Bilateral Oligopoly

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A companion to blog post "Bilateral oligopoly theory (the math)." See also "Bilateral oligopoly theory (the set-up)."

Lousy Theory

For simplicity, I imagine the insurance products and medical providers to be homogeneous products. In reality, much of the market power of insurers and providers is due to the ways in which they differ from competitors. I'm assuming away all that product differentiation, an assumption I'll comment on later.

Insurance premium (p) is the sum of medical costs incurred by the insurer (m) and other costs of providing insurance (i), like marketing, administration, profit, and so forth:

(1) $$p = m + i\ .$$

Medical costs can be decomposed into providers' marginal cost (m_0, assumed not to vary over providers for the moment) and a markup by providers. Characterize the markup of medical costs by the Lerner index L_m (ranges from zero to one) so that,

(2) $$p = \frac{m_0}{1 - L_m} + i\ .$$

In turn, insurers layer on a markup over their marginal costs. Let the marginal costs of the non-medical side of the insurance business be i_0 so that

(3) $$p = \left(\frac{m_0}{1 - L_m} + i_0\right)\left(\frac{1}{1 - L_i}\right),$$

where L_i is the Lerner index for the insurer's output market, which again ranges from zero to one.

As L_i increases from zero to one insurers gain more pricing power, a greater ability to markup prices. This could come from two different sources: (1) a higher market share, i.e. a more consolidated insurer market or (2) a lower price elasticity of demand for insurance. The first source provides the insurer with power in the input market as well, power to drive bargains w.r.t. providers. If an insurer exists in a concentrated market (has higher market share), providers are less able to afford being excluded from that insurer's network.

Or, put another way, as insurer market concentration changes (and for a fixed provider concentration), insurers gain/lose market power in both input and output markets simultaneously. Insurer industry market concentration leads to higher (medical) price elasticity in the demand for medical services by *insurers*.

To highlight and explore this relationship between input and output market power, let's decompose the Lerner index for insurers, L_i, into market concentration and demand elasticity components. Since the insurance products are assumed homogeneous, we can use the familiar markup expression (Cowling and Waterson 1976):

$$(4) \qquad L_i = -\nu_i^2 \frac{H_i}{\eta_i},$$

where H_i and η_i are the Herfindahl index and demand elasticities for the insurance industry, respectively and ν_i^2 is a nonzero scaling. The medical provider industry has a similar expression for L_m:

$$(5) \qquad L_m = -\nu_m^2 \frac{H_m}{\eta_m}.$$

As I argued above, as insurers' relative gain (loss) of market power due to market concentration in the output market is equivalent to a relative loss (gain) of market power of providers in the input market due to the increase (decrease) in insurers' elasticity of demand for medical services. That is, H_i and η_m are related for a fixed level of provider concentration H_m and fixed level of consumer demand elasticity for insurance η_i.

All I can surmise about the relationship between H_i and η_m from armchair theory is that they are negatively correlated (positively correlated in magnitude, though η_m is a negative number that means they're negatively correlated). I hypothesize a linear functional form:

$$(6) \qquad \eta_m = -\alpha^2 H_i \,.$$

Plugging in the functional forms from Equations (4)-(6) into Equation (3) we have that

$$(7) \qquad p = \left(\frac{m_0}{1 - \frac{\nu_m^2}{\alpha^2} \frac{H_m}{H_i}} + i_0 \right) \left(\frac{1}{1 + \nu_i^2 \frac{H_i}{\eta_i}} \right).$$

Simulation and Consequences

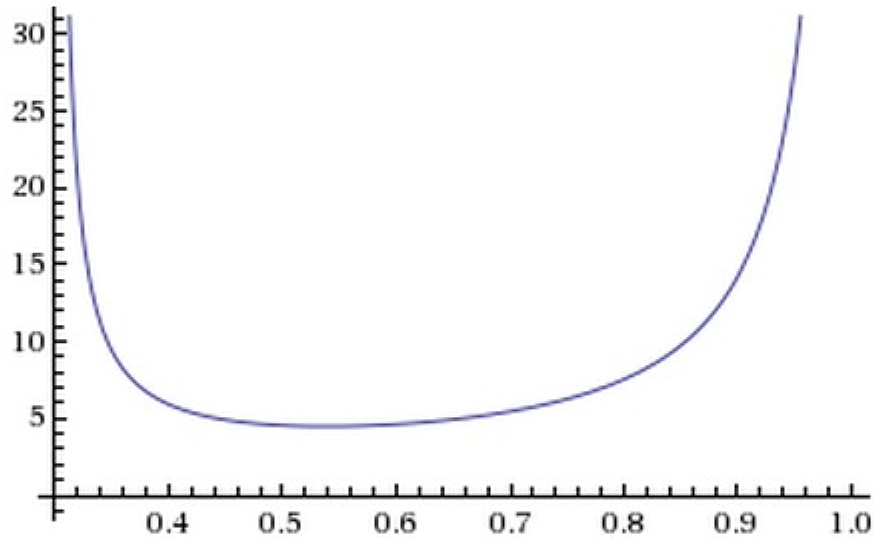
It is likely I could find values in the literature for H_m and η_i I haven't looked yet. For now, I'll plug in some values that are plausible, 0.3 and -1, respectively. Likewise, I don't know what to do about the constants ν_i^2, ν_m^2, and α^2. For now I'll set them all to 1. The first two of these have interpretations given in (Cowling and Waterson 1976). In the future I will study those and see if I can guestimate better values.

I do know something about m_0 and i_0, namely that they are probably in an 85:15 ratio. It is known empirically that 85% of premium revenue is spent on medical costs. I'm assuming that holds at the marginal cost level.

Plugging in all these numbers, premium has the following functional form:

(8) $$p \propto \left(\frac{0.85}{1 - \frac{0.3}{H_i}} + 0.15 \right) \left(\frac{1}{1 - H_i} \right).$$

This functional form is shown graphically below. The horizontal axis is H_i and the vertical axis is scaled arbitrarily (ignore the absolute values of the numbers in the vertical dimension).



The precise shape depends a lot on the assumed parameter values. One thing to notice is that the slope is relatively mild from 0.4 to 0.8. This suggests that for a very broad range of insurer market structure, there is relatively little change in premiums.

Reducing H_i below 0.4 leads to a rapid increase in premiums, as does increasing it above 0.8. But the rate of increase is faster at the low end than the high end. That is, it's far better to be an amount ε above 0.8 than ε below 0.4. One pays more for low insurer market concentration than high insurer market concentration.

The figure is drawn for fixed values of hospital market concentration and consumer price elasticity of insurance. Allowing those to vary yields a three dimensional manifold that one could explore.

Limitations and Issues (Lousy Theory, Remember?)

- I've assumed homogenous products. This is not realistic. Can I do better? Is it worth it?

- I assumed a particular relationship between H_i and η_m. Is more known, even for other industries?
- I assumed that the 85:15 medical to insurance cost ratio applied to marginal costs. Is that valid? Actually, it is cleaner to think about hospitals vs. insurers, in which case it's closer to a 2:1 ratio. I should revise this.
- I need to plug in values for parameters from the literature, if any are known.
- Is any of this related to anything in the literature? Has this been explored before?

Reference

Cowlin, K. and M. Waterson (1976), 'Price-cost margins and market structure', Econometrica 43:267-274.