

# Reading Notes

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

### Introduction

This paper mainly focuses on a “top-up” design in the health insurance topic. This “top-up” design divides medical expenditures into two parts: the first part is the cost of the baseline treatment covered by health insurance; and the second part is the extra cost above this baseline treatment which should be paid by patients. This paper compares this “top-up” design with two other types of health insurance commonly given in US, called “full coverage” and given in other countries with high income such as UK, called “no top-up”. “Full coverage” insurance covers all the cost even if patients choose an expensive treatment. “No top-up” insurance covers treatments which are categorized as “cost-effective” and these categorized as “not cost-effective” are not covered. The method this paper uses to compare these three insurance type is to provide a graphical frame work which includes the relative demand curve. This relative demand curve is the key to imply the welfare consequences of different insurances. Following that, this paper is able to estimate this curve and the welfare effects in one specific medical background: breast cancer. The reason for choosing breast cancer is that there are two types of surgery: mastectomy and lumpectomy which have very similar survival rate but the latter is more expensive. This paper uses the difference in distance to the radiation facility to identify the demand curve of lumpectomy. By estimation, “top-up” insurance increases total welfare compared to other two insurance policies. Finally, this paper discusses other tradeoffs under ex ante perspective.

### Overview of the theoretical foundation

This paper constructs a relative valuation for lumpectomy which is the “willingness to pay” difference between lumpectomy and mastectomy. Using this relative valuation, this paper provides a demand curve shown in a conceptual framework. In this framework, the efficient policy is the “top-up” which patients with higher willingness to pay for lumpectomy than the social marginal cost of the lumpectomy choose lumpectomy. In addition, The “full coverage” gives no incremental cost for either mastectomy or lumpectomy. The patients whose relative valuation for lumpectomy is lower than the social marginal cost of the lumpectomy still choose lumpectomy just because of the zero cost of it, which is described as inefficient and generates welfare loss. Furthermore, the “no top-up” which fully covers mastectomy but covers nothing on lumpectomy, which would cause a welfare loss. Patients whose relative valuation for lumpectomy higher than the social marginal cost would turn to choose mastectomy in order to avoid the cost.

### Overview of the data and empirical strategy

Two datasets are used in this paper. The patient level data is from the California Cancer Registry (CCR) which was founded in 1985. The cancer registry information is directly collected from patients’ medical records. The most important variable in CCR is patients’ exact address of residence which can be used to measure the distance between patients’ address to radiation treatment facilities. The second dataset is IMV which records radiation treatment facility locations. In general, this paper’s sample covers 323612 female breast cancer patients from 1997 to 2009.

The empirical strategy is to first assume relative utility from lumpectomy, which includes two preference parameters, the distance to the nearest radiation facility, opportunity cost of time, and the incremental price paid for lumpectomy. This utility function then leads to the equation that the probability of choosing lumpectomy is equal to the probability that this utility is greater than zero. One key assumption for this empirical strategy is

that conditional on  $\theta_i$  which is the opportunity cost of time, distance and price paid for lumpectomy have the same effect on the utility.

## Overview of the findings

First of all, by directly using the raw data, this paper finds that female who live in longer distance from radiation facilities are less like to have lumpectomies. And this relation between distance (travel time) and the choice of having lumpectomies is insensitive to other characteristics.

In the result section, the paper provides estimation on logit model. There are some specifications. The first one is the logit regression of patients' choice of lumpectomy on travel time without any control variables. The second, third and fourth are the same homogeneous logit model but with different controls. The last two are heterogeneous logit model with interaction term with distance and random coefficients. All the specifications show statistically significant results. The specification with random coefficients shows the largest effect but is noisy. The results show that the shorter travel time from patients' address to the nearest radiation facility leads to less probability to choose lumpectomy. In addition, the control characteristics do not have important effects on the distance estimation.

In the next section, the paper shows the empirical figure of the implied demand system for lumpectomy. The first empirical figure which is based on the specification with no controls implies that "full coverage" insurance design raises the lumpectomy rate by 37 percent. It also implies that "no top-up" insurance design decreases lumpectomy rate to almost zero. The second empirical figure which is based on the specification with random coefficients raises the lumpectomy rate by 10 percentage points under "full coverage" insurance design; and decreases the lumpectomy rate by 4.5 percentage points under "no top-up" insurance design.

In the last section, the paper provides discussion on ex ante efficiency. By considering the ex ante utility properties of difference insurance design, the paper shows that "full coverage" does not have ex ante risk exposure and has the largest consumer surplus. The "top-up" has ex ante risk exposure and provides ex post efficient treatment choices. On the contrary, "no top-up" has ex ante risk exposure but provides ex post inefficient treatment choices. In general, the comparison implies that "top-up" policy has a higher ranking of social welfare than "no top-up" but has unclear welfare ranking relation with "full coverage". Finally, this paper provides some alternative insurances designs like "first best", which, by construction, generates no ex ante risk exposure and reaches ex post efficient treatment choice. However, "first best" is not practical. One more practical way is to cover only the incremental cost of "top-up" policy.

## Concluding Paragraph

This paper uses a graphic framework to construct remand curve which is based on the relative valuation for lumpectomy which illustrates how much differences female breast cancer patients are willing to pay between lumpectomy and mastectomy. This framework is able to show the welfare effects of three health insurance policies. The efficient policy is "top-up" insurance design which patients only need to pay the incremental price over the cost of baseline treatment. By using the distance differences from patients' address to the nearest radiation facility, this paper provides estimations on the relative demand for lumpectomy and also estimates the welfare gains of the "top-up" policy compared to two other policies. Finally, this paper provides ex ante perspective and shows that the "top-up" has relatively higher social welfare ranking than the "no top-up"; and has unclear ranking relation with "full coverage" because "full coverage" does not has risk exposure.

One limitation in this paper is about using the distance to the nearest radiation facility to illustrate the choice of having lumpectomies. Because breast cancer is a really serious disease, patients must put large consideration on the quality or reputation of the radiation facility but not simply the distance. Another limitation is that, although mastectomy and lumpectomy have similar survival rate, we should consider the psychological hurt of the female. Mastectomy removes the breast but lumpectomy preserves it. In addition, Choosing mastectomy or lumpectomy does not depend solely on patients; instead, doctor's advice is important. The choice should largely depend on patient's actual situation and where, or how many, tumors exist.