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**Reading Note: Paying on the Marginal for Medical Care: Evidence from Breast Cancer Treatments**

The paper provides a graphical framework that uses a relative demand curve to analyze the potential welfare gains of changing health insurance policy to the “top-up” design – which allows patients to choose a more expensive treatment than the baseline treatment by paying the increment price. The paper applies the framework to a setting of breast cancer treatments in the United State, in which breast cancer patients have to choose from two different treatments: mastectomy and lumpectomy with radiation. Note that, in the United States, either public or private insurance for breast cancer is “full coverage,” which covers the cost of the treatment chosen by patients, so there is no price variation faced by patients. However, since a standard course of post-lumpectomy radiation therapy generally requires 25 round trips to a radiation facility, the paper tries to monetize the travel time and assume that it can be treated as the relative price of lumpectomy with radiation. Under such assumption, the paper estimates the demand for lumpectomy with radiation (relative to mastectomy) by the distance (driving time) between the patients’ residence and the nearest radiation clinic. Finally, the paper calculates that, by changing from “full coverage” or “no top-up” (which only covers the cost of baseline treatment) to the “top-up” design, the welfare gains are from $700 to $2,500.

Since the patients only face two choices, the framework is simply by comparing the points of three different health insurance policy designs—top-up, full coverage, and no top-up— on the graph of the relative demand curve of lumpectomy. The x-axis of the graph is the share of patients choosing lumpectomy with radiation, representing the quantity of demand. The y-axis is the cost of lumpectomy with radiation faced by the patients, or equivalently, the patients’ willing to pay for lumpectomy with radiation if they choose the treatment. Suppose we have already estimated a downward sloping demand curve. Then, for the top-up design, since the patients have to pay for the increment price, the point of the top-up design on the curve is the cross point of the demand curve and the horizontal line which represents the increment price. In addition, since such price is exactly the increment cost of lumpectomy with radiation for the society (if the price is not distorted), the top-up design is efficient. As for the full coverage design, since the patients do not have to pay for the increment price, the cost faced by the patients under this design is less than the cost under the top-up design. As a result, the share of patients choosing lumpectomy with radiation would be more than the efficient share, causing a welfare loss (some patients choosing lumpectomy with radiation but with willing to pay lower than the increment cost of the society). The amount of the welfare loss is the integral of the increment price minus the patients’ willing to pay for lumpectomy with radiation, from the efficient share to the share under the full coverage design. On the other hand, for the no top-up design, patients have to pay for the full cost of lumpectomy with radiation. As a result, the share of patients choosing lumpectomy with radiation would be lower than the efficient share, causing a welfare loss (some patients not choosing lumpectomy with radiation but with willing to pay higher than the increment cost of the society). The amount of the welfare loss is the integral of the patients’ willing to pay for lumpectomy with radiation minus the increment price, from the share under the no top-up design to the efficient share.

The paper uses a patient-level cancer registry dataset and a radiation treatment facility locations dataset. The patient-level dataset is collected from cancer patients’ medical records at the time of the cancer diagnosis. The source is California Cancer Registry (CCR), to which every cancer diagnosis made in California from 1988 is required to be reported. The dataset includes not only demographic, diagnostic, and treatment information, but also the exact address of residence of patients at the time of diagnosis. The radiation treatment facility location dataset is collected by a private firm IMV, who has conducted telephone surveys on all hospital and non-hospital sites in the US performing radiation therapy since 1996. Following the way National Cancer Institute analyzes breast cancer registry data, the paper excludes some ineligible patients. In the end, the paper uses a sample covering 323,612 female breast cancer patients diagnosed between 1997 and 2009.

As we have seen, the central analysis tool in the paper is the demand curve. The paper uses a logit model to estimate the marginal effect of the distance while controlling other characteristics, such as demographics, income, and education. The effect of the distance is negative and significant either with or without controlling other characteristics. On average, when the nearest radiation clinic is ten minutes further from the patients’ residence, the likelihood of patients choosing lumpectomy with radiation drops by 0.7 percentage points to 1.1 percentage points (varying with different model specifications). Then, the paper monetizes the distance (driving time) through the average hourly wage. Using the marginal effect of the distance and transforming the distance to price, the paper derives the implied demand curve. However, it should be noted that the variation of the implied price (from the variation of the distance) in the sample is small relative to the incremental price or the total price of lumpectomy with radiation. In fact, the average driving time to the nearest radiation clinic is ten minutes while the corresponding driving time for the increment price of lumpectomy with radiation ($10,000) is 8.7 hours. Finally, after calculating the integrals mentioned before, the paper estimates that changing to the “top-up” design from the two other designs can increase social welfare by $700 to $2,500 (varying with different model specifications).

One important assumption of the paper is that distance (driving time) is a factor that influences patients’ choices of treatments and can be monetized. However, it is hard to believe that a patient would decide not to choose lumpectomy with radiation (and hence lose her breast) because she needs to drive multiple times to a place. Also, facing such an important decision related to their lives (or their breast), few people could be calm or rational enough to consider the travel time and its opportunity cost that would incur in the future. The paper needs to provide more evidence to convince readers that driving time might be really a factor and could be monetized. This is important since the whole framework the paper provided is built on a relative demand curve of a treatment and such demand curve may not be easily estimated by the price change in other settings also. Even we assume the assumption is true, the variation in the implied price is too small and this situation will be very likely to happen in other settings trying to estimate an implied demand curve with the variation of distance. As the paper acknowledges, the key counterfactual analysis is mostly out of sample. The correct demand curve can hardly estimate by such a small variation in the implied price in the sample. Then, the estimated welfare gain can have large errors. Finally, even if the above problems had been tackled, the research question of the paper might be wrong in the first place. The governments and private insurers should already know that the top-up design is more efficient and may have considered different types of designs to increase either profit or social welfare. After all, the concept that allowing patients to pay for their choices can internalize the social cost is not hard to conceive. So, the more important question is why few governments and private insurers choose to do so. What did they consider so that they chose the full coverage design or no top-up design? The cost and obstacles of implementing the top-up design and other designs need to be analyzed in detail if the authors do believe the social welfare gains are as large as their estimate. Then, they may probably find out such gains may not be large enough for changing the health insurance policy; otherwise, the governments should have done so.