

Adverse Selection and Inertia in Health Insurance Markets: When Nudging Hurts

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Change in insurance provision

Firm implemented a change in the employee health insurance program.

Data and Software

- Proprietary panel firm data
- Johns Hopkins Medical School: Medical risk prediction software

How does changes in employee health insurance interact with inertia and adverse selection?

- Choice inadequacy
- Consumer welfare

- Features of the data allow for clean identification of inertia.
- Builds on the prior work that studies the existence and consequences of adverse selection in health insurance markets.

Preview of Findings

- In the primary specification, inertia causes an average employee to forgo \$2,032 annually.
- Estimates are used to study a counterfactual policy intervention by reducing inertia by $\frac{3}{4}$:
 - Leads to a \$105 mean per person per year welfare increase
 - Exacerbates adverse selection, leading to a 7.7% reduction in welfare

Proprietary Panel Firm Data

Contain data on employee health insurance choices and medical utilization for a single firm from 2004 to 2009:

- Plan choices
- Demographics
- Other insurance
- Expenditure
- Utilization

Hopkins Software

- Develop individual-level measures of projected future medical utilization at each point in time
- Allow us to precisely gauge medical expenditure risk at time of plan choice.

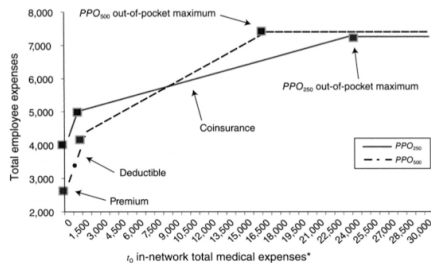
Sample Composition

TABLE 1—DESCRIPTIVE STATISTICS

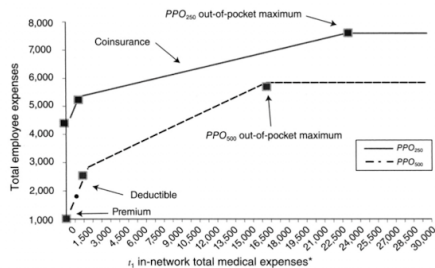
| Sample demographics | All employees | PPO ever | Final sample |
|------------------------------------|--------------------------|--------------------------|--------------------------|
| <i>N</i> –Employee only | 11,253 | 5,667 | 2,023 |
| <i>N</i> –All family members | 20,963 | 10,713 | 4,544 |
| Mean employee age (median) | 40.1 (37) | 40.0 (37) | 42.3 (44) |
| Gender (male) percent | 46.7 | 46.3 | 46.7 |
| <i>Income (percent)</i> | | | |
| Tier 1 (< \$41K) | 33.9 | 31.9 | 19.0 |
| Tier 2 (\$41K–\$72K) | 39.5 | 39.7 | 40.5 |
| Tier 3 (\$72K–\$124K) | 17.9 | 18.6 | 25.0 |
| Tier 4 (\$124K–\$176K) | 5.2 | 5.4 | 7.8 |
| Tier 5 (> \$176K) | 3.5 | 4.4 | 7.7 |
| <i>Family size (percent)</i> | | | |
| 1 | 58.0 | 56.1 | 41.3 |
| 2 | 16.9 | 18.8 | 22.3 |
| 3 | 11.0 | 11.0 | 14.1 |
| 4+ | 14.1 | 14.1 | 22.3 |
| <i>Staff grouping (percent)</i> | | | |
| Manager (percent) | 23.2 | 25.1 | 37.5 |
| White-collar (percent) | 47.9 | 47.5 | 41.3 |
| Blue-collar (percent) | 28.9 | 27.3 | 21.1 |
| <i>Additional demographics</i> | | | |
| Quantitative manager (percent) | 12.8 | 13.3 | 20.7 |
| Job tenure mean years (median) | 7.2 (4) | 7.1 (3) | 10.1 (6) |
| Zip code population mean (median) | 42,925 (42,005) | 43,319 (42,005) | 41,040 (40,175) |
| Zip code income mean (median) | \$56,070 (\$55,659) | \$56,322 (\$55,659) | \$60,948 (\$57,393) |
| Zip code house value mean (median) | \$226,886 (\$204,500) | \$230,083 (\$209,400) | \$245,380 (\$213,300) |

Health Insurance Choices

Panel A. PPO health insurance plan characteristics, t_0 low-income family



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



Findings from Preliminary Analysis (Insurance Choice)

TABLE 2—NEW EMPLOYEE HEALTH PLAN CHOICES

| New enrollee analysis | New enrollee t_{-1} | New enrollee t_0 | New enrollee t_1 |
|------------------------------|-----------------------|--------------------|--------------------|
| N, t_0 | 1,056 | 1,377 | — |
| N, t_1 | 784 | 1,267 | 1,305 |
| <i>t₀ Choices</i> | | | |
| <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%) | — |
| <i>t₁ Choices</i> | | | |
| <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%) |
| <i>Demographics</i> | | | |
| Mean age | 33 | 33 | 32 |
| Median age | 31 | 31 | 31 |
| Female percent | 56% | 54% | 53% |
| Manager percent | 20% | 18% | 19% |
| FSA enroll percent | 15% | 12% | 14% |
| Dental enroll percent | 88% | 86% | 86% |
| Median (mean) expense t_1 | 844 (4,758) | 899 (5,723) | — |
| Income tier 1 | 48% | 50% | 47% |
| Income tier 2 | 33% | 31% | 32% |
| Income tier 3 | 19% | 19% | 19% |

Findings from Preliminary Analysis (Dominated Choices)

TABLE 3—DOMINATED PLAN CHOICE ANALYSIS

| | t_1 Dominated stay | t_1 Dominated switch | t_2 Dominated stay | t_2 Dominated switch |
|---------------------------------|---|---|----------------------------|------------------------------|
| Dominated plan analysis | | | | |
| <i>N</i> | 498 | 61 | 378 | 126 |
| Minimum money lost ^a | \$374 | \$453 | \$396 | \$306 |
| <i>PPO</i> ₅₀₀ | — | 44 (72%) | — | 103 (81%) |
| <i>PPO</i> ₁₂₀₀ | — | 4 (7%) | — | 6 (5%) |
| Any <i>HMO</i> | — | 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% |
| | <i>PPO</i> ₂₅₀ stay t_1 | <i>PPO</i> ₂₅₀ switch t_1 | All plans t_1 stay | All plans t_1 switch |
| All plan analysis | | | | |
| 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% |

Findings from Preliminary Analysis (Adverse Selection)

TABLE 4—ADVERSE SELECTION AND EMPLOYEE COSTS

| Final sample total expenses | <i>PPO</i> ₋₁ | <i>PPO</i> ₂₅₀ | <i>PPO</i> ₅₀₀ | <i>PPO</i> ₁₂₀₀ |
|--|--------------------------|---------------------------|---------------------------|----------------------------|
| <i>Family t₋₁ total expenses (\$)</i> | | | | |
| <i>t₋₁</i> | | | | |
| <i>N</i> employees (mean family size) | 2,022 (2.24) | — | — | — |
| Mean (median) | 13,331 (4,916) | — | — | — |
| 25th percentile | 1,257 | — | — | — |
| 75th percentile | 13,022 | — | — | — |
| <i>t₀</i> | | | | |
| <i>N</i> (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 |
| <i>t₁</i> | | | | |
| <i>N</i> (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 |
| <i>Individual category expenses (dollars)</i> | | | | |
| 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 |

Empirical Framework

- Choice Model: Conditional on predicted family-level ex ante medical cost risk

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

- Families have CARA preferences

$$u_k(x) = -\frac{1}{\gamma_k(\mathbf{X}_k^A)} e^{-\gamma_k(\mathbf{x}_k^A)_x} \quad (2)$$

- Modeling Inertia:

$$x = W_k - P_{kjt} - OOP + \eta(\mathbf{X}_{kt}^B, Y_k) \mathbf{1}_{kj,t-1} + \delta_k(Y_k) \mathbf{1}_{1200} + \alpha H_{k,t-1} \mathbf{1}_{250} + \dots \quad (3)$$

- Where

$$\eta(\mathbf{X}_{kt}^B, Y_k) = \eta_0 + \eta_1 \mathbf{X}_{kt}^B + \eta_2 Y_k \quad (4)$$

- Estimate the choice model using a random coefficients simulated maximum likelihood approach

Results (Inertia)

TABLE 5—CHOICE MODEL PARAMETER ESTIMATES

| Empirical model results Parameter | Primary | Two plan | MH robust | γ Robust | ϵ Robust |
|--|----------------|----------------|----------------|-----------------|-------------------|
| Inertia—single, η_0 | 1,729 (28) | 1,686 (82) | 1,859 (107) | 2,430 (116) | 1,944 (150) |
| Inertia—family, $\eta_0 + \eta_2$ | 2,480 (26) | 2,401 (73) | 2,355 (113) | 3,006 (94) | 2,365 (34) |
| Inertia—FSA enroll, η_1 | -551 (56) | -355 (78) | -669 (155) | -723 (131) | -417 (50) |
| Inertia—income, η_1 | -32 (13) | -130 (22) | -59 (15) | -8 (43) | -7 (15) |
| Inertia—quantitative, η_1 | 5 (138) | -122 (110) | -40 (80) | -537 (223) | -6 (92) |
| Inertia—manager, η_1 | 198 (292) | 464 (106) | 277 (164) | 875 (200) | 224 (244) |
| Inertia—chronic condition, η_1 | 80 (46) | 26 (72) | 29 (67) | -221 (148) | 67 (35) |
| Inertia—salient change, η_1 | 156 (83) | 13 (102) | 95 (60) | 61 (212) | 123 (54) |
| Inertia— PPO_{1200} , η_1 | -19 (184) | — | -32 (46) | -327 (122) | -113 (52) |
| Inertia—total pop. mean, η [pop. standard deviation] | 2,032 [446] | 1,802 [416] | 1,886 [387] | 1,914 [731] | 1,986 [316] |

Counterfactual Analysis

- Policy implemented reduces inertia to a fraction Z :

$$U_{kjt}(P_{kjt}, Z\eta_k, \mathbf{1}_{kj,t-1}) = \int_0^\infty f_{kjt}(OOP) u(OOP, \widehat{P}_{kjt}, Z\eta_k, \mathbf{1}_{kj,t-1}) dOOP \quad (5)$$

- Welfare:

$$u(Q_{kjt}) = -\frac{1}{\gamma_k(\mathbf{x}_k^A)} e^{-\gamma_k(\mathbf{x}_k^A)(W - Q_{kjt})} = U_{kjt}(P_{kjt}, Z\eta_k, \mathbf{1}_{kj,t-1}) \quad (6)$$

- Conditional on k , the welfare impact for consumer k of policies that reduce inertia to $Z\eta_k$

$$\Delta CS_{k,j}^Z = W_k^\kappa - Q_{k,j,z,t} - W_k^\kappa - Q_{kjt} = Q_{k,jt}^\kappa - Q_{k,jz,t}^\kappa \quad (7)$$

Results (Counterfactual)

TABLE 6—WELFARE IMPACT OF REDUCED INERTIA: η TO 0.25 η

| Plan re-pricing welfare analysis reduced inertia: η to 0.25 η | t_1 | t_2 | t_4 | t_6 | Avg. t_1 - t_6 |
|--|---------|---------|---------|---------|--------------------|
| <i>Mean Δ TS</i> | | | | | |
| Population | -\$63 | -\$104 | -\$144 | -\$118 | -\$115 |
| Switcher population percent | 51 | 49 | 48 | 53 | 49 |
| Switchers only | \$86 | \$175 | \$ 245 | \$242 | \$186 |
| Non-switchers only | -\$205 | -\$391 | -\$555 | -\$432 | -\$442 |
| High expense population percent | 10 | 11 | 11 | 11 | 11 |
| High expense | \$26 | \$106 | \$119 | \$65 | \$62 |
| Non-high expense | -\$73 | -\$130 | -\$177 | -\$141 | -\$137 |
| Single population percent | 47 | 46 | 46 | 46 | 46 |
| Single | -\$249 | -\$367 | -\$414 | -\$195 | -\$319 |
| W/dependents | \$99 | \$124 | \$89 | -\$51 | \$61 |
| Low income population percent | 40 | 41 | 41 | 41 | 41 |
| Low income | -\$81 | -\$218 | -\$282 | -\$178 | -\$200 |
| High income | -\$36 | \$62 | \$57 | -\$30 | \$0 |
| <i>Welfare change: percent premiums</i> | | | | | |
| Mean employee premium | \$1,471 | \$1,591 | \$1,455 | \$1,259 | \$1,500 |
| Welfare change population | -4.8 | -6.5 | -9.9 | -9.4 | -7.7 |
| Welfare change switchers | 5.6 | 11.0 | 16.9 | 19.2 | 12.4 |
| Welfare change non-switchers | -13.9 | -24.6 | -38.1 | -34.3 | -29.4 |
| <i>Welfare change: percent total spending</i> | | | | | |
| Mean total employee spending | \$3,755 | \$4,097 | \$4,022 | \$3,862 | \$4,015 |
| Welfare change population | -1.7 | -2.5 | -3.6 | -3.06 | -2.9 |
| Welfare change switchers | 2.3 | 4.3 | 6.1 | 6.3 | 4.6 |
| Welfare change non-switchers | -5.5 | -9.5 | -13.8 | -11.2 | -11.0 |
| <i>Welfare change: percent CEQ Loss</i> | | | | | |
| Mean total CEQ Loss | \$5,888 | \$6,264 | \$6,207 | \$6,065 | \$6,190 |
| Welfare change population | -1.1 | -1.7 | -2.2 | -2.0 | -1.9 |
| Welfare change switchers | 1.1 | 2.1 | 3.1 | 3.3 | 2.4 |
| Welfare change non-switchers | -3.3 | -5.1 | -6.3 | -5.3 | -5.2 |

- Other data sets
- Inertia in other markets