PET/MRI research

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1 Empirical Strategy

$i \in \{1, 2, \cdots, I\}$ denotes each hospital. And y_i is the welfare variable, PET_i is the number of PET at hospital i, $Total_i$ is the total number of owned PETs by hospitals existing in the same prefecture as i, $Other_i = Total_i - PET_i$, and X_i is the control variables. Then consider the below model.

$$y_i = \alpha + \beta\ PET_i + \gamma\ Total_i + \delta\ Other_i + X_i^{'}\eta + \epsilon_i$$

β is the parameter representing the welfare improvement by introducing PET, γ is market expansion parameter, and δ is business stealing effect parameter. But by the variable construction, we cannot estimate all the parameter due to the perfect collinearlity.

Then we make use of panel data structure. Now p indicates the prefecture and t refers to year. Let α_p, α_t be the indicator of prefecture and year. Then we get the panel data version model.

$$y_{ipt} = \beta\ PET_{ipt} + \gamma\ Total_{pt} + \delta\ Other_{ipt} + X_{ipt}^{'}\eta + W_{pt}^{'}\xi + \alpha_t + \alpha_p + \epsilon_{ipt} + \nu_{pt}$$

where W_{pt} is the characteristics of each prefecture at each year, and ν_{pt} is the disturbance term common in individual hospitals.

In the first stage, we regress the below

$$y_{ipt} = Z_{pt} + \beta\ PET_{ipt} + \delta\ Other_{ipt} + X_{ipt}^{'}\eta + \epsilon_{ipt}$$

Then We get the estimates of Z_{pt}, denoted as $\hat{Z_{pt}}$.

If the size $P \times T$ is sufficiently large, we can use $\hat{Z_{pt}}$ as the dependent variable in the second stage regression.

$$\hat{Z_{pt}} = \alpha_t + \alpha_p + \gamma\ Total_{pt} + W_{pt}^{'}\xi + \nu_{pt}$$

By this panel data regression, we also get the consistent estimate of γ. This argument is according to Imbens and Wooldridge's NBER summer lecture notes 10.