READING NOTES: EINAV, LIRAN AND FINKELSTEIN (2016)

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The United States's increasing per capita medical expenses, at $10,498 in 2019, is the highest among OECD countries and almost 50% higher than that of the second place[2]. Various studies have been conducted on potential policies for reducing health care spending and in this paper, Einav, Finkelstein and Heidi, explore a unique "top-up" insurance design[1]. The authors present an intuitive framework for evaluating welfare consequences of different insurance designs, apply their framework on treatments for breast cancers and find the "top-up" design to provide ex post per capita welfare gains compared to status quo. They also find that, from an ex ante perspective, taking into account agents' risk exposure, the "top-up" design's dominance over status quo depends on levels of risk aversion.

The "top-up" insurance design is a middle ground between the U.K insurance design and the popular "full-coverage" plans in the U.S. The U.K government evaluates treatment plans' cost-effectiveness with cost per quality-adjusted year of life saved, and covers every plan it deems cost effective and nothing otherwise. U.S "full-coverage" insurances cover treatment plans regardless of cost effectiveness. The "top-up" design pays cash equivalent to the cost of the baseline cost-effective treatment plan and allows patients to pay the increment price for other treatments that patients might prefer.

To compare the three insurance designs, the authors focus on breast cancer, which has two common treatments, lumpectomy and mastectomy, that don't differ in survival rate. Lumpectomy is more expensive and less invasive but yields essentially the same mortality outcome. Only mastectomy is covered by all three designs. Patients under the U.K policy would need to pay the full cost for lumpectomy while under the "top-up" design, patients only need to pay for the incremental cost.

The demand curve for lumpectomy is critical for assessing the efficiency of the three designs. Even though under "full-coverage" insurances, patients don't directly face the cost differences, lumpectomy is still more costly for patients for its need of post-procedure radiation therapies. Lumpectomy requires 25 round trips for radiation therapies within five weeks post-procedure. This is a big commitment of time, which the authors assume can be monetized. Patients living at different distances away from radiation centers would bear different costs of lumpectomy even under "full-coverage" insurance. Under standard revealed preference assumptions, the authors recover the demand curve through variations in the time needed for travel.

The paper relies on two sets of data to recover the demand curve. On the patient side, the authors use California Cancer Registry(CCR), which contains every cancer diagnosis from 1988 forward and includes demographic covariates and treatment information for patients. Most importantly, it contains the exact addresses of residence for patients at the time of diagnosis. The authors drop the 5.8% of patients who opted for neither of the two treatments. On the radiation facility side, the authors use location data provided by a private firm IMV to calculate "home to radiation facility distance" needed for their revealed preference identification strategy.

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The data provides evidence in support of the identification strategy. Women living further away from radiation centers are more likely to commit to mastectomies. An extra travel time of 10 minutes reduces the likelihood of choosing lumpectomy by $0.7 \sim 1.1$ percentage points. While there are also demographic differences such as people living closer to radiation centers tend to be older, less likely to be white, and more likely to be unmarried. The authors find the relationship between distance and treatment choice is not sensitive to the inclusion of these observable demographic differences to their model.

To recover the demand curve for lumpectomy, the authors fit a series of conditional logit models with varying sets of controls and a mixed logit model allowing for random coefficient on the distance variable. Because travel time is in minutes and monetary cost of treatments is in dollars, the authors make the conversion with average hourly wage in the country. The logit models report probabilities of choosing lumpectomy under each price that the patients face, which, together with a measure of patient population, give a demand curve for lumpectomy. These estimated demand curves would allow one to calculate the surplus gains and losses for different insurance policies that expose patients to different ex-post costs of lumpectomy.

The different demand curves recovered by the different logit models estimated all yield welfare gains for switching to a "top-up" insurance design. To conduct a quantitative analysis, the authors approximate the cost difference between the two treatments to be $\$10,000$ and make the following conclusions. Under the simplest conditional logit model controlling for no covariates, the "full-coverage" design raises the lumpectomy rate by 37 percentage points and incurs a per patient welfare loss of $\$2,000$. The U.K insurance design contributes to a 21 percentage points reduction in lumpectomy rate and results in a $\$1,400$ per patient welfare loss. Under the richest model controlling for demographics, census block characteristics, clinical characteristics, all interacted with distance and allowing for random coefficient for the distance variable, the "full-coverage" design increases the lumpectomy rate by 10 percentage points and leads to a per patient welfare loss of \$710. The U.K design results in lumpectomy rate falling by 4.5 percentage points, with a per patient welfare loss of \$800. In all cases, the "top-up" plan provides improvement on social welfare.

The authors compliment the above analysis with a discussion on ex ante utilities. Because the three insurance designs expose patients to different levels of risk ex ante, affecting patients' utilities. Taking risk aversion into account, assuming homogeneous risk for breast cancer, and using the demand curves estimated before, the authors calculate the ex ante utilities for the three insurance designs and find that while the "top-up" design still dominates the U.K design, the "full coverage" design becomes more preferable as risk aversion level rises.

A natural limitation of the study, as pointed out in the footnotes of the paper, comes from the cost estimates of the two procedures. The authors use medicare payments to calibrate the relevant costs. Since the study centers around social welfare changes, it is necessary to consider how much these numbers represent true social costs. But this is obviously a complicated question and deserves its own treatment in a different paper. This paper is also limited as a cross sectional study that does not take into account market equilibrium effects of insurance designs in the long run.

The authors conclude that the "top-up" design leads to improvements on the ex post social welfare by allowing patients with lower willingness to pay to opt for the cheaper treatment while not over pricing the more expensive treatment plan as the U.K design does. This result is consistent with the standard theory of improving efficiency by internalizing social costs to decision makers.

References

[1] Liran Einav, Amy Finkelstein, and Heidi Williams. "Paying on the Margin for Medical Care: Evidence from Breast Cancer Treatments". In: *American Economic Journal: Economic Policy* 8.1 (Feb. 2016), pp. 52–79. DOI: 10.1257/pol.20140293.

[2] *OECD (2022), Health spending (indicator). doi: 10.1787/8643de7e-en (Accessed on 18 February 2022)*. Nov. 2019.