

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.

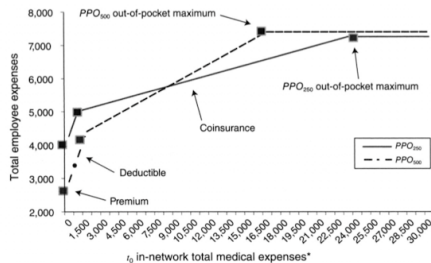
Sample Composition

TABLE 1—DESCRIPTIVE STATISTICS

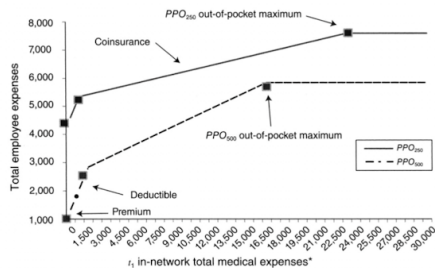
Sample demographics	All employees	PPO ever	Final sample
<i>N</i> –Employee only	11,253	5,667	2,023
<i>N</i> –All family members	20,963	10,713	4,544
Mean employee age (median)	40.1 (37)	40.0 (37)	42.3 (44)
Gender (male) percent	46.7	46.3	46.7
<i>Income (percent)</i>			
Tier 1 (< \$41K)	33.9	31.9	19.0
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	PPO ₋₁	PPO ₂₅₀	PPO ₅₀₀	PPO 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	2.7	2.8	2.2
Welfare change non-switchers	-0.9	-1.7	-2.2	-2.0	-1.9

- Other data sets
- Inertia in other markets