

Equilibrium Effects of Health Care Price Information

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Why did I choose this paper?

- **Data Is Plural** is a weekly newsletter that provides info about newly-released publicly available data.
- Back in July...

Hospital price lists. Since January 2021, the US government [has required hospitals to publish](#) machine-readable files listing the standard charges for all items and services they provide. But there's no standard format for these price lists (also known as "chargemasters"), no official central repository of them, and [compliance has been lacking](#). Seeing those problems, the versioned-data platform [DoltHub](#) earlier this year ran a [paid crowdsourcing campaign](#) that pulled [nearly 300 million prices from the published lists of roughly 1,800 hospitals](#) into a [single database](#). **Related:** Thanks to an [earlier price transparency rule](#), California posts [chargemasters for hundreds of hospitals](#), with records going back to 2011.

- Link to the data

Motivation

There is a *lot* of price dispersion among health care providers, and consumers seem to leave money on the table:

TABLE 1.—POTENTIAL COST SAVINGS IF CONSUMERS SWITCHED TO LOW-PRICE PROVIDERS

Procedure Class	Mean Total Visit Price	Consumers Switch to 1st Quartile Provider		Consumers Switch to Median Provider	
		Mean	% Savings	Mean	% Savings
Computed tomography (CT)	1,604	659	58.9%	995	37.9%
Magnetic resonance Imaging (MRI)	1,767	989	44.0%	1,283	27.4%
X-ray	593	152	74.3%	240	59.5%

The table shows the average transaction price paid in 2006, along with the potential savings if every patient paid at most the 25th or 50th percentile of visit price in New Hampshire for each procedure given the patient's insurance company and insurance type. All prices in 2010 dollars. Figures reflect the potential demand-side savings (e.g., hold negotiated prices fixed).

RQ: Do information frictions (limited access to prices) play a role?

- New Hampshire started requiring insurers to submit claims data in 2005 and launched its HealthCost website in March 2007.
 - Input: Outpatient procedure, insurance plan, remaining deductible, zip code, and radius
 - Output: Expected OOP price, insurer price, and total price for each provider
- Site shows estimated procedure cost and estimated visit cost.
- Brown has all of the claims data (9.2m claims across 2.1m visits), but only some procedures are on the site ⇒ clean DiD

Results Preview

- The website reduced the cost of outpatient medical imaging procedures by 5% for patients and 4% for insurers
- Demand-side effects are important, but...
- Supply-side effects may be even more important, driven primarily by increased provider competition
- An estimated 30-40% of medical procedures are shoppable, so the effects observed for medical imaging may hold for these procedures as well

Rest of the presentation

- Data
- Baseline DiD specification + results
- Heterogenous effects
- Demand-side effects
- Supply-side effects
- Price dispersion effects

TABLE 4.—SUMMARY OF OUTPATIENT MEDICAL IMAGING VISIT PRICE

	Visits on Website				Visits Not on Website			
	Prewebsite		Postwebsite		Prewebsite		Postwebsite	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<i>Patient cost</i>								
Copayment	15.6	41.4	19.2	39.0	15.4	53.2	18.6	40.4
Coinsurance	12.5	81.8	21.0	111.9	14.6	87.1	25.6	132.7
Deductible	46.1	181.7	84.3	298.0	58.1	206.4	103.4	331.2
Total out-of-pocket cost	76.6	226.5	124.8	331.4	90.8	253.8	148.0	371.9
<i>Insurance cost</i>								
Paid amount	634.4	1,381.4	793.5	1,737.6	740.8	1,730.7	970.9	2,141.8
<i>Total</i>								
Allowed amount	846.1	1,716.7	942.9	1,848.3	989.2	2,113.1	1,149.6	2,269.7
Charge amount	1,236.6	2,861.4	1,602.5	3,393.9	1,471.4	3,331.5	1,947.2	3,976.6
Observations (visits)	501,358		1,176,476		124,017		301,902	
Total procedures	2,018,224		5,376,584		464,574		1,325,082	

Table shows summary statistics related to transaction prices. Note that prices are lower when the website is available. Includes all outpatient medical imaging visits for privately insured individuals in New Hampshire from 2005 to 2011. All prices in 2010 dollars.

Data: Covariates

TABLE 3.—SUMMARY OF PRIVATELY INSURED INDIVIDUALS WITH MEDICAL IMAGING CLAIMS

	Mean	SD	Minimum	Maximum
Male	0.48	0.50	0	1
Age	36.9	17.6	0.0	64.0
Charlson Comorbidity Index	0.5	0.7	0	2
Zip income (1000s)	68.5	21.2	4.9	240.8
Zip more than B.A. degree	33.8	13.8	0.0	100.0
<i>Insurance type</i>				
PPO	0.32	0.47	0	1
POS	0.14	0.34	0	1
HMO	0.39	0.49	0	1
EPO	0.07	0.25	0	1
Other	0.09	0.29	0	1
<i>Insurance company</i>				
Anthem	0.45	0.50	0	1
Cigna	0.24	0.43	0	1
Harvard Pilgrim	0.13	0.33	0	1
Other	0.18	0.38	0	1
<i>Plan characteristics</i>				
Plan has deductible	0.45	0.50	0	1
Plan has copay	0.83	0.38	0	1
Plan has coinsurance	0.24	0.43	0	1
Number of individuals			811,549	

Summary statistics are for all unique privately insured individuals in New Hampshire over the period 2005 to 2011 with at least one outpatient medical imaging visit.

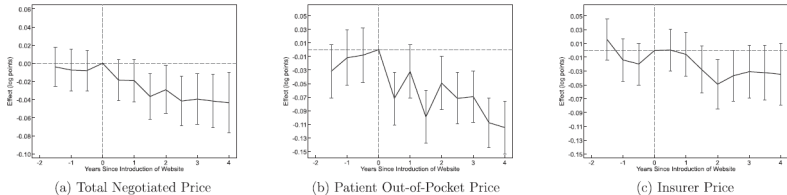
$$\log(1 + p_{imjkt}) = \beta(OnWeb_m \times Post_t) + \alpha X_{it} + \lambda_m + \lambda_k + \lambda_t + \varepsilon_{imjkt}$$

where

- p_{imjkt} : OOP/insurer/total price for individual i with insurance k getting procedure m from provider j at time t
- $OnWeb_m$: = 1 if procedure m is on the site
- $Post_t$: = 1 if after March 2007
- X_{it} : Covariates for individual i at time t

Baseline DiD Results

FIGURE 2.—EQUILIBRIUM EFFECT OF PRICE TRANSPARENCY WEBSITE ON SPENDING, BY TIME FROM WEBSITE INTRODUCTION



The charts show point estimates for each half-year using the difference-in-difference baseline specification as described in section IVB. The estimates reflect the overall equilibrium effect, including both demand-side and supply-side effects. The omitted period is the half-year prior to the start of the price transparency website. Error bars indicate 95% confidence interval using standard errors clustered at the month-year level.

Baseline DiD Results

TABLE 5.—EFFECT OF PRICE TRANSPARENCY WEBSITE ON VISIT PRICE BASELINE DIFFERENCE-IN-DIFFERENCE ESTIMATES

	Deductible			
	All	No Deductible	Not Past	Past
Dependent Variable: Log(1 + Total Visit Amount)				
OnWeb _m × Post _t	-0.031*** (0.004)	-0.029*** (0.006)	-0.044*** (0.007)	0.014 (0.010)
Mean level	950.47	835.65	1038.61	1121.35
Adjusted R ²	0.368	0.367	0.360	0.371
Observations	1,984,798	1,004,200	633,716	346,843
Dependent Variable: Log(1 + Patient Out-of-Pocket Amount)				
OnWeb _m × Post _t	-0.055*** (0.009)	-0.043*** (0.011)	-0.109*** (0.015)	-0.032 (0.020)
Mean level	115.26	23.27	295.91	51.54
Adjusted R ²	0.323	0.168	0.200	0.091
Observations	1,984,798	1,004,200	633,716	346,843
Dependent Variable: Log(1 + Insurer Paid Amount)				
OnWeb _m × Post _t	-0.038*** (0.005)	-0.030*** (0.006)	-0.026* (0.014)	0.012 (0.010)
Mean level	777.11	756.81	680.18	1012.49
Adjusted R ²	0.305	0.380	0.202	0.383
Observations	1,984,798	1,004,200	633,716	346,843
Individual controls	Yes	Yes	Yes	Yes
Insurance FE	Yes	Yes	Yes	Yes
Month-year FE	Yes	Yes	Yes	Yes
Procedure FE	Yes	Yes	Yes	Yes

Heterogenous Effects

TABLE 6.—EFFECT OF PRICE TRANSPARENCY WEBSITE ON VISIT OUT-OF-POCKET PRICE, BY PATIENT CHARACTERISTICS

	Emergency Visit		Urbanicity	
	Yes	No	Rural	Urban
$\text{OnWeb}_m \times \text{Post}_t$	-0.018 (0.014)	-0.057*** (0.009)	-0.007 (0.030)	-0.060*** (0.009)
<i>F</i> statistic of difference	5.862**		2.960*	
Adjusted R^2	0.399	0.325	0.358	0.320
Observations	198,041	1,786,758	189,240	1,795,559
	Age		Income	
	≤ 35	> 35	≤ Mean	> Mean
$\text{OnWeb}_m \times \text{Post}_t$	-0.060*** (0.018)	-0.051*** (0.011)	-0.049*** (0.011)	-0.066*** (0.011)
<i>F</i> statistic of difference	0.163		1.103	
Adjusted R^2	0.349	0.315	0.324	0.322
Observations	325,523	1,305,073	1,179,840	804,959
Full controls	Yes	Yes	Yes	Yes
Month-year FE	Yes	Yes	Yes	Yes
Procedure FE	Yes	Yes	Yes	Yes

Estimates from baseline difference-in-difference specification for various subpopulations. The dependent variable is $\log(1 + \text{patient out-of-pocket price})$. OLS regression standard errors clustered at the month-year level in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Demand-side Effects

TABLE 7.—EFFECT OF PRICE TRANSPARENCY WEBSITE ON SEARCH BEHAVIOR AND PROVIDER TYPE

	Dependent Variable:			
	Same Provider as Last Medical Imaging Visit	Low-Cost Provider	Provider in New Hampshire	Distance to Provider (miles)
OnWeb _{<i>m</i>} × Post _{<i>t</i>}	-0.0209** (0.0095)	0.0652*** (0.0077)	0.0036*** (0.0012)	0.1756** (0.0739)
Full controls	Yes	Yes	Yes	Yes
Month-year FE	Yes	Yes	Yes	Yes
Procedure FE	Yes	Yes	Yes	Yes
Adjusted R ²	0.044	0.038	0.458	0.426
Observations	806,294	1,642,953	1,984,799	1,984,799

Estimates from a linear probability model using the same controls as the baseline difference-in-difference specification presented in equation (1). A low-cost provider is defined as a provider with an average out-of-pocket cost in the lowest decile in each county conditional on procedure, insurer, and year. OLS regression standard errors clustered at the month-year level in parentheses. **p* < 0.10, ***p* < 0.05, and ****p* < 0.01.

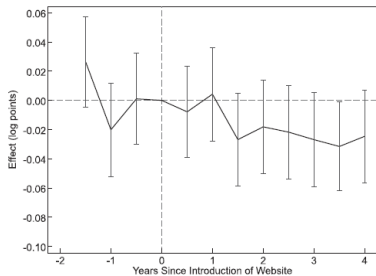
Similar specification with added provider-procedure-insurance FE:

$$\log(1 + p_{imjkt}) = \beta(OnWeb_m \times Post_t) + \alpha X_{it} + \lambda_{jmk} + \lambda_t + \varepsilon_{imjkt}$$

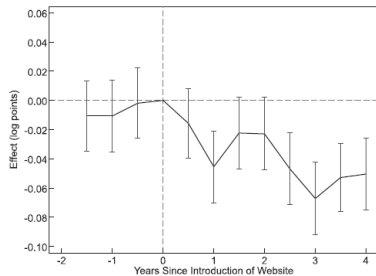
“Conditional on going to the same provider, with the same insurance, and receiving the same procedure, a change in transaction price must be due to a supply-side effect.”

Supply Side Effects

FIGURE 3.—SUPPLY-SIDE EFFECT OF PRICE TRANSPARENCY WEBSITE, BY TIME PERIOD



a. Total visit price



b. Principal procedure price

Supply Side Effects

TABLE 8.—SUPPLY-SIDE EFFECT OF PRICE TRANSPARENCY WEBSITE

	Total Visit Price	Principal Procedure Price	Total Visit Effect by County HHI		Total Visit Effect by Provider Type	
			≤ First Quartile HHI	> Forth Quartile HHI	Hospital	non-hospital
OnWeb _m × PostShortRun _t	-0.010* (0.006)	-0.005 (0.006)	0.007 (0.012)	-0.042*** (0.014)	-0.009 (0.011)	-0.009 (0.007)
OnWeb _m × PostLongRun _t	-0.017*** (0.006)	-0.030*** (0.006)	0.000 (0.012)	-0.048*** (0.015)	0.016 (0.013)	-0.024*** (0.006)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Provider × Procedure × Insurer FE	Yes	Yes	Yes	Yes	Yes	Yes
Month-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic of difference (SR)				7.355***		0.002
F-statistic of difference (LR)				6.723**		7.393***
Mean level	950.38	450.01	6.01	5.99	6.60	5.95
Adjusted R ²	0.497	0.807	0.475	0.467	0.559	0.464
Observations	1,967,086	1,967,083	609,793	441,664	338,478	1,628,608

Estimates from the difference-in-difference specification that controls for demand-side factors presented in equation (2). The dependent variable is $\log(1 + y)$, where y is either the visit price or principal procedure price. For visit price, the unit of observation is a patient visit, which may contain multiple medical claims. For principal procedure price, the unit of observation is the primary medical imaging procedure within each visit. HHI is calculated for individuals' county for each procedure class in the period before the website. The sample consists of all commercial claims related to outpatient medical imaging procedures in New Hampshire from 2005 to 2011. OLS regression standard errors clustered at the month-year level in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

We know prices have decreased, but has the spread narrowed?

TABLE 9.—EFFECT OF PRICE TRANSPARENCY WEBSITE ON PRICE DISPERSION

	Interquartile Range of Transaction Prices		Interquartile Range of Provider Prices	
	Total Visit Price	Principal Procedure Price	Total Visit Price	Principal Procedure Price
OnWeb _m × Post _t	-231.0*** (63.8)	-103.7*** (24.0)	-158.9** (68.7)	-96.3*** (20.7)
Individual controls	Yes	Yes	Yes	Yes
Procedure FE	Yes	Yes	Yes	Yes
Month-year FE	Yes	Yes	Yes	Yes
Mean IQR	1183.5	658.5	992.4	541.4
Adjusted R ²	0.307	0.447	0.271	0.465
Observations	13,572	13,572	13,572	13,572

Estimates from the difference-in-difference specification described in section IVA. The unit of observation is a procedure-month. Interquartile range is defined as the difference between 75th and 25th percentiles price for each procedure-month. OLS regression standard errors clustered at the month-year level in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Any threats/concerns?

1. Lack of website use?
 - Using site traffic data, Brown estimates 8% of patients who received an outpatient medical imaging procedure visited the website
 - Enough uptake to discern an effect, but what if this 8% differs from the rest of the pop?
2. What role does the entry/exit of providers play?
 - Current identification doesn't incorporate entry/exit of providers except through month-year fixed effects
 - Would be interesting to see if there's an inflow of low-cost firms or an exodus of high-cost firms

Final thoughts & comments

- This paper is super clean and I am a big fan!
- This guy is scarily impressive (check out his website)
- I appreciate how many dimensions of the analysis he fit into a 14 page paper. Very good use of online appendices.
- Could you do something similar with the DoltHub data? The big issue is no population claims dataset to fall back on.
- Is there anything else we can identify by looking at compliers vs non-compliers with the new hospital price transparency laws?