Subsidizing Health Insurance for Low-Income Adults: Evidence from Massachusetts

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What I have learned from this paper?

1. The institutional knowledge of healthcare in the US, the $550 b medicaid transfer, the staged function of insurance premium based on income level relative to poverty line, giving the foundations for Regression Discontinuity Design.

2. An important goal is obtain universal coverage for low-income people through subsidies. How much subsidies are sufficient? Need to estimate WTP (Willingness to Pay).

3. a. The demand curve is the relationship between insurance price and enrollment rate of the people. So at each cutoff income line of insurance price increases, there are two data points. Left side is a lower price, and higher enrollment rate, right side is a higher price, and lower enrollment rate. These two data points can line up, representing a demand curve segment at the cutoff income.
b. There are several cutoff incomes, so we can get demand curve segments at different cutoff income levels.
c. To get the entire demand curve, the authors made an assumption that these segments can shift to line up to get an entire demand curve for insurance of an income level. This assumption is the "model" in this paper.

What I have learned from this paper?

4. A similar way to get the data points for average costs and line up several segments, and the marginal cost is the slope of average cost curve.

5. The transaction of using "model" is to buy extrapolation power with assumptions.

6. A practical example of leverage exogeneous price changes to estimate demand curve. And the "model" is not daunting, it is a good illustration how to make assumptions that structural estimation needs.

7. The willingness to pay of people is much lower than the average insurer costs that the people would have cost if they enrolled. The paper attributes this to uncompensated care. Is uncompensated care more efficient than the existing system? Are the insurer costs for what people actually need, or are there more efficient uses of the insurer costs?

Motivation

- **How much are low-income people <u>willing to pay</u> (WTP) for health insurance?** What are the implications for insurance markets?

- **Health insurance is by far the largest means-tested transfer in US**
  - In 2015: <u>$550 billion</u> on Medicaid vs. $70b or less on next biggest programs (food stamps, EITC, SSI, TANF)
  - Key question: How much are <u>recipients WTP</u> for in-kind insurance?
  - Little prior evidence – until recently a non-traded good

- **Health care reforms:** Increasingly try to cover low-income uninsured via <u>partially subsidized</u> insurance
  - ACA exchanges, state Medicaid reforms requiring premiums
  - Will partial subsidies get to universal coverage? Depends on WTP

Overview of This Paper

- Evidence from setting where can measure <u>revealed preference</u> WTP (demand) and <u>cost</u> of health insurance for low-income population

- **Setting:** Subsidized exchange in Massachusetts (pre-ACA)

  - Model for ACA: Similar design, low-income population choosing b/n heavily subsidized coverage vs. uninsurance
  - **Key feature:** Subsidies vary by discrete income bin → <u>RD price variation</u>
    - E.g., 149% poverty person has $0 plan; 151% poverty pays $39/month

- **Method:** Use price variation to estimate WTP, cost of insurance

  - Descriptive: How do lower subsidies affect take-up, average cost of enrollees in insurance market?
  - Use simple model to map observed take-up, cost → WTP, cost curves

Summary of Results

- **Descriptive findings:**
  - (1) Insurance demand is highly price sensitive
  - (2) Adverse selection (despite coverage mandate)
    - Enrollee premium ↑ by $40 per month → Take-up falls 25%, Average cost of enrollees higher by $10-50 *(= 3-14%)*

- **Implications of WTP, Cost Curve Estimates:**
  - (1) Modest premiums are major deterrent to universal coverage
    - E.g., subsidies covering 75% of insurer costs still leave >50% uninsured
  - (2) Adverse selection exists but is not primary driver of low take-up
    - WTP is <u>far below</u> not just average costs, but also <u>marginal enrollees'</u> costs imposed on insurer *(for >70% of eligible pop.)*

- **Discussion:**
  - Why is WTP so far below cost? And what are the normative implications?
    - <u>Key factor</u>: Uncompensated care for uninsured (charity care, unpaid bills)

Outline

1. Setting and Descriptive Evidence

2. Model and Estimates of WTP, Cost Curves

3. Discussion and Normative Implications

4. Conclusion

1. Setting and Descriptive Evidence

Setting: Mass. Health Insurance Exchange

- **Setting**: Pre-ACA subsidized insurance exchange (CommCare)
  - Introduced in 2006 "Romneycare" reform
  - ACA-like eligible population: Low-income adults (<300% poverty) w/out access to employer insurance or other public insurance
    - Relevant choice: CommCare plan vs. Uninsurance
  - Focus on 135-300% poverty and simple market setting in 2011
   - Also show descriptive results for 2009-13

- **Benefits** standardized, set to be quite <u>generous</u>
  - Cover >94% of costs (like "platinum" plan in ACA)
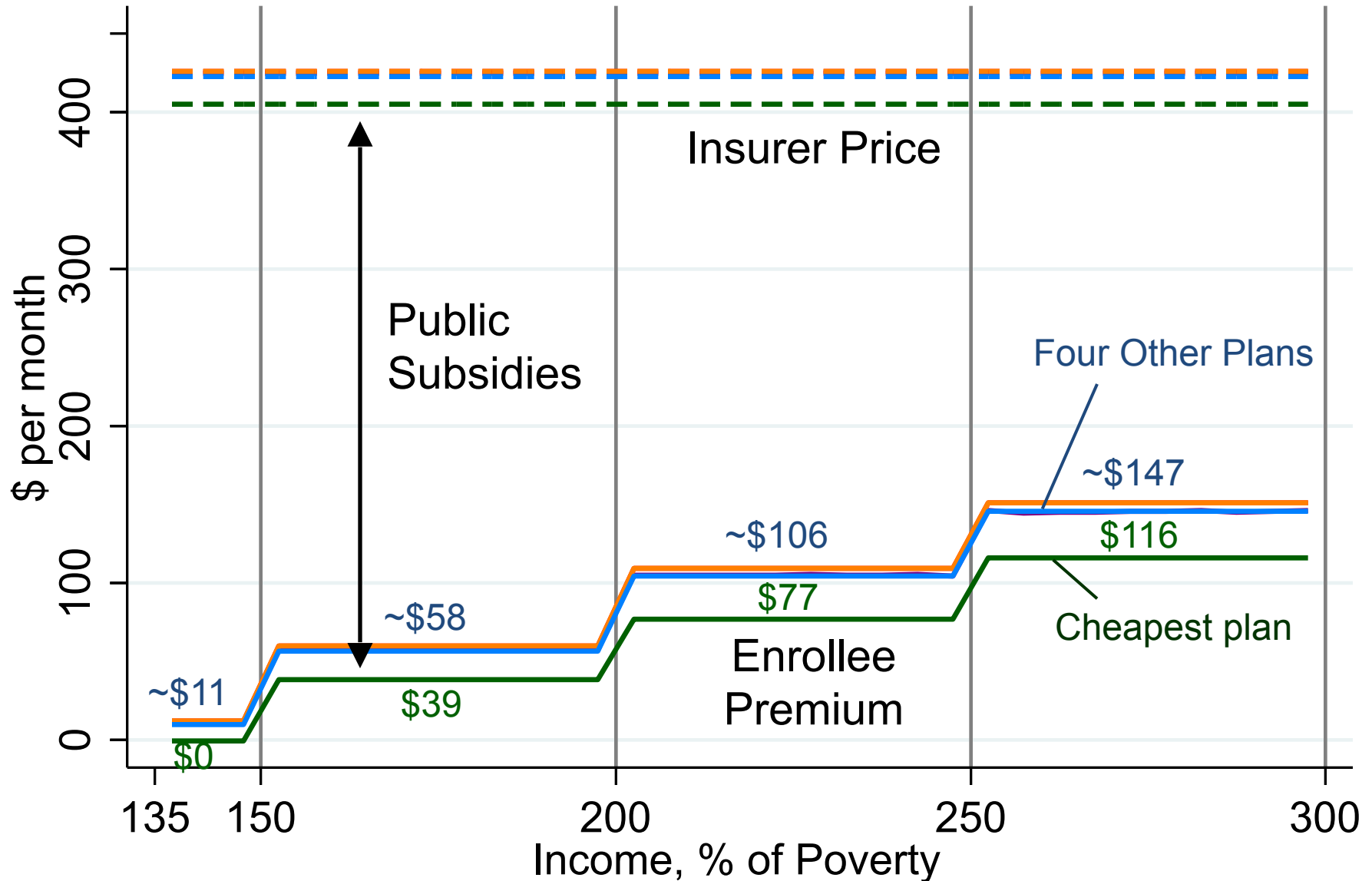 - Each insurer offers a single plan, can set networks of doctors/hospitals

- **Subsidies** are also <u>generous</u> (cover >80% of insurer prices/costs)
  - Set to make lowest enrollee premium "affordable" (0-5% of income)

Subsidy and Premium Discontinuities (2011)
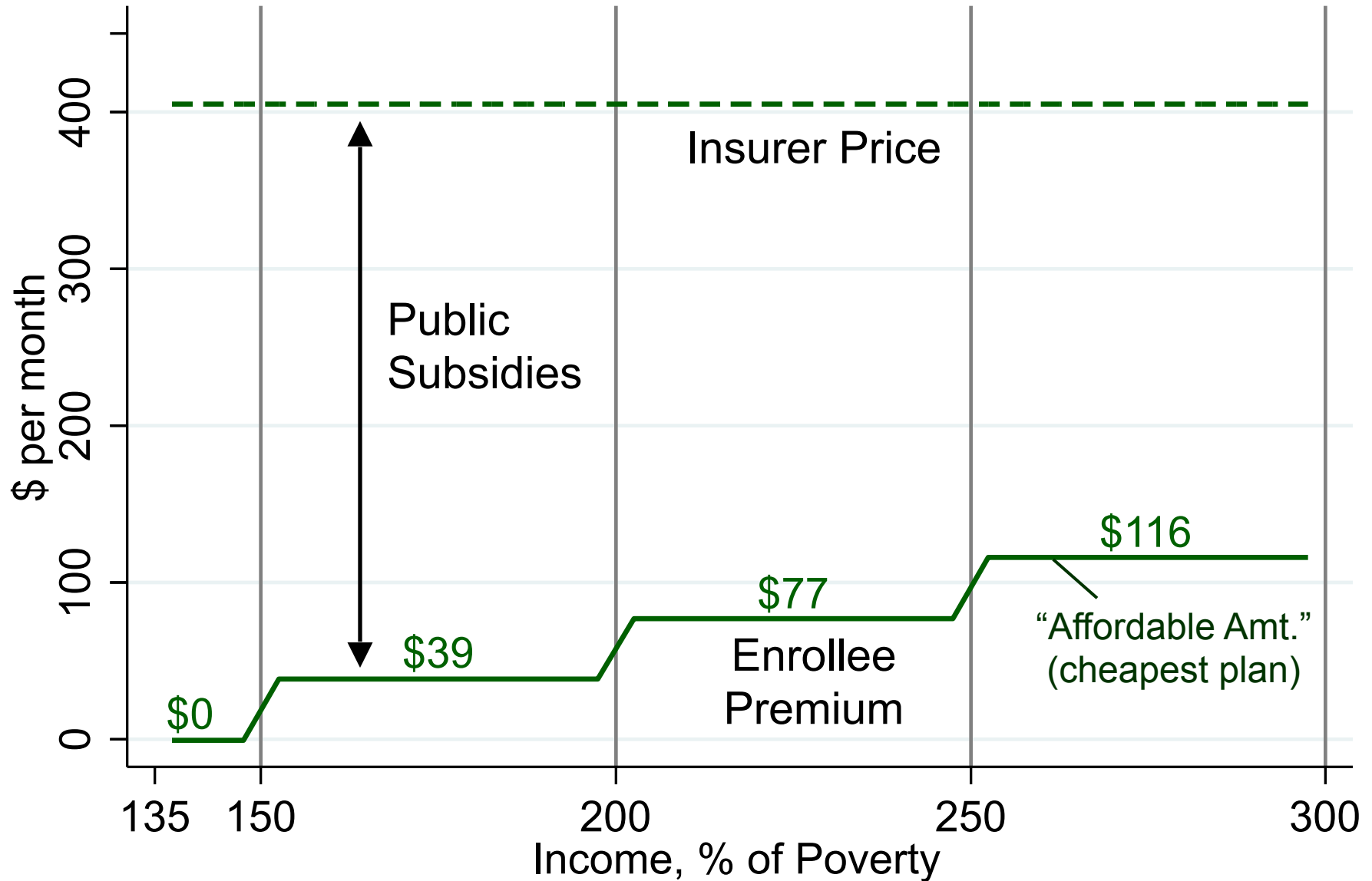
Subsidy and Premium Discontinuities (2011)

Data and Sample Construction

1. **Plan enrollment** (CommCare admin data)

   - Start with individual-level data
   - Collapse to plan enrollment by income (% of FPL)

2. **Insurer medical costs** (CommCare claims data)

   - Linked to enrollment; Collapse to average cost by income (% of FPL)

3. **Eligible population size** (American Community Survey)

   - Restrict to CommCare-eligible people based on observables
     (*age, income, insurance status, citizenship*)
   - Estimate smoothed eligible population size using this sample's
     avg. insurance take-up rate (63%) and income distribution
     - Do robustness checks on these assumptions   → *Graph*

RD Analysis and Assumption

- **RD Analysis:** Use premium change at income thresholds to test for:
  - <u>Demand response</u>: Does enrollment fall?
  - <u>Adverse Selection</u>: Do average costs of enrolled population increase (*suggesting healthy differentially leave*)?

- **Key assumption:** No strategic income manipulation around cutoffs
  - I.e., Eligible population is <u>smooth</u> through cutoffs → so any enrollment change is driven by demand response
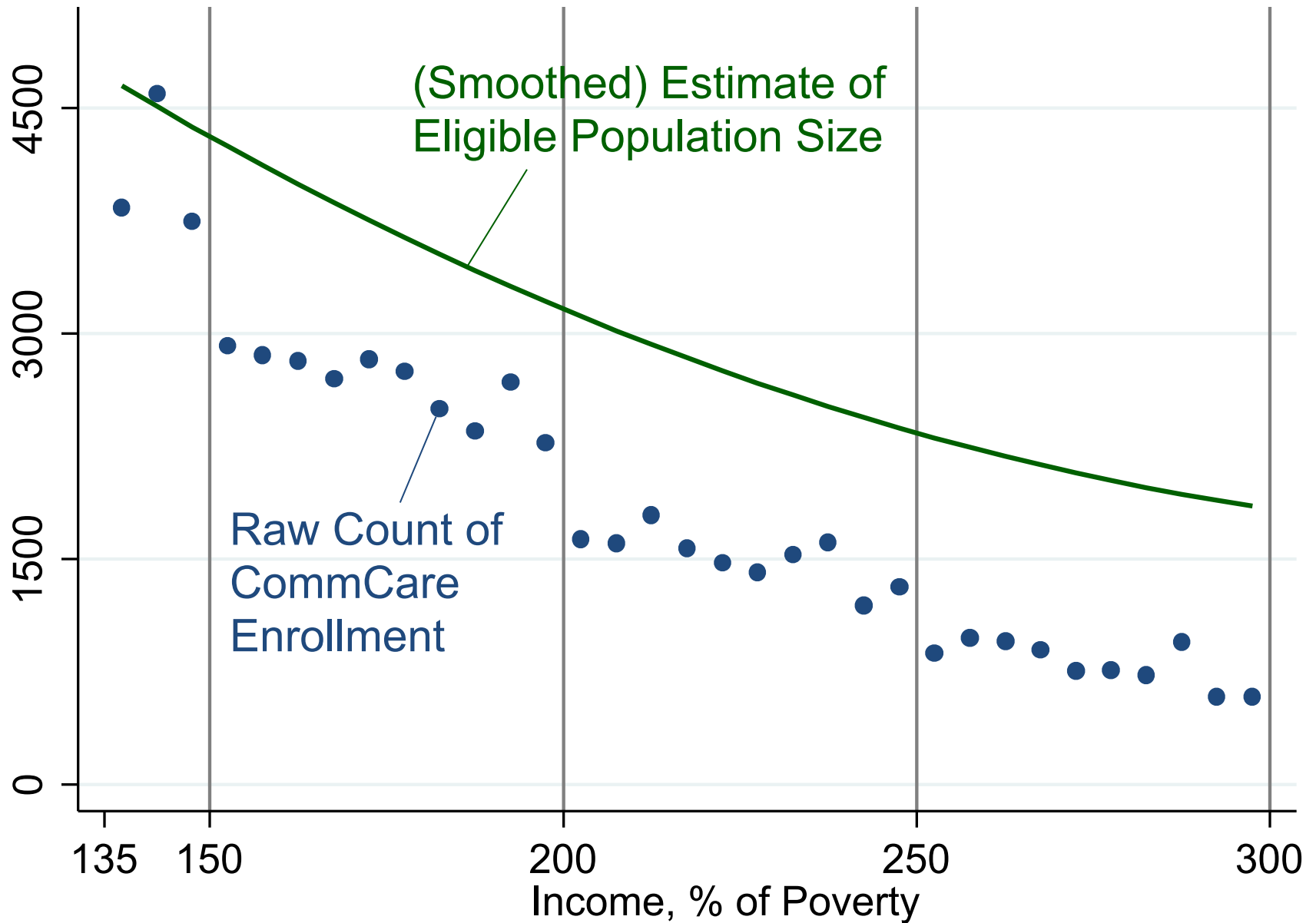
- **No evidence of strategic manipulation**

  1. Institutional: Mapping from reported info to income measure used for subsidies (income as % of FPL) is not salient to applicants
  2. No bunching in income distribution of eligible pop. in ACS (→ *Graphs*)
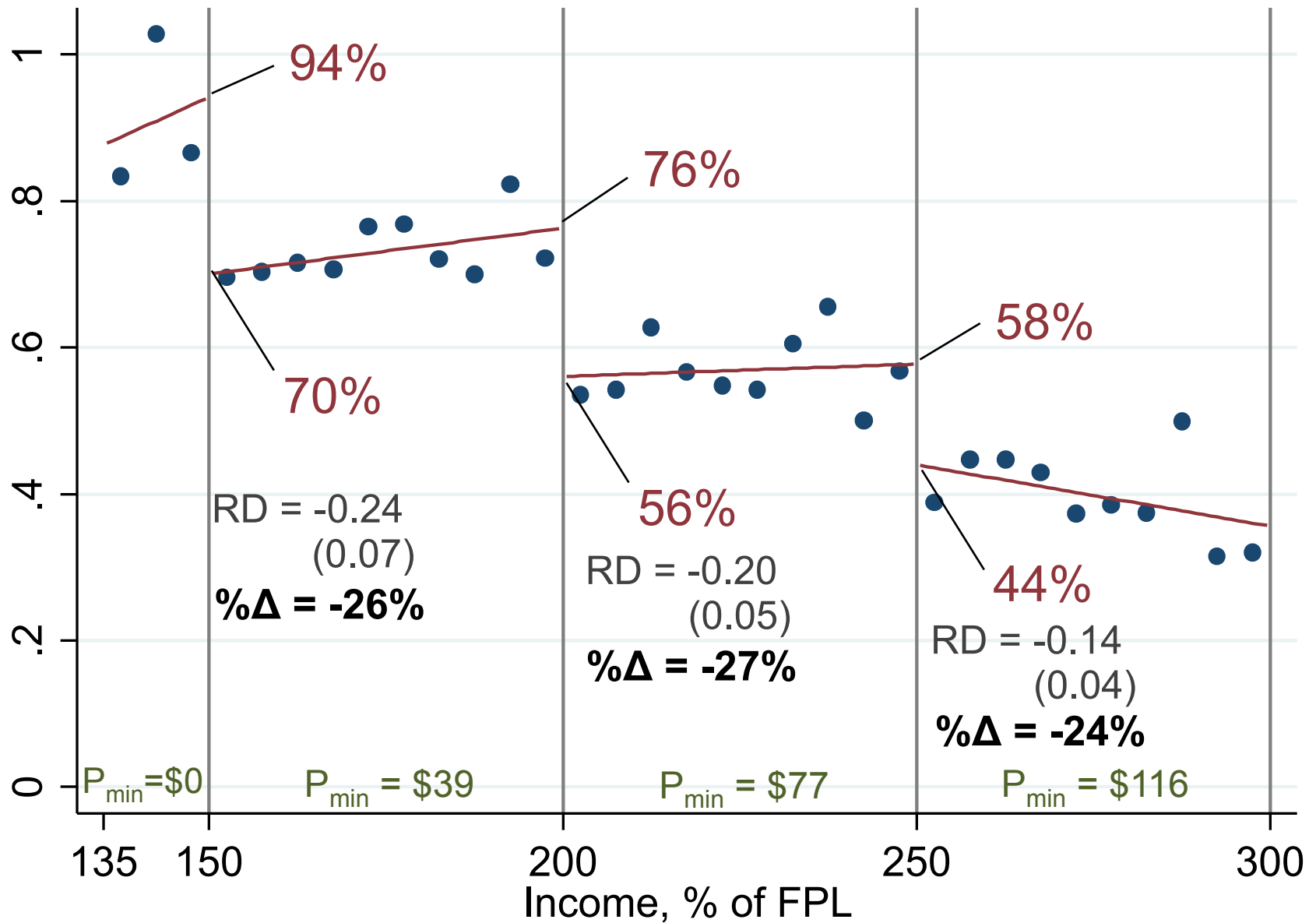 3. No spikes/holes in enrollment distribution around cutoffs in 2011

Enrollment Counts, by Income (2011)

RD = -1054
(318)
%Δ = -26%
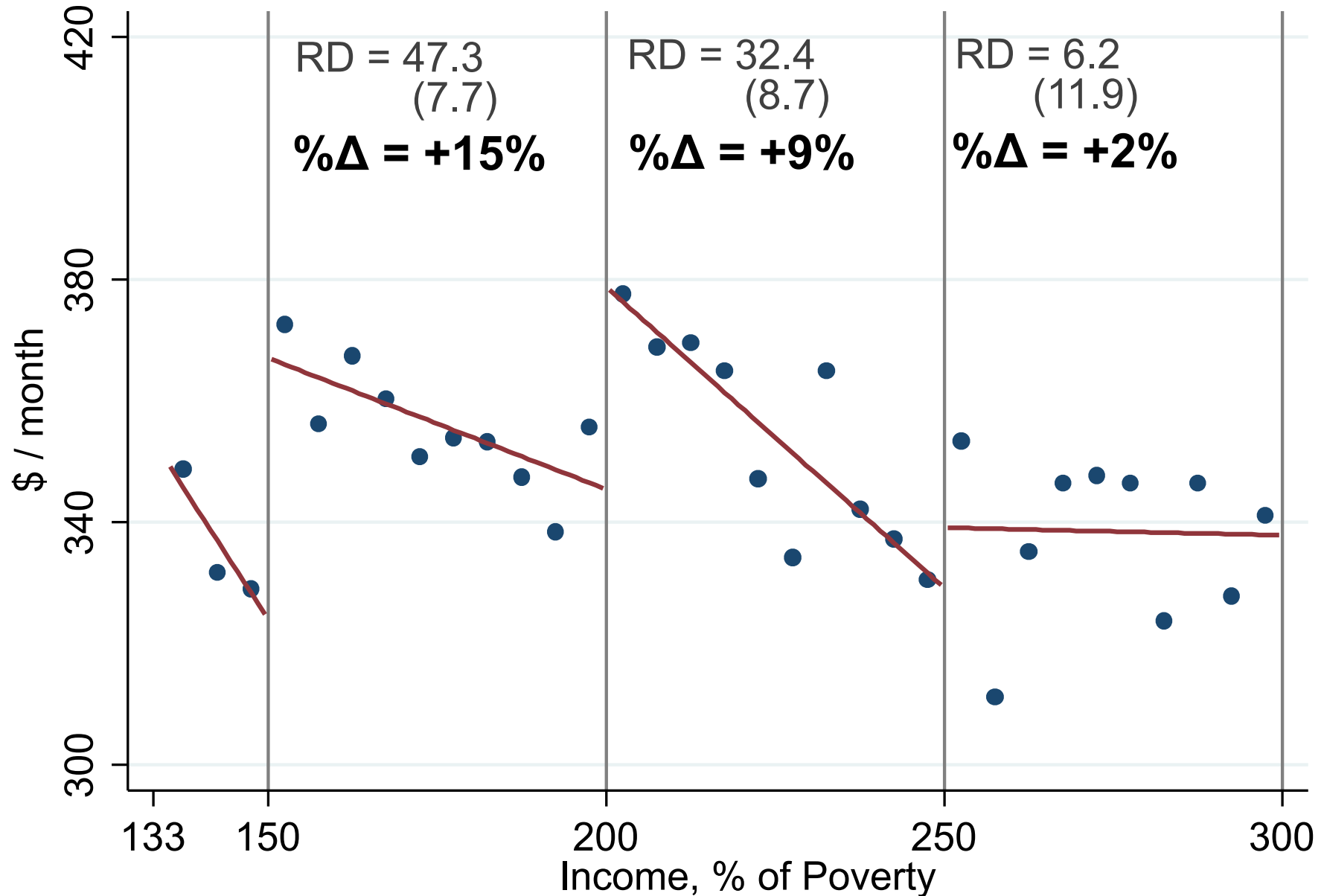
RD = -641
(157)
%Δ = -27%

RD = -326
(99)
%Δ = -25%

Income, % of Poverty
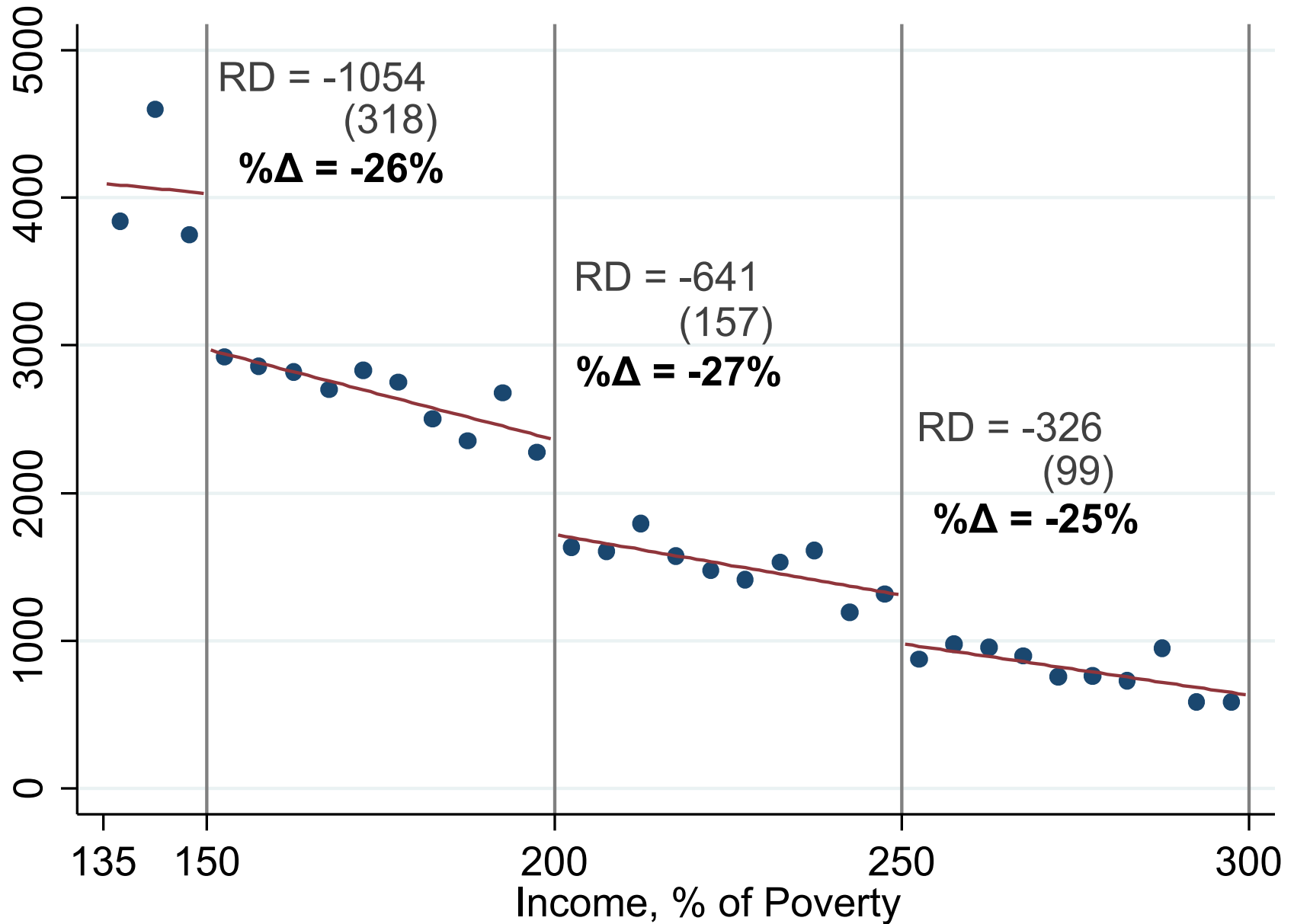
Raw Data: Enrollment and Eligible Population (2011)

(Smoothed) Estimate of Eligible Population Size

Raw Count of CommCare Enrollment

Income, % of Poverty

Share of Eligible Population Insured

94%

76%

70%

RD = -0.24
(0.07)
%Δ = -26%

56%

RD = -0.20
(0.05)
%Δ = -27%

58%

44%

RD = -0.14
(0.04)
%Δ = -24%

P_{min}=$0 P_{min} = $39 P_{min} = $77 P_{min} = $116

Income, % of FPL

Average Insurer Costs, by Income (2009-2013)

RD = 47.3
(7.7)
%Δ = +15%

RD = 32.4
(8.7)
%Δ = +9%

RD = 6.2
(11.9)
%Δ = +2%

$ / month

420

380

340

300

133   150   200   250   300

Income, % of Poverty

→ _Additional Evidence: Age and Risk Score RDs_

Average Insurer Costs, by Income (2011)

RD = 46.9
(15.8)
%Δ = +14%

RD = 30.9
(17.7)
%Δ = +9%

RD = 14.7
(21.7)
%Δ = +4%

$ / month

Income, % of Poverty
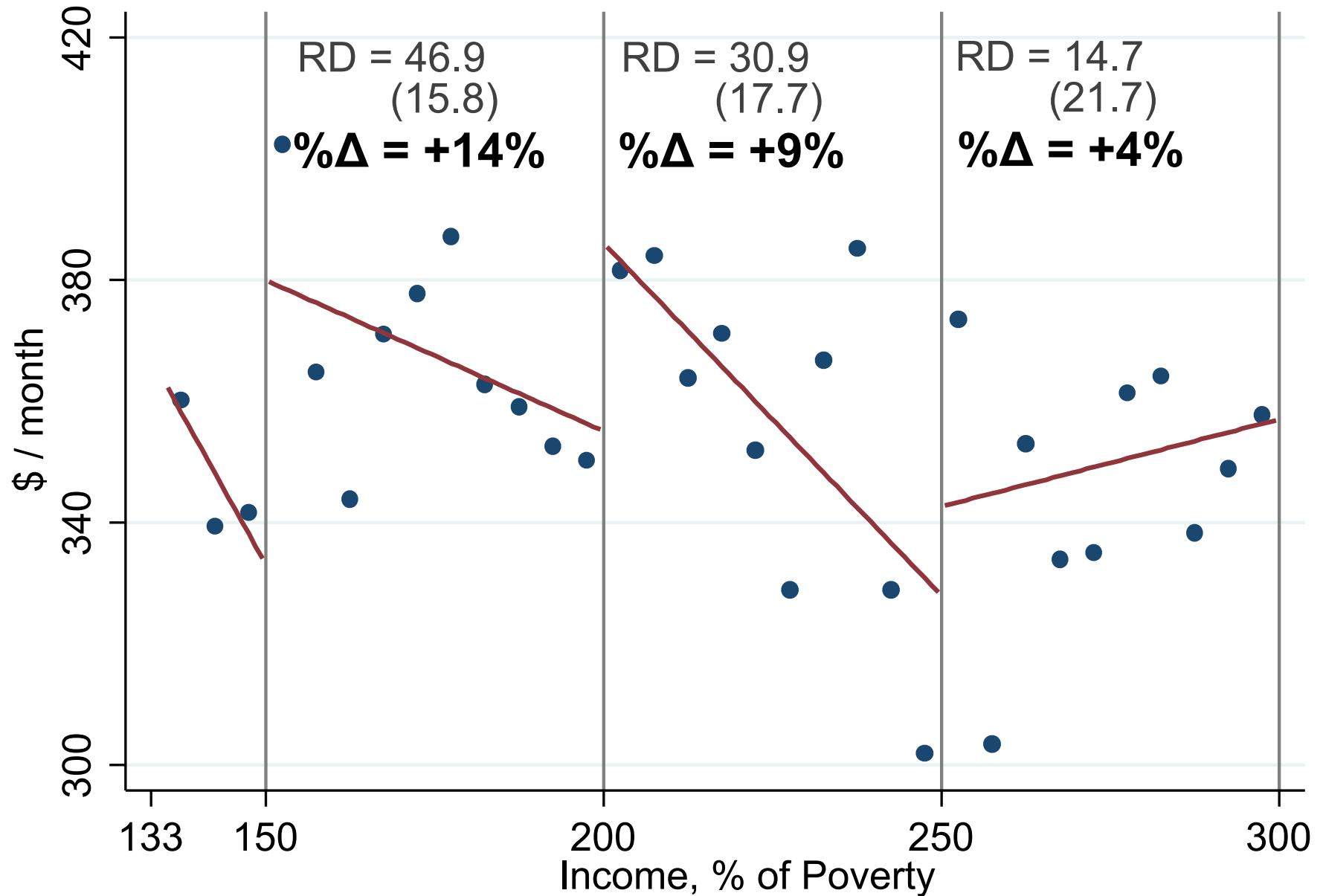
Summary of Descriptive Evidence

- **Low-income insurance demand is <u>highly price sensitive</u>**

  - Falls ~25% for each ~$40 increase in cheapest enrollee premium
  - Modest premiums are a major deterrent to coverage for low-income population

- **Cost RDs: Evidence of <u>adverse selection</u>**

  - Average cost rises by 2-15% ($6-50 / month) as covg. falls at RDs
 - Enrollees who leave are lower cost than remaining people

➢ **How to translate into WTP/cost curves?** Need a model (next step)

2. Model and Estimates of WTP, Cost Curves

Translating Evidence into WTP, Cost Curves

- **Goal:** Use this evidence to measure implied WTP, cost curves

- **Starting point:** Einav, Finkelstein, Cullen (2010) framework

  - Uses exogenous price variation to estimate (and graph) insurance demand and cost curves
  - Extend framework to allow >2 options that are vertically ranked

- **Focus on 2011 where market has useful <u>vertical structure</u>**

  - Four plans with broader networks set price w/in $3 of binding cap ($426)
  - One limited-network plan (CeltiCare) set lower price ($405)
  - Grouping: **"L plan"** (CeltiCare), **"H plan"** (all others), **"U"** (uninsured)

- **Vertical model assumptions:**

  1. <u>Vertical preferences:</u> Everyone prefers H > L
  2. <u>Single index (s) of WTP heterogeneity</u> (= *"WTP for generosity"*)
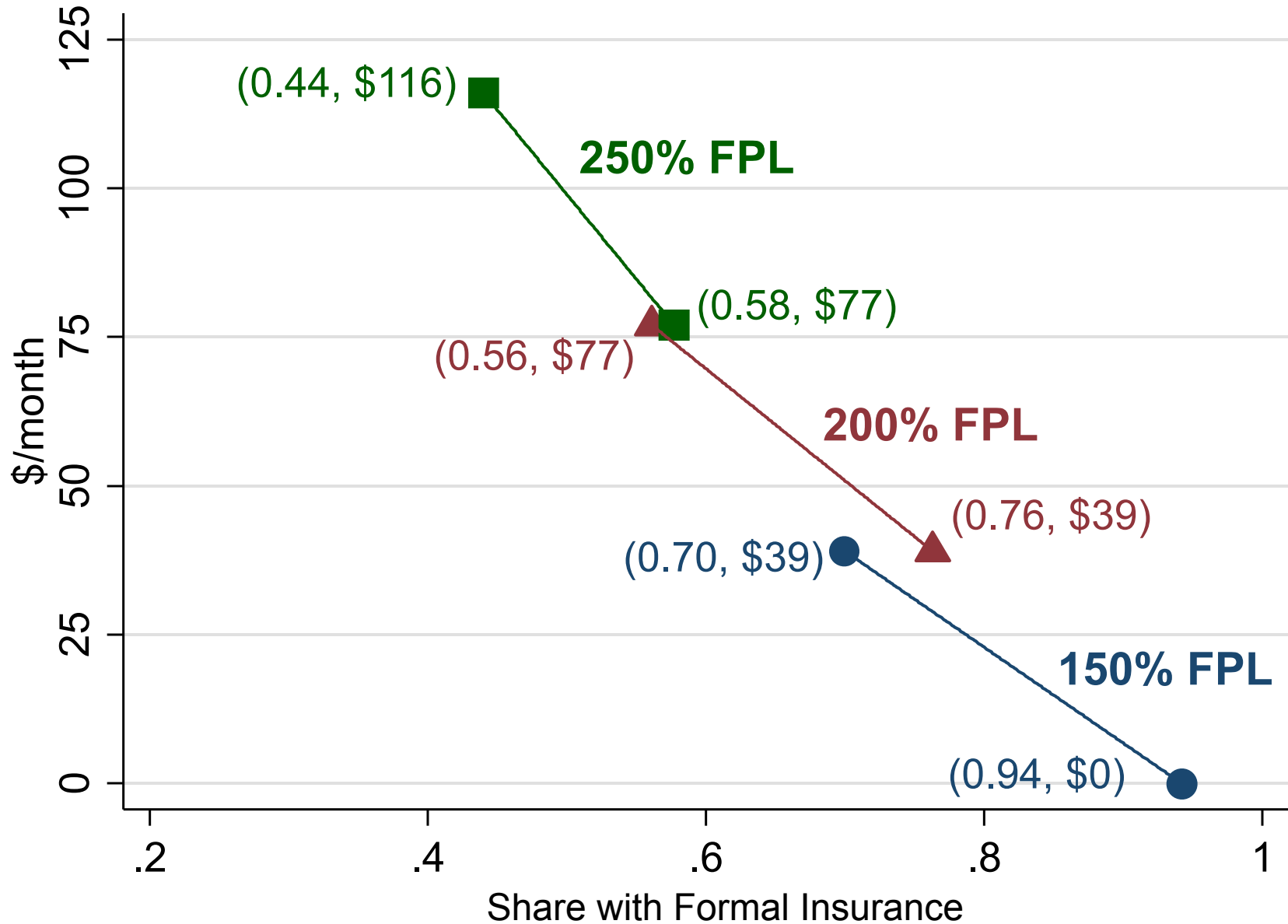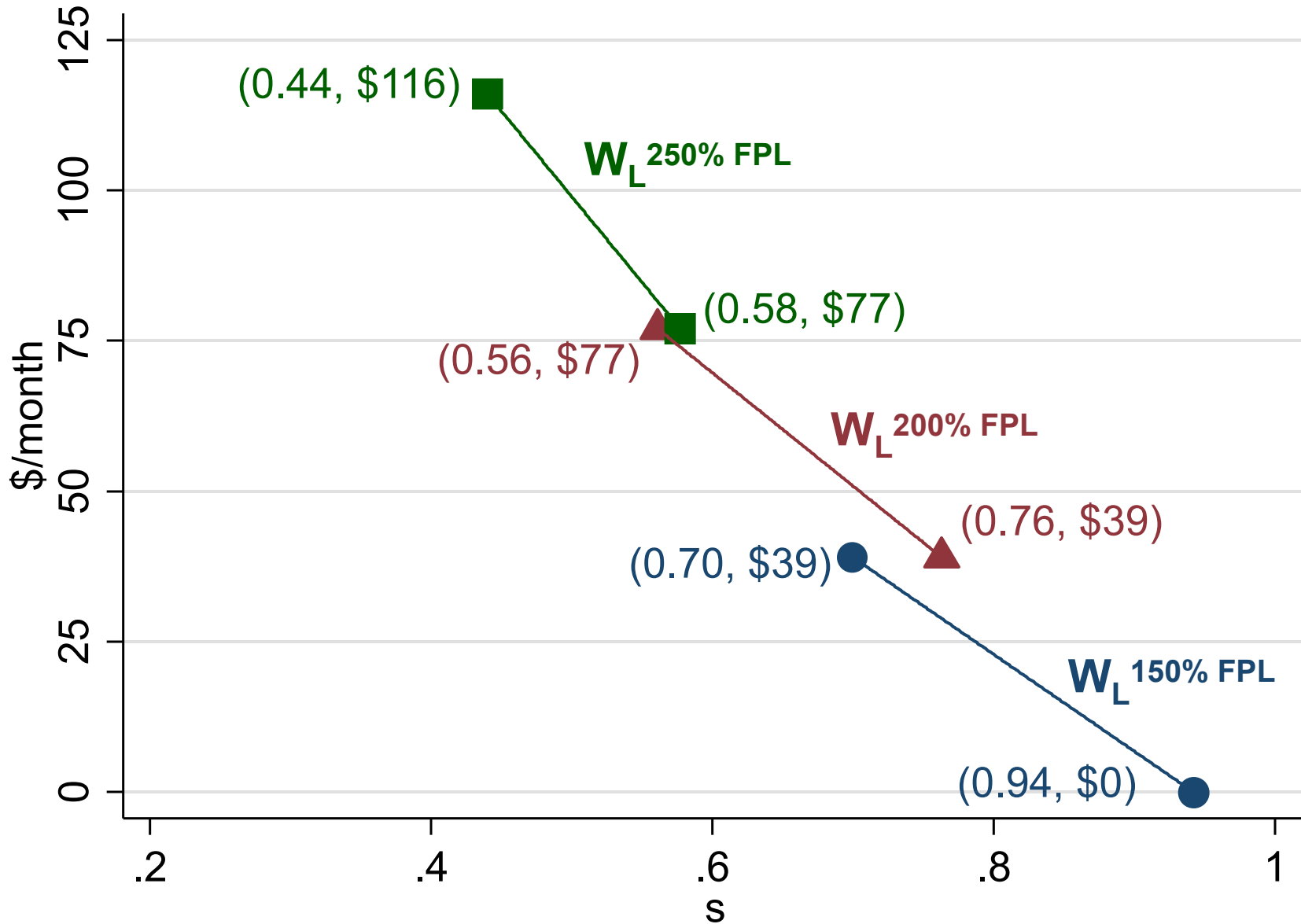
Vertical Model and Identification

WTP

W_H

$P_H - P_L$

ΔW_{HL}

W_L

P_L

Buy H $\quad$ **Buy L** $\quad$ **Buy U** $\qquad$ s

s^*_{HL} $\qquad$ s^*_{LU}
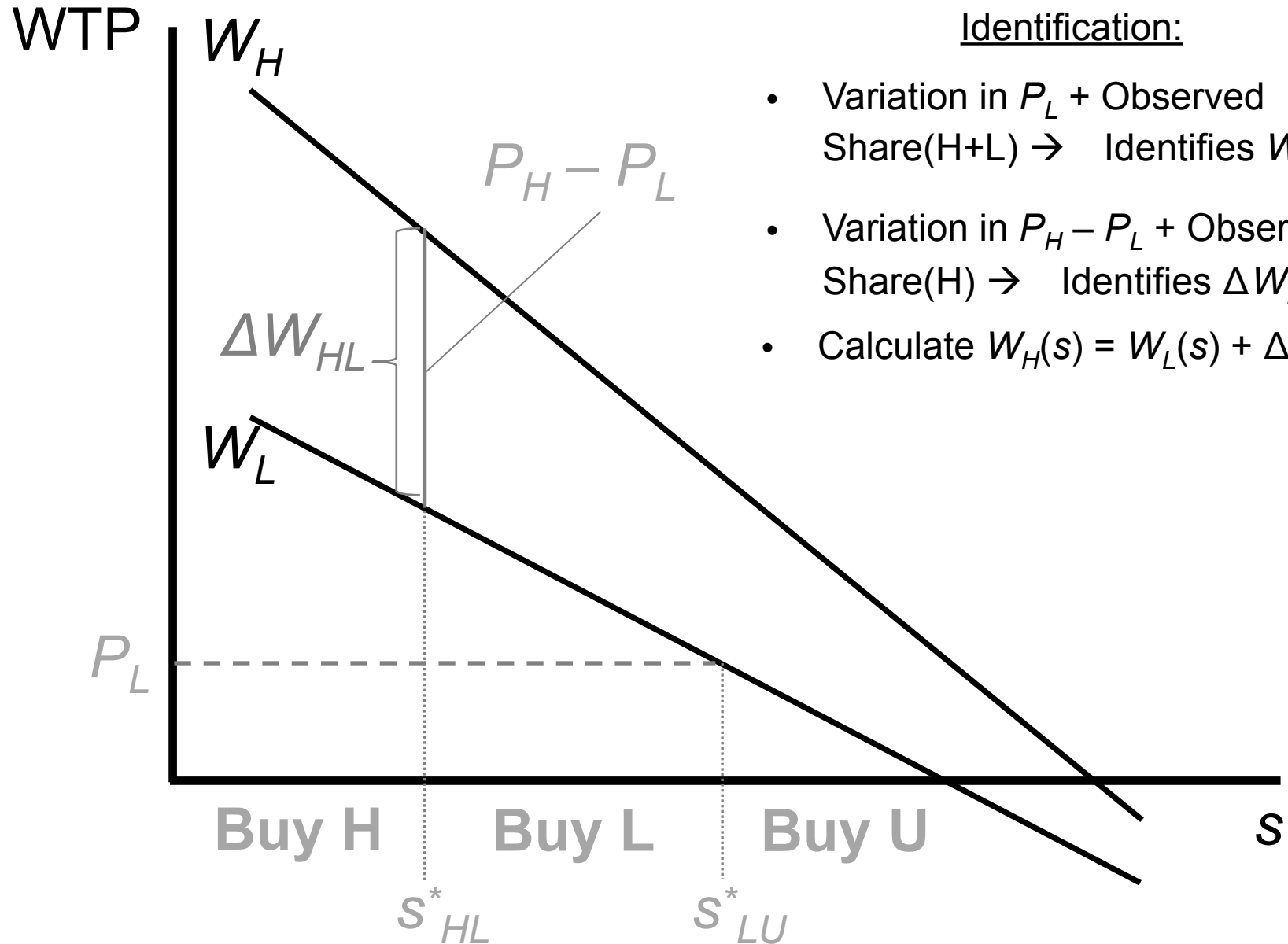
Identification:

- Variation in P_L + Observed Share(H+L) → Identifies $W_L(s)$

- Variation in $P_H - P_L$ + Observed Share(H) → Identifies $\Delta W_{HL}(s)$

- Calculate $W_H(s) = W_L(s) + \Delta W_{HL}(s)$

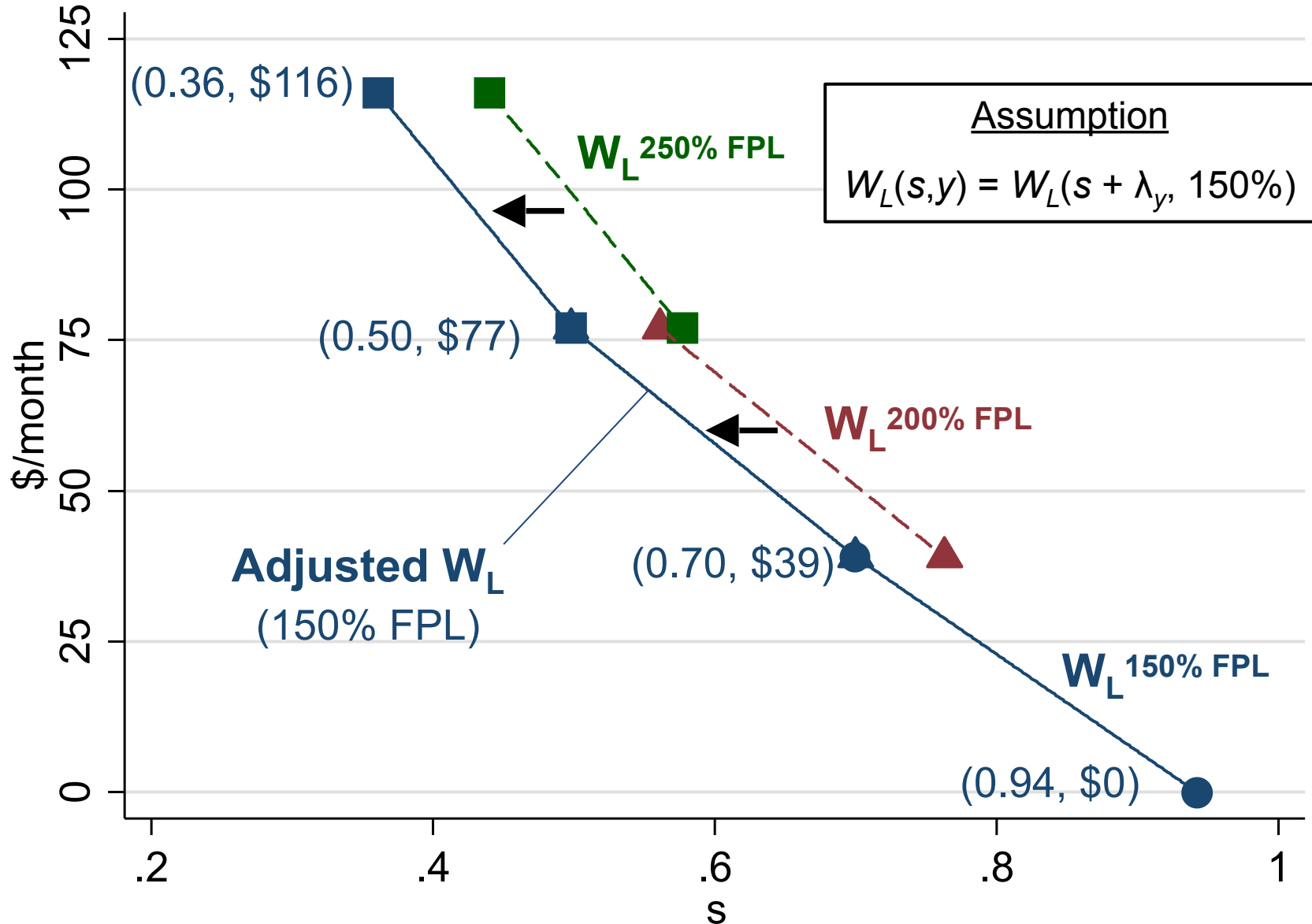Observed Demand Points ($Share_{H+L}$, P_L)

(0.44, $116)

250% FPL

(0.58, $77)

(0.56, $77)

200% FPL

(0.76, $39)

(0.70, $39)

150% FPL

(0.94, $0)

$/month

Share with Formal Insurance

WTP for *L* Plan ($W_L(s)$)

- (0.44, $116)
- W_L **250% FPL**
- (0.58, $77)
- (0.56, $77)
- W_L **200% FPL**
- (0.76, $39)
- (0.70, $39)
- W_L **150% FPL**
- (0.94, $0)

$/month

s

WTP for *L* Plan ($W_L(s)$): Income Adjustment
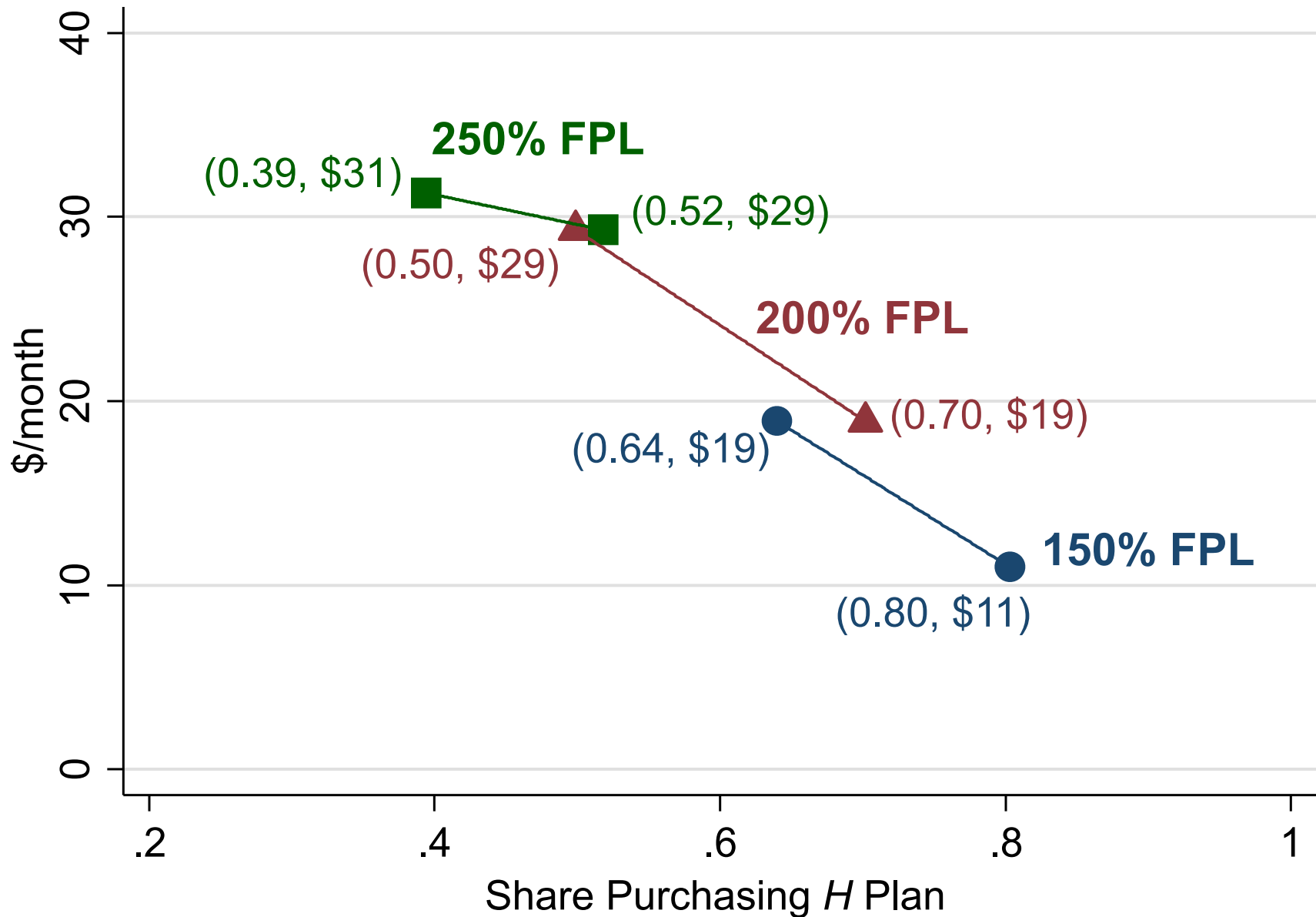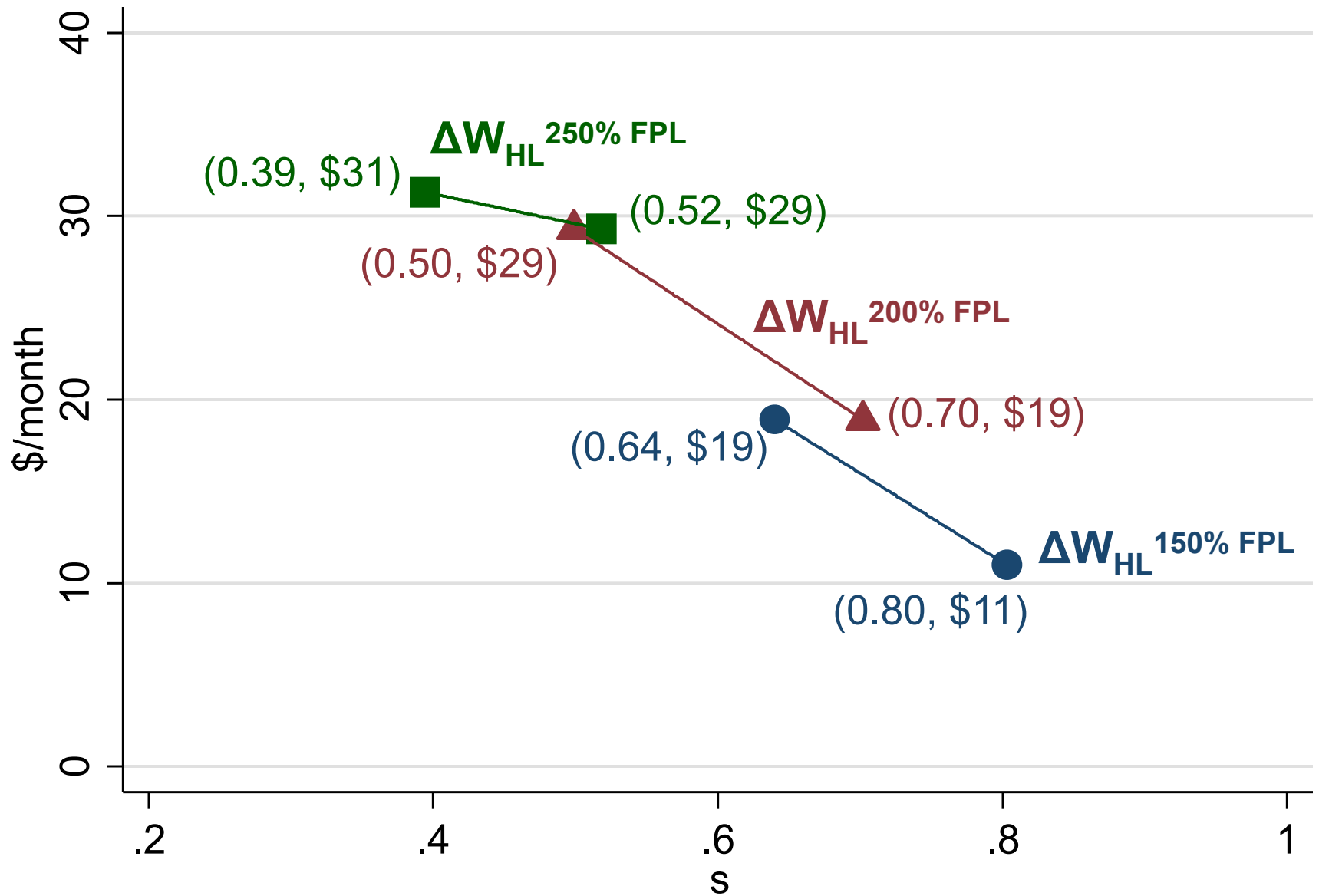
$\$$/month

(0.36, $116)

W_L 250% FPL

Assumption

$W_L(s,y) = W_L(s + \lambda_y, 150\%)$

(0.50, $77)

W_L 200% FPL

Adjusted W_L
(150% FPL)

(0.70, $39)

W_L 150% FPL

(0.94, $0)

s

Observed Demand Points ($Share_H$, $P_H - P_L$)

250% FPL

(0.39, $31)

(0.52, $29)

(0.50, $29)

200% FPL

(0.70, $19)

(0.64, $19)

150% FPL

(0.80, $11)

$/month

Share Purchasing H Plan

WTP for H relative to L ($\Delta W_{HL}(s)$)

ΔW_{HL} **250% FPL**

(0.39, $31)

(0.52, $29)

(0.50, $29)

ΔW_{HL} **200% FPL**

(0.70, $19)

(0.64, $19)

ΔW_{HL} **150% FPL**

(0.80, $11)

$/month

s

WTP for H relative to L ($\Delta W_{HL}(s)$) – Adjusted

Assumption

$$\Delta W_{HL}(s,y) = \Delta W_{HL}(s + \lambda_y, 150\%)$$

ΔW_{HL} 250% FPL

(0.31, \$31)

(0.44, \$29)

ΔW_{HL} 200% FPL

Adjusted ΔW_{HL}
(150% FPL)

(0.64, \$19)

ΔW_{HL} 150% FPL

(0.80, \$11)

\$/month

s

Final WTP Curves for Insurance

$W_H(s)$

$\Delta W_{HL}(s)$

(0.36, $116)

(0.50, $77)

(0.70, $39)

$W_L(s)$

(0.94, $0)

$ per month

s

Estimating Cost of Marginal Consumers

- Efficiency in insurance markets depends on comparison b/n WTP (*just estimated*) vs. cost of <u>marginal</u> consumers

  - <u>Adverse selection</u>: Marginal consumers are lower-cost than average

- **Cost curve notation:**

  - $C_j(s)$ = Insurer cost (in plan j) for consumer of type s
    = Cost of marginal enrollees if $P_j = W_j(s)$ (*in market with only plan j*)
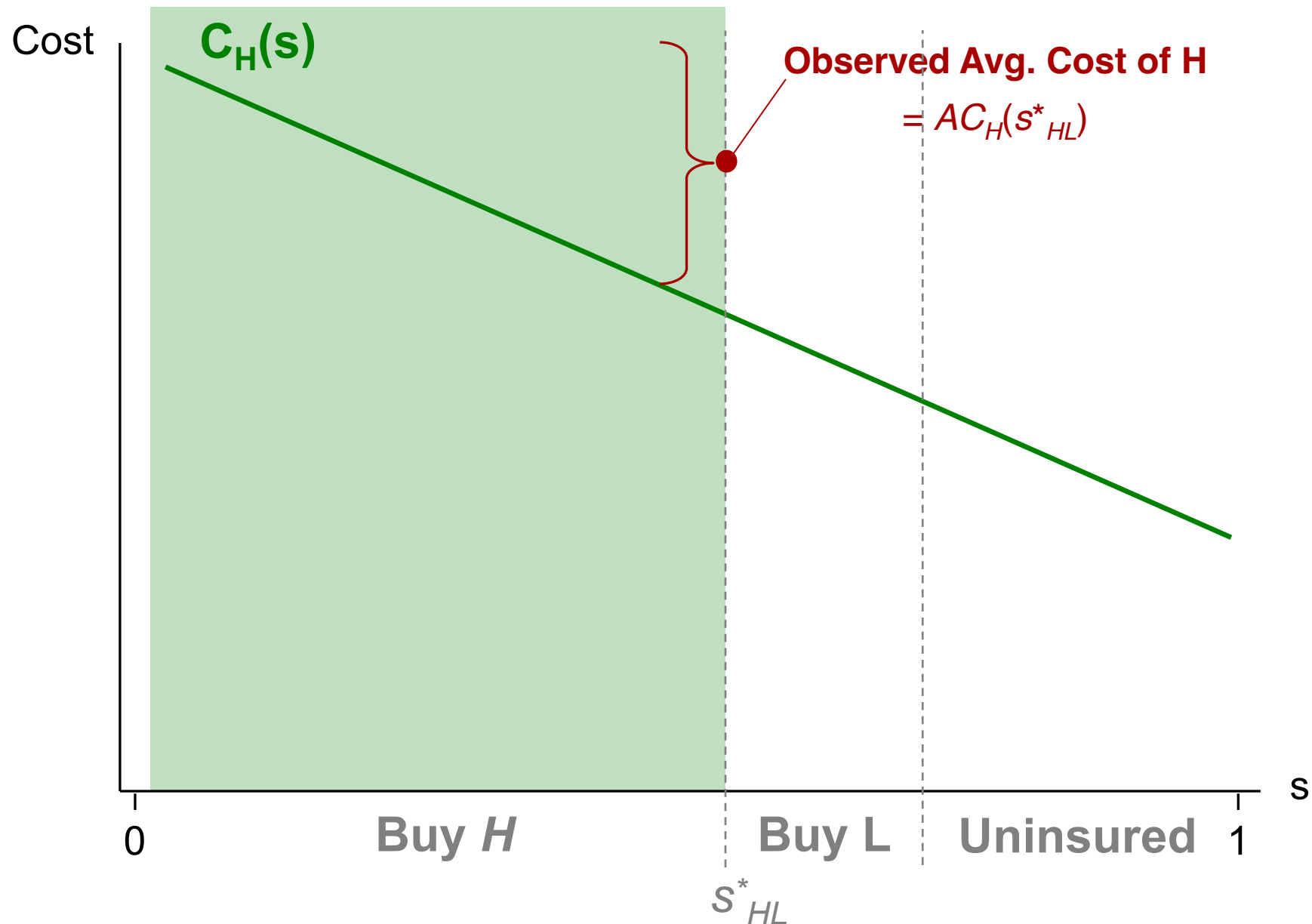 - $AC_j(s)$ = Insurer's average cost if cover all types with WTP ≥ $W_j(s)$

- **Use effect of price variation on AC_H to estimate $C_H(s)$**
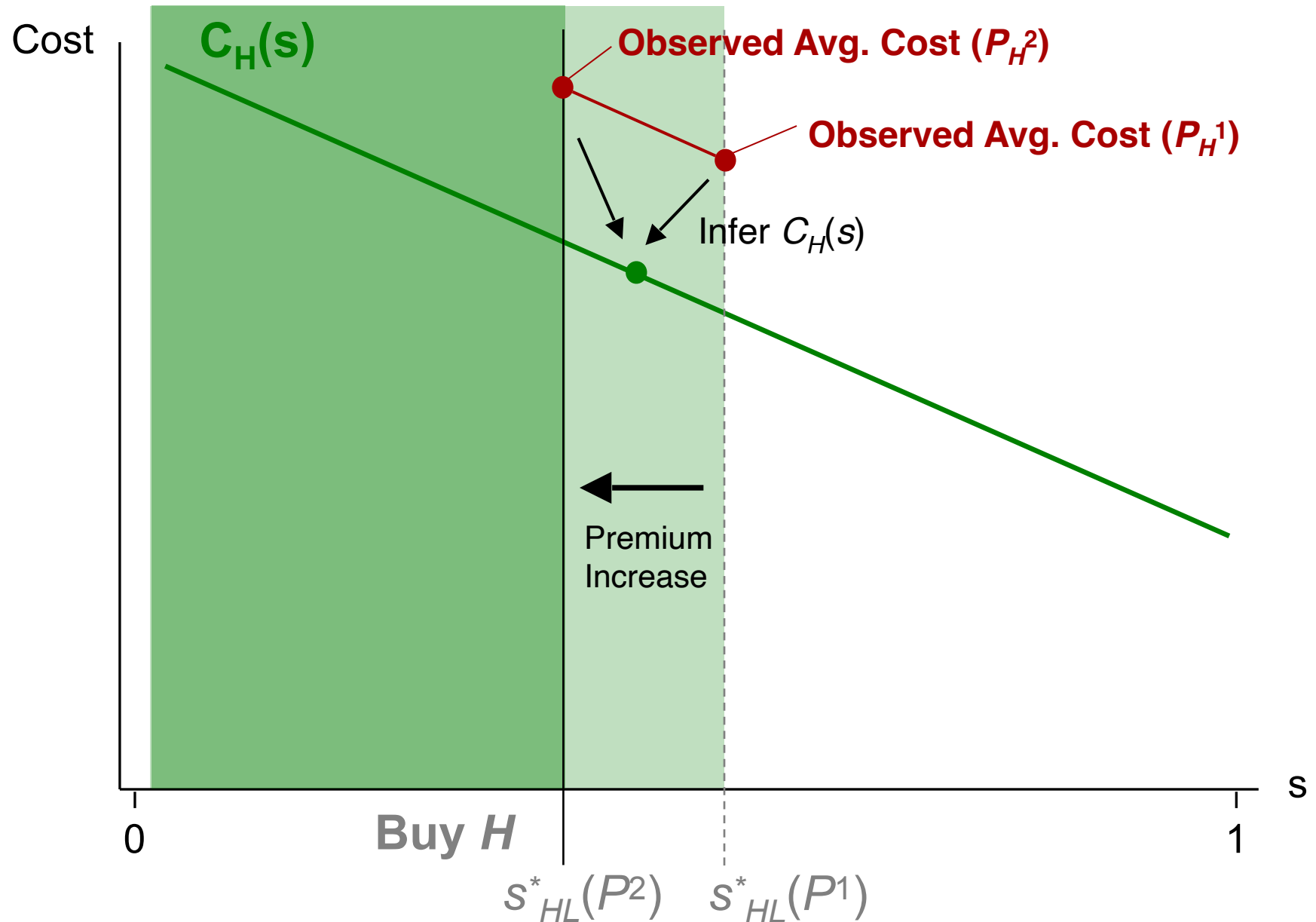
  - Analogous to Einav, Finkelstein, Cullen (2010)
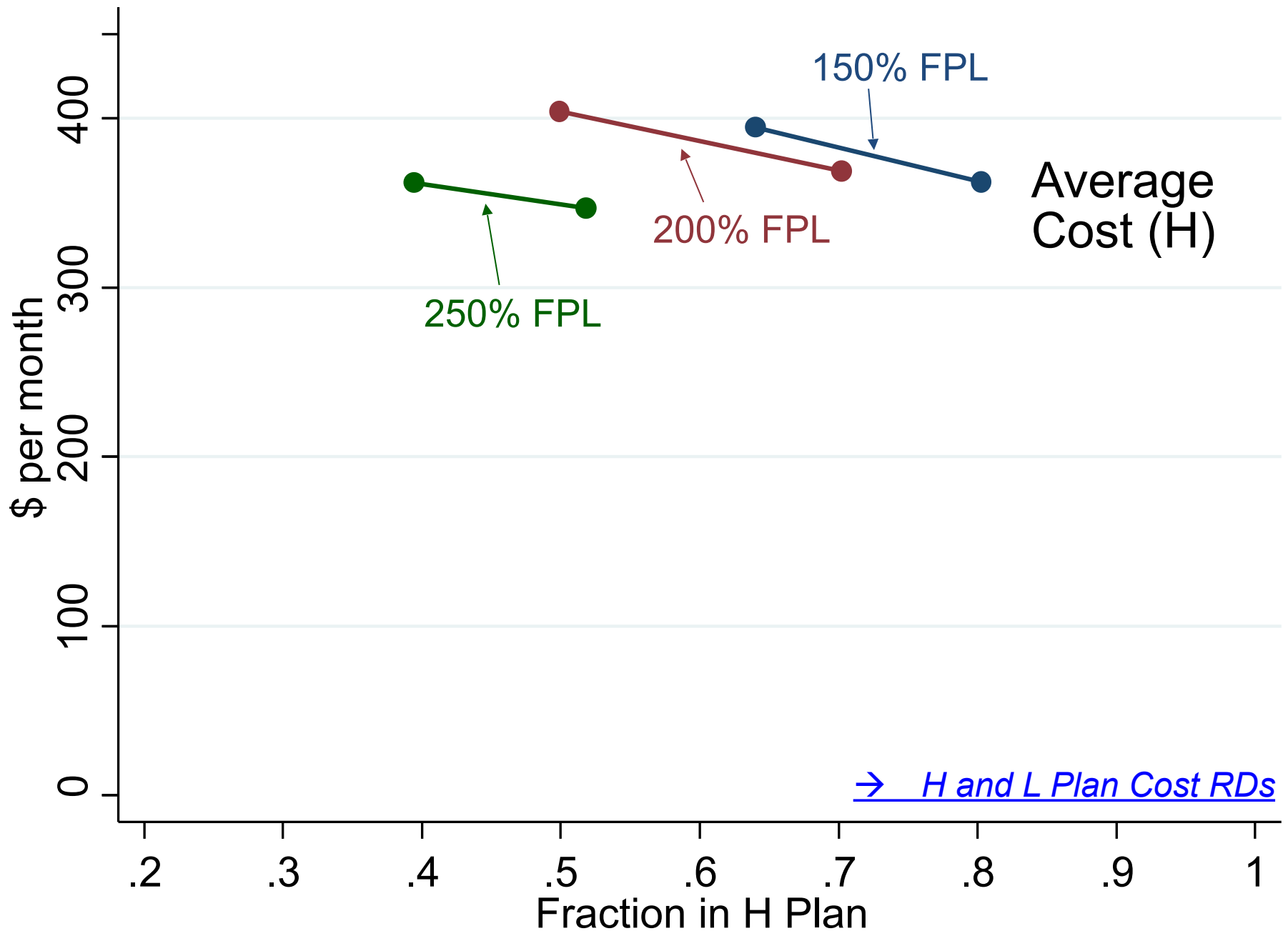 - Focus on C_H but have alternate method for estimating $C_L(s)$ (→ *Details*)
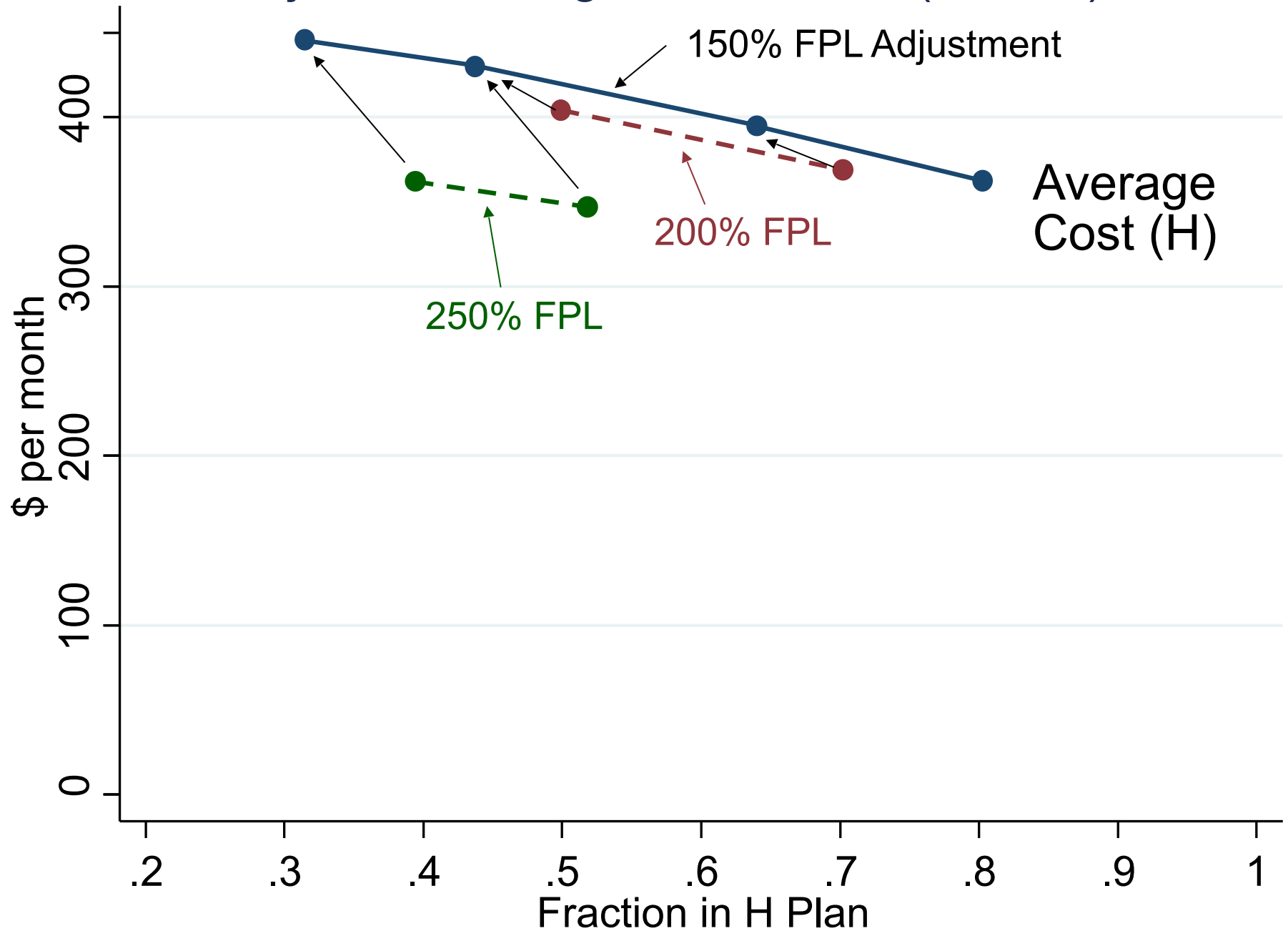
Identifying Cost of *H* Plan

Cost

$C_H(s)$

Observed Avg. Cost of H
$= AC_H(s^*_{HL})$

| 0 | Buy *H* | Buy L | Uninsured | 1 |

s

s^*_{HL}

Identifying Cost of *H* Plan: Using Price Variation

- Cost
- $C_H(s)$
- **Observed Avg. Cost (P_H^2)**
- **Observed Avg. Cost (P_H^1)**
- Infer $C_H(s)$
- Premium Increase
- **Buy *H***
- 0
- 1
- s
- $s^*_{HL}(P2)$
- $s^*_{HL}(P1)$

Observed Average Costs (*H* Plan)

150% FPL

200% FPL

250% FPL

Average Cost (H)

→ *H and L Plan Cost RDs*

$ per month

Fraction in H Plan

Adjusted Average Cost Curve (*H* Plan)

Final WTP and Cost Curves

Result #1: Substantial Adverse Selection

$ per month

Downward sloping cost curves

$AC_H(s)$

$C_H(s)$

$W_H(s)$

s

Result #2: Little Take-up w/out Large Subsidies

$\$$ per month
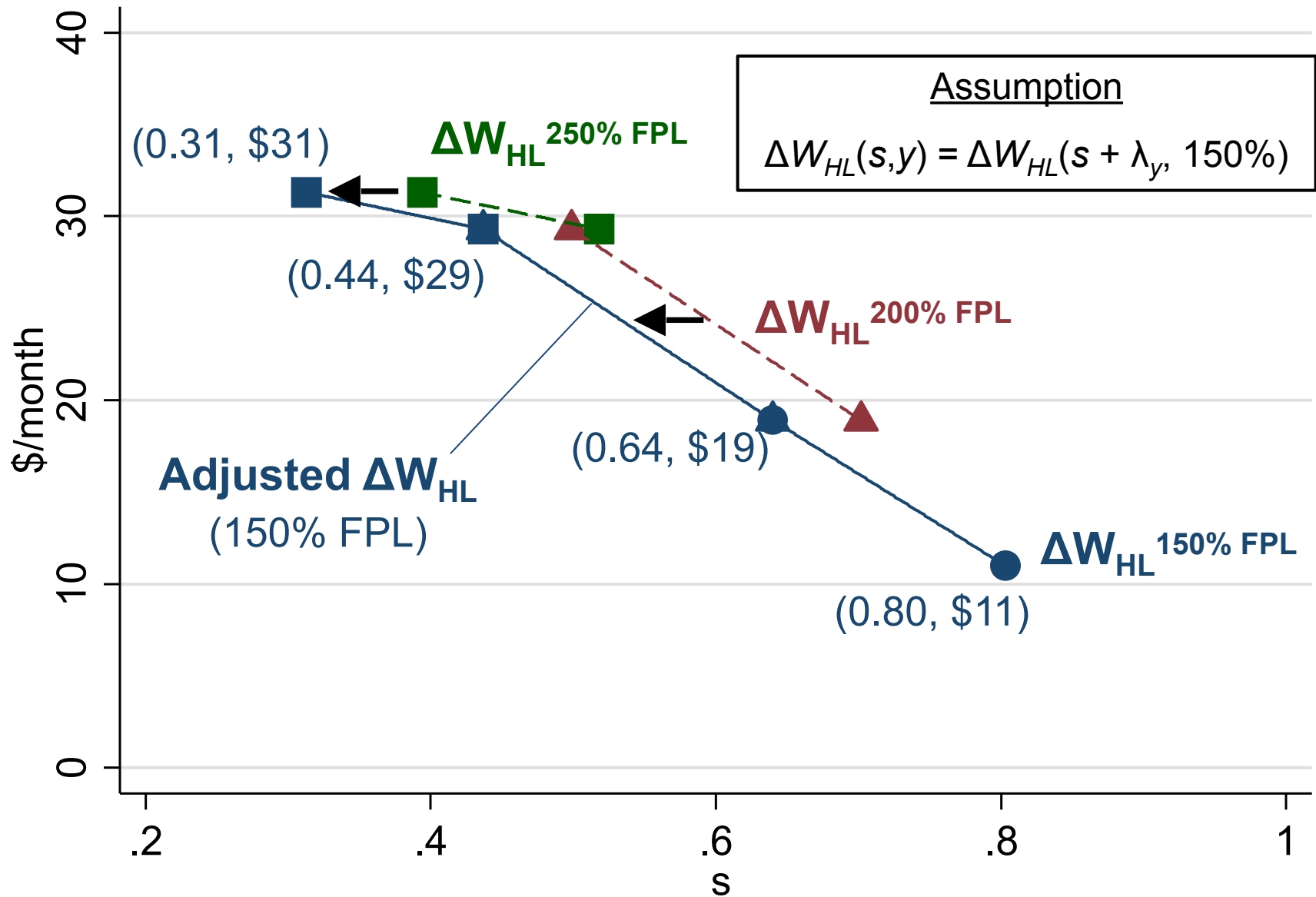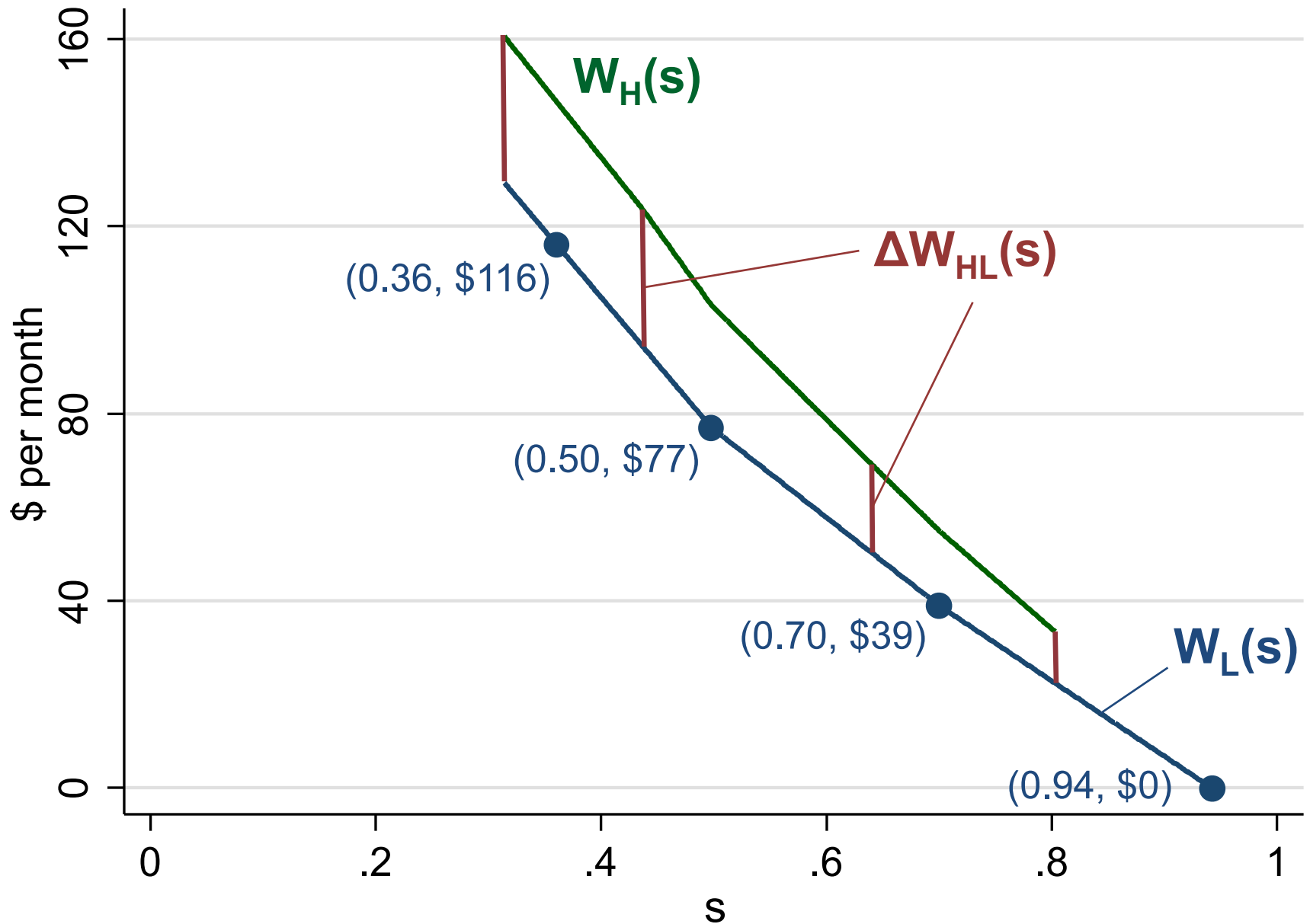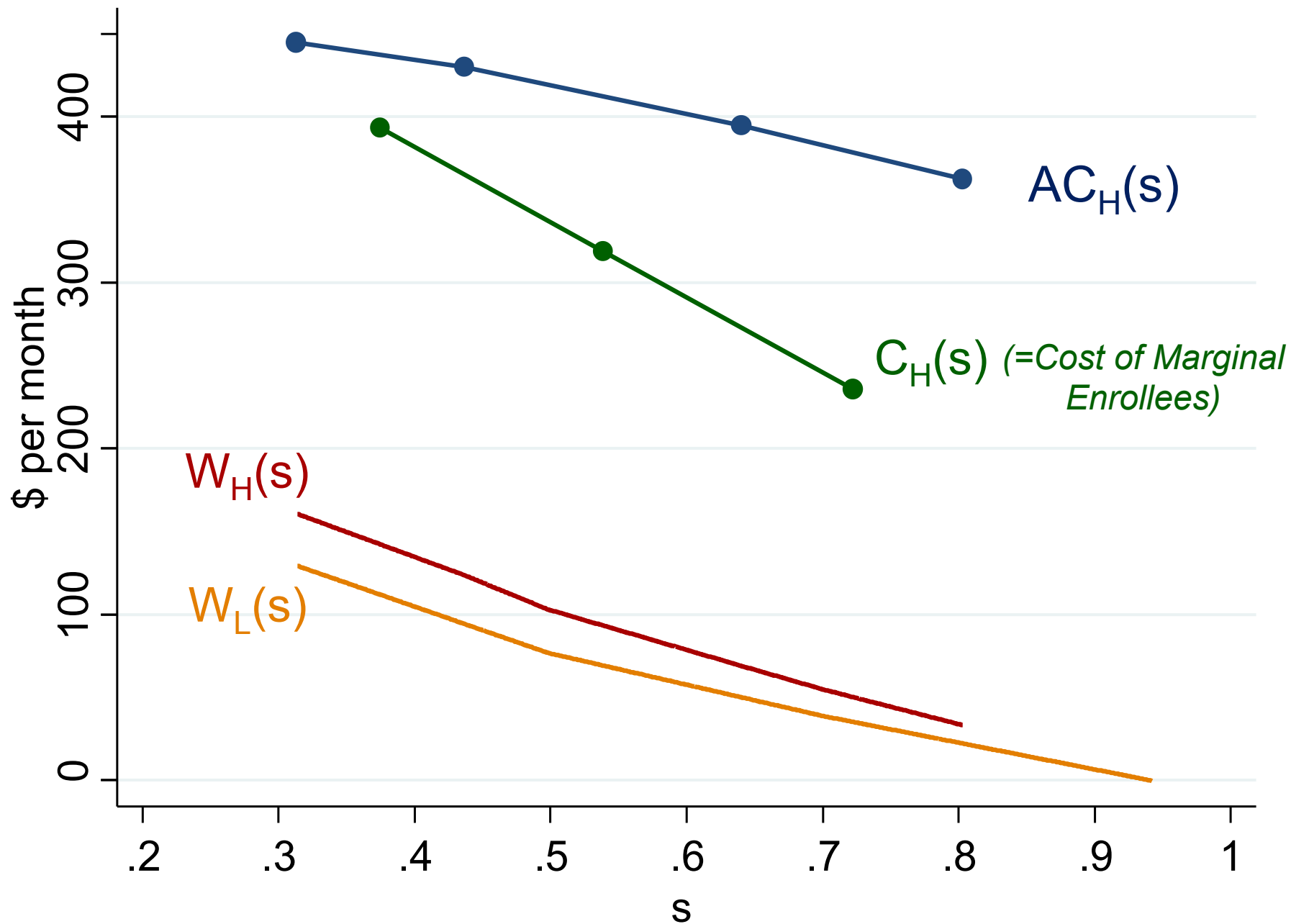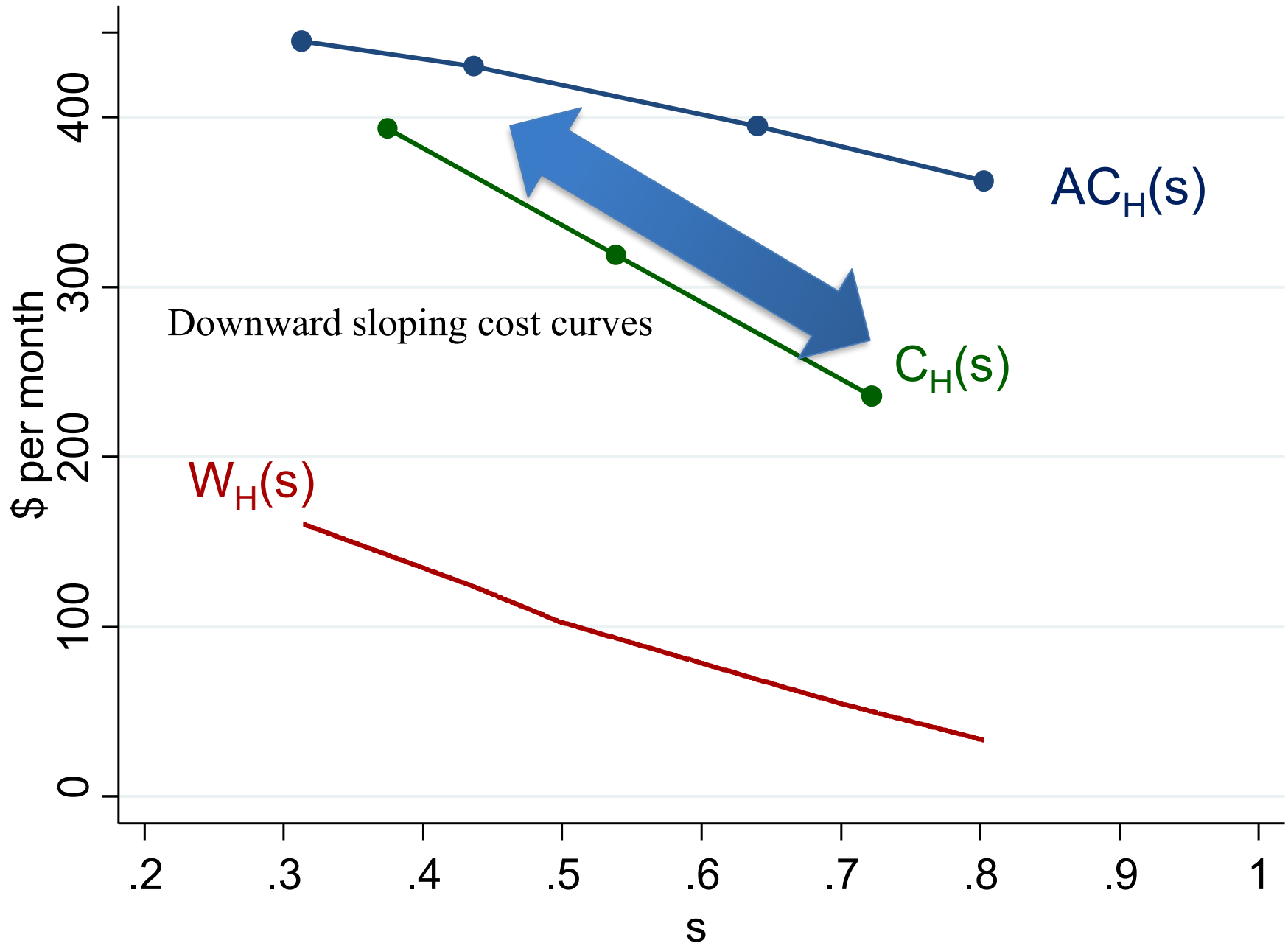
$AC_H(s)$

$C_H(s)$

$W_H(s)$

Demand well below average cost

➢ Premium = 25% of AC → 49% take-up
➢ Premium = 10% of AC → 79% take-up

s
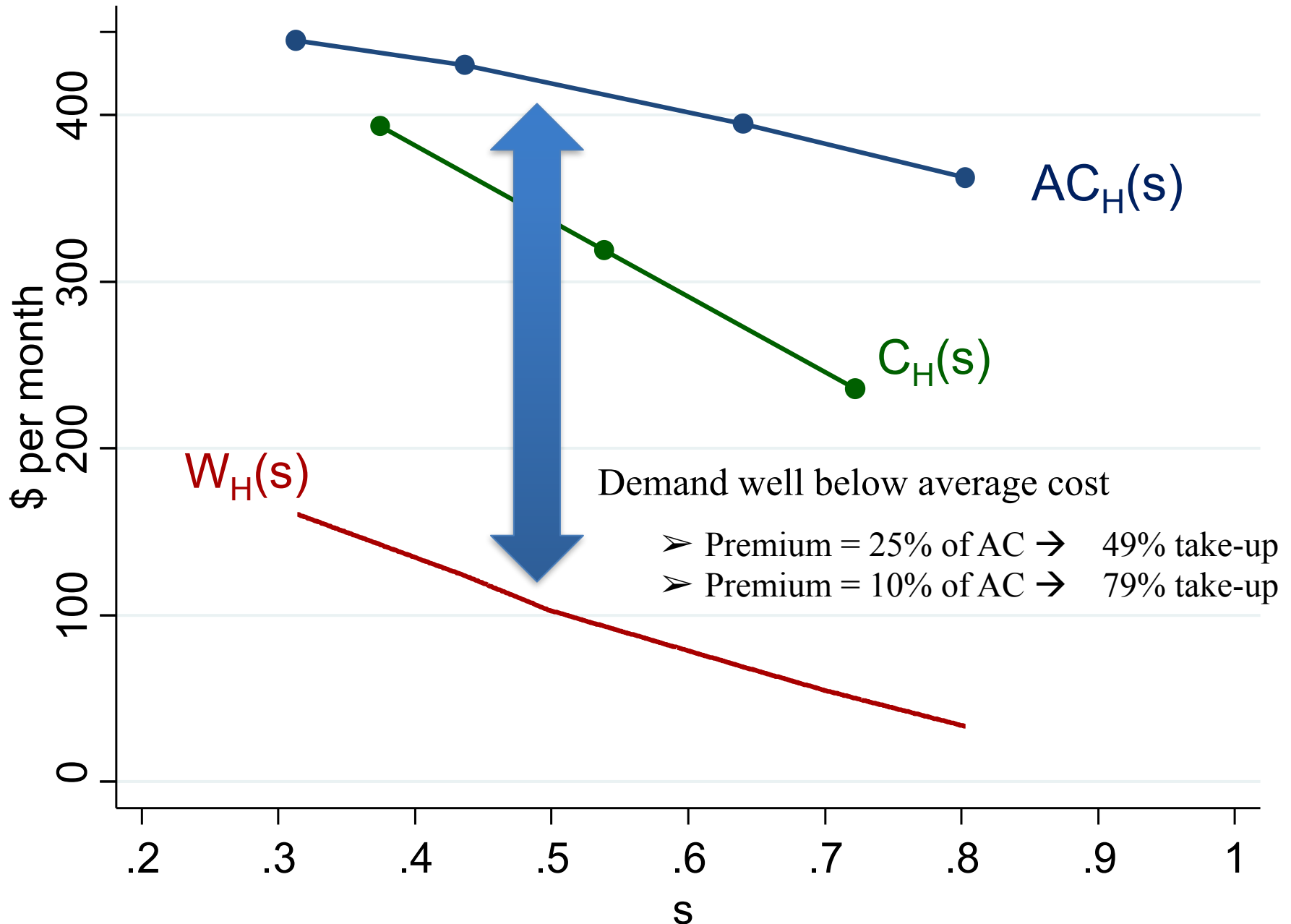
Result #3: Adverse selection alone cannot explain low coverage

$AC_H(s)$

$C_H(s)$

$W_H(s)$

Demand also well below
enrollees' *own* expected costs

$ per month

s
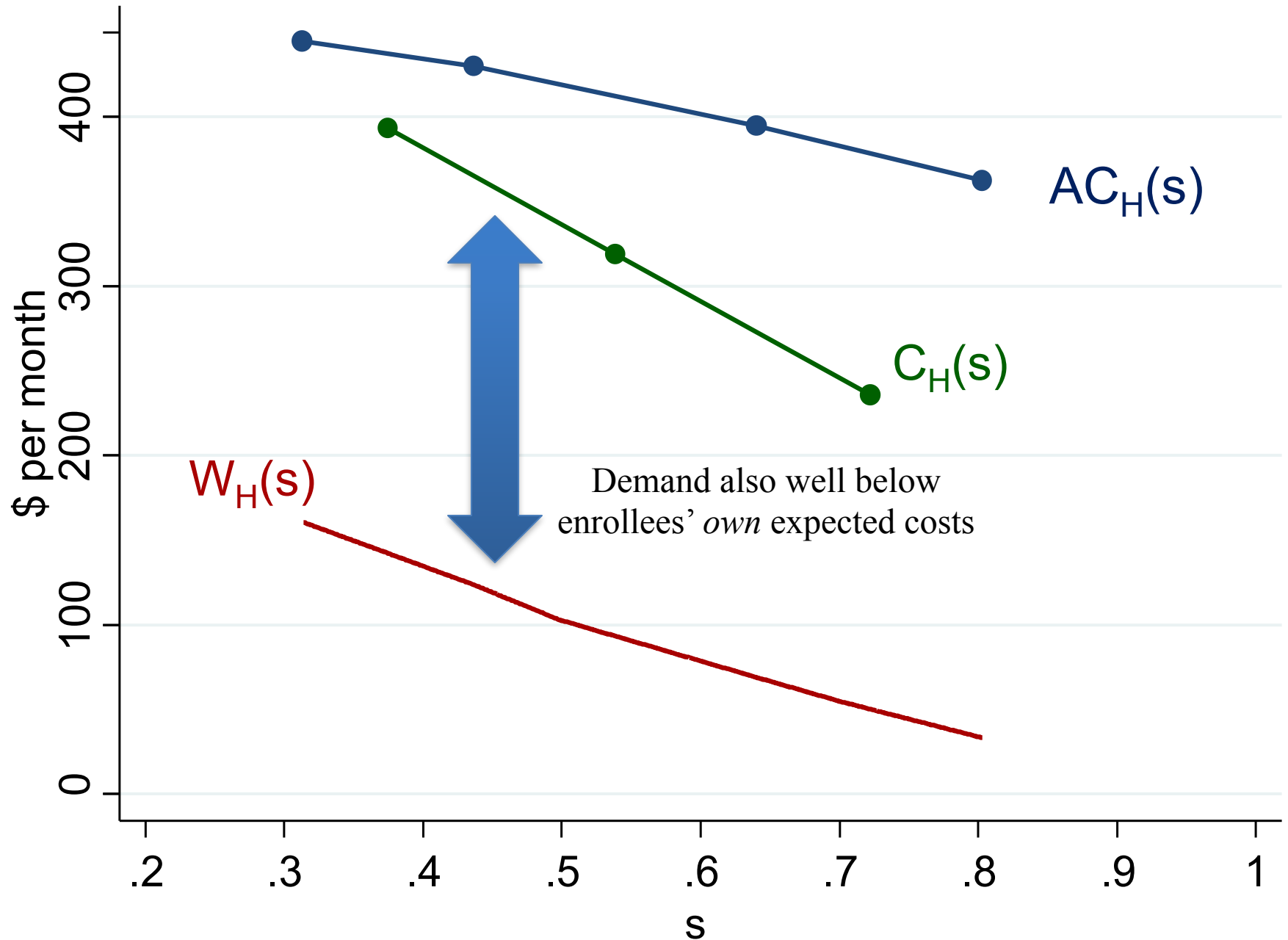
Robustness

- **Main result:** Low-income WTP for insurance is <u>far below</u> own expected medical costs (*for entire 70% of eligible pop. we observe*)

  - Also Adverse selection: Marginal enrollee costs < Average costs

- <u>**Robust**</u> **to a variety of econometric, modeling choices** (→ *Table*)

    1. Alternate RD specifications
    2. Alternate take-up estimates from ACS
    3. Accounting for mandate penalty (using "normalized" premiums)

- **Low WTP not driven by inertia** (→ *New enrollee RDs*)

- **Low WTP robust to relaxing vertical model** (→ *Bounds method*)

3. Discussion and Normative Implications

Discussion

● **Two key questions:**

1. Why is willingness to pay lower than individual's own costs?

2. What are the normative implications?

Why is WTP Below Own Costs?

- **Behavioral biases** (inattention, inertia, information, misperception…)
  - Similar demand responsiveness for new enrollees argues against inattention / inertia as explanations
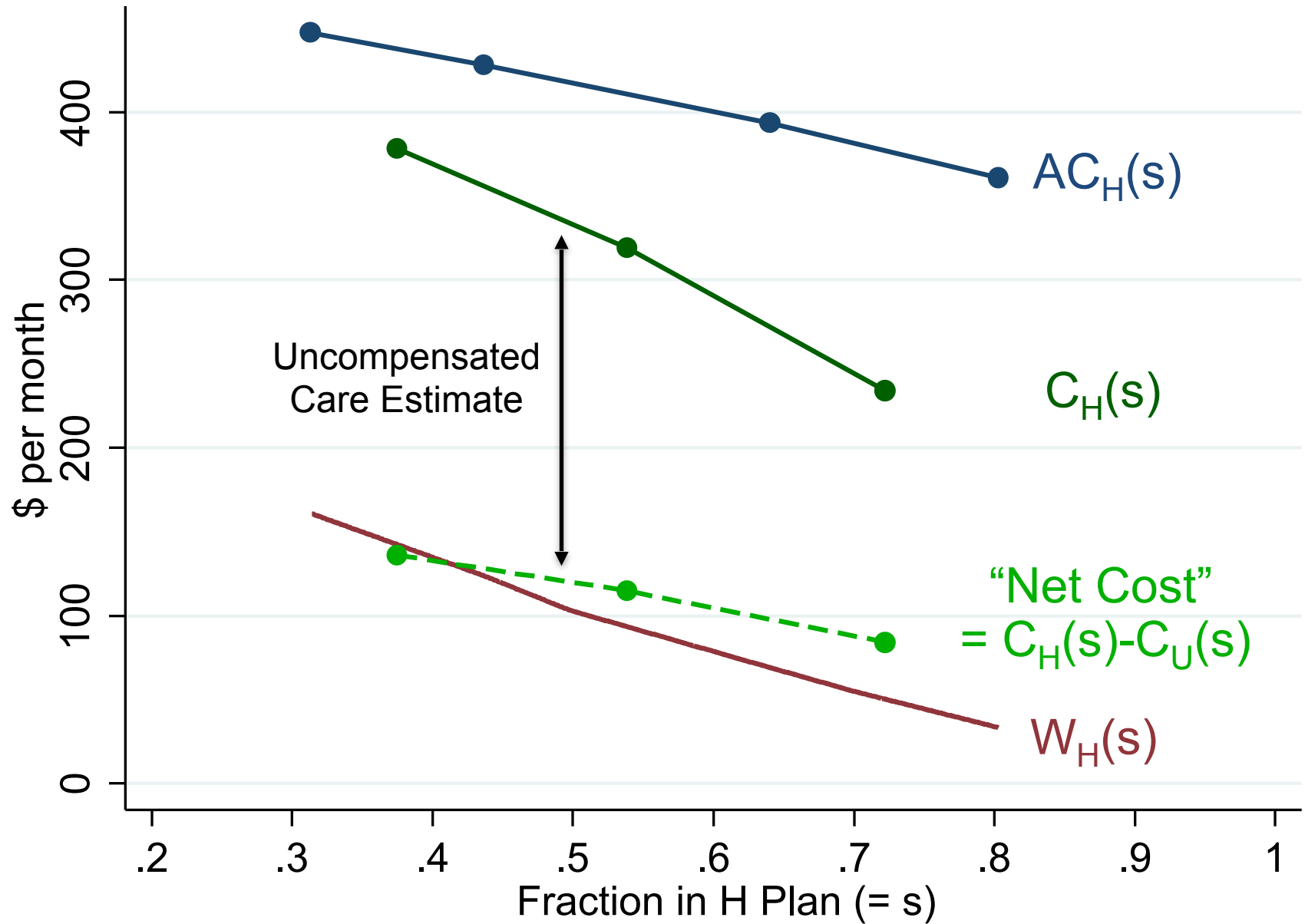 - But cannot rule out behavioral biases more broadly

- **Moral hazard** – textbook reason for WTP < Cost
  - But required magnitude not plausible
  - Moral hazard would have to increase costs by ~200% to explain gap between WTP and Costs
  - Oregon experiment moral hazard estimate: 25%

- **Uncompensated care** (charity care, unpaid bills)
  - Important: Low-income uninsured pay just ~20% of their medical costs out of pocket (Finkelstein, Hendren, Luttmer 2015)
  - Use this + moral hazard estimate to construct **"Net Cost Curve"**
    = <u>Cost</u> to insurer – <u>Savings</u> to third parties on uncompensated care

WTP and Cost Curves, Adjusted for Uncomp. Care

Chart showing $ per month on the vertical axis (0 to 400+) versus Fraction in H Plan (= s) on the horizontal axis (.2 to 1).

Curves labeled:
- $AC_H(s)$ (dark blue, upper curve)
- $C_H(s)$ (dark green curve)
- "Net Cost" = $C_H(s) - C_U(s)$ (dashed green curve)
- $W_H(s)$ (dark red curve)

Vertical double arrow labeled "Uncompensated Care Estimate"

Normative Implications

- **Normative Question:** Would a small subsidy increase be desirable?

  - Note: Need to assume WTP curves are true metrics of consumer welfare

- **Framework:** Calculate Marginal Value of Public Funds (MVPF) spent on subsidy increase *(following Hendren (2016))*

$$MVPF \; = \; \frac{\text{Marginal WTP to Beneficiaries}}{\text{Marginal Cost to Govt.}}$$

  - <u>Benefit-cost test</u>: Is MVPF > relevant threshold for alternate use of funds? (e.g., 0.90 for EITC (Hendren 2016))

- **Main finding:** Incidence of uncompensated care matters a lot

  1. **No value (pure waste)** – MVPF $\in$ [0.28, 0.56]
  2. **Govt. cost savings / Benefit to low-income** – MVPF $\in$ [0.80, 1.29]
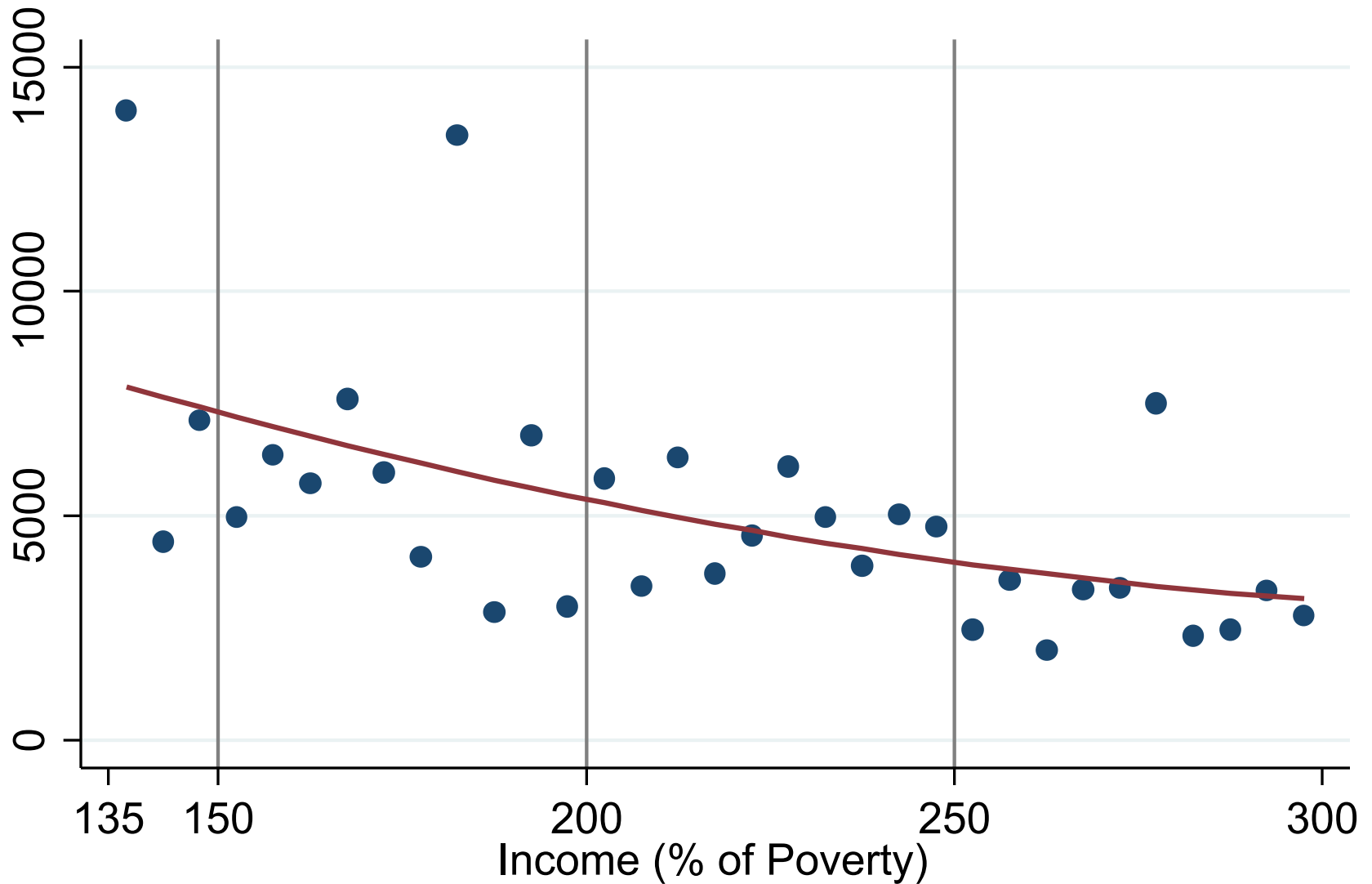 3. **Benefit to affluent** (e.g., hospital CEOs) – MVPF $\in$ [0.67, 0.71]

Conclusion

- **Exploit discontinuities** in premiums in Massachusetts to estimate WTP and cost of insurance among low-income population

- **Main Finding:** WTP is far below insurer costs
  - Adverse selection exists but is not the key issue
  - Enrollees not willing to pay *own* expected cost of coverage
    - Uncompensated care provides a potential explanation

- **Implications** for economics of subsidizing health insurance
  - <u>Partial subsidies</u> unlikely to get close to universal coverage
  - Enrollees themselves may not be primary beneficiaries of subsidies

- **Important topic for further work:** Incidence and efficiency of uncompensated care vs. formal subsidized insurance
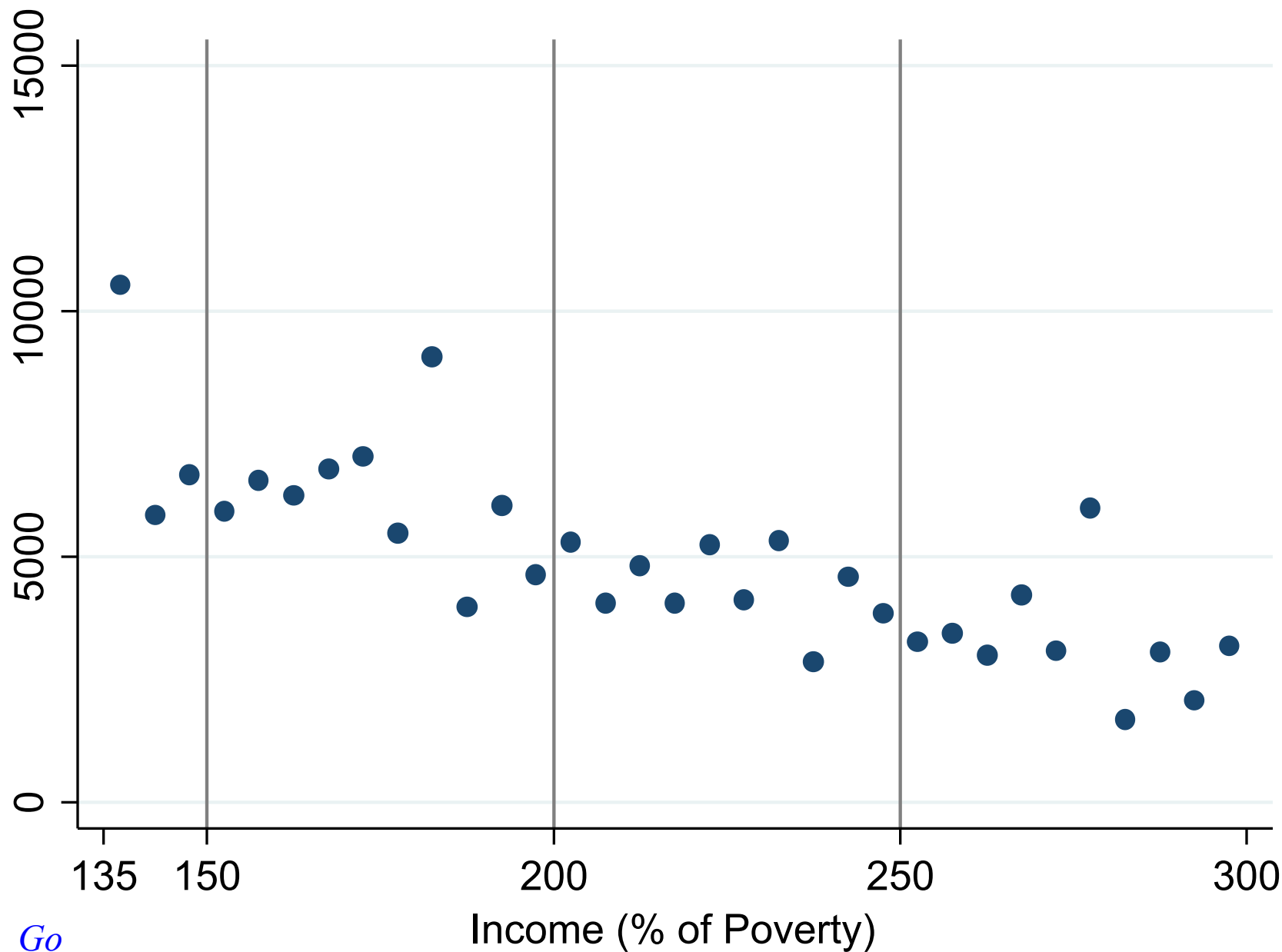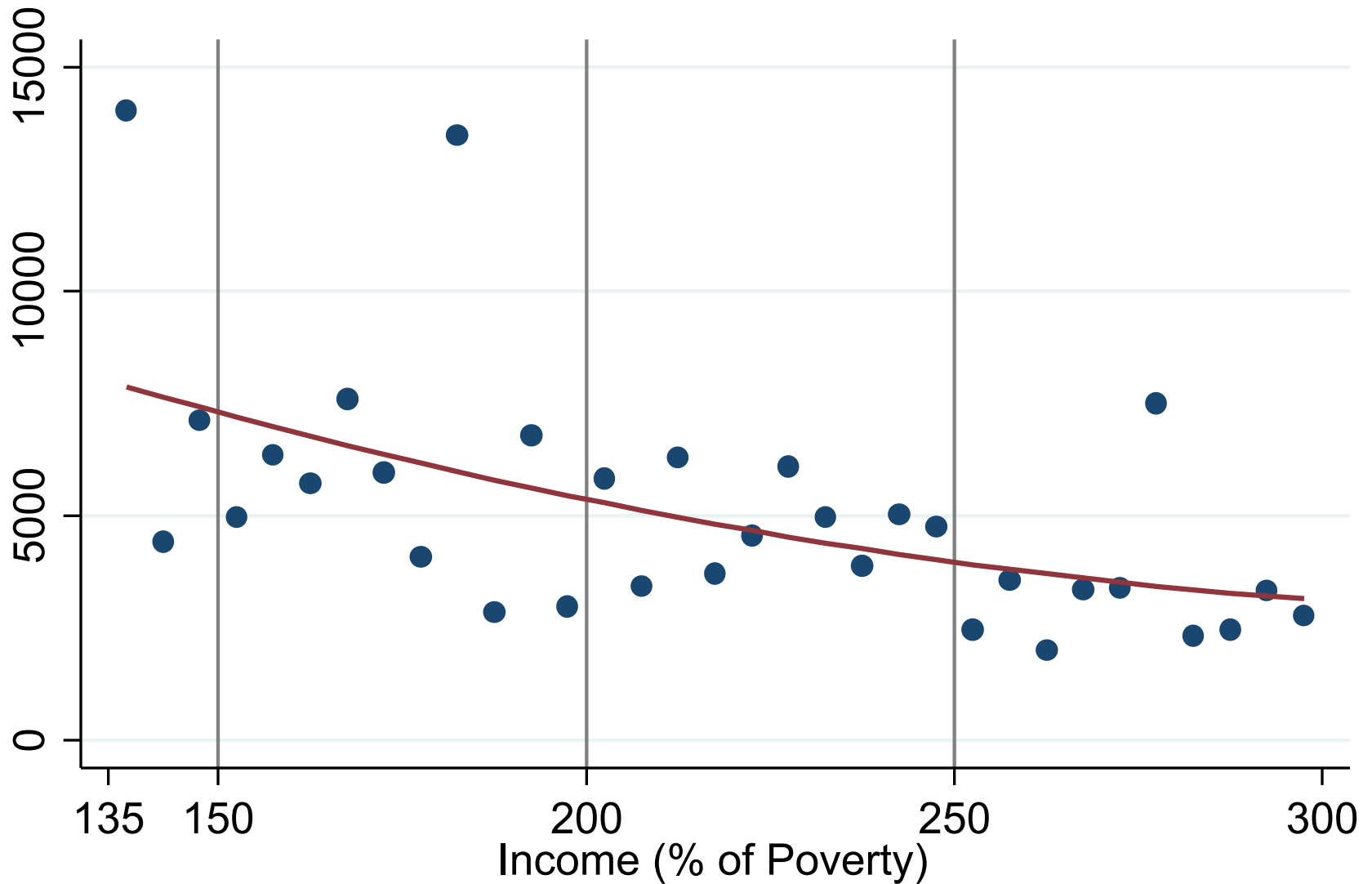
Thank You!

Appendix Slides

Estimate of Eligible Population from ACS (2011)

Legend: ● 5% FPL bins — Regression Smoothed

X-axis: Income (% of Poverty)

Estimate of Eligible Population from ACS (2009-2013)

Income (% of Poverty)

Estimate of Eligible Population from ACS (2011)

Income (% of Poverty)

Legend:
- ● 5% FPL bins
- —— Regression Smoothed

Average Age of Enrollees (2009-2013)

RD = 1.71
(0.20)

RD = 0.56
(0.21)

RD = 0.61
(0.25)

Income, % of FPL
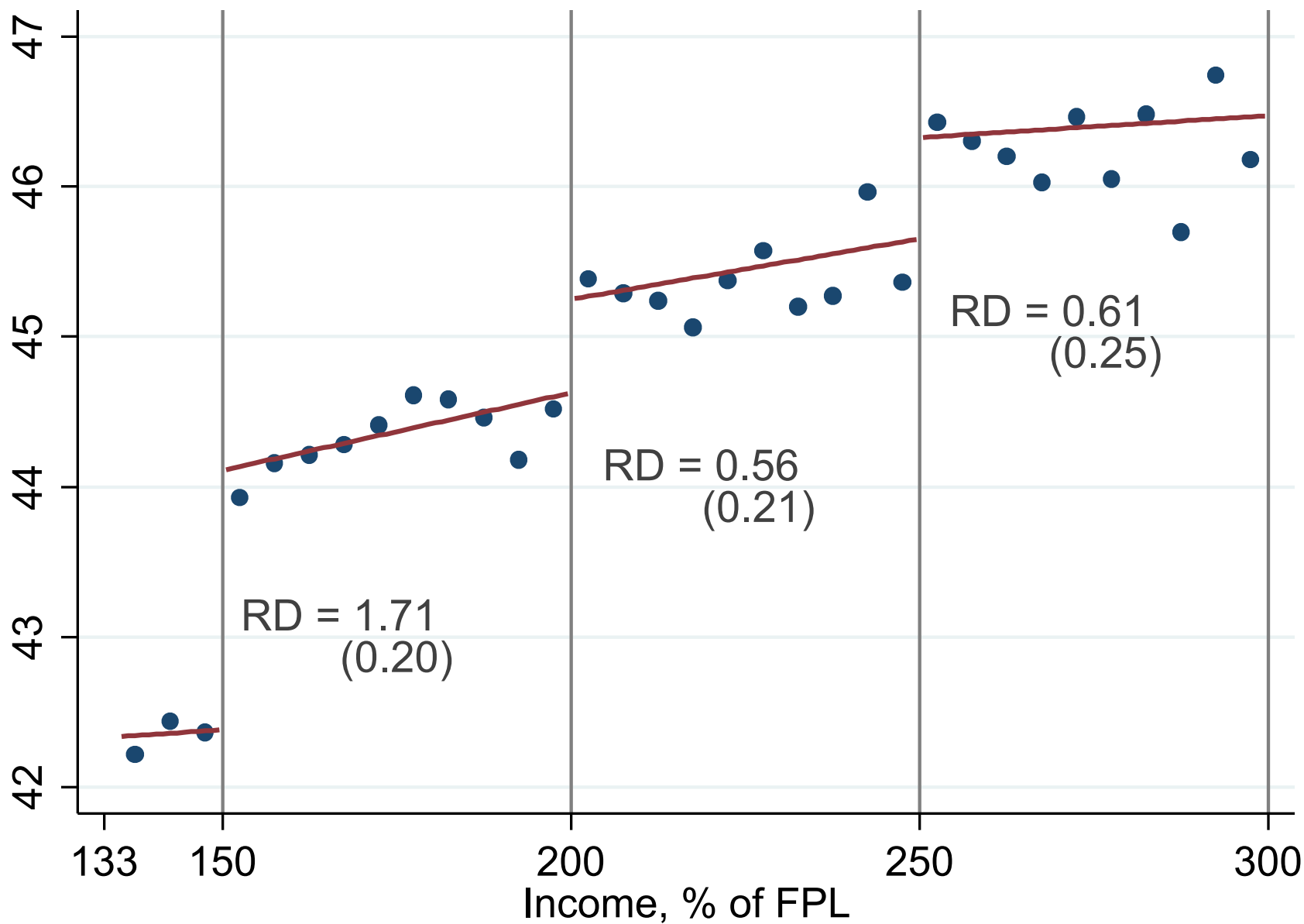
Average Risk Score of Enrollees (2009-2013)

RD = 0.063
(0.009)

RD = 0.057
(0.011)

RD = 0.022
(0.013)

Income, % of FPL
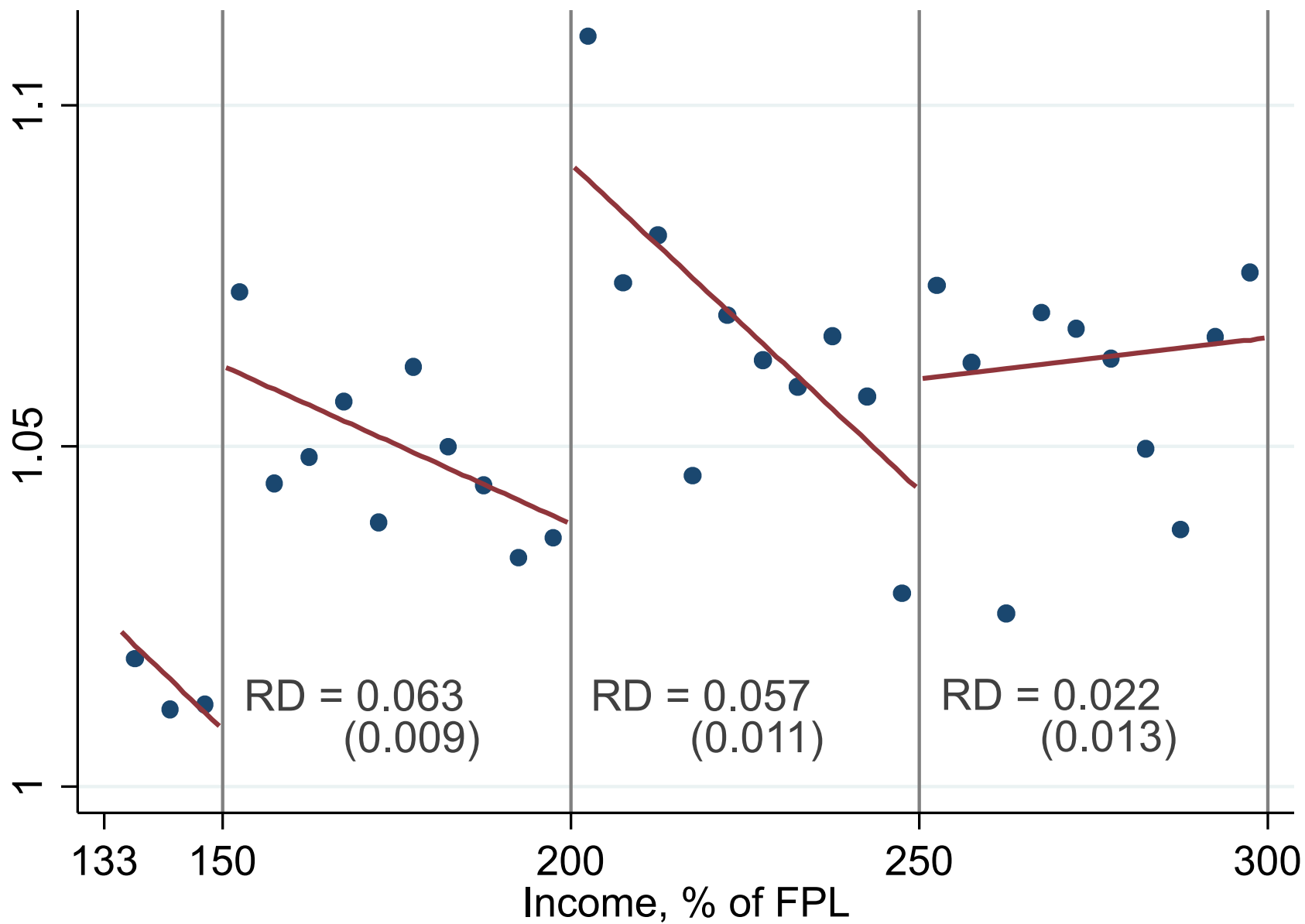
RD for Average Insurer Costs: *H* Plans, 2011

RD = 32.3
(16.7)
%Δ = +9%

RD = 34.5
(18.8)
%Δ = +9%

RD = 19.6
(24.1)
%Δ = +6%

$ per month

Income, % of Poverty
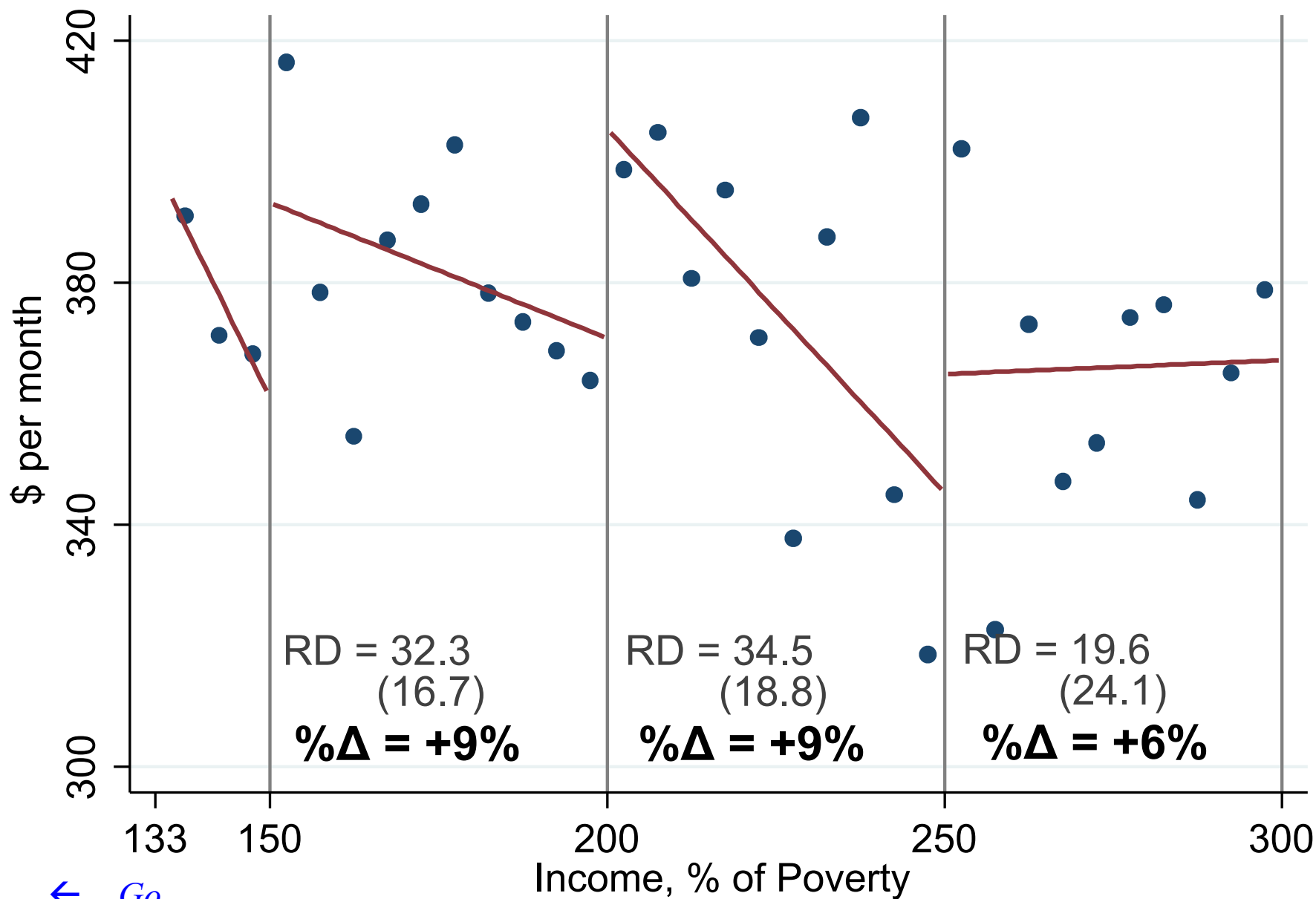
RD for Average Insurer Costs: *L* Plan, 2011

RD = 72.9
(35.0)
%Δ = +43%

RD = 54.9
(25.8)
%Δ = +32%

RD = -22.3
(27.1)
%Δ = -13%

$ per month

Income, % of Poverty
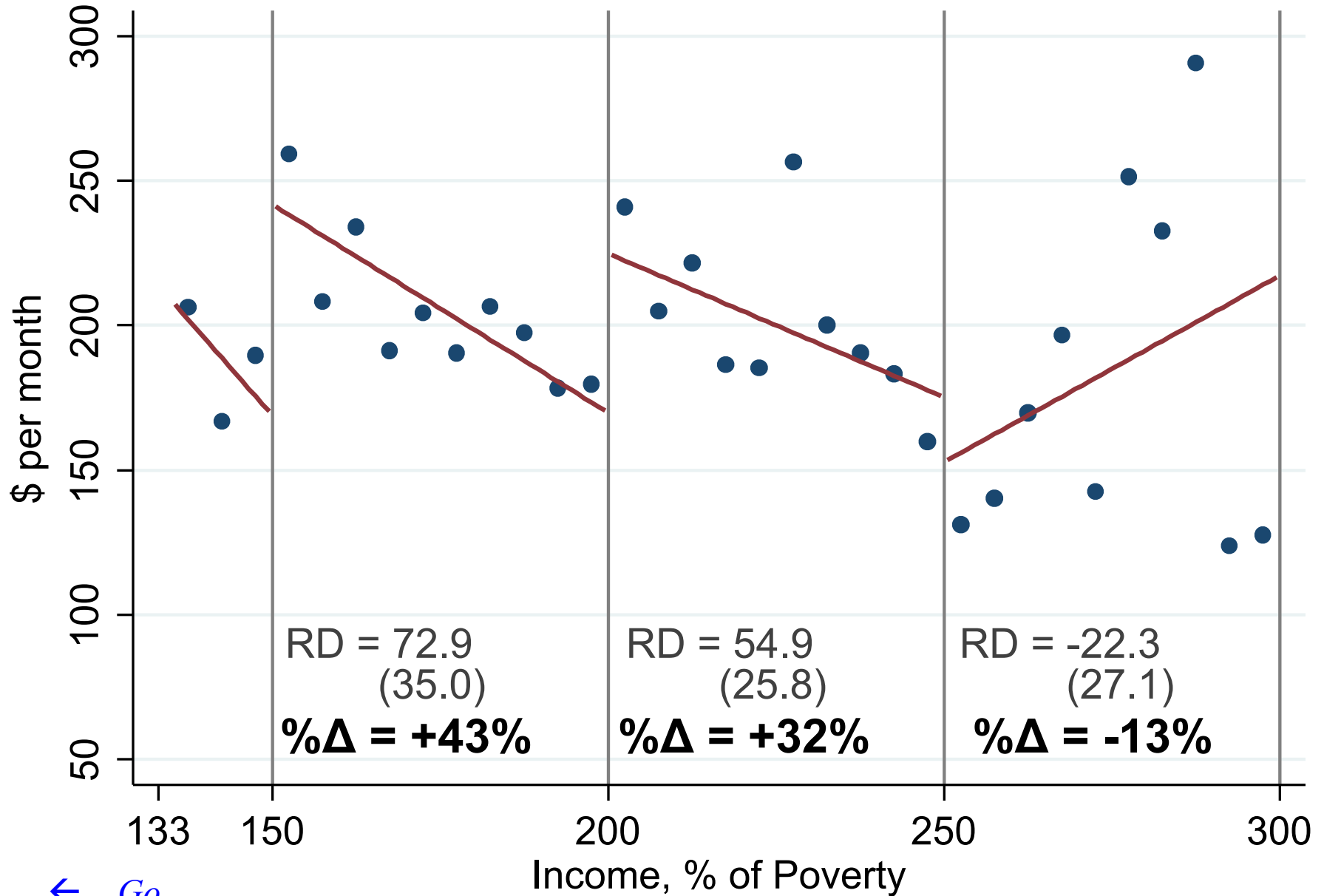
Identifying Cost Curves: *L* Plan

Cost

$C_H(s)$

$C_L(s)$

Observed Avg. Cost of L

$\approx C_L(s)$ **for** $s \in [s^*_{LU}, s^*_{HL}]$

(i.e., directly observe C_L)

0

Buy *H*   **Buy L**   **Uninsured**   1

s

s^*_{HL} s^*_{LU}
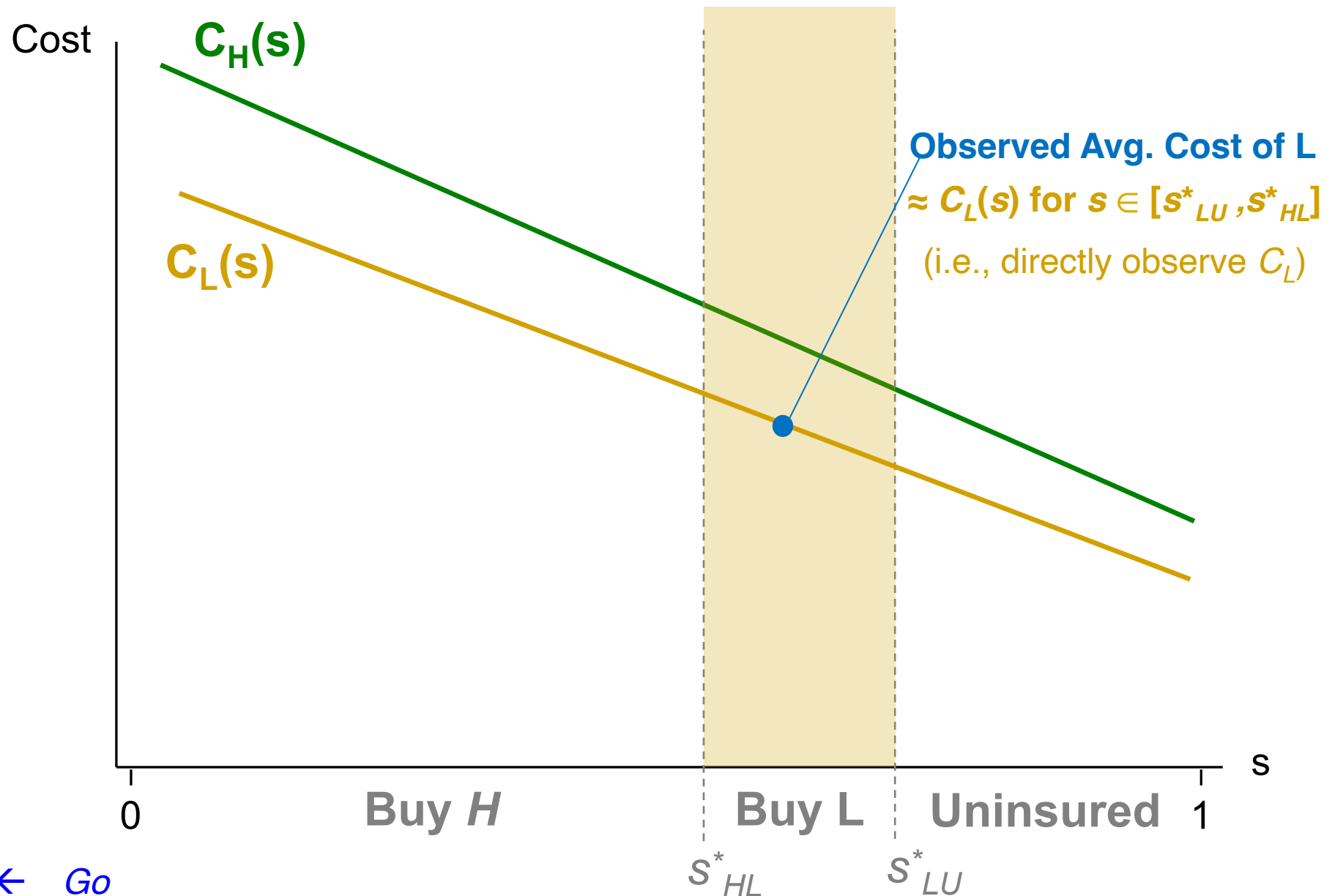
Sensitivity Analysis: WTP, Cost, and Take-Up Estimates
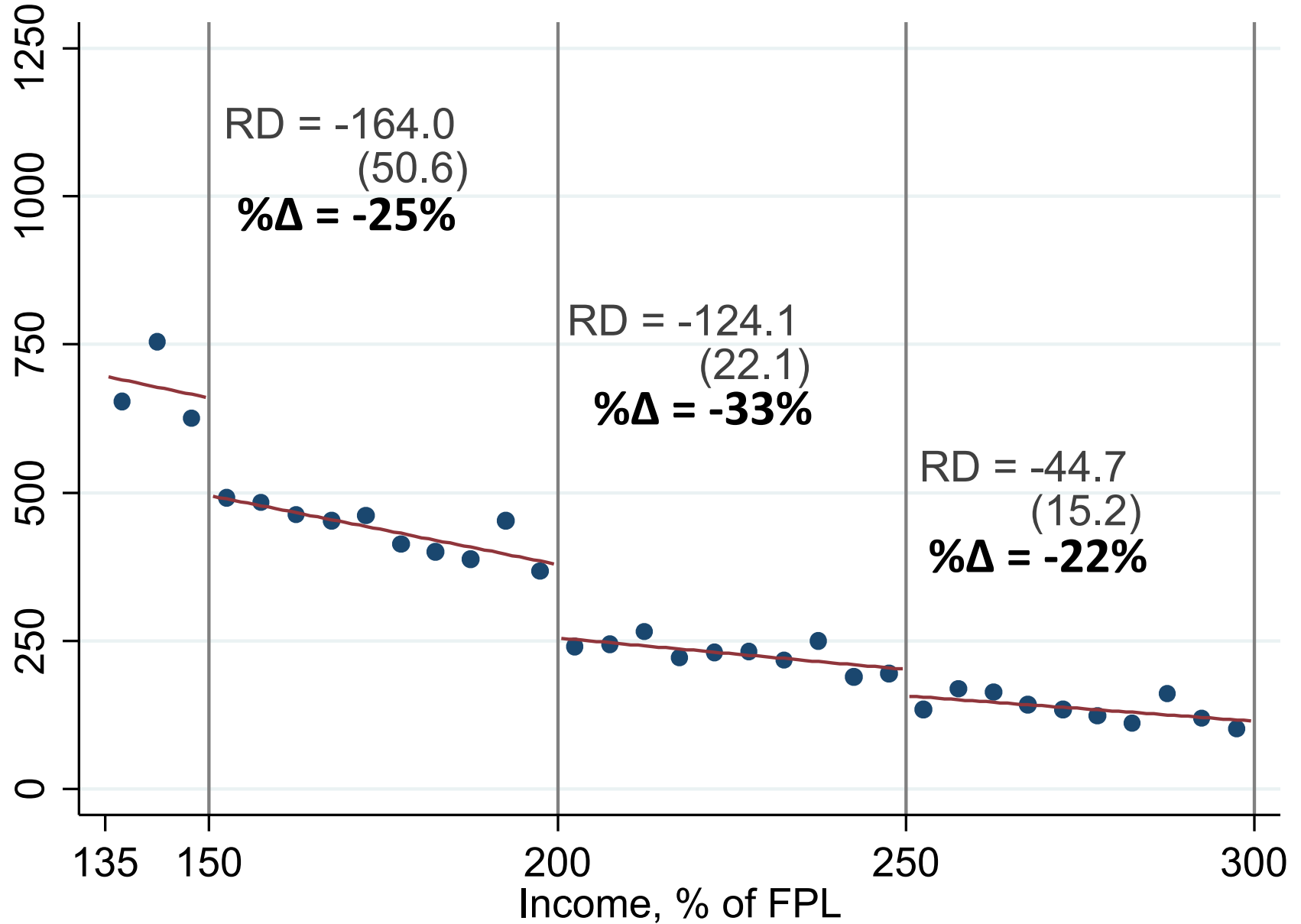
Robustness Specification	Median WTP (s = 0.5)			Share Insured with Subsidy (as % of AC_H)	
	WTP_H	C_H	AC_H	75% Subsidy	90% Subsidy
Baseline Estimates	$103	$333	$417	49%	79%
(1) Alternate RD Specifications					
Smaller Bandwidth (25% FPL)	$100	$318	$418	48%	78%
Quadratic Functional Form	$98	$351	$403	49%	73%
Omit 200% FPL Estimates	$97	$343	$412	46%	79%
(2) Alternate Take-up Estimates					
Unscaled ACS Eligible Pop.	$24	$186	$354	29%	46%
(3) Accounting for Mandate Penalty					
Use Normalized Premiums	$93	$333	$417	32%	68%

Enrollment in All Plans, Limited to New Enrollees, 2011

RD = -224.6
(57.4)
%Δ = -28%

RD = -120.2
(26.8)
%Δ = -28%

RD = -53.4
(18.4)
%Δ = -22%

Income, % of FPL
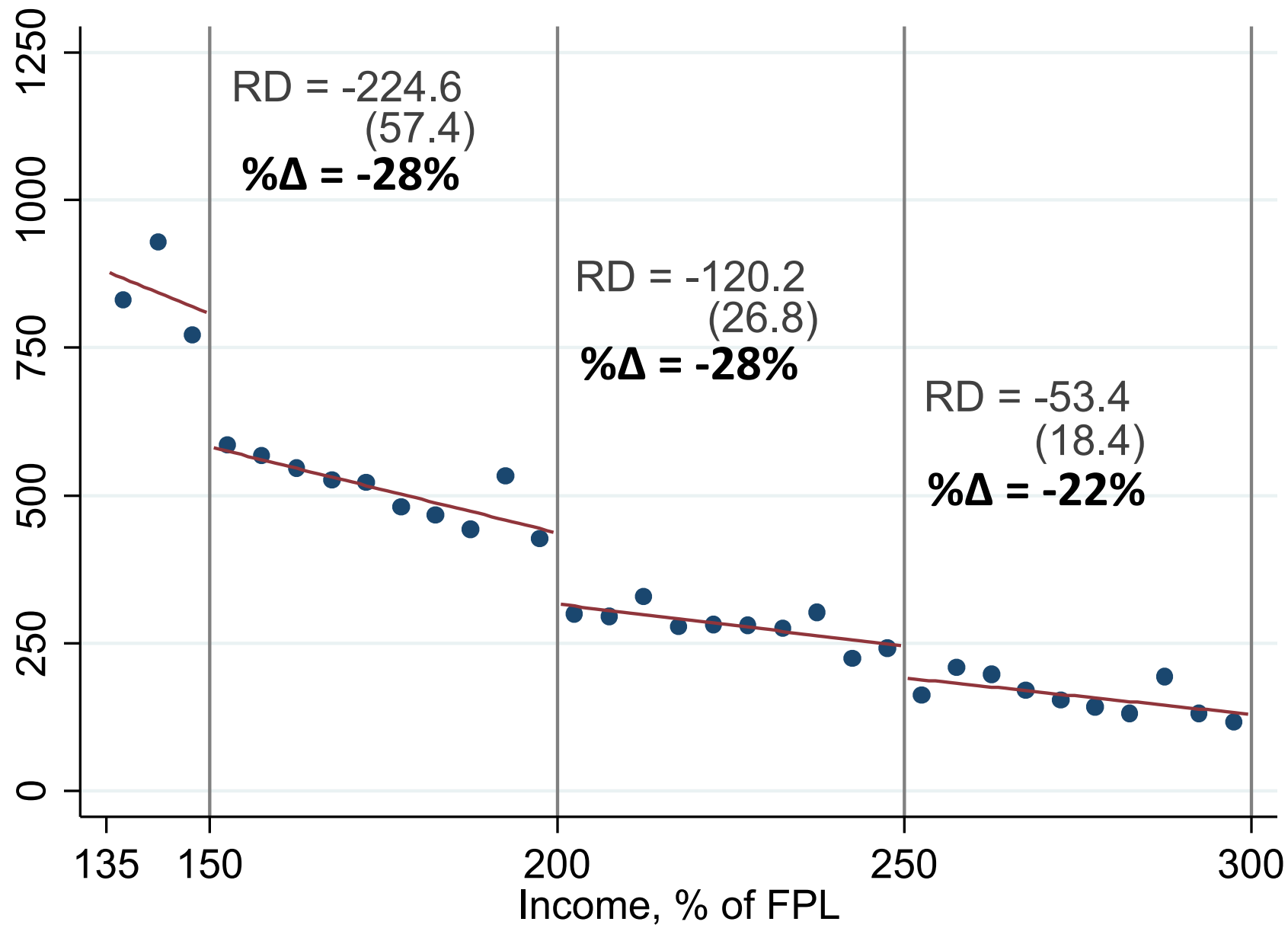
Enrollment in *H* Plan, Limited to New Enrollees, 2011

RD = -164.0
(50.6)
%Δ = -25%

RD = -124.1
(22.1)
%Δ = -33%

RD = -44.7
(15.2)
%Δ = -22%

Income, % of FPL

Bounds on WTP for CommCare Insurance

Legend:
- W_L curve (red solid line)
- W_H curve (green solid line)
- WTP lower bound (dashed line with filled circles)
- WTP upper bound (dashed line with filled triangles)

X-axis: 1-s
Y-axis: $ per month