ABOUT THE ECONOMIC INCENTIVES AND OTHER VARIABLES FOR THE VOLUNTEER DONATION OF A KIDNEY

Abstract

Today Chile faces an excess of demand for organs for transplantation, there are 1800 patients on waiting list but in 2015 only 321 transplants were performed. However the waiting lists are composed mostly by adults who require a kidney, so promoting the donation of this organ the problem could be alleviated considerably.

In this paper will evaluate how certain attributes affect the probability that a person decides to donate a kidney being still alive. For this we consider economic incentives and an additional element that has not been considered in the economic literature, which we call ***receptor value*** *that we understand as the value that a person assigns to donate as a function of the emotional distance that exist between him and the receptor of the organ.*

Finally, for estimation of the effect of this attributes on the probability of donating, we use the ***conditional logit model*** *developed by McFadden (1974). The results show that economic incentives affect in a positive but small way the decision of donating a kidney in life, and oppositely the receptor value is the main factor that encourages this decision. Therefore, a policy of economic incentives would have a very limited impact in promotion of living donation, because what really matters is the emotional closeness respect to the organ recipient.*

1. **Introduction**

Today Chile faces an excess of demand for organs towards transplantation. There are 1800 patients on waiting list but in 2015 only 321 transplants were performed. If we compare with other countries, while Uruguay has 20 donors per million people (pmp), U.S. has 23 pmp, Argentina has 25 pmp and Spain 36 pmp; Chile has only 7 pmp.

We will focus, specifically, in the case of kidney transplantation, because two main reasons.

First, according to the information given by the "Corporación del Transplante" the waiting lists are composed mostly by adults who require a kidney, so promoting the donation of this organ the problem could be alleviated considerably. Secondly, by the fact that the donation of these can come from living donors.

For the analysis of the situation, the demand for transplantation is formed by all those suffering from advanced chronic kidney disease so that they have to be subjected to dialysis to stay alive and, therefore, have been enrolled in the transplant waiting lists. Instead, the supply is formed by the people who are available to share a kidney with a family member and the dead donors who, with the family permission, give one of their kidneys to the waiting list [1]. Nowadays, and considering the historical data, it has been always low compared to the demand for most of the organs.

Looking at the data on the evolution of the waiting lists in Chile, granted by the "Corporación del Transplante", and applying a linear projection we can predict that the situation will continue in time. On the other hand the government has not implemented any policy that makes a substantial change in the current system. Considering for example, the recent reform made which amends Law No. 19,451 - that presumed donation unless it is explicitly rejected – according to Harrison et al (2011), will only have a limited impact on the willingness of donation and the rate of negative family decision.

Some studies have concluded that the effect of introducing economic incentives could stop the shortage of organs, because this would result in a decrease in the number of people on the waiting lists – with a mortality rate of 25% (Zapata 2007) - so the implementation of them could save lives. However, what is the effect in the probability that a person decides to donate? This is the relevant factor that would promote this decision?

This paper will evaluate how economic incentives can affect the probability of become a kidney living donor. But also we incorporate an additional element that has not been considered in the economic literature, which we call "*receptor value"* which is the value that a person assigns to donate as a function of the emotional distance that exist between him and the receptor of the organ.

This research continues as follows. In the following we organize the existing literature that links directly or indirectly to these research topics. In the third section will be described the procedure for the realization of the objectives of the investigation, while in

[1] In both cases there is no age restriction. But 5 to 60 years is the ideal age. Any donor outside this range can donate but the operation should be supported by some medical criteria.

the fourth section will be describe the data obtained, establishing what are the crucial elements and how these were achieved. The fifth section develops the mathematical side, the application of the econometric model and regression results. The conclusions are included in seventh section.

1. Theoretical Framework

Becker and Elias (2007) proposed a model to calculate the reserve price for which a person would agree to donate one of his/her kidney, which consists of the sum of three components: monetary compensation for the risk of death, monetary compensation for a reduction in quality of life and monetary compensation for time spent on the surgery and recovery.

They calculate the monetary compensation for an increase of the risk of death, multiplying the risk of death during surgery by the Value of Statistical Life (VSL), which corresponds to the amount of money that an average person requires to accept a marginal increase in their probability of death (Viscusi, 1993) which is determined by the hedonic wage method, assuming that the jobs are heterogeneous in their attributes, including fatal risks. Therefore, if the risks are considered a welfare loss, then workers would be willing to sacrifice some of their salary to work in less risky jobs.

The second component of the reserve price is more difficult to calculate because it depends on the lifestyle of each person. So the authors arbitrarily assigned a value and then applied a sensitivity analysis. Finally, the third component is calculated using the revenue forgone by the time spent in surgery and recovery.

For the Chilean case, Harrison *et.al* (2011) determined that a person on the waiting list that receives a kidney, generates savings of 50,000 USD for the health system, amounting to 180,000 USD when considered the increase in the quality of life. Parada and Vasquez (2010) using the model of Becker and Elias (2007) obtain a reserve price of 22,000 USD. Comparing this value with the savings calculated by Harrison *et.al*. (2011), this policy would generate savings of 158,000 USD per donation per year for the national health system.

There are also studies who have used direct methods to explore the effect of monetary incentives in the supply of organ transplants. Adams (1999) through a survey based on a sample of people with an average age of 20 years, determined that it an incentive of 5000 USD is necessary to make people accept donating their organs after dead. This policy will increase in 11 percent the amount of currents donors in the United States. Altinanahtar (2008) using the same survey of Adams, through a contingent valuation method determines that an incentive of 4,000 USD is needed to satisfy the current demand for organs of the United States, assuming that of all deaths only 3 % provide an acceptable organ.

Similarly, other market solutions to the organ shortage problem have been explored by Kaserman and Barnett (1991), Peters (1991), Barnett (2001), Roscoe (2010) and Diesel (2010), among others.

As we see, there has been no study that measure the direct effect of the economic incentives in the probability that a person would become a kidney living donor.

Therefore, we dont know if this is an important factor that promote this kind of decision. Additionally, in this context, no study has considered the "*receptor value*" variable which may be the most important factor in this kind of decision.

2. The Model

3.1 Data Recompilation

A survey was applied to 200 persons. The goal of this survey is the recompilation of data to calculate how certain attributes affect the probability that a person decides to donate, which are the following:

1. Type of donation: alive or after dead.
2. Receptor of organ: familiar, friend, acquaintance or unknown for the donor.
3. Economic incentives: in case a person decides to donate while still alive, he or she receive a monetary compensation for the costs and risks taken. Based on the theoretical framework, this compensation can it be: 0; 10000; 20000; 6000; 100000 USD

On the application of this survey, the potential donor was confronting to eight similar situations, in which everyone has two scenarios with different attributes for the donation, exposing the person to an experiment based on his preferences, such that, in each situation, he can decide donate in some scenario or not donate.

In the first scenario, the donation of organs can only happen through a centralize system (health care organizations, anonymous donations, etc.) which give an economic compensation and also makes impossible to achieve a bilateral agreement for these. In the second scenario, the bilateral agreements can be achieve between familiars or close friends with an economic compensation. Also in both scenarios are allowed to donate after dead in an altruistic way to an unknown person on a waiting list, as is usual at present.

3.2 Econometric Estimation

To estimate the effect of the different attributes on the probability of donating we use the conditional logit model developed by McFadden (1974).

As aforementioned, we assume that each person will face eight times a discrete choice between two scenarios, in which he can decide donate in one or not donate, such, that he maximizes their welfare.

Thus, each person *i* will face different alternatives that generates a particular welfare (*B*(.)). Therefore, assuming that in a given situation the individual *i* chooses the alternative *j* over another *k* we can define formally the probability of choosing the alternative *j* as the equation (1):

$$p_j = p[i: B(j) \geq B(k), \forall k \neq j] \quad (1)$$

This can generate a random utility model (RUM) in which the randomness is generated

by differences between the utility functions of a determinate sample given the heterogeneity in the preferences. This facilitates attaching it directly with the correct econometric application.

Then, defining that the particular welfare generated by the alternative *j* represents the utility of each person and can be represented as the equation (2):

$$B_{ij} = v(x_j)\beta + \varepsilon_{ij} \tag{2}$$

where:

- $x_j = x_j(t_j, r_j, c_j)$: Vector of characteristics of the alternative j.
  - t_j: Type of donation (donate in life/ posthumous donation)
  - r_j: Receptor of organ.
  - c_j: Monetary compensation.
- ε_{ij}: Error terms.

Therefore combining the equations (1) and (2), the probability of choosing the alternative *j* can be represented as the equation (3):

$$p_j = p[v(x_j)\beta + \varepsilon_j \geq v(x_k) + \varepsilon_k, \forall k \neq j] \tag{3}$$

Now, assuming that the errors are independent and have an extreme value distribution type 1, and since every person faces in each situation three alternatives, then the probability of choosing a particular alternative *j* can be represented in the equation (4) as a multinomial conditional probability model:

$$p_j = \frac{exp(v(x_j))\beta}{\sum_{k=1}^{3} e\, xp(v(x_k)\beta)} \tag{4}$$

Note that since the probability of choosing a certain alternative is constructed from the benefit it brings to each person, then we can get the probability to choose an alternative based on the characteristics of this (type of donation, receptor or the organ and monetary incentive).

4. **Data**

As noted in the previous section, surveys were to measure the willingness of individuals to become donors according to different circumstances.

Since the purpose of this research is aimed to study the case of kidney donation performed in Chile, a simple random sampling was made. The sample considers only people who are chilean citizens, that is men and women over 18. Additionally, the sample was restricted to chilean citizens who are at the time of the survey in the city of Concepcion.

Although the sample considers only people in Concepción this does not mean that the conclusions of this study are restricted to the regional level. The reason for this has to do

with the demographic organization of Chile, a country with a unitary state, so that people from different cities and regions are immersed in a culture relatively homogeneous, hence is probable that should not be cultural differences that make invalid the findings with a regional sample. Therefore, the results will always be valid on a national level.

4.1 Sample demographics

The sample contained 107 (53,5 percent) males and 92 female (46 percent) and 1 (0,5 percent) lost data. The overall response rate was 99 percent. The average age of respondents in this sample was 39-years-old with a standard deviation of 17-years. The socioeconomic data of the sample were summarized in five groups; according to these:

- 16,5 percent of the sample belongs to the group that concentrates income between 0-500 USD
- 17 percent belongs to the 501-750 USD income group
- 21 percent of the sample are inside the group of income between 751-1200 USD
- 15,5 percent goes with the group between 1201-2800 USD
- 30 percent of the sample are concentrated in the income level of more than 2800 USD.

Also, according to this sample, 50,5 percent are donators of organs in the current system, and 49,5 percent are not. In the case of prevailing the economic incentive system, from the 50,5 percent of older donors only 63 percent will still be a donor, 11 percent will stop being, and 26 percent does not know if they will still be a donor. Inside the group that are currently not donors, 52 percent of this sample established that their main reason is the low trust of the actual donation system, 5 percent prevails that their religious beliefs does not allow them to be a donor, 3 percent establish that moral and ethical issues are their main reason for not being a donor and 40 percent of this sample shows other reasons that are not specified in the instrument.

In order to know the background of this sample in relation with donation, 17 percent knows someone in waiting list for an kidney transplant, and 20 percent knows someone that have had a transplant during his life.

As we noted, the sample is heterogeneous supporting the provision of general results.

5. Results

One of the central hypothesis of this research is that knowing the receptor of the organ can influence in the choice of donating, therefore is important to know the probability that these factor influence over an alive donator of a kidney. Thus, it is necessary to compare this attribute with the scenario where the receptor is not known by the donor (with the highest emotional distance).

Similarly, regarding to the analysis of the importance of the economic incentives, is necessary to compare this with the option of donation without these. And regarding to the analysis of the type of donation we compare to donate in life with posthumous donation.

Then applying the conditional logit model, we obtained the results presented in the table 1.

As it is observed, exists a mayor probability of choosing an alternative of donation if in this one the donator obtains an economic compensation against the one that does not have this variable but the effect is very small (less than one percent for every increase in the of 10000 USD).

Regarding to organ receptor, this a more important variable. Compared to the situation where the receptor is unknown, if the receptor is a familiar the increase in the probabilities of donate is 85 percent. If the receptor is a friend the effect is around 42 percent and if an acquaintance around 7.5 percent. This is an important results because as we can notice, the effect of the "value receptor" variable is greater than economic incentives.

Finally, the coefficient sign of "donate in life" is also the expected, because the probability of donation in life is less than donate after life.

Variable	Coefficient	Std.Error	P-Value
Economic Incentives	0.001	0.000	0.043
Familiar	0.853	0.037	0.000
Friend	0.422	0.025	0.000
Acquaintance	0.075	0.034	0.027
Donate in life	-0.243	0.0028	0.000

Table 1: Marginal Effects in the Probability of donate.

6. Conclusions

According to the theoretical approach of Becker & Elías (2007) it was generated an instrument based on this compensation model, the data obtain in the sample of this research showed that the economic incentive was not a relevant factor the moment of the decision of donating a kidney during life. The data showed that the most important variable is the "receptor value". Therefore, a policy of financial incentives would have a very limited in promoting living donation effect. What really matters in this decision is the emotional closeness to the organ recipient.

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