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

Health care spending in the U.S. is high and increasing year after year. According to CMS(2021), the U.S. health care spending grew by 9.7 percent in 2020, and it accounted for 19.7% of GDP. To reduce a surprisingly high amount of health care spending, previous research has focused on the solutions related to eliminating waste or the creation of new medical technologies. This includes Garber et al. (2014) and Berwik et al. (2012). However, an economically intuitive and eclectic way, ”top-up”design, has not been paid much attention to be investigated. Therefore, this paper aims to compare three insurance designs in terms of social welfare and apply the framework to breast cancer.

“Top-up” is a policy covering the expenditure of less expensive treatment options and allowing patients to pay the additional price for the more expensive one. Besides “top-up”, two other main insurance designs operate around the world, “no top-up” and full-coverage. The former is prevalent in the UK and other high-income countries, while the US adopts the latter. Concerning the treatment for breast cancer, there are two common choices, mastectomy, and lumpectomy. The fact that the average survival between two treatments is not significantly different allows authors to analyze the welfare effects without evaluating the value of lengthened life given by one of them. Nevertheless, compared to lumpectomy, which requires 25 trips to radiation facility during five weeks, mastectomy is less costly and saves patients' time. As a result, assumptions imposed here are travel time can be monetized and the preference for a decrease in travel time is equivalent to that for the price difference. With these assumptions, authors can utilize the distance from a patient's residency to the nearest radiation facility to estimate the relative demand curve for lumpectomy, a key item of analyzing welfare effects.

Next, the paper describes two data sources documenting the patient-level cancer registry and radiation treatment facility locations in the state of California. From the California Cancer Registry (CCR), authors not only have access to demographic and diagnostic variables but know the exact address of each patient as they were diagnosed. Here, they only consider the CCR data ranging from 1997 to 2009. In addition, by the data from the private firm IMV, the address for all radiation facilities is available, enabling authors to compute the travel time and the distance between one's residency to the nearest radiation facility. With the variation across patients in this distance, they can estimate the relative demand curve for lumpectomy.

As for the empirical strategy, since a patient's utility from mastectomy is normalized to zero, the patient would choose lumpectomy as her utility is higher than zero by construction. With few assumptions involving the distance having the same impact on every individual's utility and the functional form of individual-specific preference parameters, running a standard logit regression is feasible. Moreover, it can be extended to random-coefficient logit regression later.

The preliminary result demonstrates that patients living closer to a radiation facility are more likely to choose lumpectomy, indicating the distance might be a determinant of treatment choices. However, several significant differences in demographic and neighborhood characteristics are detected as the sample is divided

by the median travel time. In other words, endogeneity problem arises as those characteristics correlated with the distance to the radiation facility might affect treatment choice meanwhile. After addressing this concern, the paper can then compute the average marginal effect of choosing lumpectomy as travel time increases by ten minutes. Considering the cases from no covariates to all controls with random coefficients, it concludes that increasing ten-minute in one-way trips makes patients less likely to choose lumpectomy by 0.7 to 1.1 percentage points. Based on these estimates, authors can then examine the effect of each policy counterfactual.

Next, in the counterfactual analysis, two demand curves for lumpectomy are plotted respectively using the average marginal effects computed earlier, and "top-up" is chosen to be the benchmark. For the one without any covariates, the probability of choosing lumpectomy increases by 37 percentage points under US full-coverage policy and the incurred welfare cost is around $2000. As for the UK "no top-up" policy, the probability of choosing lumpectomy decreases by 21 percent, and the resultant welfare decreases by $1400. Likewise, for the other one, including all controls and random coefficients, the probability of choosing lumpectomy increases by 10 percentage points under US full-coverage policy, and the incurred welfare cost is $710. Concerning the UK "no top-up" policy, the probability of choosing lumpectomy decreases by only 4.5 percentage points, and the resultant welfare is about $800.

The last section focuses on the ex ante efficiency of different treatment choices. With the following argument, it is easy to see "top-up" policy and full-coverage dominate the UK "no top-up" policy in terms of social welfare since "no top-up" not only generates ex post inefficient choices but also makes patients suffer from ex ante risk. However, a quantitative assessment is needed to compare another two policies. With assumptions that individuals have CARA utility and treating the risk aversion is homogeneous among each patient, authors compare social welfare between three policy designs given three different degrees of risk aversion. The result shows that for patients with the lowest risk aversion, the social welfare of the "top-up" policy is higher than that of full coverage. Nevertheless, for another two higher degrees of risk aversions, the result is the opposite. The explanation for this finding is that the gains from a decrease in risk exposure can cover the reduction from ex post inefficient treatment choices when the level of risk aversion is high enough.

Finally, I outline two limitations/concerns. First, the computation of social welfare only using the demand curve might not completely reflect the truth if a behavioral hazard is present. To be more specific, the assumption in this paper is relative demand curve can capture the distribution of patients' willingness to pay. However, medical counseling imparting the information of trade-offs between two treatment choices might increase the demand for lumpectomy. In this case, the assumption might no longer hold. Second, one of the differences between mastectomy and lumpectomy is that the former is breast-removing and the latter is breast-conserving. Therefore, how to monetize the conservation of the breast for a patient might be an issue when policymakers try to not only consider distance as the incremental cost.

In conclusion, this paper quantitatively analyzes the social welfare effects and ex post efficiencies under three different health insurance policies. It shows that the "top-up" policy allowing patients to pay the incremental cost of the more expensive treatment can efficiently sort patients across different choices. In addition, it uses calibration for risk aversion to examine the ex ante efficiency.