Altruism Project

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1 How to Measure Altruism

Altruism could be identified by variation in:

1. Amount of uncompensated or little compensated hours worked that benefit patients. Examples include volunteering working extra hours in a capitation system.

2. The rate of adoption of new drugs or technologies that provide less harm to patients compared to an existing equally-priced alternative. See Schnell (2019) who measures the altruism component in physicians' opioid-prescribing behavior using "using their take-up of a new, safer formulation of a popular prescription opioid that was introduced".

3. Problem: do physicians truly know how much is the optimal amount of care? One way to see this is by examining whether physicians practice what they recommend to patients.

   Relatedly, a non-altruistic physician could provide too much care (due to financial incentives) or too little care (to keep the patients sick and coming back). Thus, the degree of altruism being estimated must be context-specific.

4.

2 Confounding Factors

1. Altruism vs social pressure. What if physicians' prescription behavior is influenced by peers? DellaVigna, List, and Malmendier (2012).

2. Altruism vs reputation incentives. What kind of variation is needed to identify this? Need a setting where long-term reputation does not matter, or a setting with very inelastic demand.

3 How Price Elasticities of Supply Can Pin Down the Extent of Altruism

The idea is that increases in prices increase supply because they increase revenue, but the extent to which supply increases is moderated by consumer-side factors if the physician is altruistic.

A physician decides the amount of care x to provide for a patient. The true health benefit for the patient if he receives x is $B(x)$. The cost of providing care is $C(x)$. Let p be the per-unit price of treatment received by the physician.

The physician cares both about the reimbursement $R(x) = px$ and the patient's true welfare. Her utility is represented by

$$U(x) = (1-\theta)(R(x)-C(x))+\theta(B(x)-cpx) = (1-\theta)(px-C(x))+\theta(B(x)-cpx) \tag{1}$$

The FOC is:

$$\begin{aligned}
&(1-\theta)(p-C_x(x)) + \theta(B_x(x)-cp) = 0 \equiv F(x;p) \\
&\implies \frac{dx}{dp} = -\frac{\partial F/\partial p}{\partial F/\partial x} = \frac{1-\theta-\theta c}{(1-\theta)C_{xx}(x) - \theta B_{xx}(x)} \\
&\implies 1-(1+c)\theta = \frac{dx}{dp}(1-\theta)C_{xx}(x) - \frac{dx}{dp}\theta B_{xx}(x) \\
&\implies \theta(C_{xx}(x)\frac{dx}{dp} + B_{xx}(x)\frac{dx}{dp} - (1+c)) = \frac{dx}{dp}C_{xx}(x) \\
&\implies \theta = \frac{1-\frac{dx}{dp}C_{xx}(x)}{1-\frac{dx}{dp}C_{xx}(x) + c - \frac{dx}{dp}B_{xx}(x))}
\end{aligned} \tag{2}$$

So in this simplified model, we can identify the altruism parameter θ if we know the *physician-specific* supply curve $x(p)$, the cost curve $C(x)$, the benefit curve $B(x)$, and the coinsurance rate c. For example, note that at constant marginal costs ($C_{xx} = 0$) and $B(x) = x$, $B_{xx} = 0$, then the altruism parameter that rationalizes a given price elasticity of supply is lower the higher the coinsurance rate c. This is intuitive.

Here, variation in θ_i is pinned down by variation in $\frac{dx_i}{dp}$.

4 Bounding Approach: Measuring Altruism Using Deviation from Socially Optimal Quantity of Care

Assuming constant marginal cost κ (e.g. prescription drugs), the socially efficient account of care x^e is set by

$$B_x(x^e) = C_x(x^e) = \kappa \implies x^e = B_x^{-1}(\kappa) \tag{3}$$

The physician's utility is as before:

$$U(x) = (1-\theta)(R(x) - C(x)) + \theta(B(x) - cp) \tag{4}$$

The FOC is

$$\begin{aligned} &(1-\theta)(p-\kappa) + \theta(B_x(x) - cp) = 0 \\ \implies & B_x(x) = \frac{1-\theta}{\theta}(\kappa - p) + cp \\ \implies & x = B_x^{-1}\left(\frac{1-\theta}{\theta}(\kappa - p) + cp\right) \end{aligned} \tag{5}$$

If the marginal benefit B_x is monotonically decreasing in the amount of care, then so is its inverse and:

$$\begin{aligned} x > x^e &\iff \frac{1-\theta}{\theta}(\kappa - p) + cp < \kappa \\ &\iff \frac{1-\theta}{\theta} > \frac{\kappa - cp}{\kappa - p} \end{aligned} \tag{6}$$

(sign is flipped because $\kappa - p < 0$). So if we observe the marginal cost κ, the coinsurance rate c and the price p, AND we observe an over prescription of drugs, i.e. $x > x^e$, then we can provide a lower bound to the object $\frac{1-\theta}{\theta}$, which is decreasing in θ (and $\theta < \frac{1}{2}$ if the ratio > 1. For example, if this lower bound is high, then we can rule out that physicians are altruistic.

Note that here we do not need to know the benefit curve $B(x)$ (but still need to assume its shape), nor do we need to estimate the supply curve of each physician $x(p)$.

5 Measuring Altruism Using a Physician's Case Mix

Suppose there are two types of patients, $\{\gamma_L, \gamma_H\}$ corresponding to low and high disease severity, respectively. The high-severity patients cost more to treat but receive more health benefits from treatment. The unit price of treatment is the same for both types of patients, and each patient requires only one unit of treatment. To summarize:

$$\begin{aligned} &B_L < B_H \\ &p_L = p_H = p \end{aligned} \tag{7}$$

Let μ denote the proportion of low-severity patients. The total cost associated with treating the case mix is $C(\mu)$. The physician chooses the case mix $(\mu, 1-\mu)$ to maximize:

$$U(\mu) = (1-\theta)(p - C(\mu)) + \theta(\mu(B_L - cp) + (1-\mu)(B_H - cp)) \tag{8}$$

The FOC is;

$$\begin{aligned} &(1-\theta)(-C'(\mu)) + \theta(\mu B_L + (1-\mu)B_H) = 0 \\ \implies & \frac{C'(\mu)}{\mu B_L + (1-\mu)B_H} = \frac{\theta}{1-\theta} \end{aligned} \tag{9}$$

So if we observe the case mix μ, the cost function $C(\mu)$ and the benefits B_L, B_H, we can identify the altruism parameter through $\frac{\theta}{1-\theta}$.