Paying on the Margin for Medical Care: Evidence from Breast Cancer Treatments

Zixuan Qi

1 Introduction

1. **Summary**
   It is vital to reduce health care expenditures in the US. Measuring the social costs of insurance designs is essential in reducing medical spending. Thus, this paper examines the gains in welfare of "top-up" health insurance policy. They use distance to the nearest radiation facility to estimate the relative demand for lumpectomy. This paper finds that the ex post total gains in welfare from the "top-up" policy is larger than both the "no top-up" policy and the "full coverage" policy. The authors also analyze the ranking of the three policies from ex ante perspective. They show that the "top-up" policy dominates the "no top-up" policy, but the relative ranking of the "top-up" policy and the "full coverage" policy is not clear, which depends on the level of risk aversion.

2. **Contribution**
   The contribution of this paper is to estimate the demand curve by using the distance to the nearest radiation facility and measure the gains in the welfare of three policies. Also, the analysis in this paper can be used in other settings under the condition that the social planner can give monetized value to the benefits resulting from more expensive treatment.

2 Econometric Techniques

1. **Treatment Choices and Data Description**
   There are some critical points in this paper. First, there are no measurable differences in survival outcomes between lumpectomy and mastectomy. Second, lumpectomy with radiation costs more than mastectomy, both in money and time. Third, women living further away from radiation facilities are more likely to choose mastectomy than lumpectomy, which can estimate the demand curve for lumpectomy. The authors use a patient-level cancer registry dataset and data on radiation treatment facility locations.

2. **Conceptual Framework of Estimating Demand Function**
   The relative valuation of lumpectomy is the difference between lumpectomy and mastectomy. This relative valuation is related to the closest distance from patients' homes to the radiation facility and the relative price of lumpectomy. When the relative valuation is larger than zero, the patient will choose lumpectomy. If the distribution of the relative valuation is known, then the demand function (the inverse of the distribution function) is obtained. To estimate the distribution, the authors make price and distance have the same effect on the relative valuation of lumpectomy. As long as the relative price is equal to 0, the choice of θ_i does not matter. Thus, the authors can estimate the distribution function.

3. **The Relationship Between Distance and Treatment Choices**
   The authors use logit model with no controls, logit model with some covariates, and heterogeneous

logit models (interacted terms and random coefficients) to verify the negative relationship between distance and the possibility of choosing lumpectomy.

4. **Estimating Treatment Choices and Ex Post Welfare**
   After normalizing patients' utility from mastectomy to zero, as long as the utility from lumpectomy is larger than zero, that is, $v_i = \frac{\alpha_i}{\beta_i} - \theta_i d_i > p$, patients will choose lumpectomy. Set $p = 0$ (full coverage) and $\theta_i = 1150$, the authors can get the distribution of α_i and β_i to estimate the demand function of lumpectomy. According to the information verified by other literature, the authors choose \$10000 as the incremental cost of lumpectomy and \$50000 as the total cost of lumpectomy to explore the welfare cost of "no top-up" and "full coverage". The largest probability of choosing lumpectomy is "full coverage"; the smallest probability of choosing lumpectomy is "no top-up". Both of them do not have an efficient number of people selecting lumpectomy.

5. **Ex Ante Efficiency**
   The authors analyze the ex ante efficiency of three insurance designs in this part. The individuals' ex ante utility is related to the risk aversion r and annual probability of illness ρ. The "full coverage" has no risk exposure, while the "no top-up" policy has the highest risk exposure. The "no top-up" policy also produces the ex post inefficient treatment choices. Thus, the "top-up" policy dominates the "no top-up" policy. However, although the "full coverage" policy produces ex post inefficient result, this policy has no ex ante risk exposure. Thus, the relationship between the "full coverage" policy and the "top-up" policy is unclear. When the risk aversion is considerable, the "full coverage" policy has lower total social cost than the "top-up" policy. Subsequently, the authors propose other potential insurance contract designs. One is the "first best" policy, which has no ex ante risk exposure and achieves the ex post efficient treatment choice. But it is not practical because insurance markets provide discrete rather than continuous coverage. The other is a competitive insurance market that provides coverage for the incremental social costs of lumpectomy, but it is not as good as the "first best" policy.

3 Limitations

1. This paper only considers the survival benefits of the two treatment choices. It neglects the psychological costs of mastectomy for women.

2. The authors use all institutions in the sampling frame regardless of whether the institution responded to the survey. However, some institutions may have closed, and there is no update in the dataset. Thus, there may not be so precise.

4 Conclusions

1. First, the authors find that the "top-up" policy has ex post efficient treatment choices, while the "no top-up" policy and "full coverage" policy have welfare losses.

2. Second, from an ex ante perspective, the "top-up" policy dominates the "no top-up" policy. But the relationship between the "top-up" policy and the "full coverage" policy is unclear. The reason is that the "top-up" policy has risk exposure while the "full coverage" policy does not. Thus, when the risk aversion is large, the total social costs of the "full coverage" policy may be smaller than the "top-up" policy costs.