Productivity and Quality in Health Care: Evidence from the Dialysis Industry

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Health Care Expenditures are Rising

- Health care expenditures are rising faster than income in most developed countries.
- Policy makers are looking for mechanisms to slow the increase in health care costs by incentivizing productivity.
  - Medicare Prospective Payment System (PPS): Pay for medical care on the basis of diagnosis, not on cost of treatment provided.
  - In the private sector, HMOs operate in a similar manner.
  - Proponents of increased competition argue that medical services will compete on price and eliminate \wasteful procedures."

Our Questions:

What could go wrong?

- Being an experience good, it can be difficult for consumers or regulators to observe quality of care.
- If we give providers incentives to be more "productive", will they respond by lowering quality?

Empirical question 1: Is it costly for medical personnel to exert effort to increase quality?

Empirical question 2: Do they adjust the effort on the basis of incentives?

Basic Approach

- Focus on the US Dialysis Industry
  - Relatively homogeneous service with clear measure of output quantities.
  - Clear capital and labor measures.
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Challenges

- Quality (and input choices) are endogenous.
  - Adapt Olley-Pakes (OP) and Ackerberg, Caves, Frazer (ACF) models for use in dialysis industry.
- Quality is not directly observed.
  - Proxy for quality e ort with outcome measure (infection rate) and correct for measurement error by using a second outcome measure as an instrument.

Preview of Results

Quality is Costly:

- Holding quality and capital xed, raising output 1.2 percent would require a 5 percent increase in labor inputs. Hiring one additional part time worker for average sta levels.

Firms with stronger pro t incentive o er lower quality:

- Non-Pro t Centers have infection rates 1.3 percentage points (more than 10 percent) lower than for-pro t centers.

Competition does not seem to incentivize higher quality:

- Centers in monopoly markets do not have lower quality.

Dialysis Procedure

Production Function

We assume a Cobb-Douglas production function,

$$Y_{it} = A_{it}(q_{it}) K_{it}{}^{k} L_{it}{}^{`};$$

where for center i in year t,

- Y_{it} is patient-years of service provided.
- K_{it} is the number of stations available in the center.
- L_{it} is full-time equivalent nurses and technicians on sta .
- $A(q_{it})$ is a Hicks-neutral technology shifter which depends on \quality target" for septic infection rate.

Production Function

Let,

$$A(q_{it}) = e^{\;_0 + \;_q q_{it} + !_{it} + \;_{it}};$$

Where,

- $\;_q$ is the impact of quality targets on production.
- $!_{it}$ is the rm productivity which is observed by the rm at t.
- $\;_{it}$ is unanticipated productivity or measurement error.

Taking logs we arrive at,

$$y_{it} = \;_0 + \;_q q_{it} +$$

Endogeneity

$$y_{it} = \beta_0 + \beta_q q_{it} + \beta_k k_{it} + \beta_\ell \ell_{it} + \omega_{it} + \epsilon_{it}$$

- We face the usual endogeneity problem: centers observe ω_{it} when choosing inputs and quality target.
- Olley-Pakes approach: use investment as a proxy to develop a control function for productivity.
- However, we can't use investment because net investment is zero 90% of the time.
- Instead we'll use net hiring, because of license and training requirements, delay in hiring ts the industry.

Policy Shifters

We allow firm policies to depend on observable characteristics, x_{it} that do not directly affect production.

- **For-Profit Status:** Non-profit firms may prefer higher quality because they are maximizing something other than profits.
- **Competition:** Centers in competitive markets may want to provide higher quality of service.

So we have the policy functions:

$$q_{it} = q(k_{it}, \ell_{it}, x_{it}, \omega_{i,t-b}) \qquad h_{it} = h(k_{it}, \ell_{it}, x_{it}, \omega_{i,t})$$

Table: Production Function Estimates.

	OLS	FE	Model
Quality E ort, ${}_q$	-0.0028	-0.0018	-0.0124
	(0.0007)	(0.0004)	(0.0042)
Capital, ${}_k$	0.4607	0.1788	0.5134
	(0.0209)	(0.0514)	(0.0468)
Labor, ${}_\ell$	0.6723	0.1855	0.2453
	(0.0149)	(0.0119)	(0.0319)

Results on Quality-Quantity Tradeo

- Lowering quality target (raising targeted septic infection rate) by 1 percentage point can increase output by 1.2 percent.
  - Serving roughly one additional patient (a two percent increase in output for the average center) holding inputs & productivity xed would raise center's infection rate 1.6 points.
- Same increase in output could be achieved by raising labor input 5 percent.
  - Serving one additional patient holding capital, quality, & productivity xed would require one additional nurse (roughly a 10 percent increase in sta ng).

Incentives to o er high quality

Of course, there may be non-linear e ects; as a robustness check, we use the partially linear speci cation:

$$q_{it} = \ _{c(it)} + \ _{fp(it)} + \ (k_{it}; `_{it}; \hat{!}_{it}) + \ _{it};$$

- $_{c(it)}$ is a dummy for whether rm faces 0,1,2, or 3 or more rms in its home market (hospital service area).
- $_{fp(it)}$ is a dummy for whether rm is for-pro t.
- is a non-parametric function of capital, labor, and productivity estimate.
- Can also subsume for pro t status and competition levels into .

Table: Partially Linear Quality Regressions.

	III	IV	V
For Pro t	-1.5390	-1.5444	
	(0.2030)	(0.2111)	
Monopolist	0.4824		0.4725
	(0.2196)		(0.2222)
Duopolist	-0.2977		-0.2926
	(0.1843)		(0.1855)
Triopolist	-0.4678		-0.4431
	(0.2234)		(0.2224)
Nonparametric Control for:			
Productivity	Yes	Yes	Yes
Capital	Yes	Yes	Yes
Labor	Yes	Yes	Yes
For-Pro t Status	No	No	Yes
Competition	No	Yes	No

Conclusion

- We nd a signi cant quality-quantity tradeo in the industry | rms can raise output by reducing quality.
- Firms with di erent pro t incentives choose quality levels di erently.
- Competition does not seem-333(qu2i g 0 G0 a0.2 o)aqetition doy.