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Reading Notes Two
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Reading Notes on Paying on the Margin for Medical Care

Medical insurance design in the US mainly adopts the "full-coverage" mechanism which covers not only costs of basic treatment but also incremental costs of a more expensive treatment. While it protects patients from ex ante risk, the "full-coverage" mechanism exerts great financial pressure on the government. To another extreme, the cost-saving "no top-up" mechanism, which is operated in the UK, only covers basic "cost-effective" treatment and thus leaves patients with heavier burden. Due to high and increasing medical expenditures, efforts have been made in the US, but yet few pays attention to the 'top-up" mechanism, which can be naturally derived from the combination of the above two mechanisms. Formally, the "top-up" mechanism covers the basic treatment but requires patients pay the incremental cost of the expensive treatment. Therefore, this paper investigates how the "top-up" mechanism could increase social welfare in the US from both ex post and ex ante perspective. Specifically, between two treatments of breast cancer, *lumpectomy* and *mastectomy*, this paper first estimates the demand curve of the more expensive treatment *lumpectomy* and calculates the potential ex post welfare increase of adopting the "top-up" mechanism based on the estimated demand curve. Moreover, this paper also presents a comparison of these three mechanisms from an ex ante perspective and get mixed results between the "full-coverage" and the "top-up" mechanism.

Regarding the empirical strategy, the core of this paper is to estimate the demand curve of the *lumpectomy* , which is the basis of following welfare analysis. To make up for the lack of variation of relative price of the *lumpectomy*, this paper uses a fairly common proxy: the variation of distance to the nearest radiation treatment facility. This proxy builds on the fact that *lumpectomy* requires 25 radiation therapies in the following 5 weeks after the surgery (requires travel time to the radiation facility) and the assumption that travel time can be monetized and the preference for a reduction in travel time increase is analogous to that for a price increase. For estimation, this paper follows the basic utility theory that derives logit regression model to capture patients' binary choice. For the richest specification, this paper also embraces the random coefficient logit model. Also, this paper involves a small fraction of theory in its welfare analysis. This paper defines social welfare to be the sum of consumer surplus and producer surplus, both of which can be calculated after the estimation of the demand curve.

As for the data, this paper also data on radiation treatment facility locations (necessary for the *lumpectomy* treatment) to measure the distance of patients from his nearest radiation treat-

ment facility. In addition, this paper uses patient-level data from California Cancer Registry (CCR) with patients demographic, diagnostic, and treatment information. One advantage of this dataset is that it contains information about patients' living address, which can be matched with the location of radiation facility to estimate the demand curve of the *lumpectomy* .

The result of this paper consists of three parts. Firstly, this paper estimates the marginal effect distance has on patients' choice of the *lumpectomy* in different specifications (adding more control variables and allowing heterogeneous effects). Overall, this paper reports that if a patient is 10 minutes further from the nearest radiation treatment facility, all else equal, she is less likely to choose *lumpectomy* by about 0.7 to 1.1 percent and this effect is statistically significant under all specifications.

The second part is about policy counterfactuals where this paper compares the ex post social welfare with all three medical insurance mechanisms using the demand curve estimated in the first part under different specifications. Results show that, under no controls, the "full-coverage" mechanism raises the *lumpectomy* by 37% and induces a cost of $2000 per patient compared to the efficient level (the "top-up" mechanism); under the richest specification (random coefficient logit model), the "full-coverage" mechanism raises 10% *lumpectomy* rate and induces a cost of $710 per patient compared to the efficient level. Similarly, under no controls, the "no top-up" policy reduces the *lumpectomy* rate by 21% and induces a cost $1400 per patient compared to the efficient level; under the richest specification, the "no top-up" policy reduces the *lumpectomy* rate by 4.5% and induces a cost $800 per patient compared to the efficient level.

Finally, this paper evaluates all three insurance mechanism from the ex ante perspective since the "top-up" mechanism exposes patients to ex ante risk while "full-coverage" mechanism does not. This paper assumes patients have a CARA utility function and tries with different risk aversion parameter γ (γ=0.26, 0.27, 0.29). Results show that, when risk aversion is lowest, the "top-up" mechanism is the optimal while when risk aversion is higher, the "full-coverage" mechanism is optimal. This suggests that focusing solely on the ex post scenario may ignore the risk that patients undertake and thus get biased conclusion.

One possible limitation of this paper regards *lumpectomy* and *mastectomy* has negligible difference in treatment effects but ignores that *lumpectomy* preserves women's breast while *mastectomy* cannot. Therefore, the effect distance exerts on demand for *lumpectomy* may be modified if we consider this significant difference between *lumpectomy* and *mastectomy*.