Hospital-Physician Gainsharing

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Physician preference items: high cost drugs and devices chosen by MDs and paid for by hospitals.

Insurers pay hospitals case rates that do not vary with drug & device costs.

Hospitals have adopted a wide range of strategies to align MDs’ incentives with their own.
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- Highly regulated
Many high cost drugs and devices: stents, antithrombotic therapy, catheters, vascular closure devices, and EP.
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Gainsharing’s financial incentives and information-sharing–both informally and through benchmarking–attempt to standardize physicians’ choices.
Develop a theoretical model of MD decisionmaking under the currently-approved version of gainsharing.
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- Generate predictions of physician responses and variation in those responses.
- Test the model with reduced-form analysis of Goodroe data. Use dynamics to distinguish the effects from incentives vs. learning through information-sharing.
The Multi-Stage Game

**Stage 1:** Hospitals negotiate prices with manufacturers: tiered contracts with discounts for volume and market share;

**Stage 2:** Hospitals establish illness-specific treatment vectors $\hat{q}_{ca}(\theta)$ as a treatment guideline;

**Stage 3:** Physicians choose a vector of drugs and devices for their patients $(\bar{q}_{ca}(\theta))$;

**Stage 4:** Physicians monitor each other’s behavior;

**Stage 5:** Payouts are distributed and penalties attributed.
Hospital $h$’s net revenue $\Pi$ from $i$ patients in year $t$ as:

$$\Pi_{h,t} = \sum_{i=1}^{n} DRG_i - \sum_{a=1}^{A} \left( \sum_{c=1}^{C_a} p_{ca,t} q_{ca,t} \right) - \sum_{j=1}^{J} \sum_{a=1}^{A} \text{payout}_j^a,$$

where $c$ denotes the device in category $a$ (where the categories are mutually exclusive).
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The payout to group $j$ (defined by practice membership) is:

$$payout_j^i = \sum_{a=1}^{A} \left[ \frac{1}{2} \max \left( 0, \tilde{g}_{a,t-1}^j - g_{a,t}^j \right) \right],$$

where payouts are done at the category level and $g_{a,t}^j$ denotes total spending in $t$ and $\tilde{g}_{a,t-1}^j$ denotes the "baseline" total spending in $t - 1$. 
Physician $k$ in group $j$ is assumed to have preferences over his income and his patients’ health (a paternalistic form of altruism):

$$V^j_k = \sum_{i=1}^{l} Revenue_i + \sum_{a=1}^{A} \frac{1}{n_j} payout^j_a + \beta \sum_{i=1}^{l} h(\theta_i, \overline{q}_{ca})$$

$$- \sum_{i=1}^{l} [\Lambda(\overline{q}_{ca}(\theta_i), \widehat{q}_{ca}(\theta_i), n_j)].$$
Theoretical Model (cont.)

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- or alternatively, physician $k$ in group $j$ is assumed to have preferences over his income and certain devices:

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- Manufacturers will exert strong market power and thus maintain previous levels of prices and price dispersion.
- Gainsharing generates few savings from any of the quantity, price or discount effects.
Physicians have weak preferences for particular devices and quantities (e.g. weak altruism):

- Physicians are willing to switch to the agreed-upon treatment vector $\tilde{q}_{ca}(\theta)$. 

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- Physicians are willing to switch for some patients but not for others—potential divergence!
- Gainsharing lowers costs via both quantity and substitution effects for some types of patients but not for others.
- The degree of savings due to discount effects is positively related to the proportion of patients for whom physicians have weak preferences about devices.
By the end of 2006, 6 hospitals had implemented 13 one-year gainsharing programs (up to 4 programs each) at different times since January, 2003.

Three hospitals ended gainsharing, or had time periods without gainsharing between their programs.

In total, 161 physicians from 35 groups treated 58,399 patients under the programs.

Physician practice sizes ranged from 1 to 17 physicians.

We have pre-gainsharing data for these hospitals, and from 123 hospitals that did not implement gainsharing.
Real time data from hospital-based cath labs include:
Procedure date, which we linked with the gainsharing program status

Patient clinical data (demographics, comorbidities, illness severity, procedures performed)

Drugs and devices used (price paid; manufacturer, product and model IDs; other characteristics)

Diagnostic and interventional physician identifiers

MD practice affiliations—for gainsharing physicians only
Reduced-form analysis

For top 5 highest priced categories (drug-eluting stents, bare metal stents, antithrombotic therapy, balloon catheters, vascular closure devices) we analyze:

- Standardization on manufacturer (HHI and CR1) and price at the physician, practice and hospital levels separately, and within-hospital standardization on quantity per patient across physicians.
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- \(G\) are program year dummies (all relative to the initial baseline), \(T\) are year-by-quarter dummies, and \(H\) are provider dummies. Physician and hospital level analyses include non-gainsharing providers.
Results for Within-Physician Standardization on Manufacturer (HHI)

<table>
<thead>
<tr>
<th>Annual Program</th>
<th>DES</th>
<th>BMS</th>
<th>AT</th>
<th>BC</th>
<th>VCD</th>
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<tr>
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**Bold** indicates p < 0.05

Gainsharing effects for DES from both incentives and learning, but from incentives only for balloon catheters?

Even more large reductions in within-physician variation in device prices. Results similar at hospital level for both manufacturer and prices–convergence with peers.

But little convergence within a practice, either overall or for specific practice sizes. (Due to lack of the control group?)
Total and within-product changes in price per device ($)

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1st Column—Overall, 2nd Column—Within-Product

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- Within-product results indicate discount effects due to negotiating, rather than from contract compliance since they don’t correspond much with the results for standardization on manufacturer.
Patient-level results for risk-adjusted quantities:

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- Results by practice size suggest moral hazard—large, significant reductions for DES, BC and VCD for the smallest practices (1-2 and 3-5 physicians) but insignificant effects for the largest (11+, and often 6-10 also.)
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- Lack a reduced-form method of quantifying the between-product price effects (substitution).
Overall, gainsharing reduced costs due to lower prices from:

- substitution, primarily BMS for DES
- discounts achieved through bargaining
- Physicians' preferences were weak enough that gainsharing made them willing to switch.
- Sometimes they actually switched and standardized, other times prices dropped and converged.
- Both incentives and learning through information appear to be important.
- No overall reductions in quantity or standardization in quantity
- but some reductions in smaller practices
- preferences for quantities might be stronger than those for manufacturer- or regulation inhibited reductions.
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- Larger groups were less likely to lower quantities
- But unknown whether information-sharing occurred across or only within-practices.