Hospital Pricing and Public Payments

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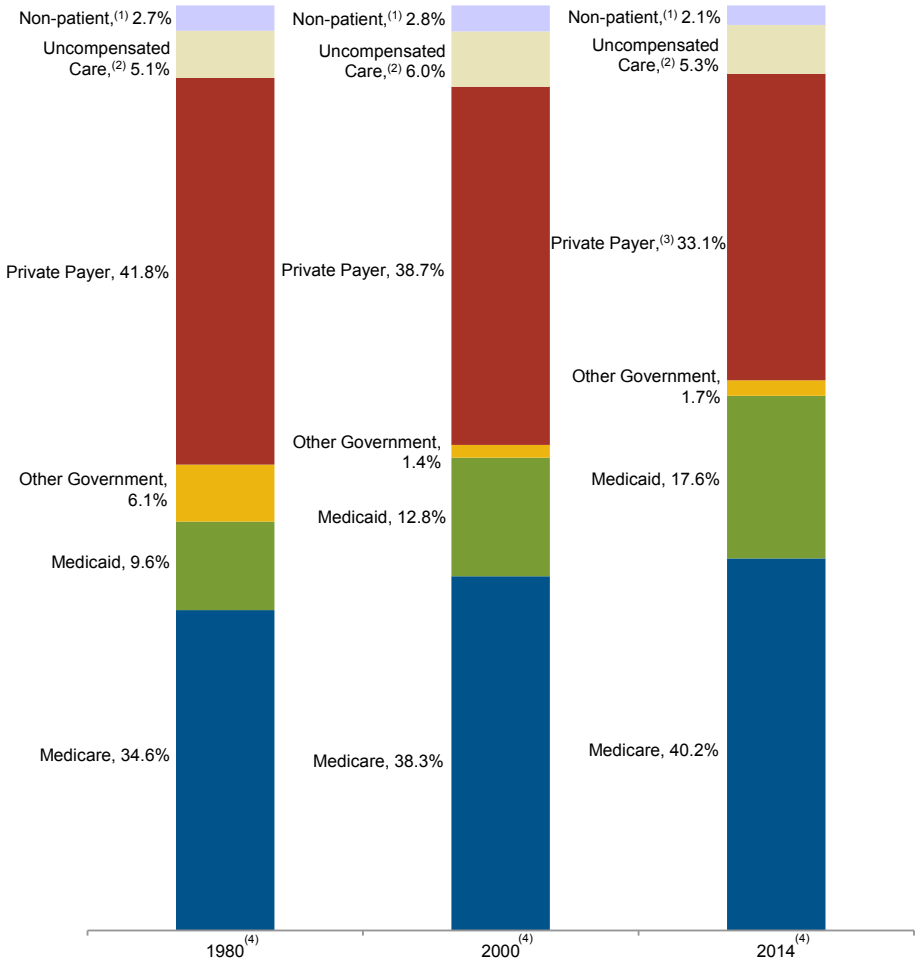
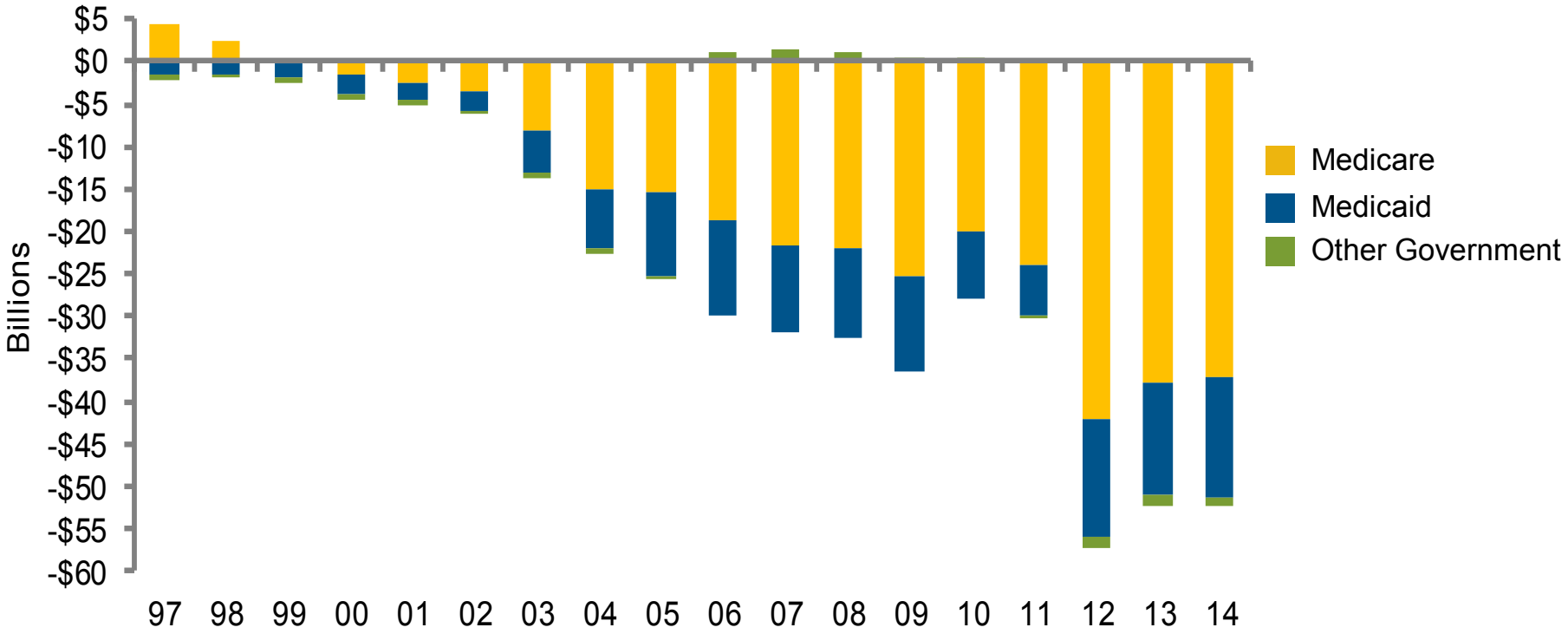
Hospital Cost by Payer Type



Source: AHA Trendwatch Chartbook 2016.

Payment Shortfall Relative to Costs



Source: AHA Trendwatch Chartbook 2016.

How have hospitals responded?

- "Cost shifts have been a fact of hospital financial survival for decades.... The data show ... how private payment is a mirror image of public payment over time and that the cost shift occurs. Hospitals must make up for shortfalls through a combination of approaches and cost-shifting is among them." -Rich Umbdenstock, Former President and CEO of American Hospital Association

The ACA and Medicare?

- Medicare reduced inpatient payment rates under the ACA
- Payments were tied to quality rather than quantity through bonus payments for higher quality *and* payment penalties for lower quality:
  - Hospital Readmissions Reduction Program
  - Hospital Value-Based Purchasing Program
  - Hospital-Acquired Condition Reduction Program

Research Questions

1. **Did hospitals respond to public reimbursement cuts by bargaining for higher prices from private insurers? (In other words... Do hospitals cost-shift?)**
2. **What characteristics of hospitals are associated with cost-shifting**

Outline

Paper Overview

- Approach:
  - Plausibly exogenous variation in Medicare payments by hospital and over time due to the Hospital Readmissions Reduction Program (HRRP) and Hospital Value-Based Purchasing Program (HVBP)
  - Estimate change in commercial price using sample of 25% of the employer-sponsored insurance population 50% of all inpatient prospective payment hospitals between 2010 and 2015
- Findings:
  - Increase in average payments of 1.0%-1.4% for hospitals facing a net reimbursement reduction
  - Results consistent with effect among hospitals with better bargaining positions:
  - Statistically significant results only for non-profit hospitals, but similar magnitude for for-profits
  - Mean effect driven by subset of admission types: circulatory and nervous system claims
  - Results not explained by changes in service mix or intensity

Arguments Against Cost-Shifting

- Firms Shouldn't Do This:
  "Economists usually presume that a profit-maximizing firm has previously fully exploited all opportunities to reduce costs or raise revenues, so absent a fundamental rethinking of the firm's strategy, it would have to absorb the loss." -Dranove *et al.* 2017
- Cost-shifting occurs rarley - if at all:
  "In fact, as a whole, the evidence does not support the notion that cost-shifting is both large and pervasive. Instead, it reveals that cost-shifting can occur but may not always do so. When it has occurred, it has generally been measured at a rate far below dollar-for-dollar" - Frakt 2011

Literature Against Cost-Shifting

- Evidence Against Cost-Shifting:
  - Zero/Small effects: Wu (2010), Dranove (2017)
  - Lower prices: Showalter (1997), Stensland et al. (2010), White (2013)
- Alternative Responses to Public Reimbursement Reductions
  - Lower Profits: Garthwaite (2011)
  - Upcoding: Dafny (2005)
  - Cutting Costs: Robinson (2011)
  - Heterogeneous Responses: Tai-Seale (1998)

Evidence in Support of Cost-Shifting

- Hospital industry claims they do it (e.g. quote from Rich Umbdenstock)
- Insurance industry believes it happens - industry funded study found *massive* cost-shifting (PWC, 2010)
- Academic Evidence/Support for Cost-Shifting
  - Zwanziger and Bamezai (2000, 2006)
  - Gowrisankaran and Town (1997)
  - Clement (1998)
  - Cutler (1998)

Hospital Readmissions Reduction Program

- Readmissions are associated with poorer outcomes and are costly:
  - 19.6% of all Medicare patients were readmitted within 30
  - In 2011, Medicare's readmission rate of 17.2% resulted in 1.8 million hospitalizations within 30 days of discharge costing $24bn (AHRQ 2014)
- HRRP reduces base payments on all Medicare inpatient admissions by a factor based on risk adjusted readmissions ratio of actual to expected based on claims lagged 2 years
- Penalties began in FY13 with a max reduction of 1% (increasing to 2% in FY14) based on three diagnoses: AMI, Pnuemonia, Heart Failure
- By FY15 the max penalty was 3% based on: AMI, Pnuemonia, Heart Failure, Hip and Knee Arthroplasty, and COPD

HRRP Timeline

Years penalties applied	FY 2013	FY2014	FY2015
Diagnoses at initial hospitalization	AMI HF PNE	AMI HF PNE	AMI HF PNE Hip and Knee COPD
Maximum rate of penalty	1%	2%	3%
Average Hospital Payment adjustment all hospitals	-0.27%	-0.25%	-0.49%
Average hospital penalty adjustment penalized hospitals	-0.42%	-0.38%	-0.63%
Percent of hospitals penalized	64%	66%	78%
Percent of hospitals at at max penalty	8%	0.6%	1.2%
CMS estimate of total penalties	$290m	$227m	$428m

Hospital Value-Based Purchasing

- Goal is to tie 85% of fee-for-service Medicare payments to quality or value
- All hospitals' DRG payments are reduced then penalties or bonuses based on quality:
  - Comparison to other hospitals
  - Comparison to their own previous performance
- HVBP quality domains include:
  - Clinical Process of Care:
  - Patient Experience of Care
  - Efficiency and Cost Reduction
  - Spending
- 2013 through 2017, payments are reduced 1%, 1.25%, 1.5%, 1.75%, and 2%, respectively

HVBP Timeline

Fiscal year	2013	2014	2015	2016	2017
CMS withholds	1%	1.25%	1.5%	1.75%	2%
Average hospital bonus	0.23%	0.24%	0.44%	0.66%	0.71%
Average hospital penalty	0.21%	0.26%	0.30%	0.48%	0.48%
Top hospital bonus	0.83%	0.88%	2.09%	3.02%	4.0%
Top hospital penalty	0.90%	1.14%	1.24%	1.75%	1.83%

Source: Managed Care analysis of CMS data

HRRP/HVBP Impacts on Quality?

- Mellor *et al.* (2016): HRRP associated with declines in AMI readmission, not due to delay, intensity, or patient mix
- Gupta *et al.* (2018): 5% point *increase* in heart failure mortality, despite a reduction in readmissions
- Gupta (2017): 5% reduction in overall readmissions and 3% reduction in all-cause mortality - mostly due to quality improvement
- Desai *et al.* (2016): Reduction in all readmissions following the announcement of HRRP in 2010 and a larger effect among penalized hospitals and diagnoses textitbut impacts plateaued by start of penalties
- Norton *et al.* (2016): HVBP improved quality only for services with the highest marginal incentives to improve
- GAO (2015): No effect of HVBP on quality - HVBP reinforced ongoing quality initiatives
- No studies of the impact on private payer patients to our knowledge

Identification strategy

Identification relies on the differential application of penalties across hospitals and over time (difference-in-differences)

- Penalties are a plausible sources of exogenous variation because
  1. HRRP/HVBP generates variation in total hospital payments
  2. Penalties are based on lagged data that is largely beyond the hospitals control during the study period
- Use allowed payments (i.e. actual prices paid) from a national, multi-year commercial claims dataset rather than charge or cost-based measures (correlation of charge-based and allowed payments = 0.435)
- Large sample of hospitals with a rich set of hospital-level characteristics including detailed measures of the HRRP and HVBP penalties

Data Sources

- Commercial health insurance claims from Health Care Cost Institute
  - Includes claims from 3 national commercial insurers (Aetna, UnitedHealthCare, and Humana) from all 50 states and DC.
  - Policies that cover 28% of Americans under 65 with employer-provided health insurance.
- Hospital and other regional data from:
  - Hospital Compare.
  - American Hospital Association (AHA) annual surveys
  - Healthcare Cost Report Information System (HCRIS)
  - American Community Survey

Analytic Dataset

Balanced panel of 1,386 inpatient prospective payment system hospitals from 2010 to 2015:

- Smaller hospitals and those without sufficient history (such that HRRP and HVBP don't apply) are excluded
- Use person-level inpatient claims to calculate a hospital-level risk-adjusted average price (Gowrisankaran, Nevo, and Town (2015) Gaynor and Vogt (2003), and Cooper, et al. (2015)).:
  - Commercial price calculation uses general acute care admits within 180 miles of patient ZIP code.
  - Excludes invalid claims and outlier payment ratios (allowed/billed) indicative of incomplete claims
  - Regress inpatient episode payment divided by DRG weight on gender, age, and dummies for hospital in each year.
- Net penalty indicator accounts for possibility of HRRP penalties and HVBP penalties or bonuses

Dependent Variables

Table: Characterization of Research Sample over Time

Fiscal Year	Sample Size	Payment $ Mean (St. Dev.)	Percent Penalized
2010	1,386	10,729.22 (4,936.50)	0.00
2011	1,386	11,602.74 (5,076.45)	0.00
2012	1,386	12,079.46 (5,477.37)	0.32
2013	1,386	12,668.44 (5,567.76)	0.74
2014	1,386	12,795.83 (5,444.21)	0.76
2015	1,386	13,397.63 (5,921.74)	0.79
Total	8,316	12,212.22 (5,481.55)	0.43

Variables by Penalty Status

Table: Hospital Characteristics by Penalties

Variable	Never Penalized	Ever Penalized	p-value
Log(Charge)	8.843	8.726	0.000
Log(Payment)	9.423	9.300	0.000
System Membership	0.768	0.784	0.352
Non-prfit	0.790	0.692	0.000
Log(Case Mix Index)	0.437	0.447	0.090

Baseline Model

Hospital Fixed Effects Estimator:

$$y_{hct} = \alpha_h + x_{ht}^{'}\beta + Z_{ct}^{'}\gamma + \delta 1[Penalty] + \theta_t + \epsilon_{hct}, \quad (1)$$

- y_{hct} = outcome in hospital y in county c in year t.
- α_h = hospital fixed effect.
- x_{ht} = time-varying hospital characteristics.
- Z_{ct} = time-varying county characteristics.
- θ_t = year fixed effect.
- ϵ_{hct} = i.i.d. across hospitals and time error component.

$1[Penalty]$ penalty variable is zero in years 2010 and 2011 for all hospitals.

Fixed Effects Results: Baseline

Table: Baseline Results

	Log Mean Payment	Log Mean Net Charge	Log MDCD Discharges	Log MDCR Discharges	Log Other Discharges
Net Penalty	0.014***	0.008	-0.045**	-0.027***	-0.004
	(0.005)	(0.008)	(0.021)	(0.007)	(0.011)

Notes: n = 8,316. All regressions include hospital and year xed eects and other hospital level controls including bed count and labor force characteristics. Market power variables are constructed using the overall hospital service area. Large market is a binary variable for a hospital in the top half of the market size distribution. In cases in which independent variables are missing, we recode them and control for missing variable indicators to ensure a balanced panel. Standard errors are clustered at the hospital level. *** p-value$<$0.01, ** p-value$<$0.05, * p-value$<$0.1.

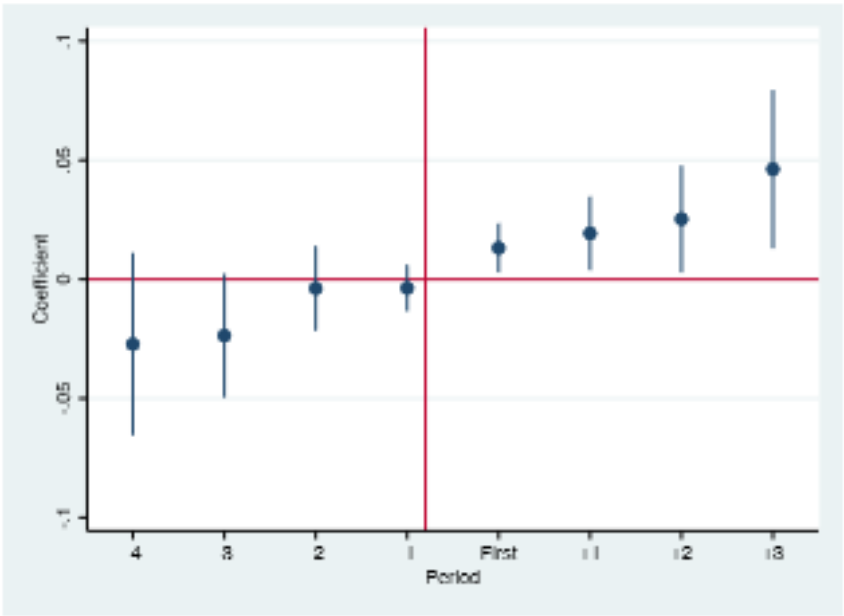
Fixed Effects Results: Intensive Margin

Table: Intensive Margin Results

	Log Mean Payment	Log Mean Net Charge	Log MDCD Discharges	Log MDCR Discharges	Log Other Discharges
Low Bonus	Omitted				
Large	-0.005	0.017	0.022	0.026**	0.042**
Bonus	(0.008)	(0.012)	(0.034)	(0.013)	(0.017)
Low	0.010*	0.015	-0.026	-0.017*	0.004
Penalty	(0.006)	(0.010)	(0.029)	(0.010)	(0.015)
Large	0.013*	0.017	-0.047	-0.009	0.034**
Penalty	(0.007)	(0.012)	(0.030)	(0.011)	(0.016)

Notes: n = 8,316. Results derived from breaking the dollar change in reimbursements above and below the median for those hospitals receiving a bonus and those receiving a penalty, respectively. All regressions include hospital and year xed eects and other hospital level controls including bed count and labor force characteristics. Market power variables are constructed using the overall hospital service area. Large market is a binary variable for a hospital in the top half of the market size distribution. In cases in which independent variables are missing, we recode them and control for missing variable indicators to ensure a balanced panel. Standard errors are clustered at the hospital level. *** p-value$<$0.01, ** p-value$<$0.05, * p-value$<$0.1.

Event Study



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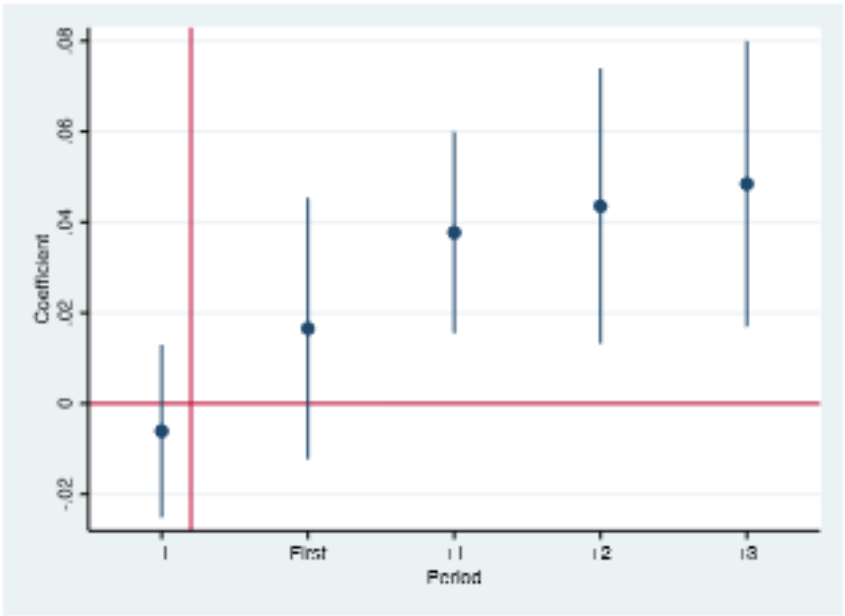

b.

Notes: Depiction of event study results in which "first" represents the first year in which a penalty is realized. Panel a. presents lagged and lead estimates for the entire sample without regard to selection effects (i.e., not all penalized hospitals contribute to the point estimates for each lag/lead). Panel b. depicts results restricting the sample to just hospitals first penalized in 2012 and those never penalized.

Robustness Checks: Penalty Specific Trends

Table: Penalty Specific Trends Specification

	Log Mean Payment	Log Mean Net Charge	Log MDCD Discharges	Log MDCR Discharges	Log Other Discharges
Net Penalty	0.010**	0.018**	-0.037	-0.024***	-0.008
	(0.005)	(0.008)	(0.023)	(0.006)	(0.011)
p-value	0.473	0.034	0.282	0.003	0.182

Notes: Further controls include those in our baseline specication. The p-value is in reference to the null hypothesis that trends in the outcome of interest are the same between ever and never penalized are the same conditional on the model covariates. When independent variables are missing, we recode them and control for missing variable indicators to ensure a balanced panel. Standard errors are clustered at the hospital level. *** p-value$<$0.01, ** p-value$<$0.05, * p-value$<$0.1.

Robustness Checks: Alternative Controls

Table: Net Penalty Coefficient Estimates

Specification	Log Mean Payment	Log Mean Net Charge	Log MDCD Discharges	Log MDCR Discharges	Log Other Discharges
1. Hospital, Year, County FEs	0.015***	0.009	-0.048**	-0.027***	-0.003
	(0.005)	(0.008)	(0.022)	(0.007)	(0.011)
2. Medicaid Expansion	0.014***	0.008	-0.044**	-0.027***	-0.005
	(0.005)	(0.008)	(0.021)	(0.007)	(0.010)
3. HCAHPS Rating	0.014***	0.008	-0.045**	-0.026***	-0.003
	(0.005)	(0.008)	(0.021)	(0.007)	(0.010)
4. Drop Fiscal Year 2012	0.012**	0.010	-0.045*	-0.028***	-0.007
	(0.005)	(0.009)	(0.023)	(0.007)	(0.012)
5. Case Mix Controls	0.014***	0.004	-0.044**	-0.026***	-0.005
	(0.005)	(0.008)	(0.021)	(0.007)	(0.011)

Notes: Further controls include those in our baseline specication. When independent variables are missing, we recode them and control for missing variable indicators to ensure a balanced panel. Standard errors are clustered at the hospital level. *** p-value$<$0.01, ** p-value$<$0.05, * p-value$<$0.1.

Modeling Heterogeneous Effects

- Dranove (1988) finds hospitals may cost-shift if their objective functions includes something other than pure profit (e.g. quantity) which suggests cost-shifting is more likely among non-prot hospitals.
- We examine the conditions necessary for cost-shifting by embedding the Dranove (1988) model in a hospital-insurer bargaining model (e.g. Ho and Lee, 2017 or Gowrisankaran et al., 2015).
- Hospitals must have some diminishing marginal utility of profits for cost-shifting to occur but do not need to derive utility from something other than profits.

Theoretical Predictions of Heterogeneous Effects

- Assuming diminishing marginal utility reflects risk-aversion (e.g., uncertain demand or uncertain exposure to the HVBP/HRRP penalties), our model predicts:
  1. Any risk-averse hospital to potentially cost shift, regardless of whether the hospital is for-profit or non-profit.
  2. Cost-shifting should be largest for hospitals with more bargaining power or a better bargaining position.

Heterogeneity by Objective Function

Table: Net Penalty Coefficient Estimates by Profit Status

Baseline Model	Log Mean Payment	Log Mean Net Charge	Log MDCD Discharges	Log MDCR Discharges	Other Discharges
Non-profit	0.015***	0.008	-0.046*	-0.029***	-0.011
	(0.005)	(0.009)	(0.024)	(0.007)	(0.012)
For-profit:	0.020	0.023	-0.018	-0.008	0.026
	(0.014)	(0.021)	(0.050)	(0.018)	(0.020)
Penalty Specific Trends					
Non-profit	0.012**	0.015*	-0.039	-0.023***	-0.015
	(0.005)	(0.009)	(0.026)	(0.007)	(0.014)
p-value	0.805	0.205	0.241	0.001	0.849
For-profit:	0.011	0.043*	0.002	-0.028	0.007
	(0.014)	(0.023)	(0.050)	(0.017)	(0.020)
p-value	0.417	0.025	0.885	0.013	0.003

Notes: Further controls include those in our baseline specication. The p-value is in reference to the null hypothesis that trends in the outcome of interest are the same between ever and never penalized are the same conditional on the model covariates. When independent variables are missing, we recode them and control for missing variable indicators to ensure a balanced panel. Standard errors are clustered at the hospital level. *** p-value$<$0.01, ** p-value$<$0.05, * p-value$<$0.1.

Heterogeneity by Bargaining Position

Table: Triple Difference by Payer Mix

	Log Mean Payment	Log Mean Charge
Net Penalty	0.039***	0.043***
	(0.010)	(0.013)
* Public Share 2	-0.020*	-0.014
	(0.012)	(0.014)
* Public Share 3	-0.033**	-0.043***
	(0.013)	(0.015)
* Public Share 4	-0.044***	-0.070***
	(0.013)	(0.016)
Public Share 2	0.007	0.049***
	(0.010)	(0.013)
Public Share 3	0.016	0.087***
	(0.011)	(0.016)
Public Share 4	0.023*	0.157***
	(0.012)	(0.018)

Notes: All regressions include hospital and year xed eects. Further controls include those in our baseline specication for mean payments. The share of a hospitals patients insured by the public sector is broken into quartiles and interacted with penalty variables. In cases in which independent variables are missing, we recode them and control for missing variable indicators to ensure a balanced panel. Standard errors are clustered at the hospital level. *** p-value$<$0.01, ** p-value$<$0.05, * p-value$<$0.1.

Heterogeneity by Vertical Integration

Table: Net Penalty Coefficient Estimates by VI Status

	Log Mean Payment	Log Mean Charge	Log MDCD Discharges	Log MDCR Discharges	Other Discharges
VI prior to 2012	0.023***	0.017***	-0.036	-0.026**	0.008
	(0.008)	(0.006)	(0.032)	(0.009)	(0.016)
Never VI	0.008	0.021***	-0.063**	-0.024**	-0.005
	(0.007)	(0.012)	(0.031)	(0.010)	(0.015)

Notes: Further controls include those in our baseline specification for mean payments. In cases in which independent variables are missing, we recode them and control for missing variable indicators to ensure a balanced panel. Standard errors are clustered at the hospital level. *** p-value$<$0.01, ** p-value$<$0.05, * p-value$<$0.1.

Heterogeneity by Service Line

Table: Condition Specific Admissions

	n	Mean Payment	Net Penalty Coefficient
Nervous System	1,410	13,762.86	0.021***
			(0.010)
Respiratory System	1,758	12,015.13	0.001
			(0.011)
Circulatory System	2,754	13,071.17	0.019**
			(0.008)
Musculoskeletal System	3,060	12,981.58	0.004
			(0.007)
Labor and Delivery	5,226	11,308.56	-0.001
			(0.005)
Neonatal	3,204	8,911.19	0.016
			(0.010)

Notes: We restrict the sample to include at least 25 admissions per hospital per year. The dependent variable is the log of average payments for each associated acute care admission category. The net penalty coefficient is estimated from the baseline specification. Standard errors are clustered at the hospital level. *** p-value$<$0.01, ** p-value$<$0.05, * p-value$<$0.1.

Potential Alternative Explanations

- Did hospitals improve quality that private insurers are willing to pay more for?
  - Mixed evidence of quality improvements and unclear if private payer patients quality improved following HRRP/HVBP
- Are hospitals are changing the service mix?
  - No evidence of more profitable services?
  - No evidence of higher intensity of services?

Table: Test of Changes in Service Use

	Profit Index	Mean DRG Weight	Mean LOS
Net Penalty	0.002	0.004	0.015
	(0.001)	(0.004)	(0.012)

Notes: n = 8,316. The net penalty coefficient is estimated from the baseline specification. Standard errors are clustered at the hospital level. *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

Conclusion

- Baseline estimate of 1.4% increase in commercial prices for hospitals that were penalized under the HRRP/HVBP programs.
  - Result is robust to a variety of alternative specications - no evidence of changes in underlying quality or intensity of treatment.
  - Estimate implies an increase of $167 per inpatient stay based on an average private insurance payment of approximately $12,100 among penalized hospitals
  - Accounting for differential trends with hospital xed eects controlling for time-varying unobserved heterogeneity, the estimated effect is still signicant: 1%
- These results should not be interpreted as pay for performance is inherently bad rather that the design of the pay for performance program is important