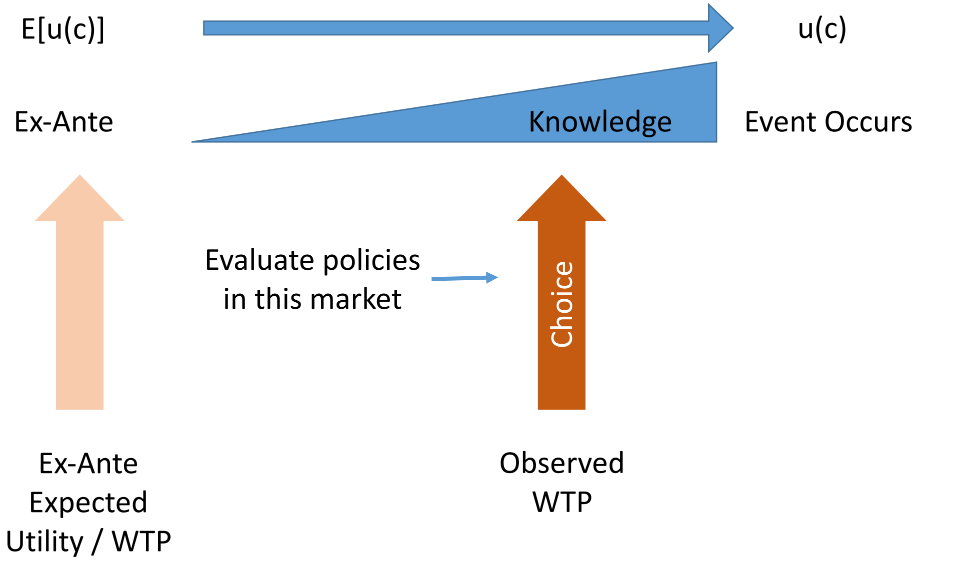

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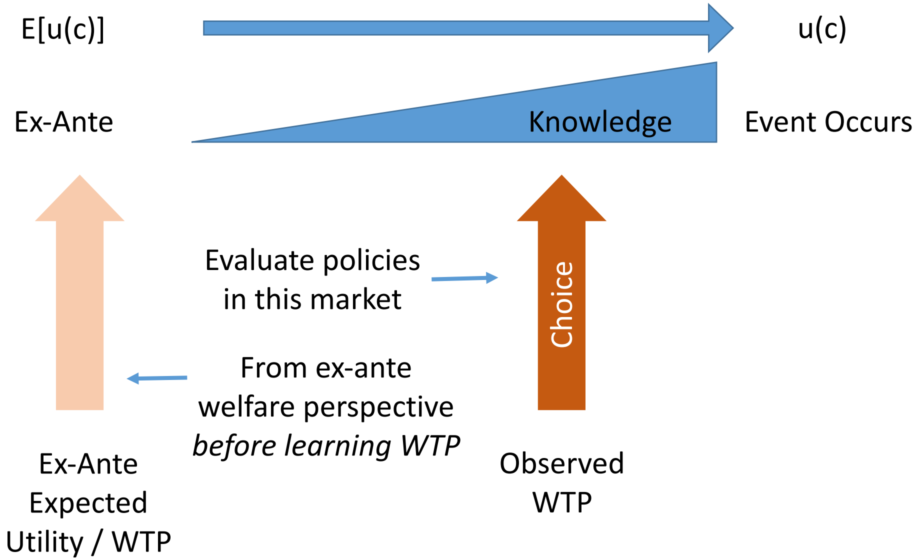
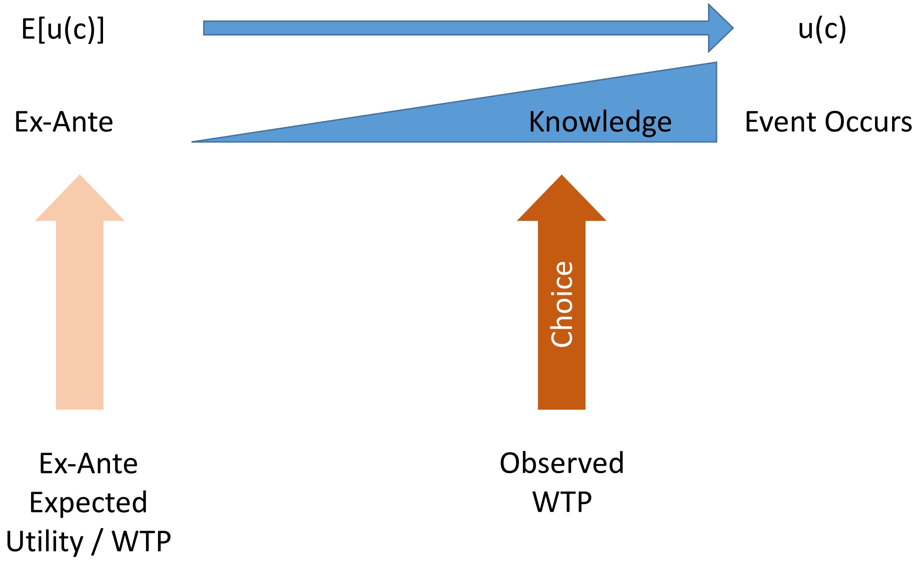


Approach: Combine Market Surplus with Sufficient Statistics



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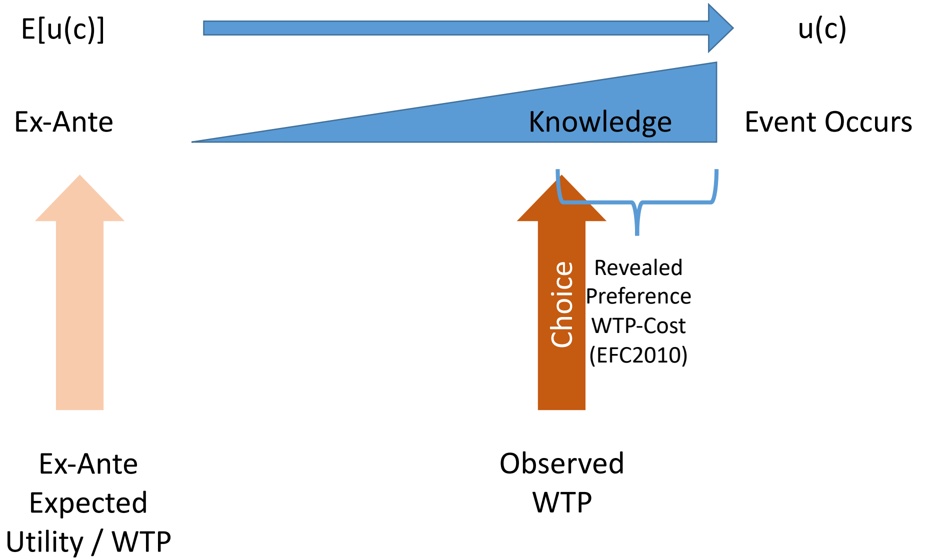

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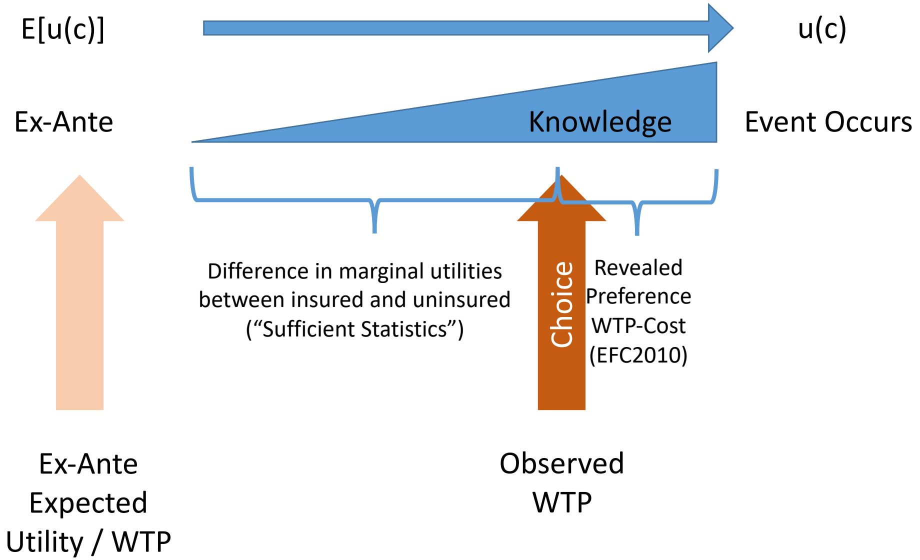

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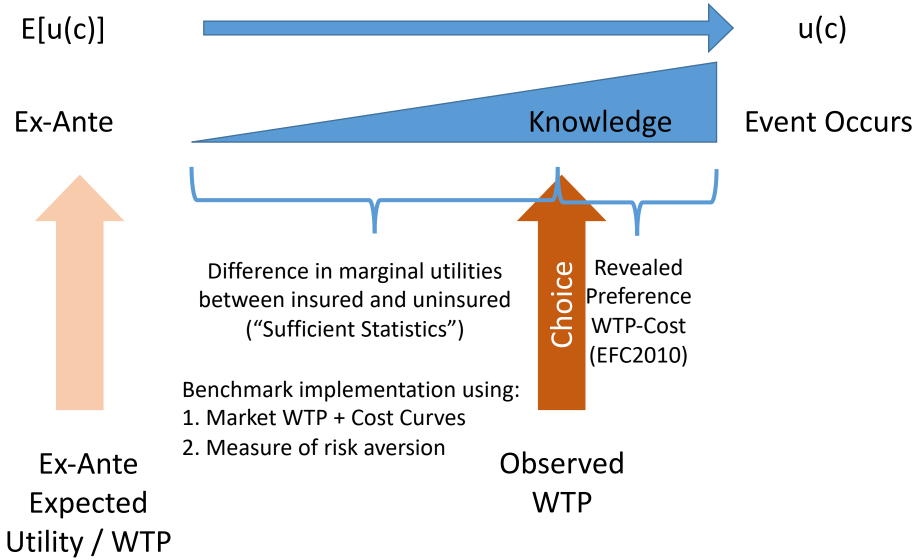
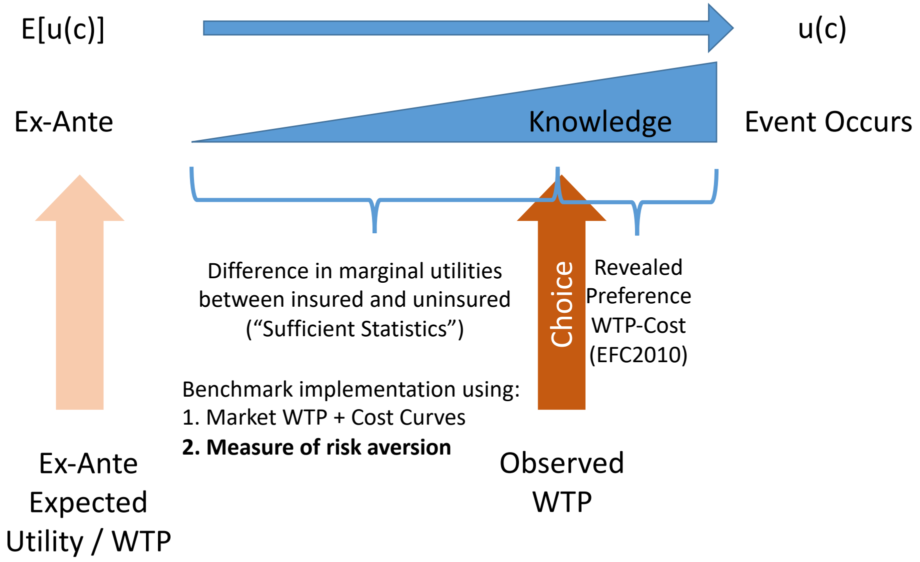


Approach: Combine Market Surplus with Sufficient Statistics



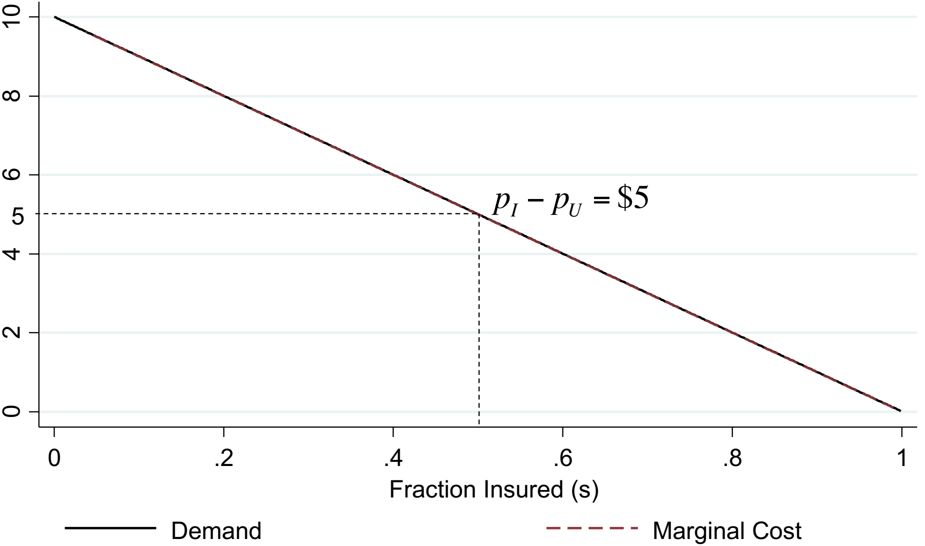
Deriving the Ex-Ante Demand Curve

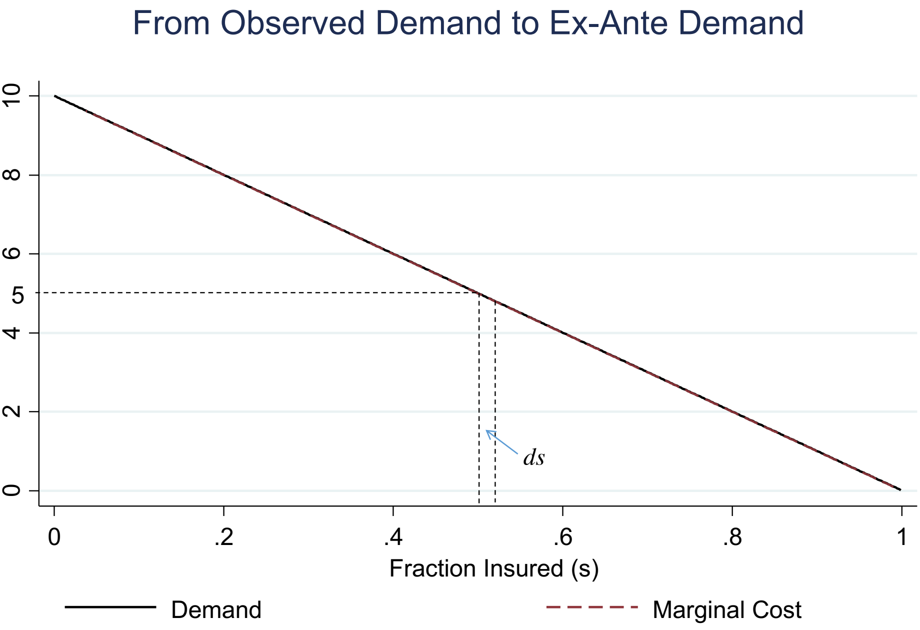
- Return to example in which D(s)=m(s)

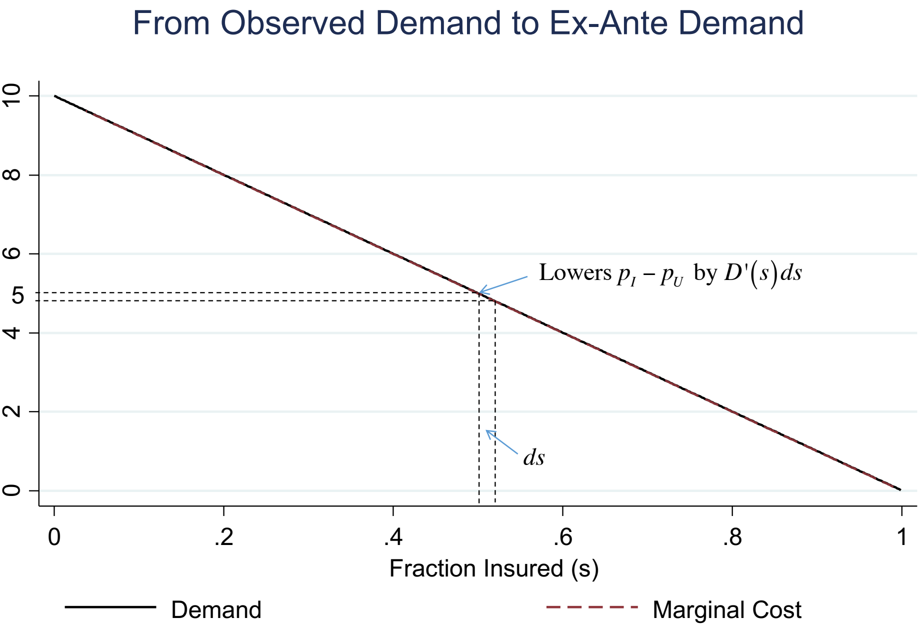
- Suppose $s = 50\%$ of the population has insurance

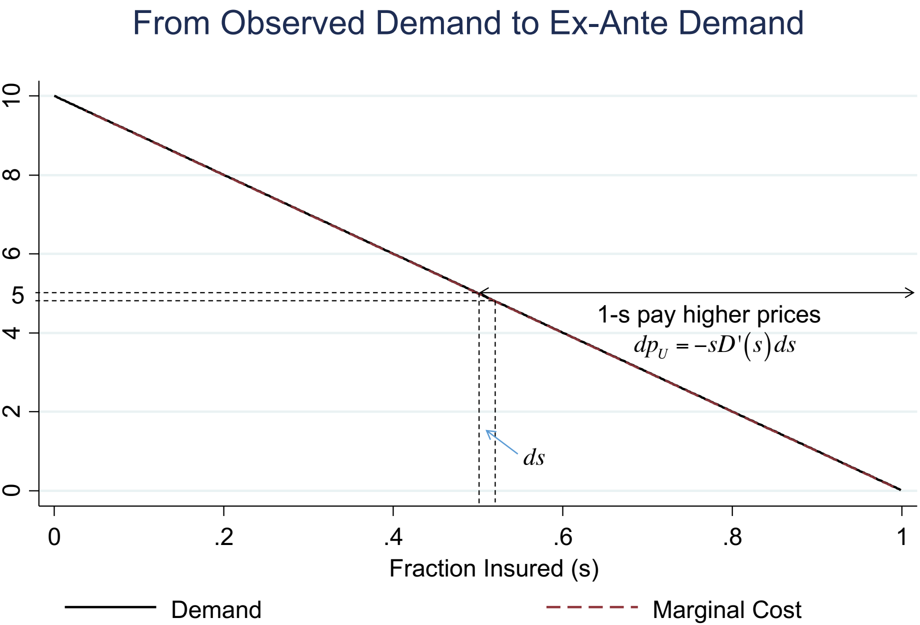
- Obtained by setting prices subject to a resource constraint:
  - Price of insurance, p_I
  - Price/penalty of being uninsured, p_U
  - Set so that $sp_I + (1-s)p_U = sAC(s)$

From Observed Demand to Ex-Ante Demand

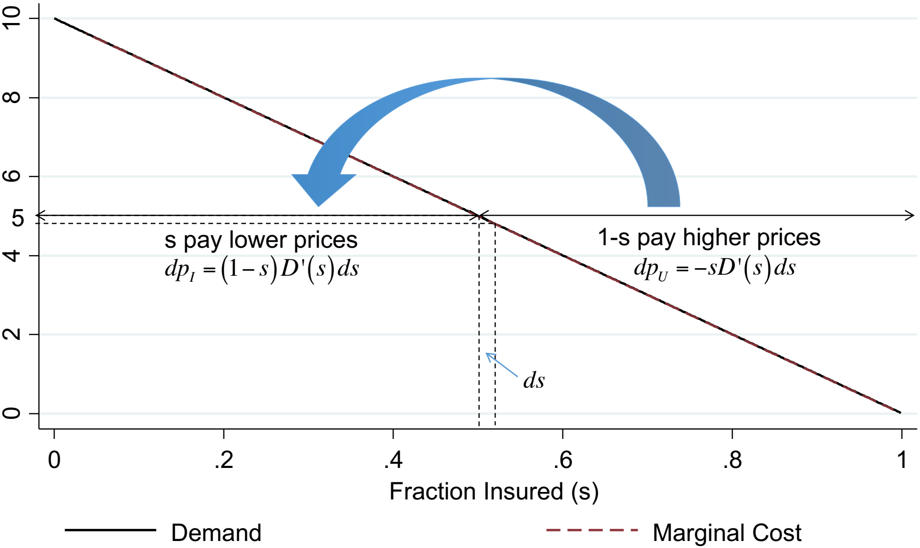


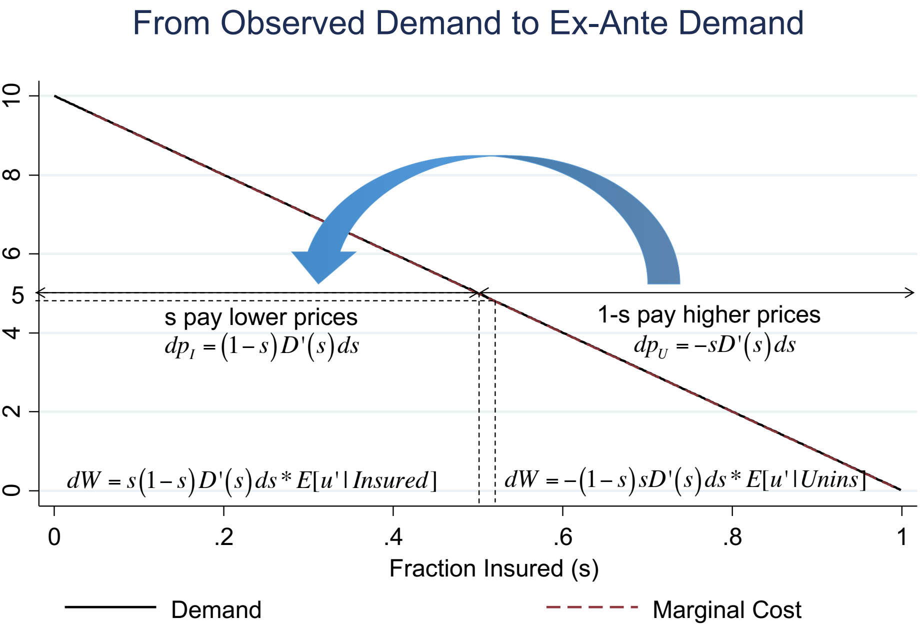

From Observed Demand to Ex-Ante Demand
10
8
6
5
4
2
0
0
.2
.4
.6
.8
1
ds
Fraction Insured (s)
Demand
Marginal Cost


From Observed Demand to Ex-Ante Demand
10
8
6
5
4
2
0
Lowers $p_I - p_U$ by $D'(s)ds$
ds
0
.2
.4
.6
.8
1
Fraction Insured (s)
Demand
Marginal Cost


From Observed Demand to Ex-Ante Demand
10
8
6
5
4
2
0
1-s pay higher prices
$dp_U = -sD'(s)ds$
ds
0
.2
.4
.6
.8
1
Fraction Insured (s)
Demand
Marginal Cost

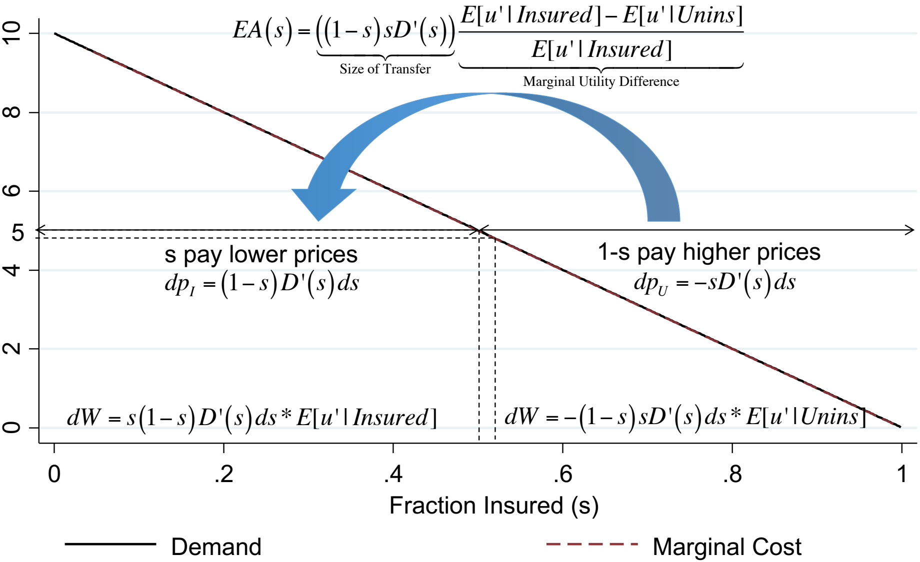
From Observed Demand to Ex-Ante Demand



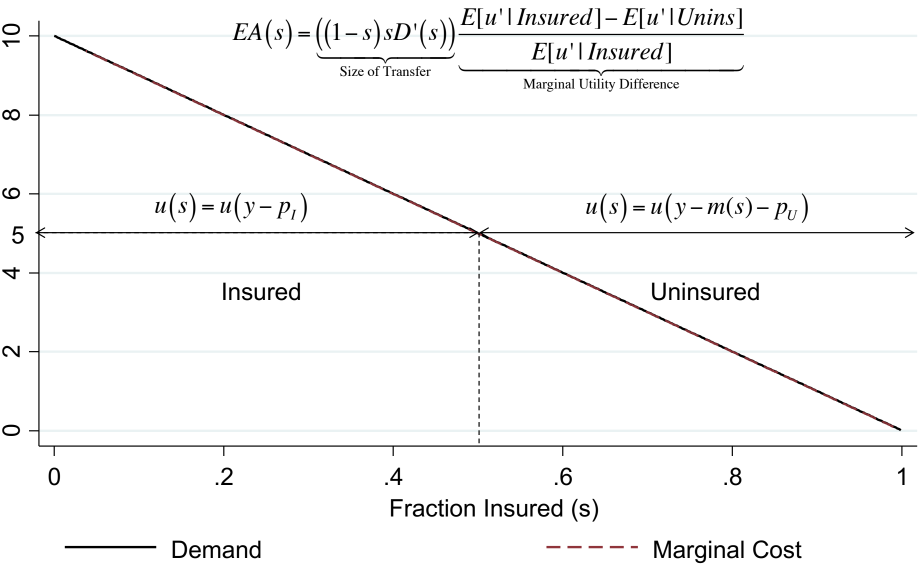


From Observed Demand to Ex-Ante Demand
s pay lower prices
$dp_I = (1-s)D'(s)ds$
1-s pay higher prices
$dp_U = -sD'(s)ds$
$dW = s(1-s)D'(s)ds * E[u' | Insured]$
$dW = -(1-s)sD'(s)ds * E[u' | Unins]$
0
2
4
5
6
8
10
0
.2
.4
.6
.8
1
Fraction Insured (s)
Demand
Marginal Cost

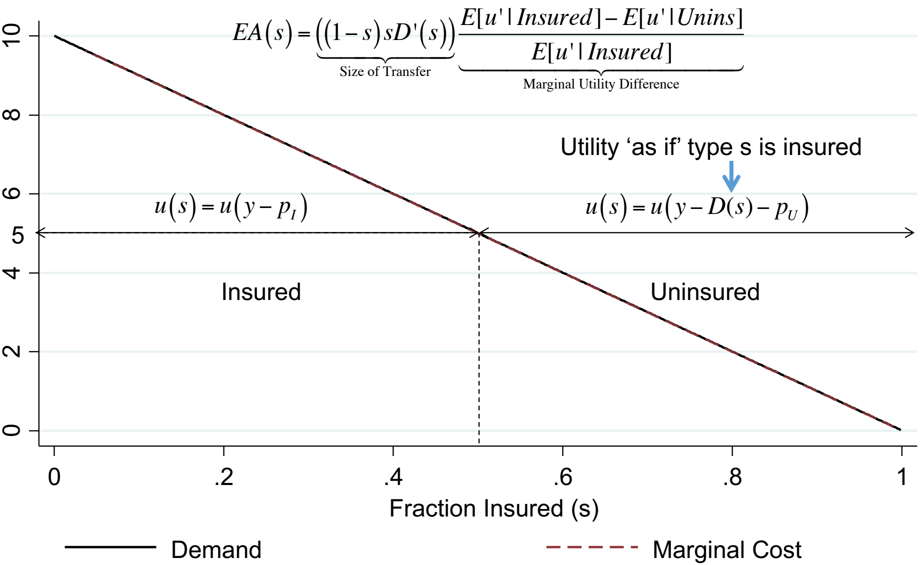
From Observed Demand to Ex-Ante Demand

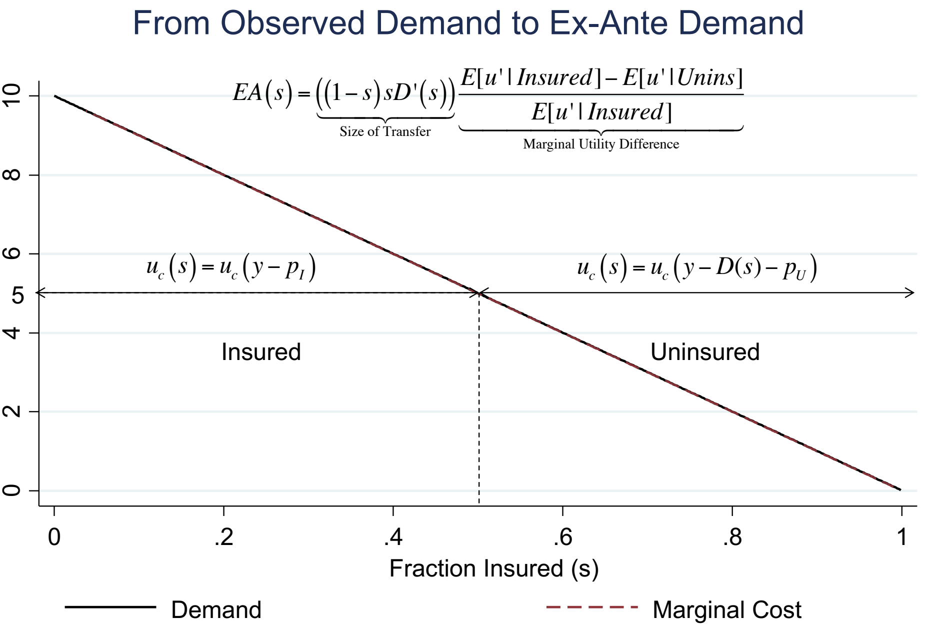


From Observed Demand to Ex-Ante Demand



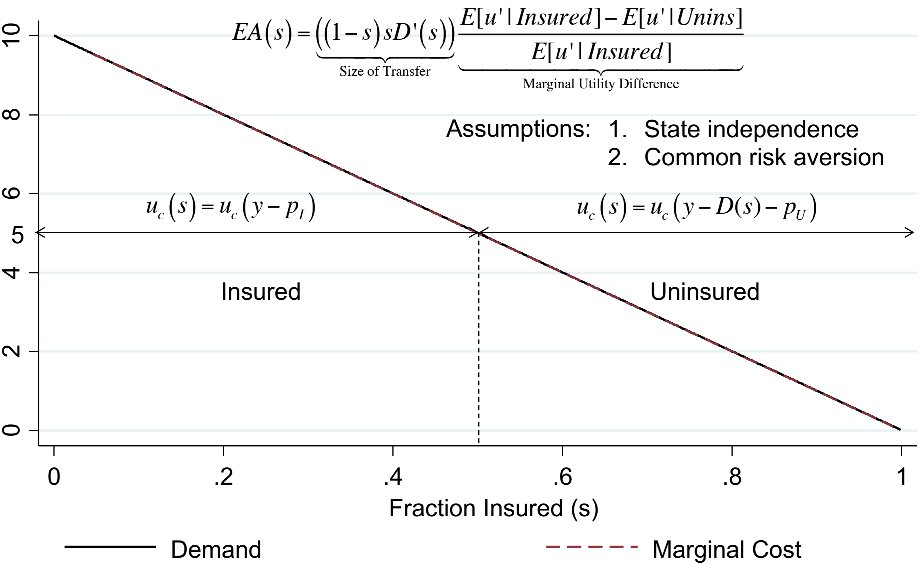
From Observed Demand to Ex-Ante Demand

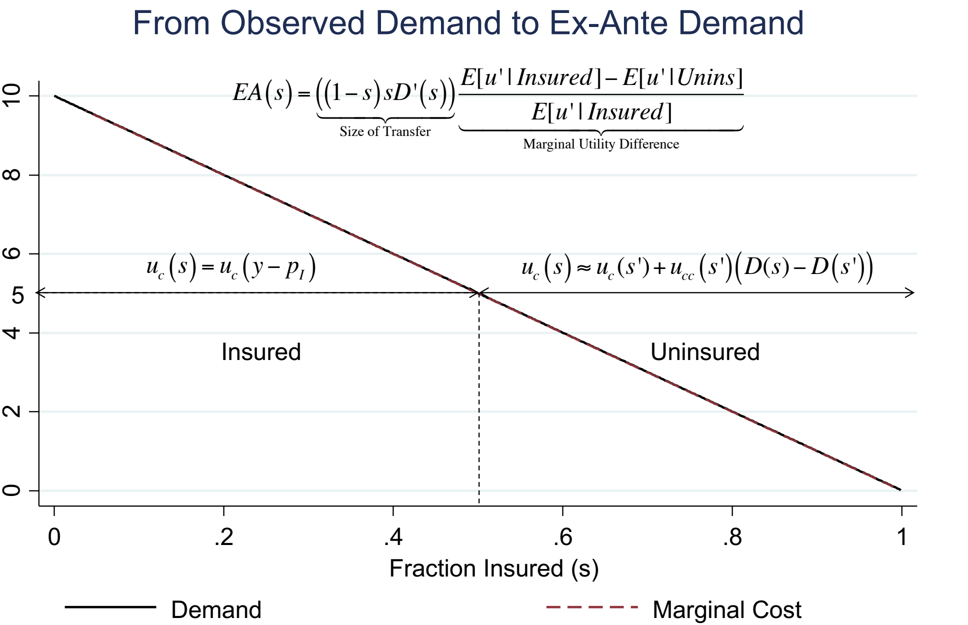




From Observed Demand to Ex-Ante Demand
$EA(s) = \underbrace{((1-s)sD'(s))}_{\text{Size of Transfer}} \underbrace{\frac{E[u'|Insured]-E[u'|Unins]}{E[u'|Insured]}}_{\text{Marginal Utility Difference}}$
$u_c(s) = u_c(y - p_I)$
$u_c(s) = u_c(y - D(s) - p_U)$
Insured
Uninsured
10
8
6
5
4
2
0
0
.2
.4
.6
.8
1
Fraction Insured (s)
Demand
Marginal Cost

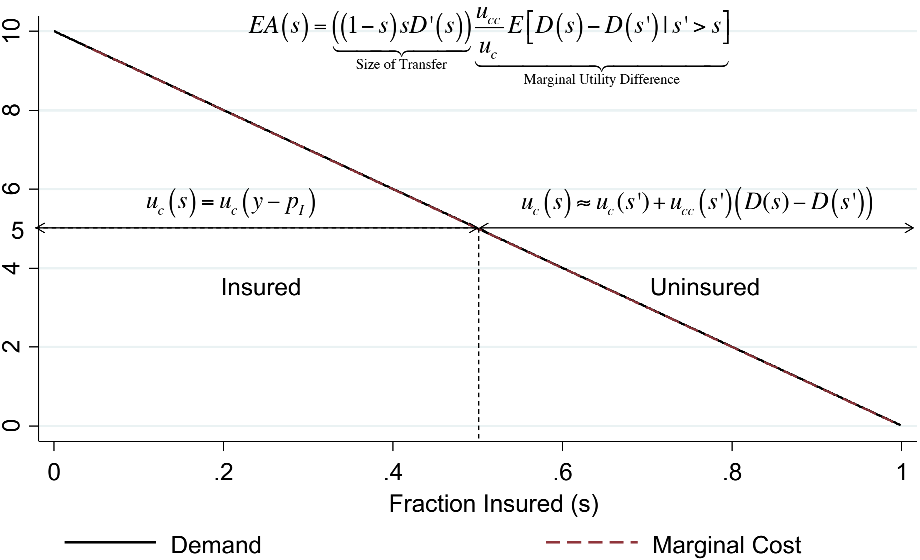
From Observed Demand to Ex-Ante Demand



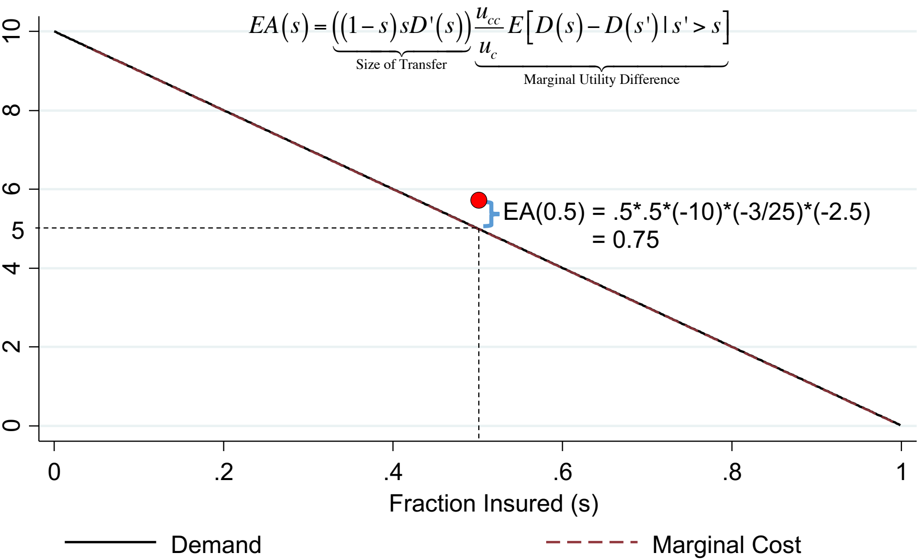


From Observed Demand to Ex-Ante Demand
$EA(s) = \underbrace{((1-s)sD'(s))}_{\text{Size of Transfer}} \underbrace{\frac{E[u' | Insured] - E[u' | Unins]}{E[u' | Insured]}}_{\text{Marginal Utility Difference}}$
$u_c(s) = u_c(y - p_I)$
$u_c(s) \approx u_c(s') + u_{cc}(s')(D(s) - D(s'))$
Insured
Uninsured
0
2
4
5
6
8
10
0
.2
.4
.6
.8
1
Fraction Insured (s)
Demand
Marginal Cost

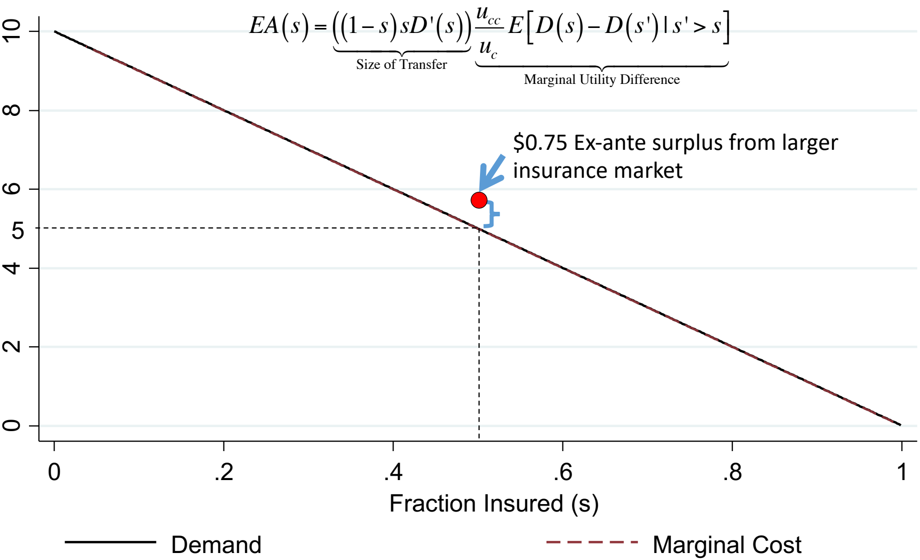
From Observed Demand to Ex-Ante Demand

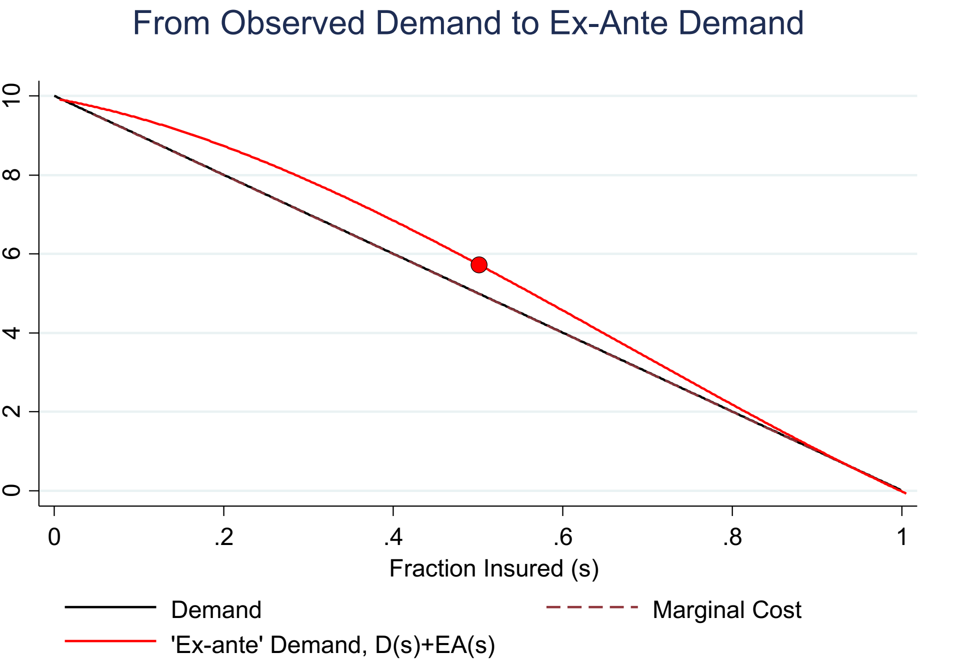


From Observed Demand to Ex-Ante Demand

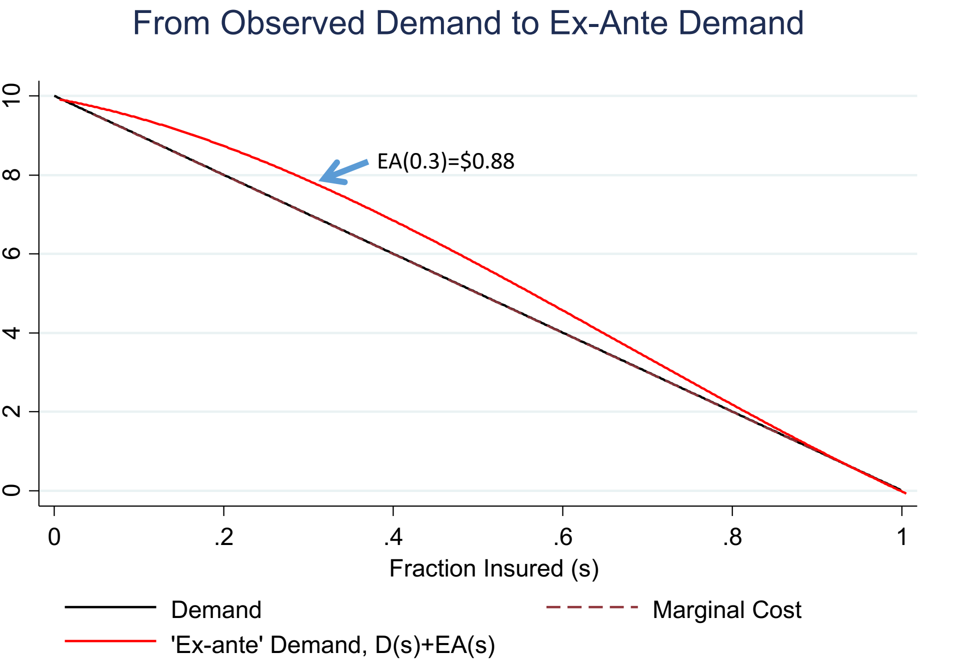


From Observed Demand to Ex-Ante Demand

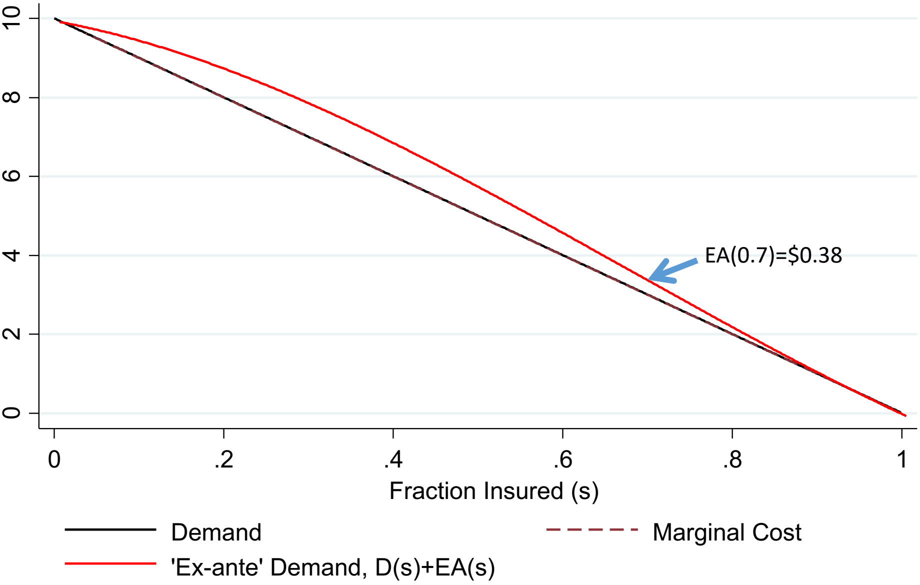


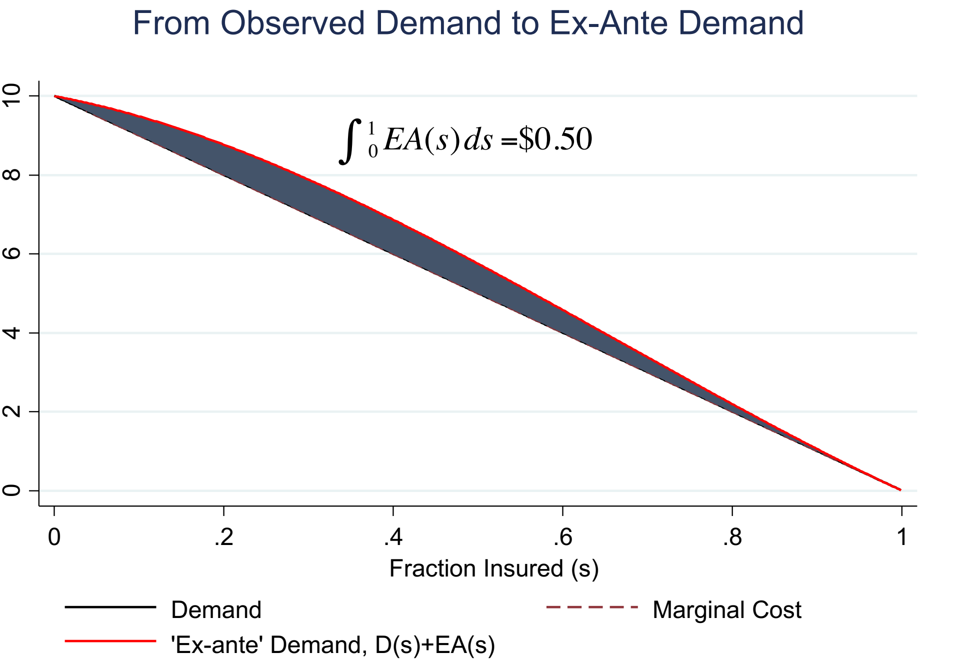


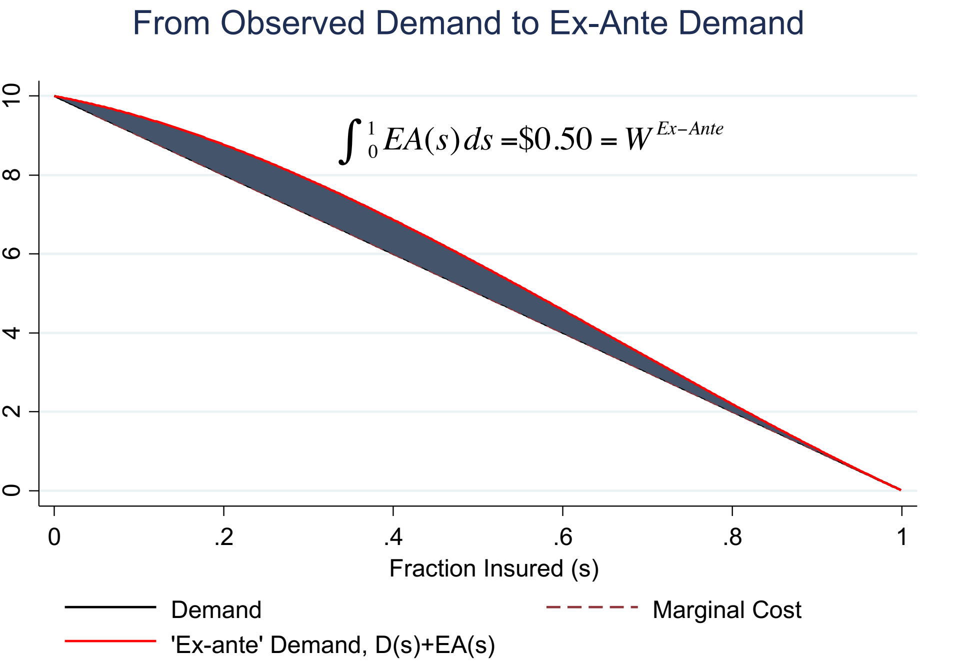
From Observed Demand to Ex-Ante Demand
10
8
6
4
2
0
0
.2
.4
.6
.8
1
Fraction Insured (s)
Demand
Marginal Cost
'Ex-ante' Demand, D(s)+EA(s)


From Observed Demand to Ex-Ante Demand
EA(0.3)=$0.88
0
2
4
6
8
10
0
.2
.4
.6
.8
1
Fraction Insured (s)
Demand
Marginal Cost
'Ex-ante' Demand, D(s)+EA(s)

From Observed Demand to Ex-Ante Demand




From Observed Demand to Ex-Ante Demand
$\int_0^1 EA(s)\,ds = \$0.50$
10
8
6
4
2
0
0
.2
.4
.6
.8
1
Fraction Insured (s)
Demand
Marginal Cost
'Ex-ante' Demand, D(s)+EA(s)



From Observed Demand to Ex-Ante Demand
$\int_0^1 EA(s)\,ds = \$0.50 = W^{Ex-Ante}$
0
2
4
6
8
10
0
.2
.4
.6
.8
1
Fraction Insured (s)
Demand
Marginal Cost
'Ex-ante' Demand, D(s)+EA(s)

DWL versus Ex-Ante WTP

- Ex-ante demand curve facilitates ex-ante/utilitarian welfare analysis
  - Even though demand is measured after information is revealed

- Ex-ante (ex-post utilitarian) surplus can lead to different conclusions about the value of insurance
  - Ex-ante efficient to have full insurance
  - No value to insurance market after info is revealed
    - (Strictly positive DWL if there was moral hazard)

General Model with Moral Hazard

- Ex-ante/Utilitarian welfare when fraction s has insurance

$$W(s) = E\left[u(c(s;\theta), m(s;\theta);\theta)\right]$$

- Ex-ante WTP for larger insurance market:

$$\frac{W'(s)}{E[u' \mid Insured]} = \underbrace{D(s) - MC(s)}_{\text{Ex-Post Surplus}} + EA(s)$$

where

$$EA(s) = (1-\mathrm{s})\mathrm{s}\frac{-\partial D}{\partial s}\frac{E[u'(s)|Insured] - E[u'(s)|Uninsured]}{E[u'(s)]}$$

Implementation

- Use common assumptions to approximate difference in marginal utilities between insured and uninsured

  - State independence: u_c only depends on c
  - Income doesn't vary with s
  - Common risk aversion (Andrews and Miller, 2013)

- Implies:

$$EA(s) = (1 - \mathrm{s})\mathrm{s}\frac{-\partial D}{\partial s}\frac{u_{cc}}{u_c}E[D(s) - D(s')|s' > s]$$

- Ex-ante component increasing with the square of demand/cost
  - $D(s) \to aD(s)$ implies $EA(s) \to a^2 EA(s)$

Risk Aversion

- Measuring ex-ante demand requires risk aversion
- Can be assumed externally
  - CRRA = 3
  - CARA = 5×10^{-4}
- Or can be estimated internally

$$\frac{-u_{cc}}{u_c} \approx 2\frac{\text{Markup}}{\text{Variance Reduction}} \approx 2\frac{D(s) - MC(s)}{\text{var}(m^U) - \text{var}(x^I)}$$

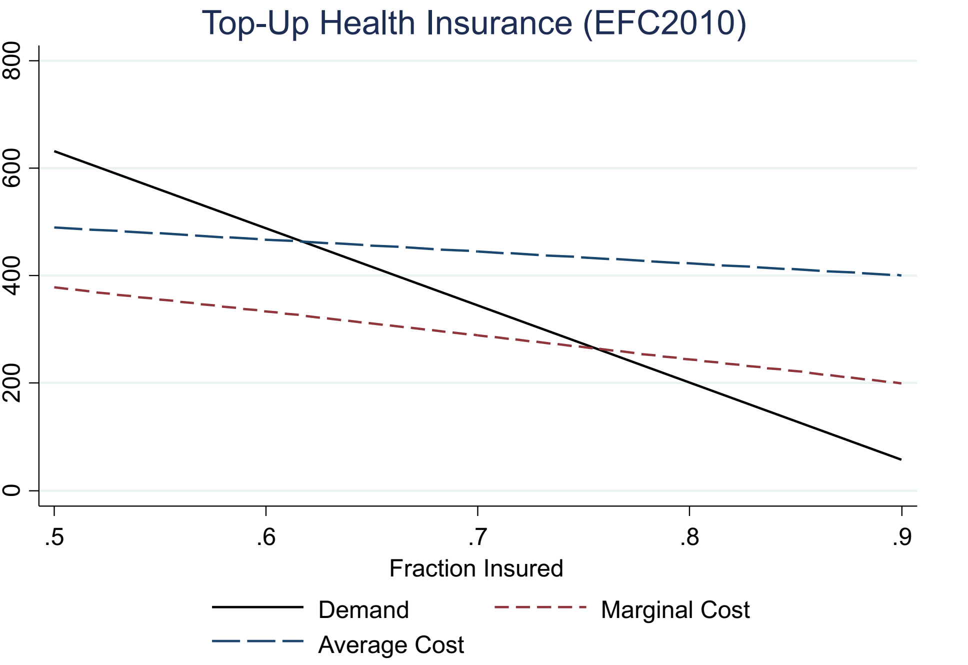
- WTP for insurance against remaining risk reveals can proxy for WTP for insurance against realized risk

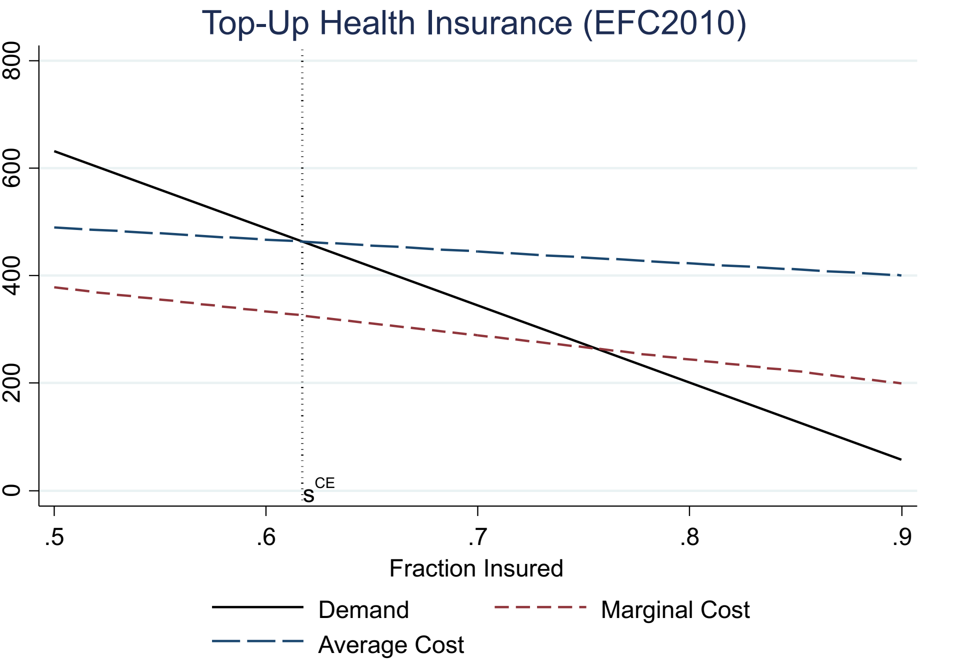
Illustration to Einav, Finkelstein, and Cullen (2010)

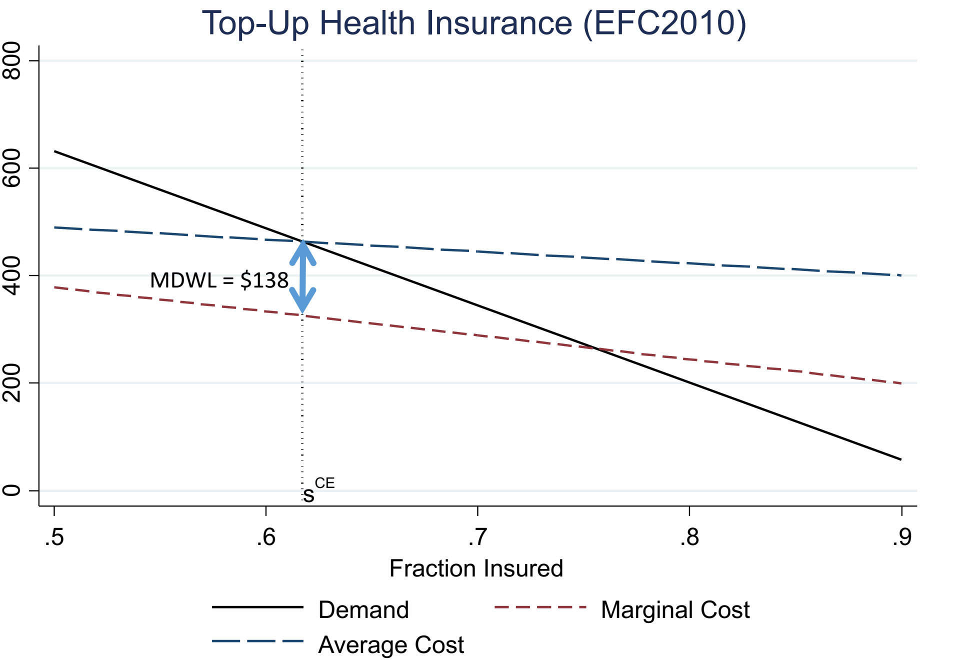
1. Top-up market for more generous PPO coverage in Alcoa
   - Demand and Cost Curves from Einav, Finkelstein, and Cullen (2010)
   - Average annual cost: $500

2. “Medium risk”
   - 4x Demand and Cost curves from Einav, Finkelstein, and Cullen (2010)
   - Average annual cost: $2,000

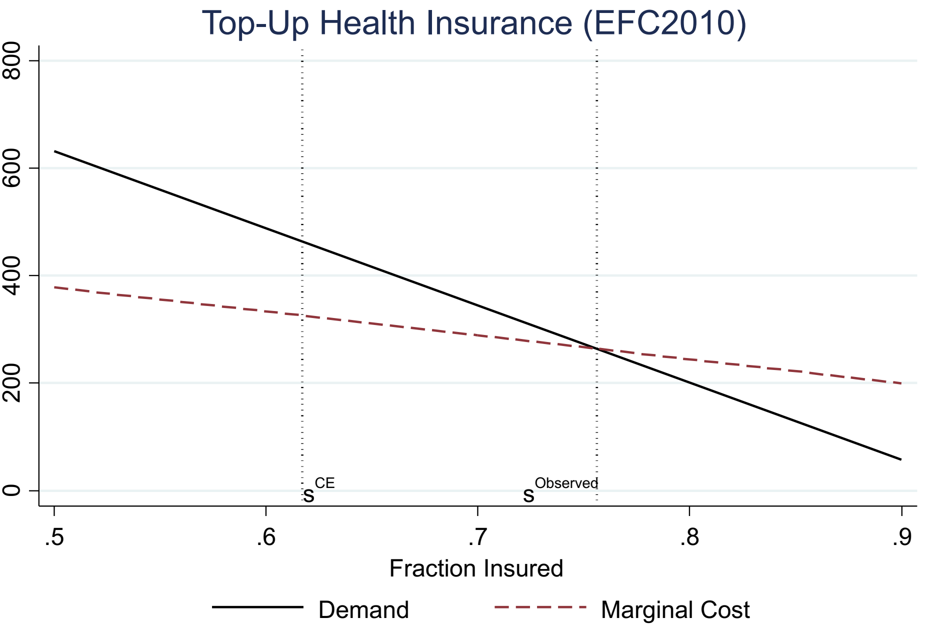
3. “Large Risk”: Conservative approx. to insured vs. uninsured
   - 8x Demand and Cost curves from Einav, Finkelstein, and Cullen (2010)
   - Average annual cost: $4,000
   - Smaller than $5,922 (full vs. no insurance) or $5,270 in MA (Hackman, Kolstad, Kowalski, 2015)


Top-Up Health Insurance (EFC2010)
0
200
400
600
800
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost
Average Cost

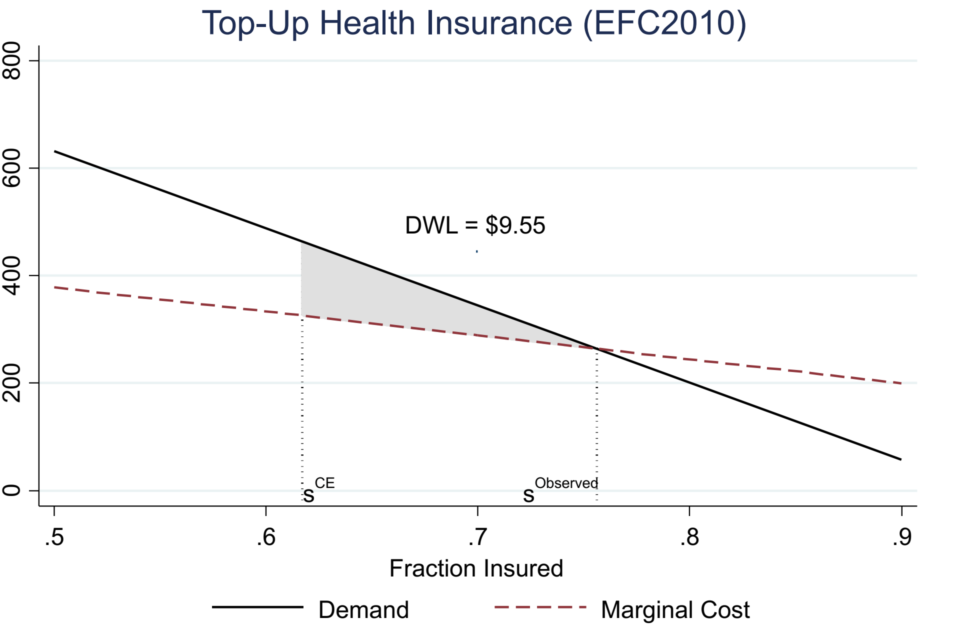

Top-Up Health Insurance (EFC2010)
800
600
400
200
0
s^CE
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost
Average Cost

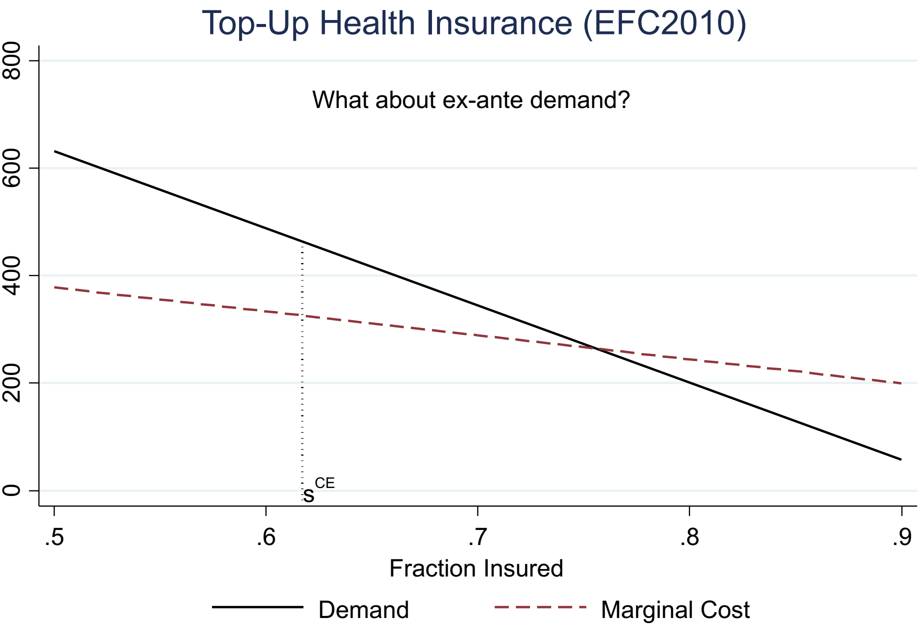


Top-Up Health Insurance (EFC2010)
800
600
400
200
0
MDWL = $138
s^{CE}
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost
Average Cost

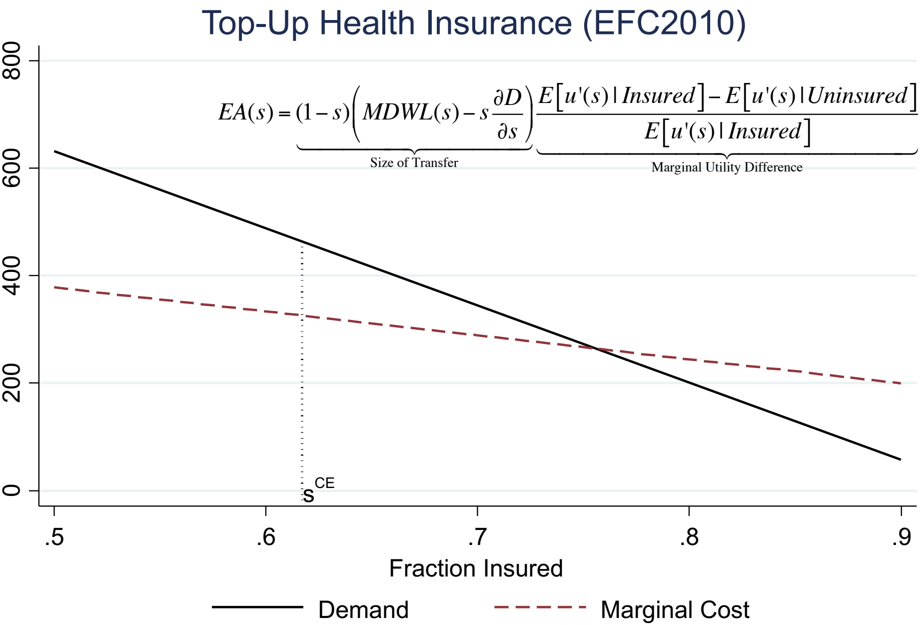


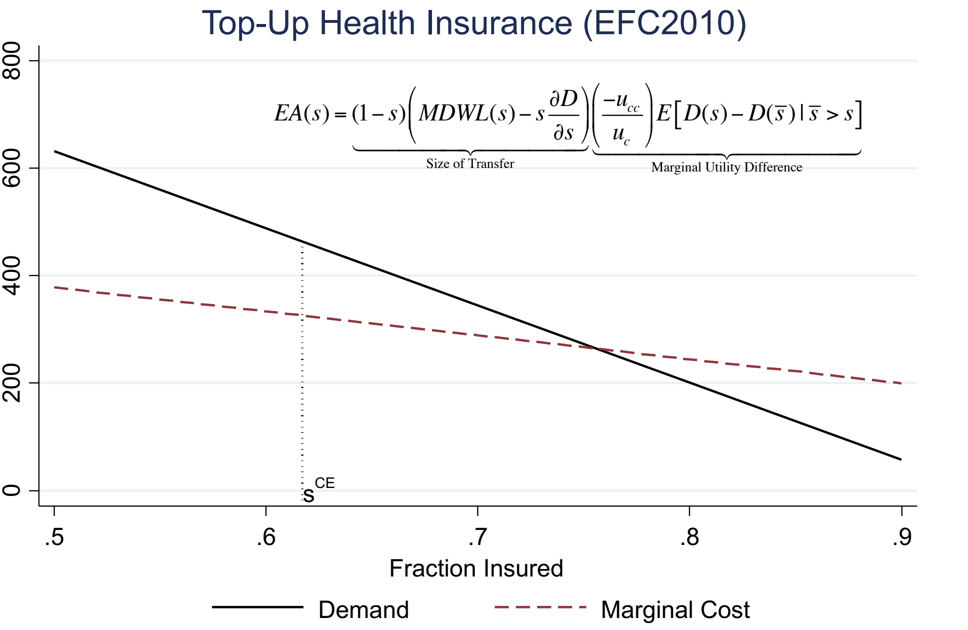
Top-Up Health Insurance (EFC2010)
800
600
400
200
0
s^CE
s^Observed
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost


Top-Up Health Insurance (EFC2010)
DWL = $9.55
0
200
400
600
800
.5
.6
.7
.8
.9
Fraction Insured
s^{CE}
$s^{Observed}$
Demand
Marginal Cost

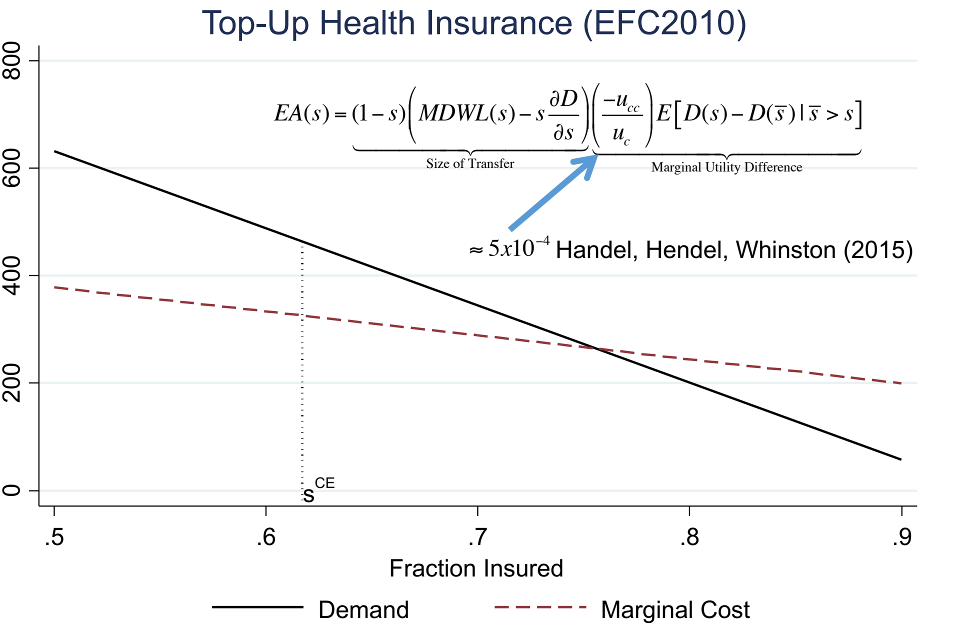


Top-Up Health Insurance (EFC2010)
What about ex-ante demand?
800
600
400
200
0
s^CE
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost

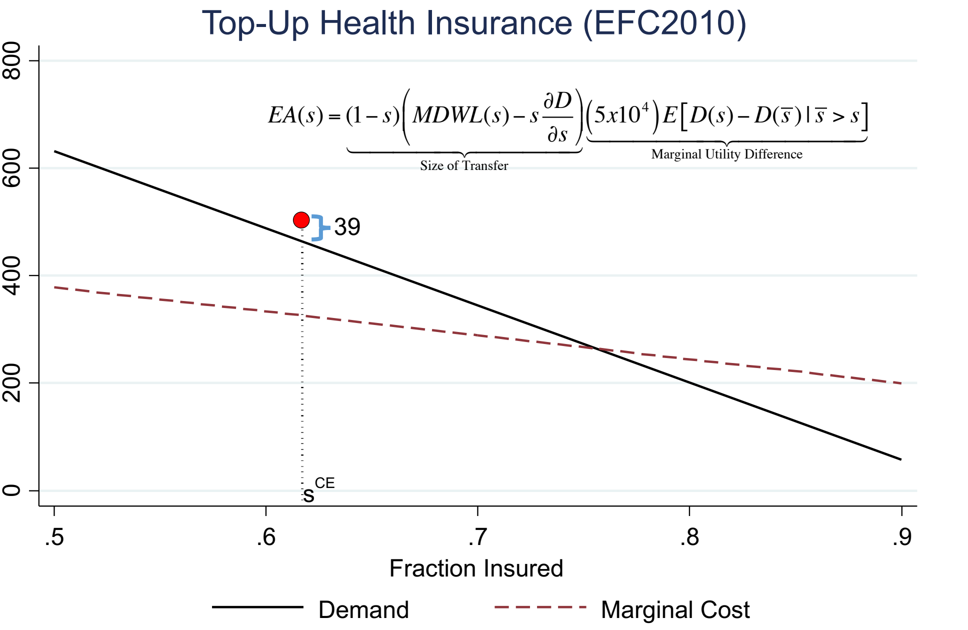

Top-Up Health Insurance (EFC2010)
$EA(s) = \underbrace{(1-s)\left(MDWL(s) - s\frac{\partial D}{\partial s}\right)}_{\text{Size of Transfer}} \underbrace{\frac{E[u'(s) \mid Insured] - E[u'(s) \mid Uninsured]}{E[u'(s) \mid Insured]}}_{\text{Marginal Utility Difference}}$
800
600
400
200
0
s^{CE}
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost



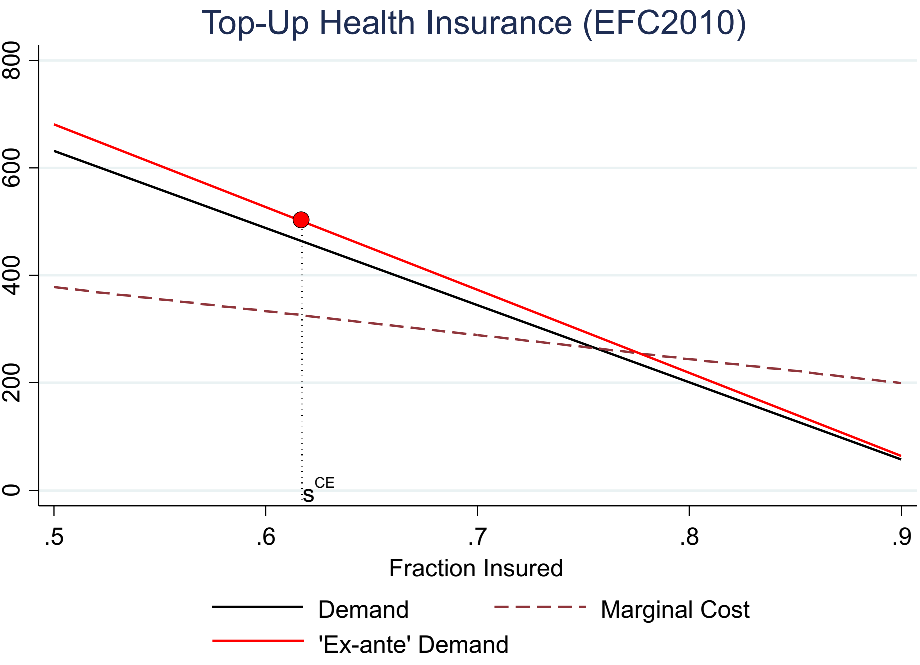
Top-Up Health Insurance (EFC2010)
$EA(s) = \underbrace{(1-s)\left(MDWL(s) - s\frac{\partial D}{\partial s}\right)}_{\text{Size of Transfer}}\underbrace{\left(\frac{-u_{cc}}{u_c}\right)E\left[D(s) - D(\bar{s}) \mid \bar{s} > s\right]}_{\text{Marginal Utility Difference}}$
800
600
400
200
0
s^{CE}
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost



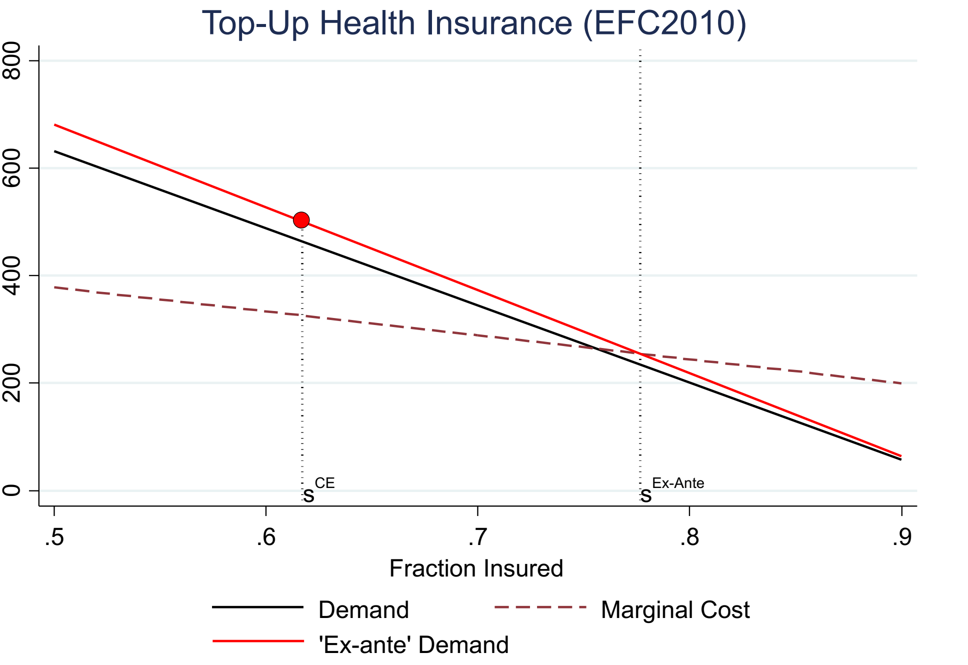
Top-Up Health Insurance (EFC2010)
$$EA(s) = \underbrace{(1-s)\left(MDWL(s) - s\frac{\partial D}{\partial s}\right)}_{\text{Size of Transfer}} \underbrace{\left(\frac{-u_{cc}}{u_c}\right) E\left[D(s) - D(\bar{s}) \mid \bar{s} > s\right]}_{\text{Marginal Utility Difference}}$$
$\approx 5x10^{-4}$ Handel, Hendel, Whinston (2015)
800
600
400
200
0
s^{CE}
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost



Top-Up Health Insurance (EFC2010)
$EA(s) = \underbrace{(1-s)\left(MDWL(s) - s\frac{\partial D}{\partial s}\right)}_{\text{Size of Transfer}} \underbrace{\left(5x10^4\right)E\left[D(s)-D(\bar{s}) \mid \bar{s} > s\right]}_{\text{Marginal Utility Difference}}$
39
s^{CE}
0
200
400
600
800
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost



Top-Up Health Insurance (EFC2010)
800
600
400
200
0
.5
.6
.7
.8
.9
Fraction Insured
s CE
Demand
Marginal Cost
'Ex-ante' Demand


Top-Up Health Insurance (EFC2010)
800
600
400
200
0
s^CE
s^Ex-Ante
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost
'Ex-ante' Demand

Ex-Ante Optimal Insurance Markets Generate DWL

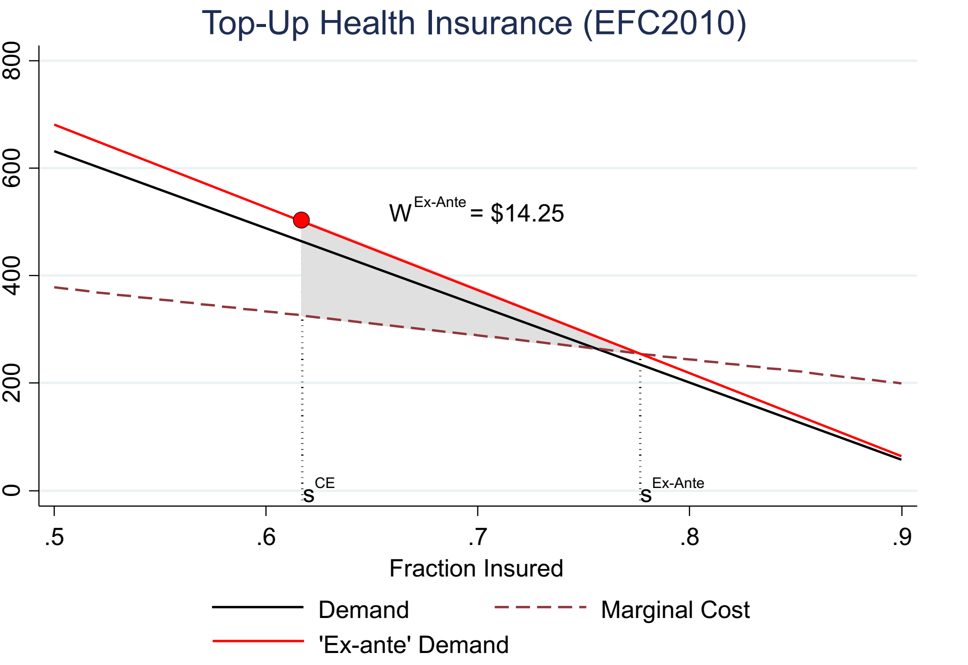
- Ex-ante optimal size of the insurance market solves:

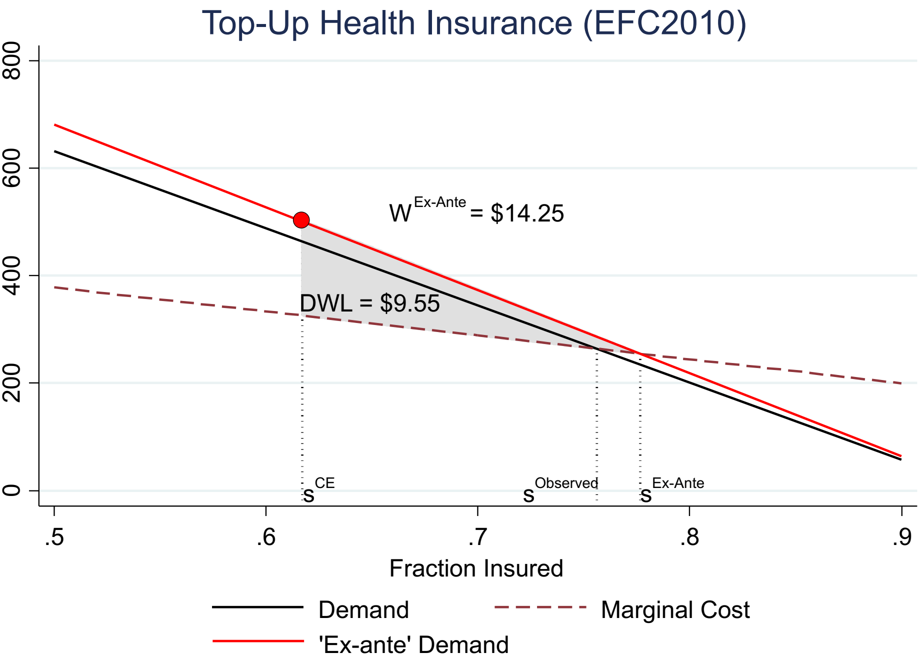
$$\frac{W'(s^{Ex-Ante})}{E\left[u' \mid Insured\right]} = \underbrace{D(s^{Ex-Ante}) - MC(s^{Ex-Ante})}_{\text{Ex-Post Surplus}} + EA(s^{Ex-Ante}) = 0$$

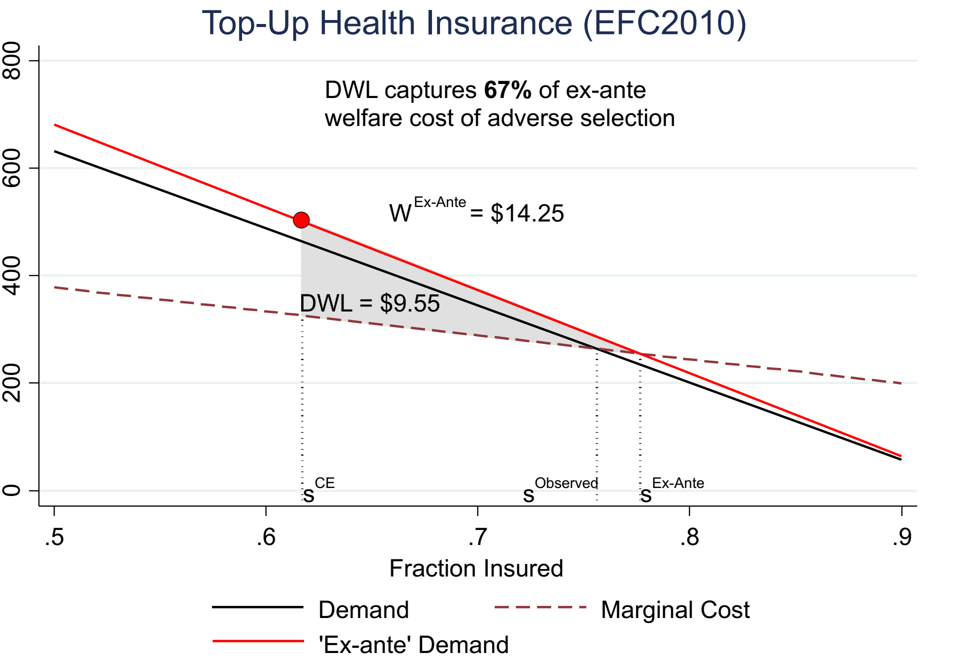
- Yields a “Baily-Chetty” condition:

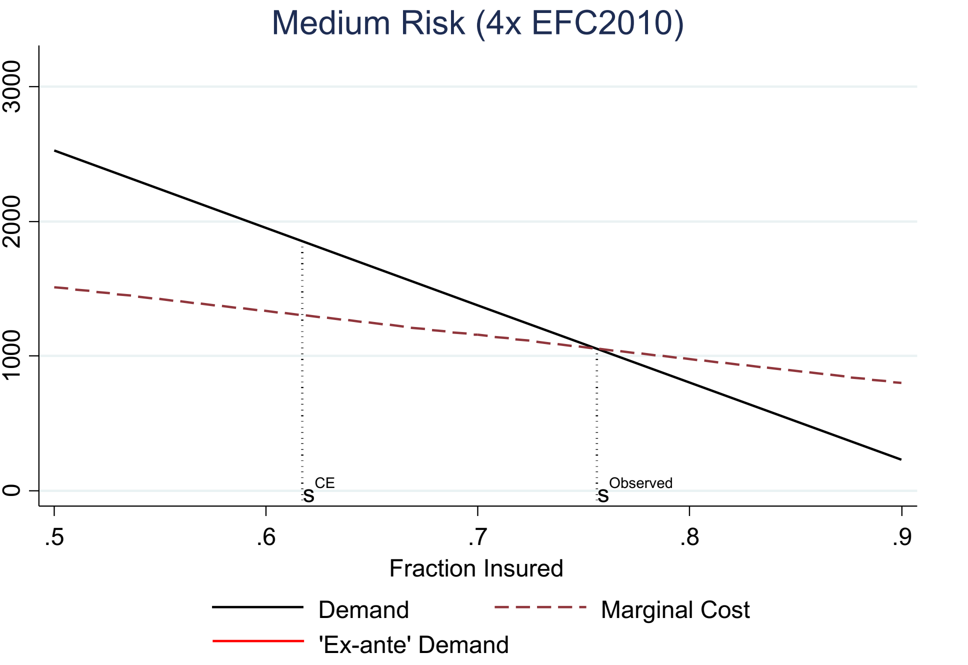
$$EA(s^{Ex-Ante}) = MDWL(s^{Ex-Ante})$$

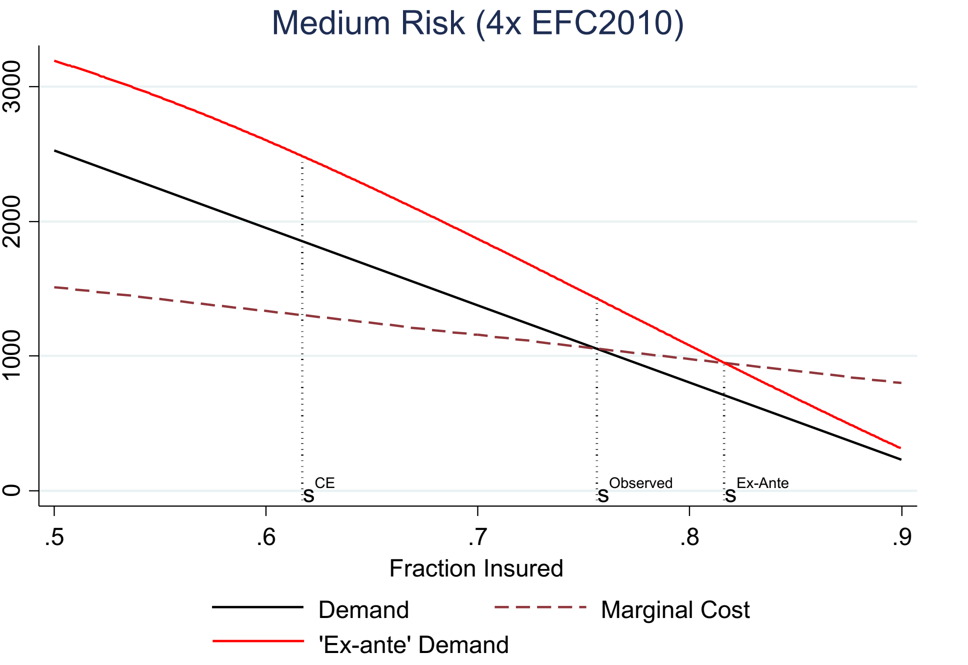
- **Corollary:** The ex-ante optimal allocation generally involves (ex-post) deadweight loss
  - Easy to show that MDWL(s)=0 implies EA(s)>0 whenever marginal utilities are higher for the insured than uninsured
  - MDWL is a cost we’re willing to accept for ex-ante insurance

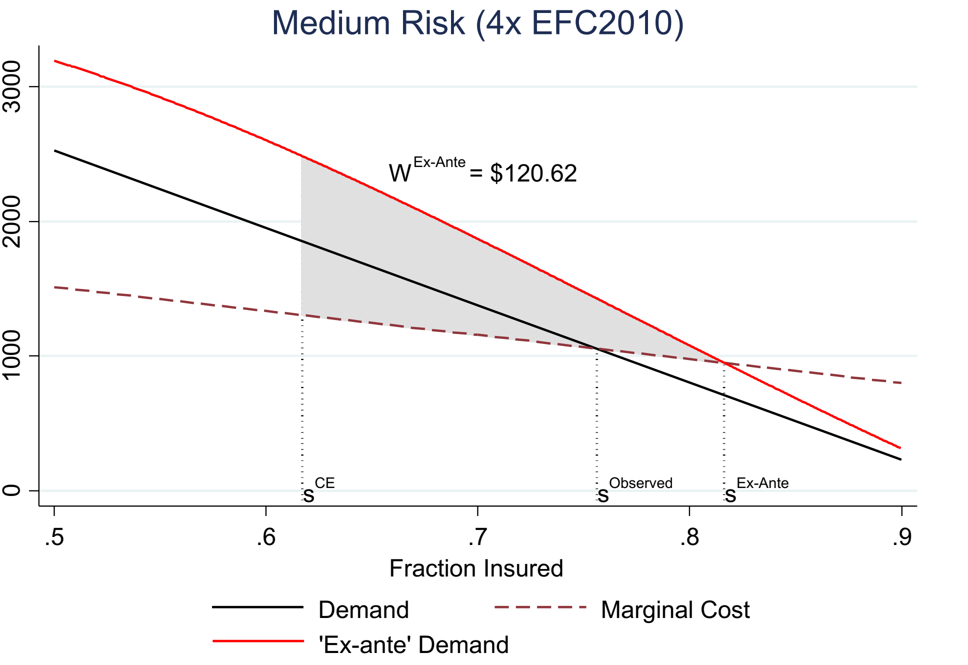

Top-Up Health Insurance (EFC2010)
800
600
400
200
0
W^Ex-Ante = $14.25
s^CE
s^Ex-Ante
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost
'Ex-ante' Demand

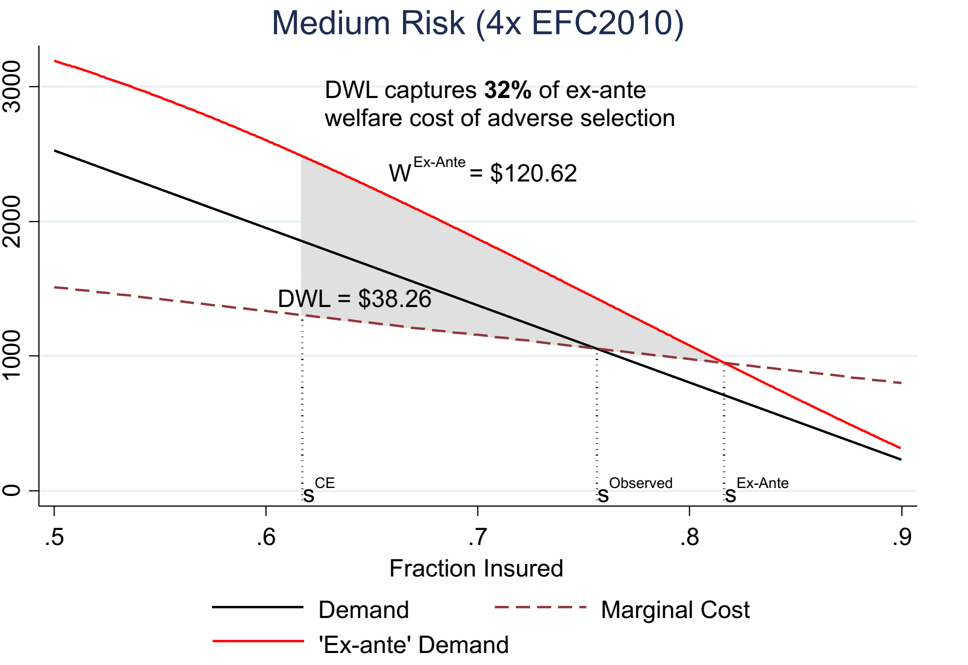

Top-Up Health Insurance (EFC2010)
800
600
400
200
0
W^Ex-Ante = $14.25
DWL = $9.55
s^CE
s^Observed
s^Ex-Ante
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost
'Ex-ante' Demand


Top-Up Health Insurance (EFC2010)
DWL captures **67%** of ex-ante welfare cost of adverse selection
W^Ex-Ante = $14.25
DWL = $9.55
s^CE
s^Observed
s^Ex-Ante
0
200
400
600
800
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost
'Ex-ante' Demand

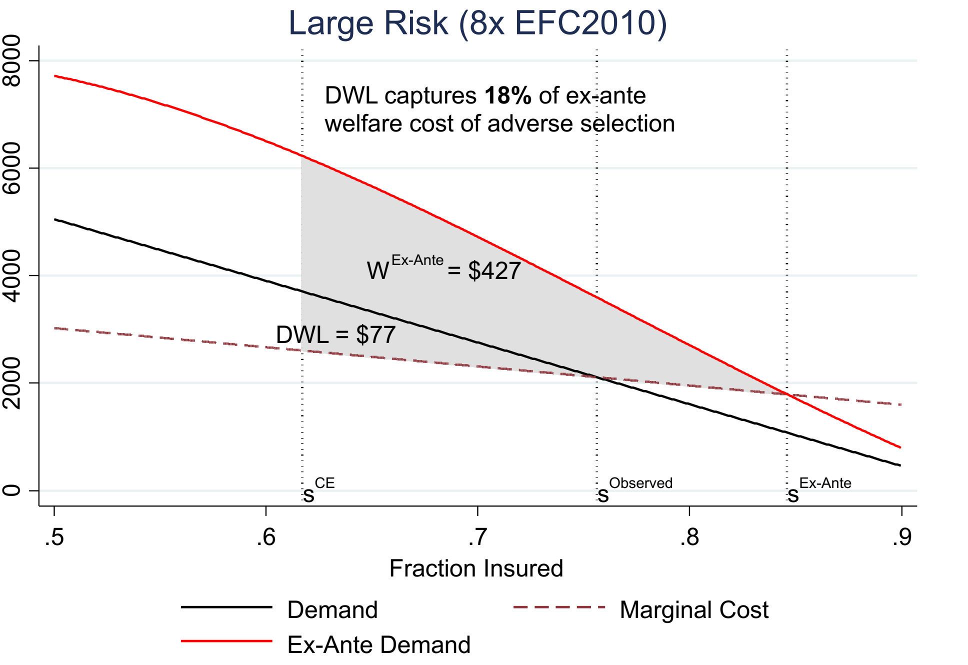

Medium Risk (4x EFC2010)
3000
2000
1000
0
.5
.6
.7
.8
.9
Fraction Insured
s^{CE}
$s^{Observed}$
Demand
Marginal Cost
'Ex-ante' Demand


Medium Risk (4x EFC2010)
3000
2000
1000
0
s^CE
s^Observed
s^Ex-Ante
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost
'Ex-ante' Demand


Medium Risk (4x EFC2010)
$W^{Ex\text{-}Ante} = \$120.62$
3000
2000
1000
0
.5
.6
.7
.8
.9
s^{CE}
$s^{Observed}$
$s^{Ex\text{-}Ante}$
Fraction Insured
Demand
Marginal Cost
'Ex-ante' Demand



Medium Risk (4x EFC2010)
DWL captures **32%** of ex-ante welfare cost of adverse selection
$W^{Ex\text{-}Ante}$ = $120.62
DWL = $38.26
s^{CE}
$s^{Observed}$
$s^{Ex\text{-}Ante}$
0
1000
2000
3000
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost
'Ex-ante' Demand



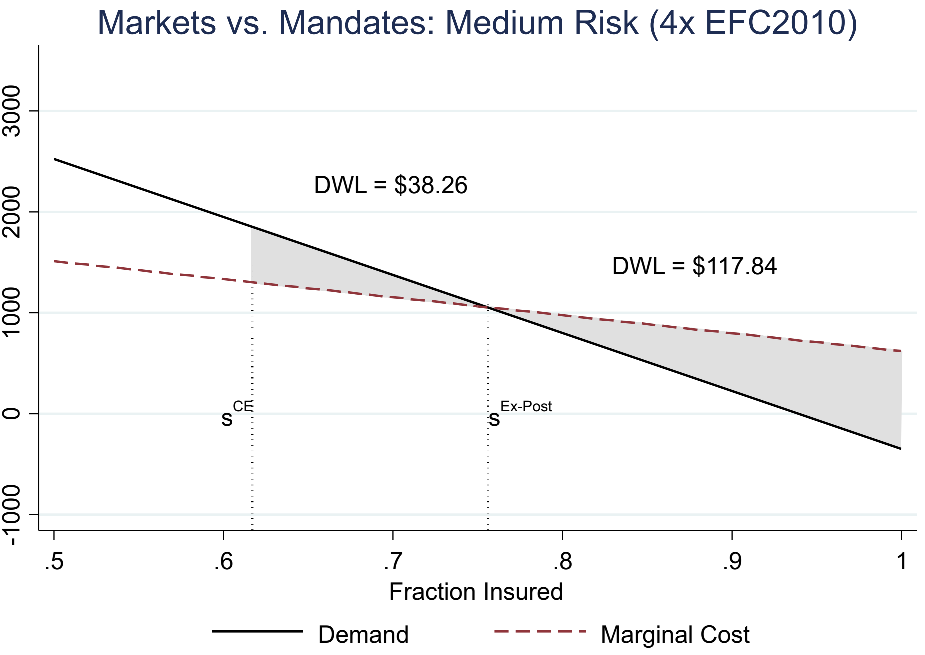
Large Risk (8x EFC2010)
DWL captures **18%** of ex-ante welfare cost of adverse selection
W^Ex-Ante = $427
DWL = $77
s^CE
s^Observed
s^Ex-Ante
0
2000
4000
6000
8000
.5
.6
.7
.8
.9
Fraction Insured
Demand
Marginal Cost
Ex-Ante Demand

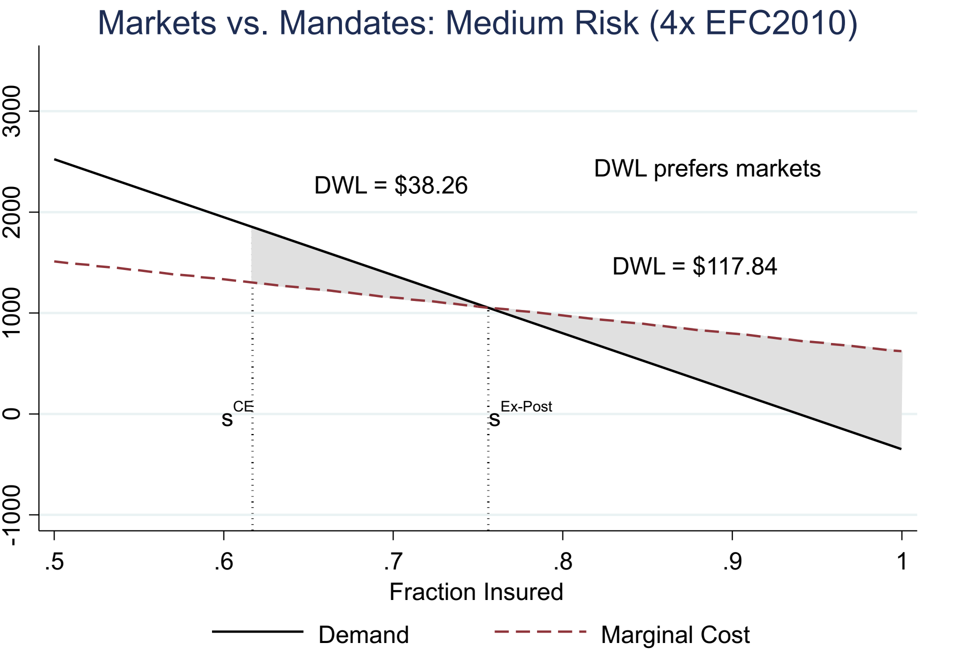
Ex-ante Insurance Value Increasing in Premium

- Divergence between Observed and Ex-ante value of insurance is increasing in the size/importance of the risk
  - DWL captures 67% of the ex-ante welfare cost of adverse selection for baseline specification in Einav, Finkelstein, and Cullen (2010)
  - Only 18% if risks are 8x as large
- More important for risks where the premiums are a significant share of people's incomes
  - Health, life, disability, unemployment insurance
  - Less important for iPhone insurance…

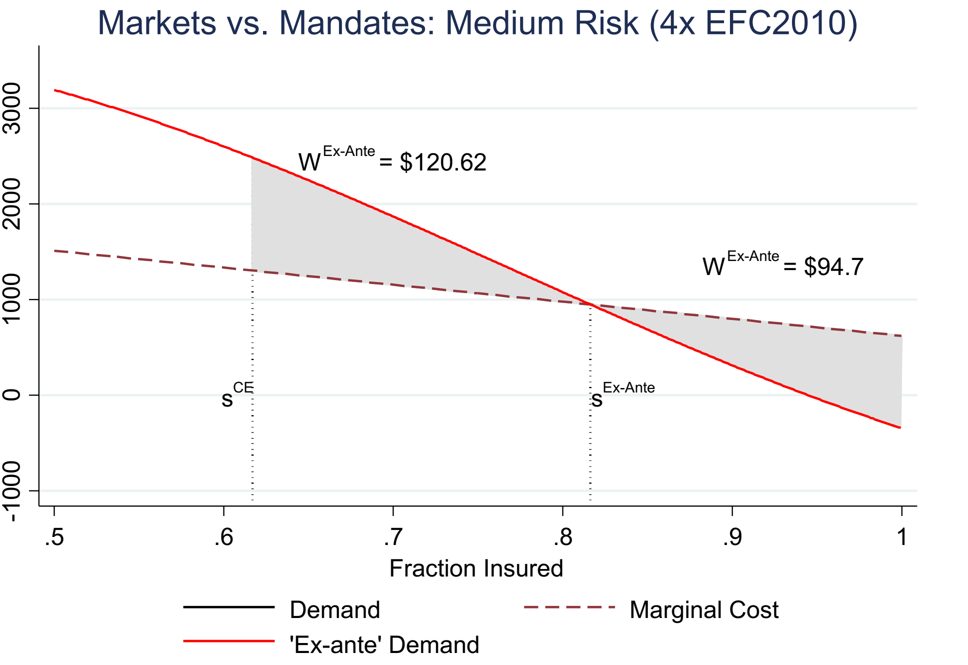
Competitive Markets vs. Mandates

- Are competitive markets better or worse than govt mandates?
  - Competitive markets suffer adverse selection
  - Mandates may require some to buy insurance that don't want it

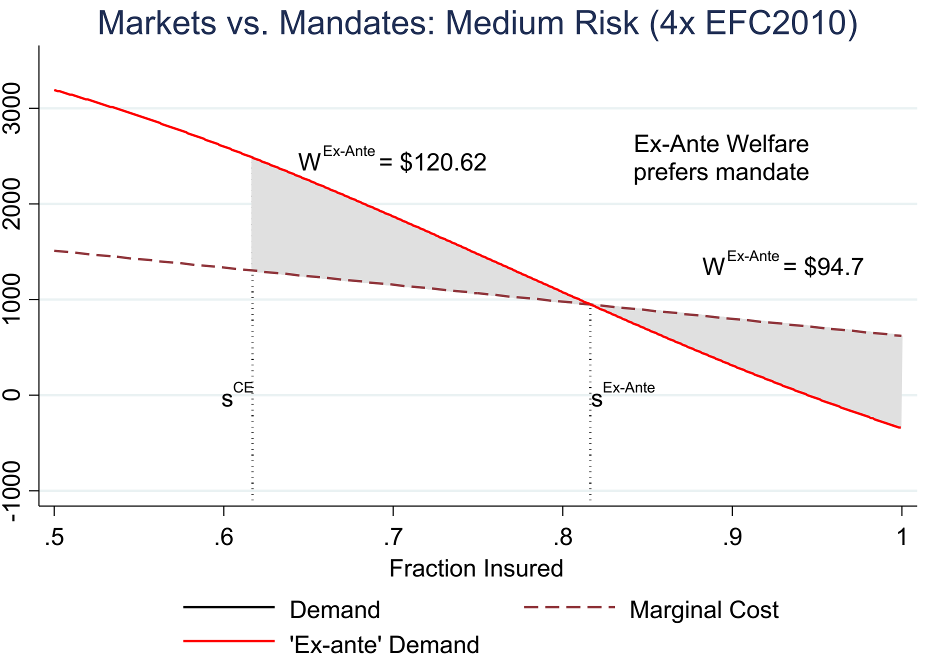

Markets vs. Mandates: Medium Risk (4x EFC2010)
DWL = $38.26
DWL = $117.84
s^CE
s^Ex-Post
3000
2000
1000
0
-1000
.5
.6
.7
.8
.9
1
Fraction Insured
Demand
Marginal Cost



Markets vs. Mandates: Medium Risk (4x EFC2010)
DWL prefers markets
DWL = $38.26
DWL = $117.84
s^{CE}
$s^{Ex\text{-}Post}$
3000
2000
1000
0
-1000
.5
.6
.7
.8
.9
1
Fraction Insured
Demand
Marginal Cost



Markets vs. Mandates: Medium Risk (4x EFC2010)
3000
2000
1000
0
-1000
$W^{Ex\text{-}Ante}$ = $120.62
$W^{Ex\text{-}Ante}$ = $94.7
s^{CE}
$s^{Ex\text{-}Ante}$
.5
.6
.7
.8
.9
1
Fraction Insured
Demand
Marginal Cost
'Ex-ante' Demand


Markets vs. Mandates: Medium Risk (4x EFC2010)
-1000
0
1000
2000
3000
.5
.6
.7
.8
.9
1
Fraction Insured
W^Ex-Ante = $120.62
Ex-Ante Welfare prefers mandate
W^Ex-Ante = $94.7
s^CE
s^Ex-Ante
Demand
Marginal Cost
'Ex-ante' Demand

DWL vs. Ex-Ante Welfare Lead to Different Conclusions

- For the medium and large risk specifications, ex-ante and ex-post (DWL) welfare measures generate different conclusions
- DWL perspective prefers markets
- Ex-ante/utilitarian perspective prefers mandates

Key Lessons

- Insurance insures against the realization of risk
  - Adverse selection implies a divergence between DWL and Ex-ante welfare
- Exploit Baily-Chetty logic to create ex-ante demand curve
  - Conduct utilitarian/ex-ante welfare analysis
- DWL and Ex-ante welfare can differ in conclusions about:
  - Optimal size of insurance market
  - Welfare cost of adverse selection
  - Competitive markets vs. mandates
  - Difference between DWL and Ex-ante welfare increasing in size of risk

Reclassification Risk

- Suppose there are T periods
  - No discounting for simplicity
- Each period, medical spending shock m_t is realized
  - Shocks can be persistent: future m_{t+1} correlated with m_t
  - No choice in m_t (can be extended)
- Ex-Ante (time 0) budget constraint

$$E\left[\sum_t c_t\right] = E\left[\sum_t y\right] - E\left[\sum_t m_t\right]$$

  - Equivalent to selling claims to y_t and buying insurance in competitive ex-ante market to cover cost, m_t (price in the market equals probability)
- Utility given by

$$E\left[\sum_t u\left(c_t\right)\right]$$

Reclassification Risk

- Ex-ante optimal allocation, $\{c_t\}$, solves

$$u'(c_t) = \lambda \quad \forall t$$

  where λ is the lagrange multiplier on the budget constraint
- Individuals are fully insured
  - State independent utility implies $c_t = \bar{c} = E\left[\sum_t y\right] - E\left[\sum_t m_t\right]$

Implementing the Optimal Allocation

- Are ex-ante contingent claims time-consistent?
  - No. Suppose you get a positive health shock – might want to withdraw and consume future endowment
    - Requires commitment to sell future income stream to cover health costs
    - But healthy people might want to leave!
- Cochrane (1996): Can implement with 1-period contracts
- Each period t buy insurance that pays $t_t\left(m_{t+1}\right)$ if m_{t+1} occurs in period $t+1$ at price $q_t\left(m_{t+1}|m_t\right) = \Pr\left\{m_{t+1}|m_t\right\}$

$$c_t\left(m_t\right) + m_t + \sum_{m_{t+1}|m_t} t_t\left(m_{t+1}\right) q_t\left(m_{t+1}|m_t\right) = y + t_{t-1}\left(m_t\right)$$

- Lagrange multiplier $\lambda_t\left(m_t\right)$ = marginal utility of consumption if m_t is realized

Time Consistent Allocation

- Consider period t optimization after m_t has been realized
- Can collapse period $t' > t$ budget constraints (recursively substitute out $t_t(m_{t+1})$)

$$c_t + m_t = y - E\left[\sum_{t'>t} m_{t'} | m_t\right]$$

or

$$c_t = y - E\left[\sum_{t' \geq t} m_{t'} | m_t\right]$$

Time Consistent Allocation

- The maximization becomes

$$\max E\left[\sum_{t'\geq t} u\left(c_t\right)|m_t\right]$$

subject to

$$c_t = y - E\left[\sum_{t'\geq t} m_{t'}|m_t\right]$$

- Claim: can equate marginal utilities across all states/time periods:

$$u'\left(c_{t'}\right) = \lambda\left(m_t\right)$$

for all $t' \geq t$

- WLOG, extend back to $t = 0$ and we can implement the first best!

Insurance Product

- What do the insurance products look like that implement the first best?
- Each period:

$$\bar{c} + m_t + \sum_{m_{t+1}} t_t\left(m_{t+1}\right) q_t\left(m_{t+1} \middle| m_t\right) = y + t_{t-1}\left(m_t\right)$$

or

$$\bar{c} + m_t + E\left[t_t\left(m_{t+1}\right)|m_t\right] = y + t_{t-1}\left(m_t\right)$$

or

$$t_{t-1}\left(m_t\right) = \underbrace{m_t + \bar{c} - y}_{\text{Net Deficit}} + \underbrace{E\left[t_t\left(m_{t+1}\right)|m_t\right]}_{\text{Future Insurance Cost}}$$

- Payments, $t_{t-1}\left(m_t\right)$, are increasing in m_t for **two** reasons:
  - Medical shock, m_t
  - Impact of m_t on future insurance costs, $E\left[t_t\left(m_{t+1}\right)|m_t\right]$
    - "Reclassification Risk"

Reclassification Risk: Commitment

- But, we don't see markets for "reclassification risk" insurance
  - Why?
- Private information about future realizations of m_t
  - Akerlof unraveling?
  - No evidence of this, but could be true...
- Lack of 1-period commitment (Hendel and Lizzeri, 2003)
  - Good realizations of m_t may induce people to "run" from the contract
    - Can implement with zero profits in each period, but requires $t_t(m_{t+1}) < 0$ for some realizations of m_{t+1}
    - Incentive to leave the contract and not pay!

Front-Loading

- Solution: Front-load the contract!
  - Pay the insurer lump sum upfront
  - Can sustain $t_t\left(m_{t+1}\right) \geq 0$ in all future periods so that consumers never wish to leave the contract
  - Hendel and Lizzeri (2003) argue this explains why life insurance contracts are front-loaded
- Many reasons to want to front-load insurance contracts
  - Prevents ex-post healthy people from leaving the risk pool
- But, if front-loading helps increase commitment, should people be allowed to re-sell their insurance contracts?
  - "Life settlement" market (Fang and Kung, 2010)

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WHAT IS A LIFE SETTLEMENT?

A life settlement is a cash settlement obtained through the sale of your existing life insurance policy.

When life insurance is no longer wanted or needed a life settlement can be a much more valuable financial option than surrendering or lapsing your insurance. The beauty of a life settlement is that you receive a cash settlement that is significantly more than what your insurance company will pay and you will be free from the obligation and financial burden of paying future premium payments.

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Secondary Markets: Fang and Kung (2010)

- Should people be allowed to re-sell their insurance contracts?
  - "Life settlement" market
- Downside: Prevents commitment
- Upside: Increases flexibility / choice
  - But choice not necessarily welfare improving with asymmetric information
- In general, if first period insurance contracts were optimal but required commitment, then re-trading in life settlement markets ex-post will reduce welfare

Reclassification Risk

- In practice, most health insurance contracts do not look like optimal contracts in Cochrane (1996)
  - Repeated static contracts
  - Perhaps because of both commitment and private information problems?
- Opens up important questions in optimal insurance designs
  - Community rating versus adverse selection
- Handel, Hendel, and Whinston (2015, ECMA): Equilibria in Health Exchanges: Adverse Selection versus Reclassification Risk

Handel, Hendel, and Whinston (ECMA, 2015)

- Simulate model of health insurance with repeated static insurance contracts
    - Community rating: everyone pays same price
    - Risk-based pricing: prices of insurance is risk-rated
- Community rating generates adverse selection within periods
    - Healthy people don't buy insurance
        - Wait until they're sick to buy
    - Leads prices for insurance to be too high
- Risk-based pricing generates risk against the realization of health conditions
    - Expose to reclassification risk: higher price of insurance if sick
- Results: community rating generates signfiicant adverse selection but 5x higher welfare than risk-based pricing
    - Reduces reclassification risk!

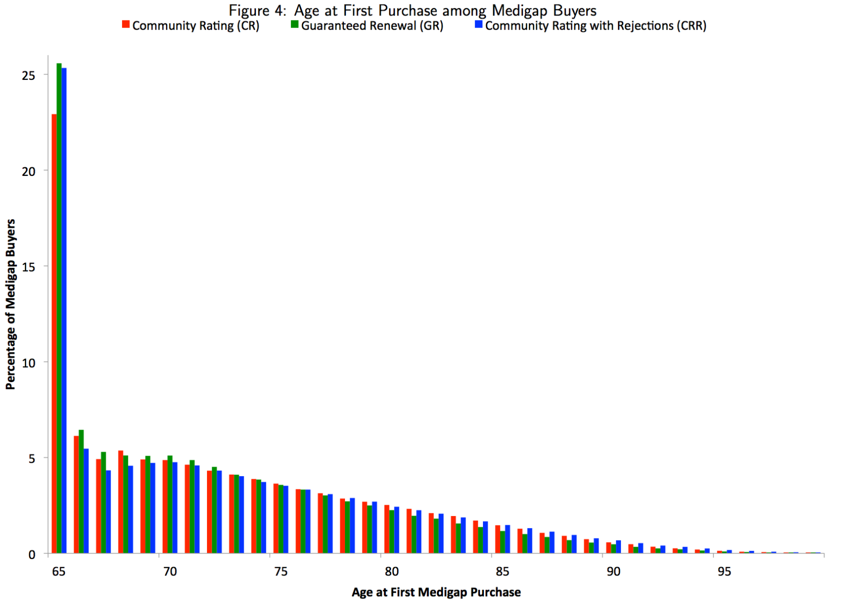
Curto (2016)

- Curto (2016): "Pricing Regulations in Individual Health Insurance: Evidence from Medigap"
- Studies Medigap Market
  - Medicare pays 80% of bills; coinsurance of 20%
  - Medigap reduces this 20% (several standardized/regulated policies available)
- Two regulatory regimes that vary by states:
  - Community rating for all ages
  - Open enrollment period (6-months) at age 65
    - Followed by ability of insurers to underwrite post age 65
    - But, if purchased at age 65, policy is guaranteed renewable

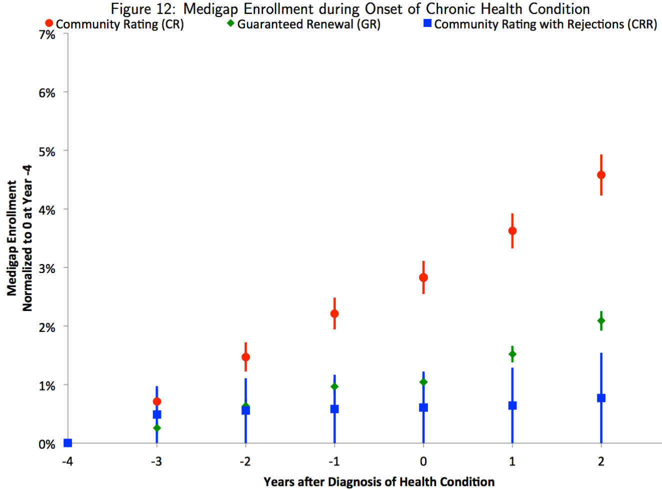
Curto (2016)

- Incentives under community rating?
  - Wait until sick to buy Medigap...
- Curto (2016) provides evidence for this strategic behavior
- Empirical strategies:
  - Compare take-up across states with different policies
  - Robustness: explore differences only along border discontinuities

Curto (2016)



Notes: This figure shows a histogram of age at first Medigap purchase among Medigap buyers. The sample is restricted to individuals living in Community



Notes: This figure shows estimates of Medigap enrollment for each of the years prior to and after the onset of a chronic health condition. The chronic health conditions examined are severe cancers including those of the lung and upper digestive tract. The sample is all aged Medicare beneficiaries ever diagnosed with this health condition between 2006 and 2010. Year 0 is defined as the first year the health condition was diagnosed. Estimated coefficients are obtained from a regression of Medigap coverage on yearly indicators and individual fixed effects. The bars show 95 percent confidence intervals.

Market Power and Provider Networks

- Considerable evidence of lack of competition in several dimensions:
  - Health insurers
  - Health providers
- Additional reason for insurance: bargaining power with providers
- Generates role of provider networks
  - Ability to go to some but not all hospitals

Shepard (2016)

- Shepard (2016), "Hospital Network Competition and Adverse Selection: Evidence from the Massachusetts Health Insurance Exchange"
- Star hospitals (e.g. MGH) attract sicker patients (adverse selection) and also cause an increases in costs (moral hazard)
- But, people have strong demand for them!
  - Adverse selection can lead to inefficiently low coverage of star hospitals
  - But, adverse selection can reduce market power effects
    - higher prices -> higher costs -> less incentive to raise prices and exploit market power
- [Aside: Thanks to Mark Shepard for sharing his presentation slides!]

High-Price Star Hospitals: Partners Healthcare

- **Price**: Estimated with model of average amount paid per admission, adjusted for patient severity → *Details*

Star Hospitals

Partners Healthcare

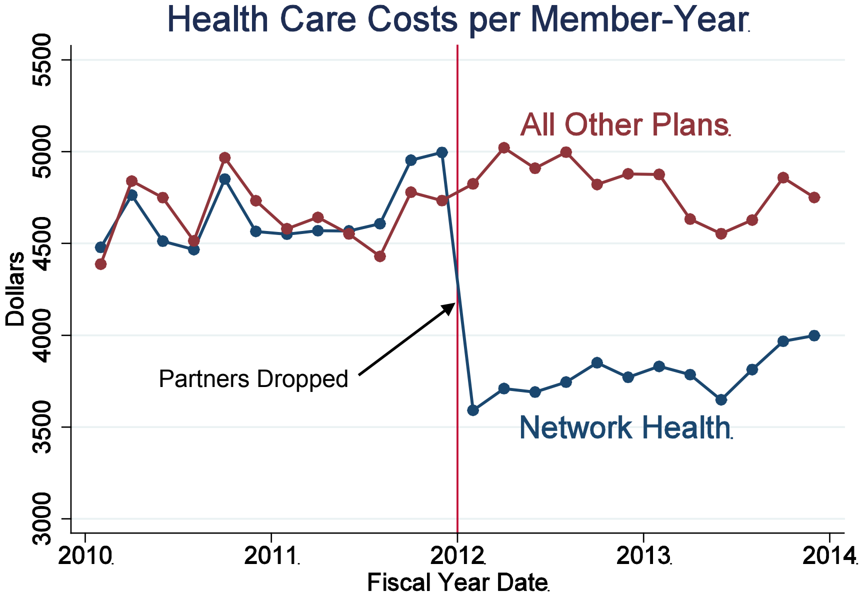
	Hospital	System	Average Values: Price	Average Values: Severity
1	Brigham & Women's	Partners	$20,474	1.12
2	Mass. General	Partners	$19,550	1.09
3	Boston Med. Ctr.	BMC	$15,919	1.05
4	Tufts Med. Ctr.	Tufts	$14,038	1.10
5	UMass Med. Ctr.	UMass	$14,111	1.07
6	Charlton Memorial	Southcoast	$14,210	1.03
7	Baystate Med. Ctr.	Baystate	$12,223	1.11
8	Lahey Clinic	Lahey	$11,742	1.13
9	Beth Israel Deaconess	CareGroup	$11,787	1.08
10	St. Vincent	Vanguard	$11,455	1.03
	All Other Hospitals	---	*$8,585*	*0.95*

Evidence from Network Changes

- **Additional evidence**: How do selection patterns, costs respond to <u>change in network coverage</u> of Partners?

- **Biggest change** : Large plan (Network Health) drops Partners (+ several other hospitals) in 2012

- How did network changes affect selection and costs?
  - **Selection**: Look at plan switching
  - **Cost changes (moral hazard)**: Analyze cost changes for non-switchers

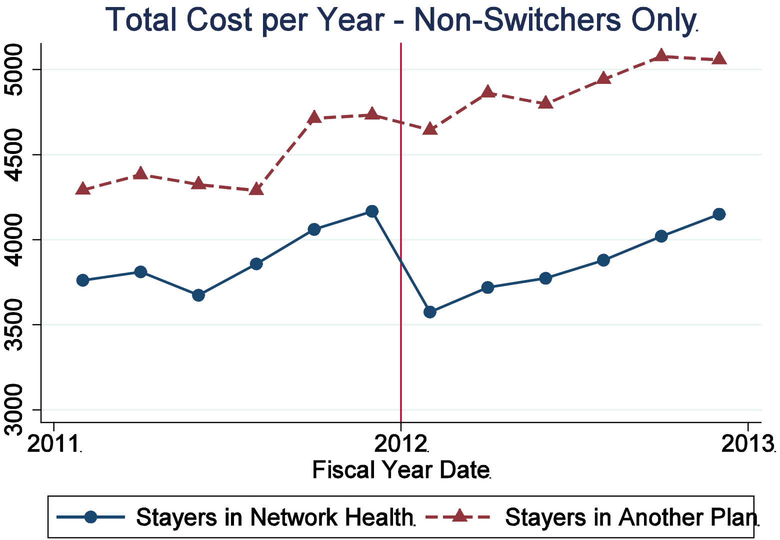


Health Care Costs per Member-Year
Dollars
5500
5000
4500
4000
3500
3000
All Other Plans
Partners Dropped
Network Health
2010
2011
2012
2013
2014
Fiscal Year Date

Shepard (2016): Main Results

- Costs to policy decrease after Network Health plan drops Partners
- Is this moral hazard or adverse selection?
  - Study costs on those who don't switch policies
  - Finds some reduction in costs
  - Indicates "moral hazard'

Evidence of Overall Cost Reductions for Stayers



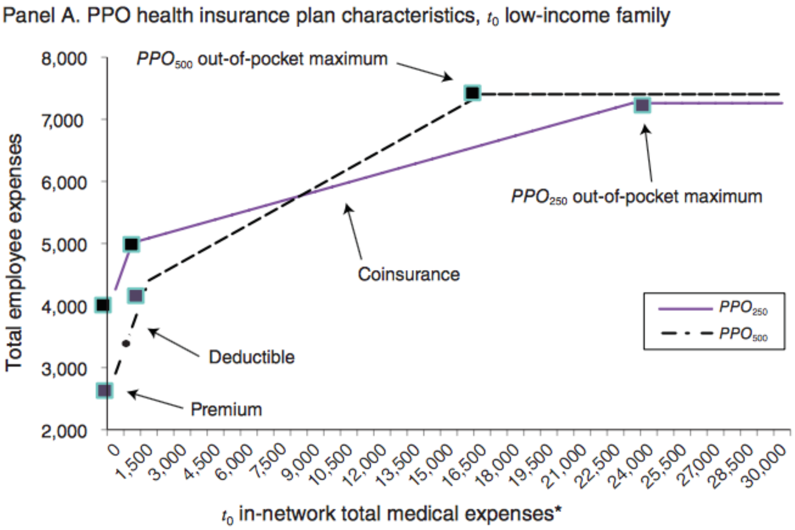
Note: Points are group x time coeffs. from regression with individual fixed effects.

Shepard (2016): Main Results

- Paper sets up structural model to:
  - Study the welfare impact of covering a star hospital?
    - e.g. do too few or too many plans include MGH?
  - Studies counterfactual policies (e.g. increased risk adjustment)
    - Can prevent unraveling of coverage of star hospitals
    - But this doesn't increase welfare on net
- Main Lessons:
  - Adverse selection discourages covering star hospitals
    - Adverse selection may help explain rise in narrow network plans
  - Additional non-risk channel for thinking about adverse selection: selection on use of higher-cost option
    - Do people value this from an ex-ante perspective?

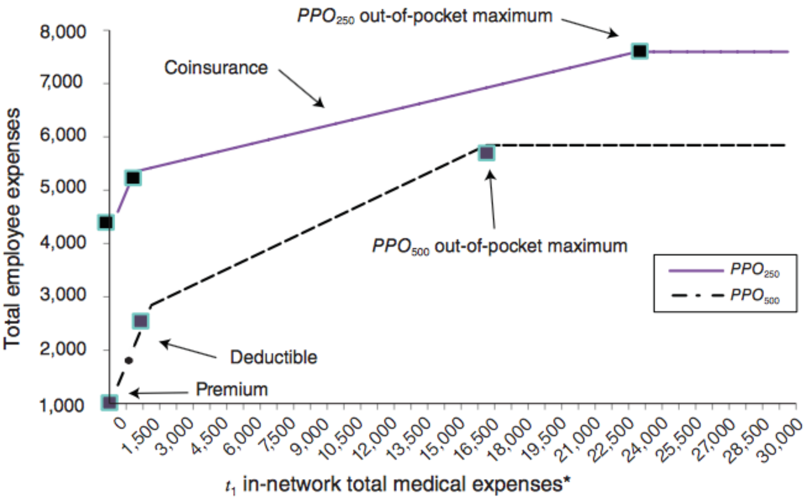
Health Insurance: Dominated Plan Choices

- Evidence people also make "sub-optimal" choices in health insurance contexts
  - Plans are often difficult to understand
- But, not clear privately inefficient choices lead to socially inefficient outcomes
- Handel (2013, AER): "Adverse Selection and Inertia in Health Insurance Markets: When Nudging Hurts"
- Studies choice of two PPO contracts
- In year 0, tradeoff between greater coverage and price
  - PPO500 is better if have high expenses
- In year 1, PPO500 completely dominates PPO250


Panel A. PPO health insurance plan characteristics, t_0 low-income family
PPO_{500} out-of-pocket maximum
PPO_{250} out-of-pocket maximum
Coinsurance
Deductible
Premium
PPO_{250}
PPO_{500}
Total employee expenses
8,000
7,000
6,000
5,000
4,000
3,000
2,000
0
1,500
3,000
4,500
6,000
7,500
9,000
10,500
12,000
13,500
15,000
16,500
18,000
19,500
21,000
22,500
24,000
25,500
27,000
28,500
30,000
t_0 in-network total medical expenses*

Inertia: Handel (2013)

Panel B. PPO health insurance plan characteristics, t_1 low-income family



How Many People Switched?

TABLE 3—DOMINATED PLAN CHOICE ANALYSIS

Dominated plan analysis	t_1 Dominated stay	t_1 Dominated switch	t_2 Dominated stay	t_2 Dominated switch
N	498	61	378	126
Minimum money lost[a]	\$374	\$453	\$396	\$306
PPO_{500}	—	44 (72%)	—	103 (81%)
PPO_{1200}	—	4 (7%)	—	6 (5%)
Any *HMO*	—	13 (21%)	—	17 (14%)
FSA t_1	25.4%	32.1%	27.2%	28.6%
FSA t_2	—	—	28.1%	30.9%
Dental switch t_1	4.3%	14.1%	3.5%	10.9%
Dental switch t_2	—	—	6.9%	17.2%
Age (mean)	44.9	38.3	46.2	41.4
Income tier (mean)[b]	1.6	1.4	1.6	1.7
Quant. manager	11%	8%	11%	11%
Single (percent)	40%	41%	40%	33%
Male (percent)	42%	46%	39%	55%
All plan analysis	**PPO_{250} stay t_1**	**PPO_{250} switch t_1**	**All plans t_1 stay**	**All plans t_1 switch**
Sample size	1,626	174	2,786	384
FSA t_1 enrollee	31%	41%	25%	39%
Dental switch	3.2%	13.1%	3.8%	14.5%
Age (mean)	48.3	40.6	44.0	39.1
Income tier (mean)[b]	2.5	2.2	2.3	2.1
Quant. manager	20%	17%	17%	14%
Single (percent)	50%	56%	53%	59%
Male (percent)	48%	42%	49%	40%

Notes: This top panel in this table profiles the choices and demographics of the employees enrolled in PPO_{250} at t_0 who (i) continue to enroll in a firm plan in t_1 and (ii) have PPO_{250} become dominated for them at t_1. The majority of these employees (498 out of 559 (89 percent)) remain in PPO_{250} even after it becomes dominated by PPO_{500} with 378 of 504 (25 percent) still remaining in this plan at t_2. People who do switch are more likely to exhibit a pattern of active choice behavior in general as evidenced by their higher FSA enrollments and level of dental plan switching. Apart from this, these populations are similar though switchers in this group are slightly younger. The bottom panel studies the profiles of those who switch at t_1 and those who don't for the two groups of (i) PPO_{250} enrollees at t_0 and (ii) the entire universe of PPO plan enrollees present in t_0 and t_1. This reveals a similar pattern of active decision making as switchers in these populations are also more likely to enroll in FSAs and switch dental plans.

Health Insurance: Dominated Plan Choices

- Everyone has the option to switch to PPO250
- But, only 11% of those who chose PPO500 in year 0 switch to PPO250
- 89% remain in dominated plan!
- Leave at least $374 per family on the table
- Those who switched would have left more money on the table ($453)
    - Some evidence of rationality
- Is this inertia bad?
    - Significant evidence that PPO 250 had much higher cost enrollees
        - This was why they increased the price...
    - Inertia kept many healthy people enrolled in the more generous 250 deductible plan
        - Lowers prices of the more generous policy

Costs Went Up for PPO250

Table 4—Adverse Selection and Employee Costs

Final sample total expenses	PPO_{-1}	PPO_{250}	PPO_{500}	PPO_{1200}
Family t_{-1} total expenses (\$)				
t_{-1}				
N employees (mean family size)	2,022 (2.24)	—	—	—
Mean (median)	13,331 (4,916)	—	—	—
25th percentile	1,257	—	—	—
75th percentile	13,022	—	—	—
t_0				
N (mean family size)	—	1,328 (2.18)	414 (2.20)	280 (2.53)
Mean (median)	—	16,976 (6,628)	6,151 (2,244)	6,742 (2,958)
25th percentile	—	2,041	554	658
75th percentile	—	16,135	6,989	8,073
t_1				
N (mean family size)	—	1,244 (2.19)	546 (2.19)	232 (2.57)
Mean (median)	—	17,270 (6,651)	7,759 (2,659)	6,008 (2,815)
25th percentile	—	2,041	708	589
75th percentile	—	16,707	8,588	7,191
Individual category expenses (dollars)				
Pharmacy				
Mean	973	1,420	586	388
Median	81	246	72	22
Mental health (> 0)				
Mean	2,401	2,228	1,744	2,134
Median	1,260	1,211	1,243	924
Hospital/physician				
Mean	4,588	5,772	2,537	2,722
Median	428	717	255	366
Physician OV				
Mean	461	571	381	223
Median	278	356	226	120

Notes: This table investigates the extent of adverse selection across *PPO* options after the t_0 menu change for those in the final estimation sample. All individuals in this sample were enrolled in PPO_{-1} in t_{-1} and continue to be enrolled in some plan at the firm for the following two years. The numbers in the table for all choices represent t_{-1} total claims in dollars so that these costs can proxy for health risk without being confounded by moral hazard (t_0 and t_1 cost differences could be the result of selection or moral hazard). The table reveals that those who choose PPO_{250} have much higher expenditures at t_{-1} than those who choose the other two plans, implying substantial selection on observables in the vein of Finkelstein and Poterba (2006). The bottom panel presents a breakdown of these costs according to our cost model expenditure categories.

Handel (2013): Nudging versus Adverse Selection

- Develops model with inertia (switching costs) to explain why only 11% switched
- Uses model to study impact of reducing inertia
- Results suggest adverse selection would increase
- Would overall reduce welfare despite improving individual choices

Abaluck and Adams (2021): Slutsky Symmetry

- Large literature documenting seeming inattentiveness to best options
- Abaluck and Adams (2021) show general way of testing for "consideration set" models
- Implication of standard discrete choice models is "slutsky symmetry"
- Impact of price changes of good j on choice of good i should equal impact of price change of good i on choice of good j

Abaluck and Adams (2021): Slutsky Symmetry

- Suppose there are two goods, $j \in \{0, 1\}$.
- Each plan has price x_j.
- 0 is a default good always considered. Let $\mu(x_0)$ denote the probability that the consumer also pays attention to price of good 1.
- Probability of picking plan j is given by

$$
\begin{aligned}
s_0(x_0, x_1) &= (1-\mu) + \mu s_0^*(x_0, x_1) \\
s_1(x_0, x_1) &= \mu s_1^*(x_0, x_1)
\end{aligned}
$$

where s^* is the choice probability under full attention

Abaluck and Adams (2021): Slutsky Symmetry

- Differentiate 2.1:

$$\begin{aligned}
\frac{\partial s_1}{\partial x_0} - \frac{\partial s_0}{\partial x_1} &= \mu \frac{\partial s_1^*}{\partial x_0} + \frac{\partial \mu}{\partial x_0} s_1^* - \mu \frac{\partial s_0^*}{\partial x_1} \\
&= \frac{\partial \mu}{\partial x_0} s_1^* \\
&= \frac{\partial log\left(\mu\right)}{\partial x_0} s_1
\end{aligned}$$

  where we use the fact that full consideration yields Slutsky symmetry: $\frac{\partial s_0^*}{\partial x_1} = \frac{\partial s_1^*}{\partial x_0}$, and the fact that $s_1 = \mu s_1^*$.
- So,

$$\frac{\partial log\left(\mu\right)}{\partial x_0} = \frac{1}{s_1}\left[\frac{\partial s_1}{\partial x_0} - \frac{\partial s_0}{\partial x_1}\right]$$

- The impact of x_0 on considering the outside good can be estimated from the differences in the price responses to x_0 versus x_1. In the two good case, note that $\frac{\partial s_1}{\partial x_1} = -\frac{\partial s_1}{\partial x_0}$. So,

$$\partial log\left(\mu\right) \qquad 1 \; \left[\partial s_1 \qquad -\partial s_1\right]$$

Switching Response to Default vs. Outside Good Attribute

TABLE III

EXCESS SENSITIVITY TO DEFAULT ATTRIBUTES IN SWITCHING MODEL

	Share weighted	Lowest 3 plans	Lowest-cost plan
Annual premium	0.0801***	0.0931***	0.0914***
(hundreds)	(0.0305)	(0.0348)	(0.0292)
Annual out-of-pocket	0.0057**	−0.0051	−0.0096**
costs (hundreds)	(0.0028)	(0.0048)	(0.0046)
Variance of costs	−0.0075**	0.0040	−0.0006
(millions)	(0.0037)	(0.0058)	(0.0003)
Deductible (hundreds)	0.1203**	0.1242**	0.1219**
	(0.0545)	(0.0501)	(.0556)
Donut hole coverage	0.0827**	0.0926**	0.0909**
	(0.0410)	(0.0376)	(0.0396)
Average consumer	0.0186	0.0234	0.0210
cost sharing %	(0.0141)	(0.0161)	(0.0143)
Normalized quality	0.0024	0.0479	0.0103
rating	(0.0156)	(0.1663)	(0.0136)
# of top 100 drugs in	0.1669	0.0183	0.1347
formulary	(0.0985)	(0.0157)	(0.1158)

Notes. This table reports coefficients from a panel data regression of an indicator for whether individual i switched at time t on attributes of the default plan, as well as the difference between default plan attributes

Abaluck and Adams (2021): Slutsky Symmetry

- Abaluck and Adams estimate a structural model of plan choice
- Consider welfare impact of “smart default” policy that automatically defaults consumers into lowest expected cost plan
- Would suffer large welfare costs if inertia was “real”
- Estimate low inertia costs and large savings in the consideration set model

Summary and Key Lessons

- Einav, Finkelstein and Cullen (2010) provide baseline framework for welfare analysis of insurance
- But, may not capture ex-ante welfare because information is realized over time
- Suggests may be willing to trade off adverse selection for insurance against reclassification risk (Handel, Hendel, and Whinston, 2015)
- Health insurance also provides access to providers
  - Additional adverse selection on preference for hospitals
  - Creates more complicated welfare/design questions
- People struggle to make health insurance choices
  - Can affect welfare impact of policies, and highlights importance of choice architecture