Physician Agency and Financial Incentives

Iizuka (*AER*, 2012) and Clemens and Gottlieb (*AER*, 2014)

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Preview

Yes, physicians are affected by financial incentives.

- Iizuka (2012) shows that the prescription decisions of vertically integrated physicians in Japan are influenced by the difference in markup of generic and branded drugs.
- Clemens and Gottlieb (2014) show that physicians in the United States increase care in response to increases in Medicare reimbursement rates.

Physician Agency and Adoption of Generic Pharmaceuticals

Iizuka (2012)

Overview

- In Japan, about half of small clinic doctors both prescribe and dispense drugs, i.e. vertically-integrated.
- Generic drugs are cheaper to the patient and are more profitable on average to VI clinics compared to branded drugs.
- Around the study period only, 16.8% of prescriptions were for generics in Japan.

Key question

Do physicians consider the costs to their patients when making prescription decisions?
How do financial incentives affect physician prescription decisions?

Distribution of Generic Prescription

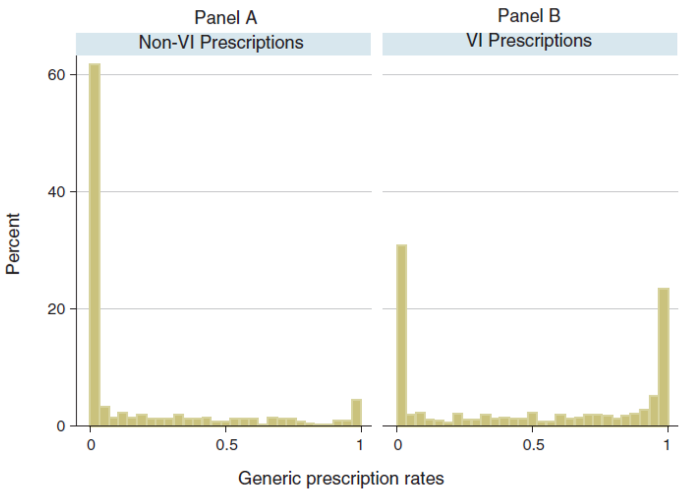

Figure 2. Distribution of Doctor's Generic Prescription Rate by the VI Status

Data

Prescription data come from medical insurance claims from the Japan Medical Data Center. Drug price data come from the Drug in Japan database. This paper focuses on outpatient visits.

- Includes all prescriptions from Aug. 2003 to Dec. 2005 for about 360,000 individuals from ten corporate health insurance programs
- Includes prescription information, patient information, and medical provider information
- Analysis is focused on the small clinic segment of providers and looks at 40 drugs.

Model

The goal is to model the prescription decision of physician j treating patient i with drug k at time t.

- The **utility differential** between generic and branded versions of the drug is

$$\Delta U_{ijkt} = U^{GE}_{ijkt} - U^{B}_{ijkt}.$$

- This can be decomposed into the **physician's utility differential** Δu^{d}_{ijkt} and the **patient's utility differential** Δu^{p}_{ijkt}.

$$\Delta U_{ijkt} = \gamma_d \Delta u^{d}_{ijkt} + \gamma_p \Delta u^{p}_{ijkt}$$

Model

The utility differentials can be expressed as

$$\Delta u^d_{ijkt} = f(y_{ijkt-1}, \Delta M_{ikt}, VI_j, \boldsymbol{H}_j, \boldsymbol{X}_{kt}, \tau^d_{ijk})$$
$$\Delta u^p_{ijkt} = f(y_{ijkt-1}, \Delta P_{ikt}, \boldsymbol{Y}_i, \boldsymbol{X}_{kt}, VI_j, \tau^p_{ijk}),$$

where

- y_{ijkt-1} is prescription choice in the previous visit
- ΔM_{ikt} is the size of the markup differential per day
- VI_j is an indicator for vertical integration
- $\boldsymbol{H}_j$ is physician characteristics
- $\boldsymbol{Y}_i$ is patient characteristics
- $\boldsymbol{X}_{kt}$ are drug and prescription characteristics
- τ^d_{ijk} and τ^p_{ijk} are physician and patient preferences, respectively

Estimation

The physician decision model can be estimated using a dynamic probit model.

$$
\begin{aligned}
\Pr(y_{ijkt} = 1) &= \Phi(\gamma_d \Delta^d_{ijkt} + \gamma_p \Delta u^p_{ijkt}) \\
&= \Phi[\{y_{ijkt-1}(\alpha_1 + \alpha_2 VI_j) + \Delta M_{ikt}(\alpha_3 + \alpha_4 VI_j) + \alpha_5 VI_j \\
&\qquad + \boldsymbol{H}_j \boldsymbol{\alpha}_6 + \boldsymbol{X}_{kt} \boldsymbol{\alpha}_7 + \tau^d_{ijk}\} \\
&\quad + \{y_{ijkt-1}(\beta_1 + \beta_2 VI_j) + \Delta P_{ikt}(\beta_3 + \beta_4 VI_j) + \beta_5 VI_j \\
&\qquad + \boldsymbol{Y}_i \boldsymbol{\beta}_6 + \boldsymbol{X}_{kt} \boldsymbol{\beta}_7 + \tau^p_{ijk}\}]
\end{aligned}
$$

- There are two sources of heterogeneity: (1) physician preferences τ^d_{ijk} and (2) patient preferences τ^p_{ijk}.
- These are correlated with both past prescription choice and the VI dummy.

→ The correlated random effects model allows for this (details in Woolridge (2005)).

Estimation

...but there are still other problems.

- The combined error term including both physician and patient unobserved preferences is **correlated across observations**.
- This violates the independence assumption!

Solution

Reduce the number of sources of heterogeneity from two to one by capturing physician preferences in a new variable $GEpref_{j-kt}$. This measures the proportion of generics in prescribing behavior of drugs **excluding** k.

Results

In this setting, prescription decisions are influenced by cost differentials.

- VI doctors are sensitive to the price-cost markup differential between generic and branded drugs, but non-VI doctors are not.
- VI doctors are sensitive to the differential in patient costs between generic and branded drugs, but non-VI doctors are not.

In particular, a 100 yen (about $1 USD) increase in markup differential per day increases the probability of generic adoption by 4.1% within VI doctors. The response of non-VI doctors is close to zero.

Do Physicians' Financial Incentives Affect Medical Treatment and Patient Health?

Clemens and Gottlieb (2014)

Overview

- Medicare reimbursement consists of three things: the conversion factor, Relative Value Units (RVUs), and the Geographic Adjustment Factor (GAF).
- In 1997, Medicare consolidated the geographic regions across which it sets the GAF. This resulted in differential price shocks.

Key question

How do changes in Medicare reimbursement rates impact quantity of care delivered, adoption of technology, and patient health outcomes?

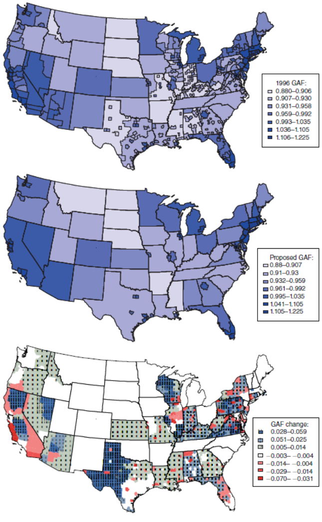

Figure 1. Medicare Payment Areas

Data

Data on health care provision come from **Medicare claims data**.

- All claims from a 5% random sample of the Medicare Part B beneficiary population
- Same individuals are sampled every year from 1993 to 2005

Estimation

Analysis utilizes shock to GAF as a plausibly exogenous price shock. For county i in state $s(i)$ during year t,

$$\ln(RVUs_{i,t}) = \sum_{p(t)\neq 0} \beta_{p(t)} \cdot \Delta RR_i \times 1_{p(t)} + \gamma_i + \delta_t + \eta_{s(i),t} + \zeta' \boldsymbol{X}_{i,s(i),t} + \epsilon_{i,t},$$

where

- ΔRR_i is county level price shock
- $\boldsymbol{X}_{i,s(i),t}$ are county characteristics
- γ_i, δ_t, $\eta_{s(i),t}$ are county, year, and state-by-year fixed effects

To account for time-varying rural-urban differences, match treated counties to control counties with similar baseline characteristics.

Aggregate care

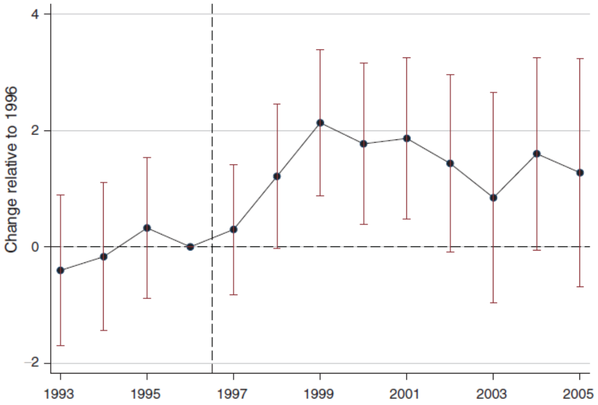

Figure 3. Impact of Price Change on Aggregate Quantity Supplied

In the long run, a 2% increase in reimbursement rates leads to a 3% increase in care.

Two unanswered questions:

1. Why is the response to the policy delayed?
2. What are the welfare implications?

Physician decision model

Let Q denote aggregate market supply, and let $b(Q)$ be the marginal benefit from care, with $b'(Q) < 0$. Each physician has productivity $\gamma_i \in (0, \infty)$ following distribution F.

Physicians have two practice styles in this framework:

1. **Standard practice style** physicians (S) have cost of care $\bar{c}$ per unit of care.

$$U_S(q; \gamma_i) = (r - \bar{c})q - e\left(\frac{q}{\gamma_i}\right) + \alpha b(Q)q$$

2. **Intensive practice style** physicians (I) have reduced cost of care $\underline{c}$, but with some fixed cost of technology adoption $k > 0$.

$$U_I(q; \gamma_i) = (r - \underline{c})q - k - e\left(\frac{q}{\gamma_i}\right) + \alpha b(Q)q$$

Physician decision model

This is some threshold productivity γ^* such that all physicians with $\gamma > \gamma^*$ invest.

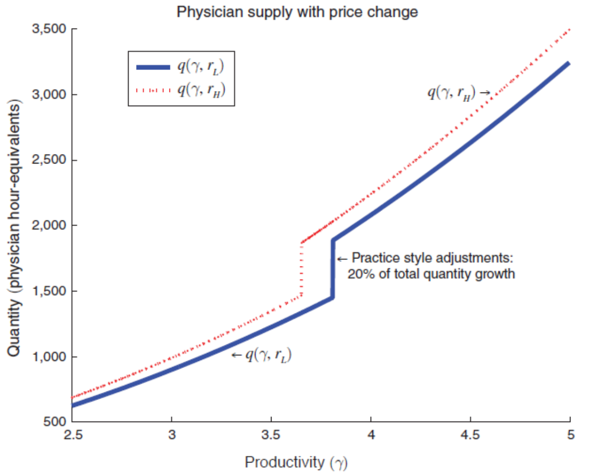

Figure 4. Physicians' Production at Two Reimbursement Rates

Results by type of treatment

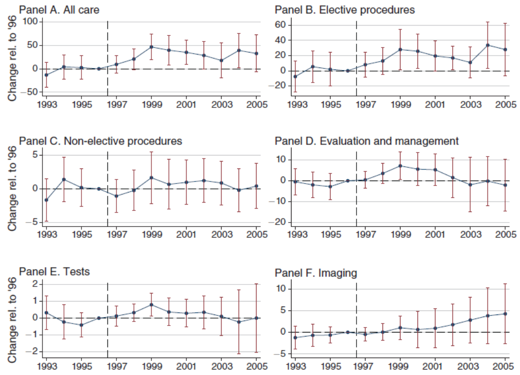

FIGURE 5. SUPPLY RESPONSE BY SERVICE CATEGORY

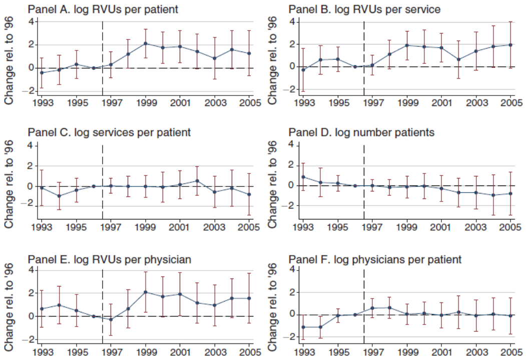

FIGURE 6. POTENTIAL MARGINS OF RESPONSE

Results on MRI investment

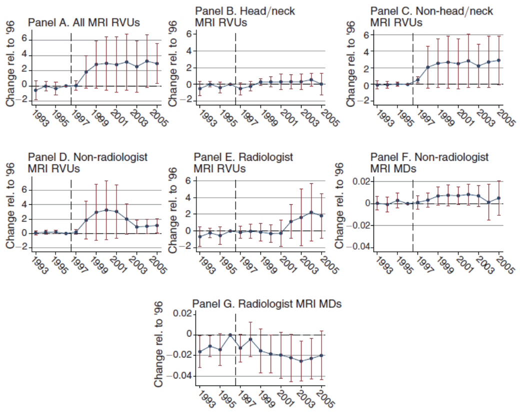

Figure 7. Impact of Price Change on MRI Provision and Ownership

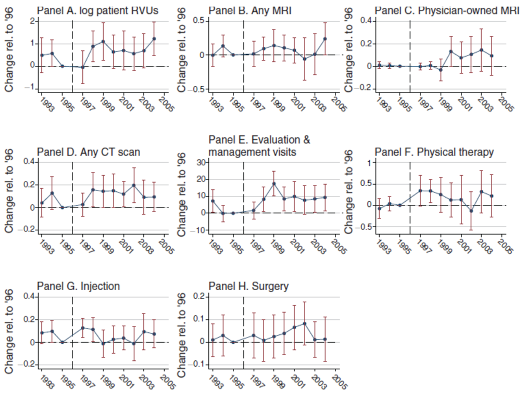

Figure 8. Impact of Price Change on Back Pain Treatment

Results on CVD outcomes

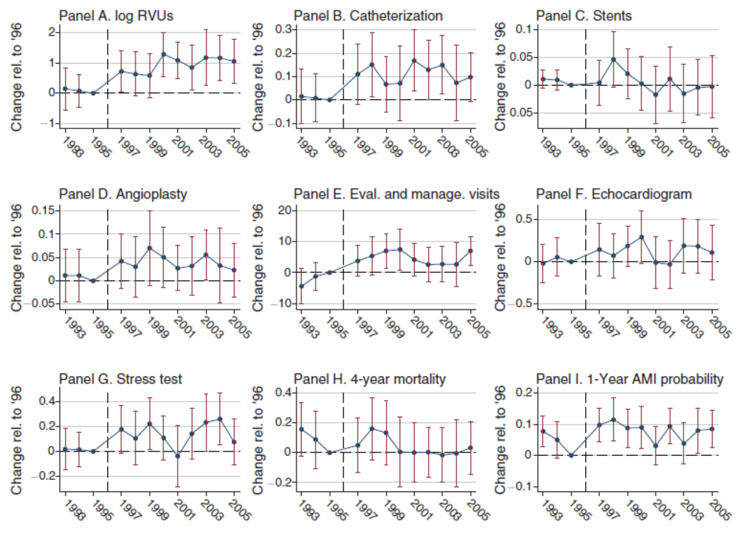

FIGURE 9. IMPACT OF PRICE CHANGE ON CARDIAC PATIENT TREATMENT

Conclusion

In these two particular cases, physicians do respond to financial incentives.

Discussion questions:

1. Compare evidence from Japan about prescription decisions to the US, where prescribing and dispensing are usually separate. Do pharmacies internalize patient costs?
2. Changes in Medicare reimbursement can lead to investment in technology like MRI machines. Do the efficiency gains from physician self-referral for imaging balance out the potential overuse of diagnostic images?