Micro-economic foundations of the Supply of Human Organs: Behavioral Insights

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Prepared and Submitted by

DIPTANU DAS

Year: 2019

Jadavpur University, Department of Economics,

Kolkata: 700032

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Contents

Outline of Chapters

Chapter 1 begins with highlighting the role of cadaveric organ donation in a country like India, and shows the importance of building a non-market framework to devise interventions to increase the organ donation rate in the economy. Chapter 1 also encompasses the literature review which is used to identify the variables affecting an individual's willingness to become an organ donor.

In Chapter 2, human behavior is modeled through a theoretical framework under the assumption of perfect information regarding the transaction cost of organ donation, to discern the necessary and sufficient conditions that lead an individual to become an organ donor. This chapter also shows the plausible strategies that can be deployed to nudge people into becoming organ donors, and examines scenarios under which the given interventions might not be as effective as estimated.

Chapter 3 has two sections: the first section exhibits as to why the total cost involved in becoming an organ donor is not trivial while the second section is used to formulate a more realistic model of organ donation under the assumption of imperfect information regarding the transaction cost associated with becoming an organ donor.

Chapter 4 provides policy prescriptions that can be employed to increase the organ donation rate in a nation with imperfect information regarding transaction cost of organ donation. At last, the chapter concludes with identifying possible extensions of this thesis.

Chapter 1- Introduction

1.1. Perspective

On average, fifteen people in India die each day waiting for organ transplants because of a growing shortage of transplantable organs (Swati G et.al, 2016). Although there has been a marked increase in the number of organ transplants in India since the 1970s, still the organ donation rate in India lies at an abysmally low level of 0.5 per million persons. To give an example of the seriousness of the scenario, every year in India around 175000 people are diagnosed to have kidney failure and in need of transplantation while the actual number of kidney transplants undertaken in India are 5500 annually (Dhiman et.al.). It is estimated that an increase in the organ donation rate to 1 per million persons is enough to take care of almost all current demand for organs whereas an increase in the organ donation rate to 2 per million persons is enough to eliminate the necessity of living kidney donations (ORGAN India).

Economists have a simple solution for such a persistent gap between demand and supply of organs – permitting free markets for organs. Accordingly, a considerable amount of literature is dedicated to showing the advantages of permitting free trade in organs (Becker &Elı´as 2007, Barnett II et.al 2001, and Andrew V & Block 2011). Although, the prospects of a free market in organs sounds exciting but remarkably no nation has adhered to such a prescription and it seems to be spectacularly unpopular for reasons not well understood (Thaler & Sunstein, Nudge 2008). This is probably because of the existing fear that permitting an unsupervised free market in organs can lead to unscrupulous activities where the less privileged might be coerced into selling their organs, leading to the exploitation of the poor (Barnett, Beard, and Kaserman 1993; Barnett, Blair, and Kaserman 1992; Blair and Kaserman 1991; DeJong et al. 1995). Finally, payment for cadaveric donation is opposed on the grounds that totalitarian governments and others might kill prisoners or individuals to sell their organs.

Following medical advances in the 1980s, India witnessed a short period of free trade in kidneys with foreign patients flocking to the country for transplants from paid “donors”. These transplants were often done discreetly in small hospitals in substandard conditions, while some large private institutions tacitly participated in this activity (Nagral and

Amalorpavanathan, 2014). At first, attempts were made to justify paid-for donations as being in line with libertarian and free market philosophy (Richards et.al, 1998), but the ground reality of market donors often being coerced and deprived by middlemen of any monetary rewards led the Government of India to pass the Transplantation of Human Organs Act (THOA) in 1994, which effectively banned any form of 'commercial trading' in organs. At present, India has an opt-in system of organ donation through which an individual can pledge to donate her organs after death, and live donation is permitted on grounds of altruism but only with the sanction of an authorization committee.

Thus, attempting to solve the problem of supply shortage of human organs through mere market mechanism appears to be a superficial approach. Instead, the focus should be on understanding and identifying the necessary and sufficient conditions that lead to organ donation under the present system. Having a clear understanding of what makes a person sign up as an organ donor will enable us to understand the current scenario of excess demand and how that could be removed in the future. This paper is an attempt to develop such an understanding through a theoretical framework for explaining the micro-foundation of the supply of human organs in the backdrop of the Indian scenario.

It is to be noted that in this paper we explicitly focus on cadaveric organ donation and not on living organ donation. This is because under the present system of organ donation in India, where buying and selling of human organs is strictly prohibited, living organ donation is likely to occur only when the donor feels a strong sense of attachment to the organ receiver or when the donor is related to the receiver, given that the living organ donor incurs a huge transaction cost and possible future health problems. Because living organ donation mainly stems from love and affection we do not build an economic framework in this paper to analyze it but concentrate on the more significant phenomenon of cadaveric organ donation with its greater economic underpinnings.

We begin by identifying from previous literature the possible factors influencing a representative individual's decision to donate organs. Thereafter, we build a theoretical framework to ascertain the conditions under which such an individual donates his organs. In the following section given the conditions of organ donation, we try to provide possible interventions to 'nudge' people into donating organs. Last, we examine different scenarios under which the mentioned strategies might be rendered ineffective and the possible implications for future studies.

1.2. Literature Review

An individual's decision to donate his/her organs depends on several factors. These are:-

1. **Degree of Altruism & Empathy (A) -** Altruism is defined as behavior which is other-regarding i.e. the willingness of a person to do things for the welfare of others even when such an action is costly to the decision maker. Most people like to think themselves in a positive light i.e. as possessing some positive attributes such as kindness, and helpfulness. This need to be and remain righteous or nice can prompt an individual to take decisions regarding activities which lead to charitable giving and organ donation. The Nuffield Council on Bioethics report 2011 emphasizes the role of altruism in organ donation in UK as:

   "Altruism, long promulgated as the only ethical basis for donation of bodily material, should continue to play a central role in ethical thinking in this field. While some of the claims made for altruism may be overblown, the notion of altruism as underpinning important communal values expresses something very significant about the kind of society in which we wish to live"

   The importance of altruism in organ donation has also been highlighted in a recent study by Milaniak et al (2018) which shows a significant association between altruism and posthumous organ donation. Thus, altruism seems to be an important factor determining the decision of an individual to donate organs[1].

2. **Default rule regarding organ donation system prevailing in the country (D) –**The Default rule relates to organ donation in the considered country (D), i.e. whether the country has an explicit consent system, where individuals cannot donate until they explicitly register their consent or a presumed consent system where individuals automatically become posthumous organ donors unless they explicitly opt-out. So we can consider D to be a dummy variable where D = 0 (1) for opt-in or synonymously exclusive consent (opt-out or presumed consent) system.

[1]The reason why altruism has been inserted as a factor influencing an individual's willingness to become an organ donor is because both theoretical and empirical work preceding this paper leads me to believe that there is a wide variation of altruism across individuals within a society. For example there are three predominant models in regard to bequests based on varying degree of altruism: Extreme altruism (Barro (1974), Becker (1974, 1981, 1991), and Stark (1995)); bequests occurring only if the family line of business is continued by the next generation (Modigliani and Brumberg, 1954); and bequests based only on the condition that the older generation is looked after by new generation (Chu 1991).

Richard Thaler and Cass Sunstein in their book NUDGE show the immense power of 'defaults'. Faced with a number of options people in general have an inadvertent tendency to stick to their current situation, or choose the option that requires least effort. This is known as "status quo bias" which makes the default option a powerful tool for nudging. Johnson and Goldstein (2003) demonstrated the role of defaults in the domain of organ donation. In their study they showed that, with transaction cost of organ donation being the bare minimum, keeping presumed consent to be the default can possibly increase organ donation by 40 per cent points compared to the scenario when explicit consent is the default. Thus, the default rule for organ donation seems to be a crucial factor influencing the typical individual's decision regarding organ donation.

3. **Knowledge of Organ Transplantation (K) -** The first step in solving a problem is in knowing that the problem exists. If a person has no knowledge about a problem plaguing the society he/she is unlikely to make any effort in finding a feasible solution to that problem. Similarly, if a person has no knowledge about the current lack of supply of human organs, and the potential of organ donation in regard to saving lives, he/she is unlikely to sign-up as a donor. Studies have shown a significant relationship between knowledge about organ transplantation and organ donation i.e. knowledge of 'organ donation facts' was found to be positively associated with people requesting or holding a donor card (Horton and Horton 1990). Further studies, such as that by Haustein and Sellers 2004, state the importance of intense efforts to improve public awareness and knowledge about organ transplantation to maximize organ donation and the overall success of transplantation.

4. **Perception of the medical and organ allocation system prevailing in the society (P) -** Studies have shown that the perception among individuals regarding the contemporary medical & organ allocation system in the society is likely to be a salient factor affecting the willingness to donate organs. People who believe that the organ distribution system is 'unfair' in its allocation of organs -- i.e. there is discrimination while allocating organs among people on the basis of income, education, country of origin, political affiliation, sexual orientation, gender and religion etc.-- are less likely to become organ donors (Boulware et.al., 2007). Similarly, distrust in the health care system is likely to have a negative impact on the organ donation intentions of people (Russel et.al, 2012). Since organ donation and related concepts such as 'brain death' are not understood by the

general public in India (Wig et.al, 2003), trust and public perception of the healthcare system is expected to significantly influence the decision to donate organs.

5. **Initiatives taken by the government (I) –** Initiatives undertaken by the government and other institutions to increase organ donation are expected to have a positive impact on an individual's decision to donate organs. In USA, initiatives are undertaken by Organ Procuring Organizations (OPO) to continually identify prospective donors through routine review of medical reports of hospitals in their respective regions (Nathan et.al, 2003). In UK, initiatives to raise the rate of organ donation are undertaken in the form of creation of awareness and counseling of people through channels such as Transplant co-ordination services (ORGAN India). In India, there is an urgent need for the government to create a nationwide initiative in partnership with the NGOs to spread awareness and information regarding the needs and benefits of organ donation (ORGAN India).

6. **Cost of Consent (C) –** There can be two types of transaction cost depending upon the system of organ donation that is prevalent in the economy. In an explicit consent system an individual has to bear a transaction cost of becoming an organ donor, whereas in a presumed consent system an individual has to bear a transaction cost for refusing to become an organ donor. India has an explicit consent system of donation whereas European countries like Austria, Spain and Belgium have presumed consent. I believe that the cost needed to be undertaken to become an organ donor, i.e. the transaction cost of becoming a donor, is perhaps the most important impediment in the way of increasing the donation rate in an explicit consent system. This is true even when individuals obtain positive utility from donating organs. People possessing necessary knowledge and willing to donate organs might often back out from signing up as a donor just because of high transaction costs.

   In most 'explicit consent' nations an individual need not explicitly pay anything to enroll as an organ donor but needs to allocate some amount of time and effort to acquire and fill up the registration form. In India, an individual can become an organ donor by signing the donor card in the presence of two witnesses (Dhiman et.al.). Although this opportunity cost of becoming an organ donor is quite moderate (given limited actions required to become an organ donor and the widespread use of the internet) I still expect this factor to play a deciding role in an individual's decision to donate organs. Consider the example of the study of Iowa residents undertaken by Sheldon Kurtz and Michael Saks (1995) which

showed that a lion's share of the population wanted to donate their own organs and those of their children but only thirty-six per cent of these individuals signed an organ donor card. This can only result from the individual factoring in a positive transaction cost before deciding to donate/not donate.

7. **Religion (R) -** Religious belief of the person concerned (R). Here we can take this variable as a dummy variable with
   - R = 0, when the person concerned is a Muslim.
   - R = 1, when the person concerned follows any religion other than Islam.

   We choose to conceptualize R in this manner because of various reasons. First, our discussions with some medical experts in the field of organ donation reveal the important role played by religion in India as a key determinant of an individual's decision to donate. According to them there is a very small probability of a person following Islam to be enlisted as an organ donor in India. Although we don't have hard data in favor of the claims made by the experts but it is true that religion may be an important element in a decision against organ donation (Alkhawari et.al, 2005 and Ahlawat et.al, 2013). Almost all of the major religions in the world support organ donation but there exists a striking variability in attitude towards transplantation throughout the Muslim world (Oliver et.al, 2010). In Saudi Arabia Islamic scholars have been influential in promoting organ donation (Randhawa G, 1998 &Aswad et.al, 1992). In Iran organ donation is sanctioned by religious and national law (Larijani et.al, 2004). In Turkey the influence of Islam is ambiguous (Bilgel et.al, 1991). Last, in Egypt a dispute between religious authorities has almost completely inhibited cadaveric organ donation (Daar AS, 1997). All in all there appears to be some discrepancy between Arab and Indo-Asian Muslim scholars in that the latter often appears to be less approving of organ donation (Shafi MM). Here we can cite the example of Singapore where a presumed consent system of organ donation is prevalent but Muslims are automatically exempted (Teo B, 1991). This variability in attitude towards organ donation in the Muslim world stems from the two seemingly contradictory principles in Islam: one which prohibits the violation of human body whether living or dead, the other which can be stated as follows: "Whosoever saves the life of one person it would be as if he saved the life of all mankind" (Qur'an chapter 5:32). Given such a dilemma, the principle that reconciles the two contradictory edicts is 'necessity allowing what is prohibited' *(al-darurattubih al-mahzurat).* This

principle was used previously to approve porcine bone graft and pork insulin (Hassaballah AM, 1996). In UK the Muslim Law Council in a formal decision in 1996 issued an *Ijtihad* (religious ruling) that organ transplantation is entirely in keeping with Islam (Golmakani, 2005). Accordingly, Muslims in UK carry donor cards and live donation is seen as an act of merit. Saudi Arabia also approved organ donation in a landmark judgement in 1988 (Golmakani, 2005). Similar rulings have also taken place in other Muslim nations like Pakistan, Iran and Egypt.

Although at an international level most scholars support organ donation and transplantation, individuals within the faith, particularly in the Indian subcontinent (A R Gatrad, 1994), still remain reluctant regarding cadaveric organ donation. This reluctance can possibly be explained by Islam viewing human body as being entrusted to man by *Allah* (God) and not for man to interfere with at leisure (Oliver et.al, 2010). Further religious considerations such as burial of human body within 24 hours add to the uncertainties of organ donation. Even Muslim physicians can cite religious concerns for not playing a proactive role in organ donation (Topbas et.al, 2005). With all these uncertainties, a Muslim individual might consult a local *imam* (local religious leader) before making decisions regarding organ donation & transplantation, and ultimately his decision is in most cases respected.

8. **Others factors (O)** – Apart from the factors mentioned above there can be a number of other elements which can exert an influence on an individual's decision to donate organs. Siminoff et.al, (2001) in a study, conducted in nine trauma hospitals in South western Pennsylvania and Northern Ohio, showed that families who discussed more topics and had more conversation about organ donation were more likely to donate organs, as were families with more Organ Procurement Organization (OPO) staff. Factors such as ethnicity (Rubens 1996, Goldberg et.al, 2013 and Miniefield et.al, 2001), age (Roels et.al 1997, Boulware et.al 2002, and The Gallup Organization 1993) and socio-economic status (Saleem et.al 2009, Bilgel et.al 1991, and Ashraf et.al 2005) are also known to influence a person's attitude and willingness to donate organs.

Chapter 2 - Modeling human behavior regarding organ donation under Perfect Information of transaction cost

2.1. Framework

Now, given the above factors let the individuals perceived utility from deciding to donate organs be given by

$$U = U(A, D, K, P, R, O)^2 \quad (1)$$

Ex ante the probability that the utility of any individual (i.e. one for whom the value of exogenous variables is unknown) lies in a certain range would depend on the area under a probability density function (p.d.f) under that range. Ceteris paribus, as the spread of a variable increases the entire spread of the mentioned p.d.f would also increase.

To begin with we assume a continuous uniform distribution ranging from utility levels a to b which can take on any values on the real number line. This is just done for the sake of simplicity and as a starting point for the later introduction of more complications in the framework. These complications provide a pointer to the diversity of outcomes which can be generated, given a fixed level of transaction costs, from varying assumptions about the nature of the utility distribution.

It is obvious that the mentioned probability of utility lying in the range [c,d] is given by $\frac{d-c}{b-a}$ where $a \leq c \leq d \leq b$ with the value of this area obviously lying between 0 and 1

[2] Government Initiatives (I) is not included in the utility function because it is a function of Knowledge regarding organ transplantation and donation (K).

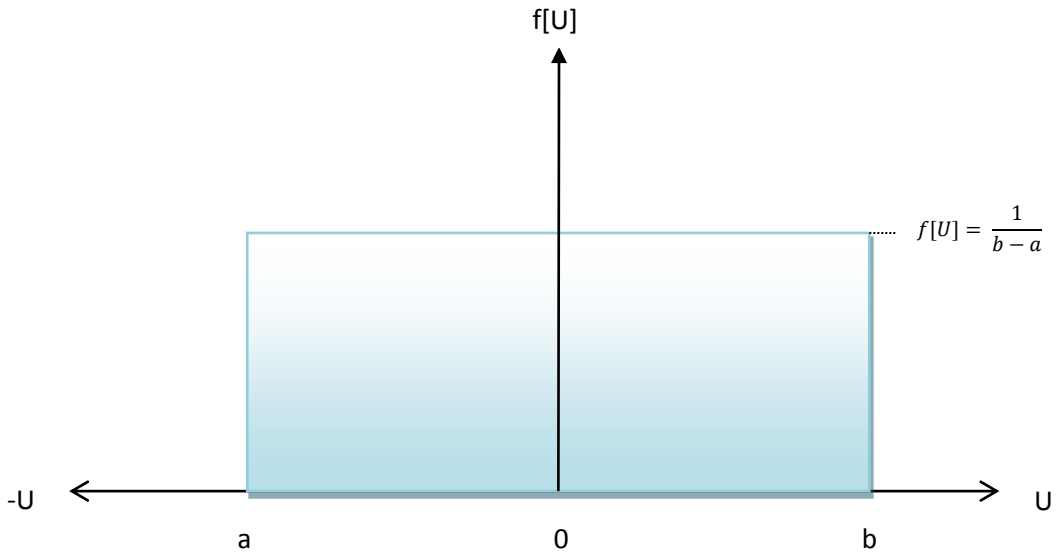

Diagram - 1

In the diagram given above, 'a' is negative and 'b' is positive. A negative value of 'a' may be caused by religious beliefs and/or repulsion to post-mortem mutilation. Let us refer back to the Indian case to illustrate the use of this diagram. In India, to become an organ donor one has to fill up an organ donor form issued by NOTTO (National Organ & Tissue Transplant Organization), available with various NGOs and certified organ transplant centers. In this form, the prospective donor has to list his/her personal details along with the details and signatures of two witnesses. Thus, both time and effort is required. We make the simplifying assumption that this time and effort involved in signing up involves an implicit transaction cost which, in utility terms, is invariant across individuals.

Thus, given other things, an individual will donate his/her organs under a system of explicit consent if and only if the utility gained from donating organs exceeds the transaction cost of signing up as an organ donor. To elaborate, let the transaction cost of donating one's organ in utility terms be given byC_0. Then, ceteris paribus, an individual *i* will become an organ donor only when he/she obtains a utility greater than C_0 from deciding to donating his/her organs.

i.e. if $U_i - C_0 > 0$ (2)

where U_i represents the utility obtained by the i-th individual from the decision to donate organs.

On the other hand, a reversal of this inequality will also lead to a reversal of the decision. On the other hand, $U_i - C_0 = 0$ implies indifference between deciding to donate organs or not donating organs.

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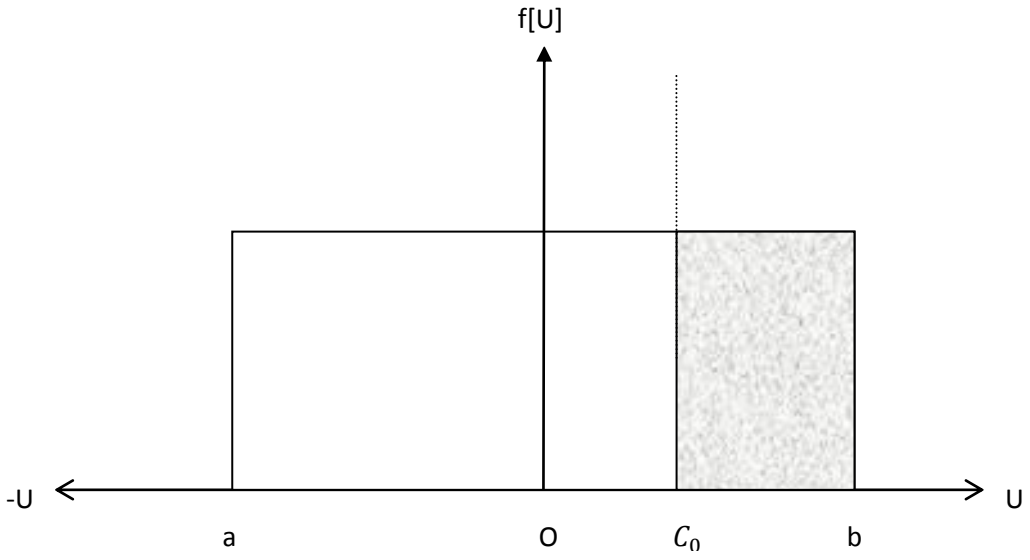


Diagram - 2

Given, the mentioned probability distribution and the cost of donating one's organ, C_0, the proportion of the population which obtains a utility greater than the transaction cost will only decide to donate whereas others will not. Hence, the proportion of population deciding to donate will be the area under the pdf between C_0 and b, $(\frac{b-C_0}{b-a})$ as depicted by the shaded region under the diagram, and consist of those individual's obtaining a utility greater than the transaction cost.

2.2. Strategies to increase organ donation under perfect information

Now, given the framework a number of strategies can be implemented by the policy makers to increase the organ donation rate in the economy. ***First, we will examine the possibility of changing the default system of organ donation from explicit consent to presumed consent.*** Under the policy of presumed consent all citizens of the nation are presumed to be consenting

donors i.e. a person under this system need not fill up a form stating his/her intentions to donate organs upon his/her death. Rather it is assumed that upon an individual's death, the organs of the person concerned will belong to the state unless he had earlier filled up a form stating his intentions of not donating. Thus, the cost of becoming an organ donor under opt-out system is technically nil while the cost of opting out is positive[3].

A rational individual will become an organ donor only when his total benefit from donation exceeds the benefit obtained from not donating organs. Let the transaction cost of not donating organs be C_1 under presumed consent. An individual will donate his organs only when

$$Total\ Net\ Benefit\ from\ organ\ donation > Total\ Net\ Benefit\ from\ not\ donating\ organs$$

The total net benefit that an individual procures from donating organs is the utility derived from becoming an organ donor; $U(.)$. On the other hand, the total benefit from not donating organs under presumed consent is zero minus the additional cost incurred from refusing to become an organ donor.

Thus, when

$$U(.) > -C_1 \qquad (3)$$

Where $U(.)$ represents the utility obtained by the ith-individual from donating organs, the ith individual signs up as an organ donor.

The scenario under presumed consent is depicted in the diagram below:

[3] Note that this cost can be considered to be monetized disutility.

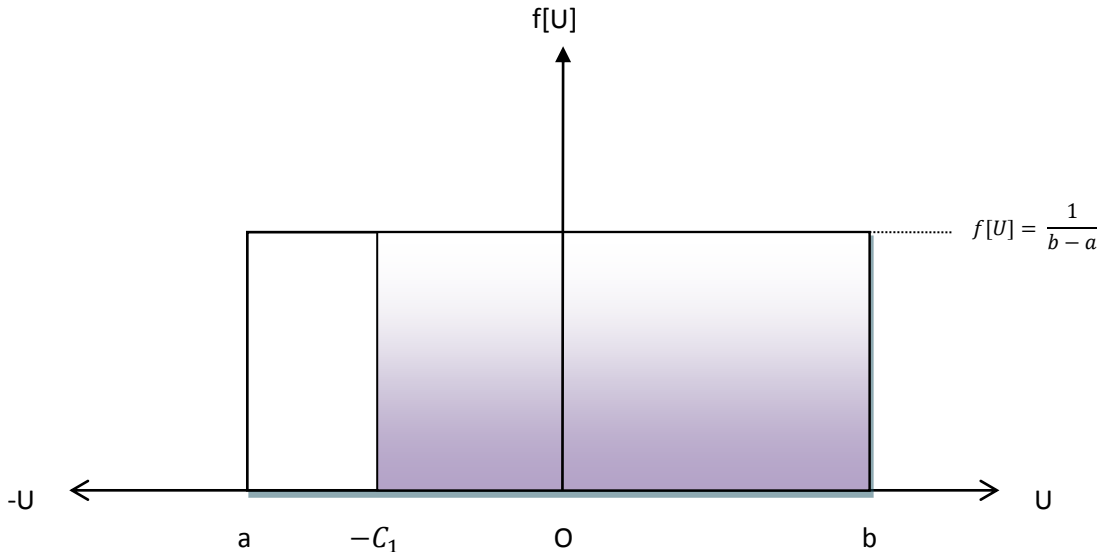


Diagram - 3

The above diagram illustrates that an individual will become an organ donor as long as her utility from donating is greater than $-C_1$. The proportion of population thus becoming organ donors is given by the shaded area in the above diagram, $[-C_1$, b]. Mathematically, this is represented by:-

$\frac{b+C_1}{b-a}$ (See diagram 3)

It is often noticed that nations having presumed consent indeed have a significantly higher organ donation rate per million compared to countries having explicit consent, but we hardly find economies with presumed consent having cent per cent donation rate. This is probably because a significant number of people suffering extreme disutility from the act of not donating organs will be willing to undertake the transaction cost of not donating and is identically equal to the area $\frac{-C_1-a}{b-a}$. The choice 'not to become an organ donor' is a result of one or more of the following factors assuming significance: a poor sense of social responsibility or 'selfishness', poor knowledge of organ transplantation and its benefits, and religious biases against organ donation. Thus, a shift from explicit consent to presumed consent can result in considerable rise in the number of donors in the economy as those with utilities in the range $[-C_1, C_0]$[4] turn organ donors after the switch. This is over and above the

[4]Where C_0 is the transaction cost associated with enrolling as an organ donor under explicit consent and C_1 is the transaction cost associated with refusing to donate organs under presumed consent.

original mass of organ donors under explicit consent. This can be best explained with the help of the following diagram.

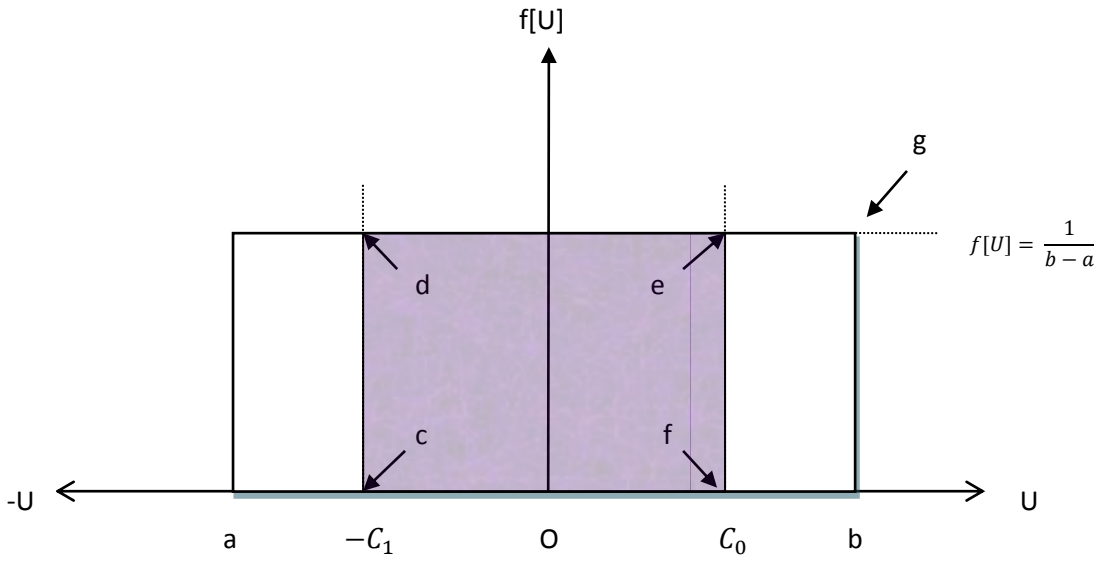


Diagram - 4

We assume that the nation concerned initially has an explicit consent policy, with transaction cost of donation given by C_0. A rational individual thus becomes an organ donor only if $U(.) > C_0$. Hence the proportion of population signing up as donors is given by the area fegb. Now suppose the country shifts to 'presumed consent' to increase the donation rate. This increases the proportion of population registered as organ donors to the shaded area *cdgb* as all individuals with utility above C_0 become organ donors. The area *cdef* represents the increase in the proportion of population donating organs when a switch is made from opt-in to opt-out. It is to be noted that if such a shift in the default system of organ donation does occur, then C_1 becomes the cost of not donating organs under presumed consent. Then the area under the curve $\frac{-C_1}{a-b}$ represents people who derive disutility from organ donation but still donate organs because the disutility derived from donation is less than the transaction cost

one has to undertake in order become a non-donor. Thus, the default policy of organ donation is likely to play a strong role in determining the donation rate in a country[5].

The above analysis seems to be in line with an earlier study done by Abadie and Gray (2004), which showed that holding everything constant, a switch from an explicit consent to presumed consent can bring about an increase in the donation rate of a country by roughly 16 per cent. Changing the default choice for organ donation to increase the organ donation rate might be implausible in a country such as India due to social and political opinion. For example, many people might vehemently object to the idea of the state owning the rights of a deceased person's organs sighting religious belief or breach of freedom. Further, a recent empirical study by Ammann (2010) provides a case study of a change in the default being ineffective in bringing about a significant rise in registration rates. The plausible reasons for such ineffectiveness, which might hold under certain circumstances, are analyzed later in the thesis. Under such circumstances, the best a government can do is to reduce the transaction cost of signing up as an organ donor.

This brings us to our second strategy – reduction in the transaction cost of becoming an organ donor. Minimizing and simplifying the procedure to obtain a donor card is expected to increase the organ donation rate in an economy under perfect information of transaction cost. Consider the example of the state of Illinois in USA which successfully reduced the cost of consent by enacting the First Person Consent registry in 2006, enabling people to register online and thereby attracting more than 4 million organ donors by the end of 2008.

This strategy can also be explained with the help of the following diagram:-

[5]It is to be noted that returns from switch in organ donation systems decrease when either or both of the transaction cost decreases. When both are zero, the returns are zero. By returns, we mean an increase in the proportion of the population undertaking organ donation.

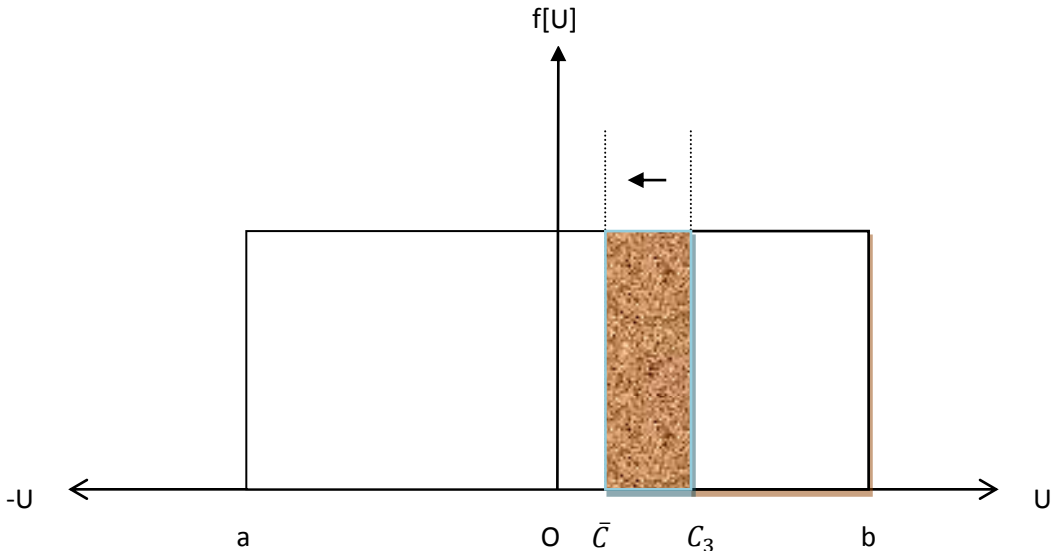


Diagram - 5

The above diagram shows that reducing the transaction cost from C_3 to $\bar{C}$ can increase the proportion of population willing to become organ donors by the shaded area $\frac{C_3-\bar{C}}{b-a}$.

Despite the presence of perfect information regarding transaction cost of organ donation, it is expected that a high transaction cost can deter an individual from opting to become an organ donor. This is because transaction cost under perfect information not only involves filling up a donor registration form, but also obtaining the form and submitting the form at a certain specified place. So reduction in transaction cost under perfect information can be achieved either by simplifying the organ donor registration form and/or by reducing the opportunity cost associated with the time taken to obtain and submit the donor registration form. One of the simplest ways to decrease the transaction cost of organ donation under perfect information is distribution of donor forms in healthcare centers when people are waiting in a queue for their check-up.

The third strategy to increase organ donation consists of developing appropriate interventions in the form of hiking people's sense of altruism, increasing knowledge regarding organ donation and its benefits, imbibing people's trust in the present medical system, and increasing government initiatives in the field of organ donation. The online study conducted by UK's Behavioural Insights Team 2013 showed that handing out of organ donation registration form with a cognitive perspective taking nudge statement like "If you needed an organ transplant would you have one? If so please help others" can incite an

emotional response thereby increasing the number of donor registrations significantly. A similar research done by Robitaille et.al (2015) showed that providing more information along with organ donation registration forms in health centers can increase an individual's odd of signing up as an organ donor by two times.

With respect to our framework, deploying of such interventions attempts to bring about a surge in a typical individual's utility from organ donation. Assuming that such an intervention has a homogeneous impact upon all individuals in the economy this implies a rightward shift in the utility distribution and a consequent increase in the number of donors by an amount proportional to the magnitude of the rightward shift in the distribution function.

This can be explained with the help of the following diagram:

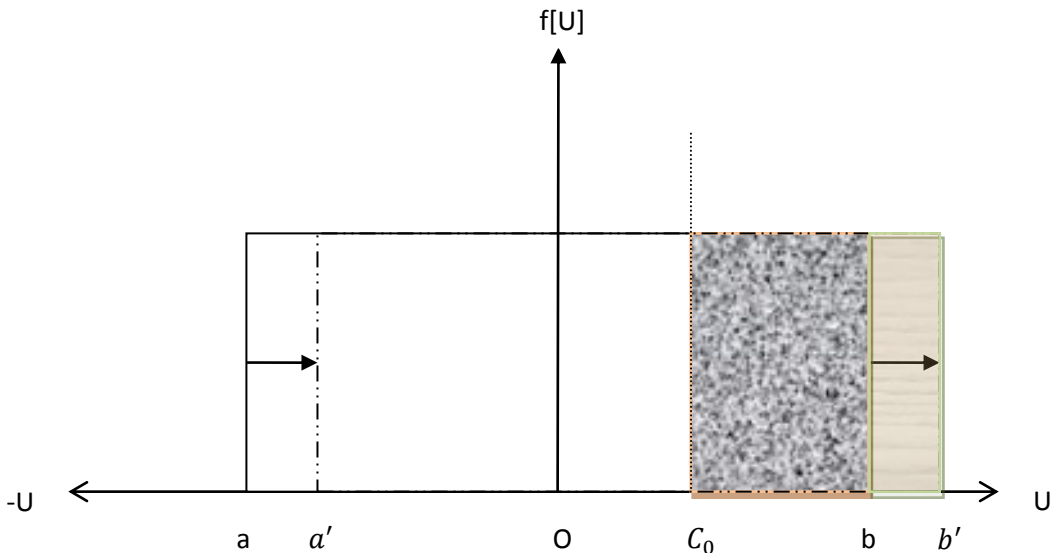


Diagram - 6

Diagram 6 shows that initially the probability distribution function of U(.) is defined within the range a to b. After introducing interventions to nudge people to sign-up as donors, the utility obtained by each and every individual within the population increases by a constant term. Diagrammatically this is represented by a rightward shift in the utility distribution from the range ab to $a'b'$. As the utility gained from donation rises by a constant term for each and every individual, more people find that the satisfaction derived from donation exceeds the transaction cost. So, additional people enlist to become organ donors and this pushes up the organ donation rate in the economy. The increase in the number of donors is captured by the

area under the curve within the range b to b' (which is proportional to the magnitude of the rightward shift of the utility distribution).

Other strategies that can be applied to increase organ donation under perfect information:-

- ✓ Richard Thaler and Cass Sunstein in their book 'Nudge' suggests that probably the best choice architecture in the field of organ donation is mandated choice. In USA mandated choice can be implemented through a simple addition to the driver license registration scheme where renewal of one's driving license would be accompanied by a requirement for checking a box stating preferences for organ donation. Under such a system one can easily say 'no' to organ donation but the application for driving license is not accepted unless one of the boxes is checked. The state of Illinois adopted a version of this scheme and the early results were highly encouraging. We believe that undertaking a similar strategy in India would be highly beneficial. In the Indian context, mandated choices should be associated with a scheme which involves large participation of the population. In our framework, implementation of mandated choice would mean reduction of transaction cost to zero, as individuals need not spend additional time on filling up the organ donor card separately. For example, if mandated choice regarding organ donation were introduced to driver license registration then the information given by individuals for license registration purposes could be used for furnishing a donor card provided the individual concerned agreed to become an organ donor. Thus, an individual who had prior knowledge about benefits of organ donation and derived a positive perceived utility from donation but couldn't get himself around filling up the donor card will have an opportunity to become an organ donor without incurring any additional cost.

- ✓ Schools & colleges can spread information regarding organ donation and its benefits, and encourage parents to discuss topics related to organ donation with their children. In the context of our framework, this will heighten the sense of altruism among individuals thereby causing the perceived utility distribution function to shift rightward resulting in an increasing number of organ donors.

- ✓ Given that sometimes people within the Muslim community in India remain averse to organ donation and seek advice from their local imam before taking decisions relating to

organ donation and transplantation, efforts should be made to educate those individuals who are most influential within the community. A study conducted by Najafizadeh et.al (2010) in Iran showed that Ramadan with its emphasis on altruism might be a good opportunity to foster organ donation among Muslims and described an increase in organ donation cards during the period. A similar approach can be undertaken in Muslim dominated areas in India. An application of such a strategy in our framework will have an impact exactly similar to the earlier strategy.

It should be mentioned that application of any one of the above strategies in an isolated manner wouldn't do much good, but rather implementation of a policy with a judicious mix of all the above strategies can bring forth a substantial increase in the supply of organs.

2.3. Normal probability density function of utility of individuals

In the above analysis one of our key assumptions was that the perceived utility obtained from organ donation, $U(A, D, K, P, R, O)$, followed a continuous uniform distribution ranging from a to b, and symmetric about the origin. Although this assumption is helpful for equal representation of all possible utilities that can be attained from becoming an organ donor, in reality such an assumption might seem impractical. This is because the proportion of the population procuring an extreme utility from donating organs might not be the same as the proportion of the population acquiring a small positive utility from organ donation. Similarly the proportion of population obtaining a high positive utility from donation might not be equal to the proportion of population obtaining a high disutility from organ donation. Thus, the assumption of uniform utility distribution might not always hold.

Now, if there is reason to believe that the number of individuals deriving extreme satisfaction or dissatisfaction from signing up as donors is less than the number of individuals who gain small utility and the number of individuals who gain small disutility from organ donation, then a normal utility distribution symmetric at the origin might be more apt. Such a scenario might occur when a large number of individuals in the population simply do not care whether their organs are donated or not after their death.

The case of normal utility distribution from organ donation can be explained with the help of the following diagram.

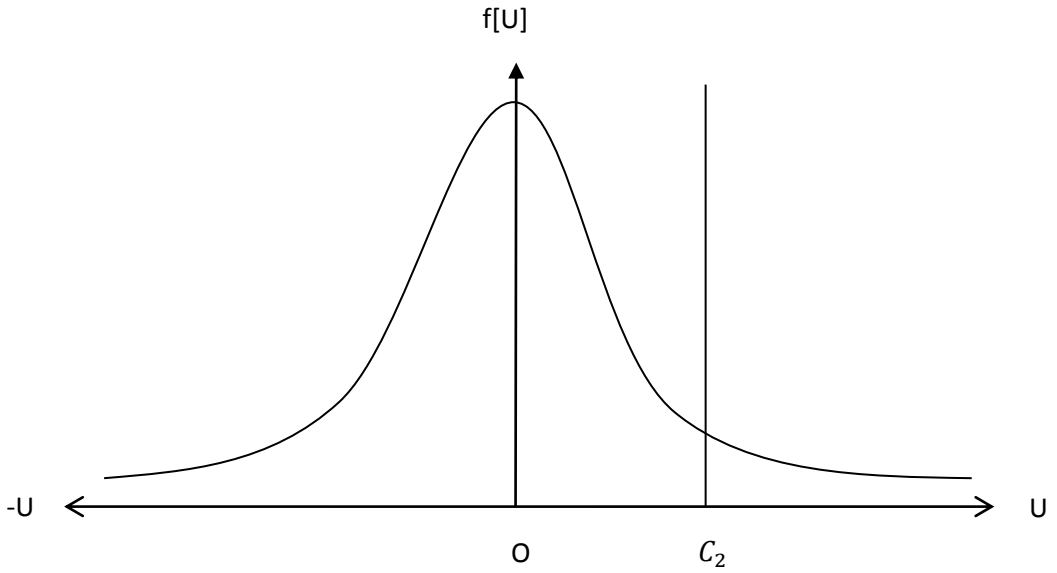


Diagram - 7

Diagram 7 shows that given the transaction cost C_2, individuals who have a perceived utility from organ donation greater than C_2 will sign up as organ donors under the explicit consent system and others will not. Mathematically we can obtain the number of organ donors as:-

$$\int_{\infty}^{C_2} f[U(.)]dU$$

As in the case of continuous uniform distribution, here too reduction in transaction cost will increase the number of prospective organ donors but not at a constant rate. If the transaction cost is very high i.e. towards the right tail of the distribution, then a reduction in transaction cost will raise the number of individuals willing to become organ donors but not as much as in the case of uniform distribution. However, subsequent decreases in the transaction cost will lead to larger and larger proportion of the population willing to sign up as organ donors. Thus, under the assumption of normal utility distribution, reduction in the transaction cost of organ donation will increase the number of organ donors in the economy at an increasing rate.

Lastly, the strategies to increase organ donation discussed previously will also be applicable in the case normal utility distribution.

2.4. Implications of bipolar probability density function of utility of individuals

In this section we explore the possibility of a bi-polar utility distribution function by taking important notes from social psychology. Suppose at first, given the transaction cost of organ donation C_4, we have a uniform utility distribution function ranging from a to b and symmetric about the origin. This is given by:-

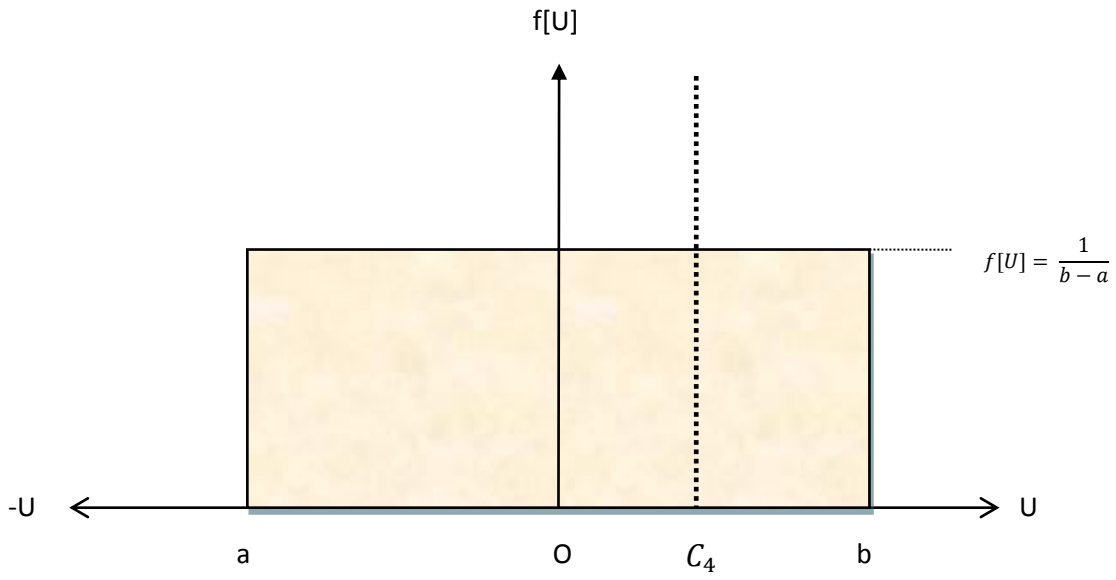


Diagram - 8

In the above diagram we have two kinds of people: individuals who derive a positive perceive utility from organ donation (individuals within the range 0 to b) and individuals who obtain disutility from pledging to donate their organs (individuals within the range a to 0). For simplicity of explanation we assume that such deviation in perceived utility arises only because of religion. So, let religion of people deriving a positive utility be B, whereas the religion of people deriving a negative utility be A. Now studies in social psychology show

that there exists a tendency for people to have ties with people who are similar to themselves in socially significant ways, and this is called 'Homophily'. In other words, this means that like-minded individuals tend to have greater interaction among them. Friendship, marriage and confiding relationships show religious homophily in all societies with religious diversity (Laumann 1973, Verbrugge 1977, Fischer 1977, 1982, Marsden 1988, Louch 2000). Assuming that there exists such religious homophily in both religions (A & B), individuals in both communities will have greater interaction among themselves than with individuals from a different religion.

There are a number of studies which show that existence of homophily alone can cause polarization of behavior among individuals. This means that people in groups, having more interaction among themselves can often influence each other's opinion and behavior. Given that we have two groups of individuals, we can show through logical explanation that the presence of homophily arising out of religion can cause the utility distribution to become bi-polar in nature i.e. where all the mass of the distribution would be concentrated around the values $\frac{a}{2}$ and $\frac{b}{2}$. This implies that opinions will be moderated in the presence of homophily.

To show how this happens we will consider the following diagram:

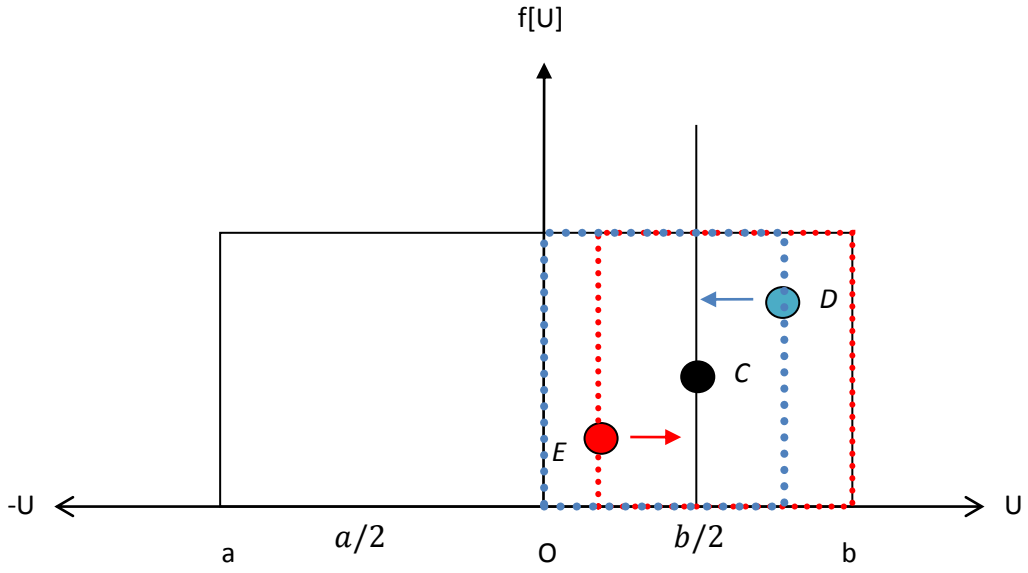


Diagram - 9

Consider the individual given by the point C who derives a utility b/2 from organ donation. This individual interacts with people both towards his right and left. This means he interacts with both types of individuals within his group; individuals who get lower utility from organ donation than the given individual (people within the range 0 to b/2) and individuals who obtain higher utility from organ donation than the given individual (people within the range b/2 to b). In the presence of homophily this person's utility from organ donation should be influenced by interaction with others, but since the person concerned interacts with equal number of people from both sides his utility remains unchanged. In other words, since the degree of interaction with both kinds of individuals is equal the person's utility is unaltered.

Now, consider the individual given by point D. This particular individual derives a utility greater than b/2. This individual too interacts with both types of people within the group, but the degree of interaction is more with people obtaining lesser utility from organ donation. Coming in contact with more people gaining lesser utility than him will exert an influence on individual D and he is expected to decrease his utility and move towards b/2. With similar logic all people to the right of utility b/2 is expected to move towards b/2.

Lastly, consider individual E. This person obtains a perceive utility less than b/2 from becoming an organ donor, and interacts with more people acquiring higher utility from pledging to donate organs. So individual E will increase his perceived utility and move towards b/2. With similar reasoning all people to the left of utility b/2 is expected to move towards b/2.

Thus, all individuals with religion B will move towards b/2, whereas all individuals with religion A will move towards a/2, causing the utility distribution to become bi-polar in nature.

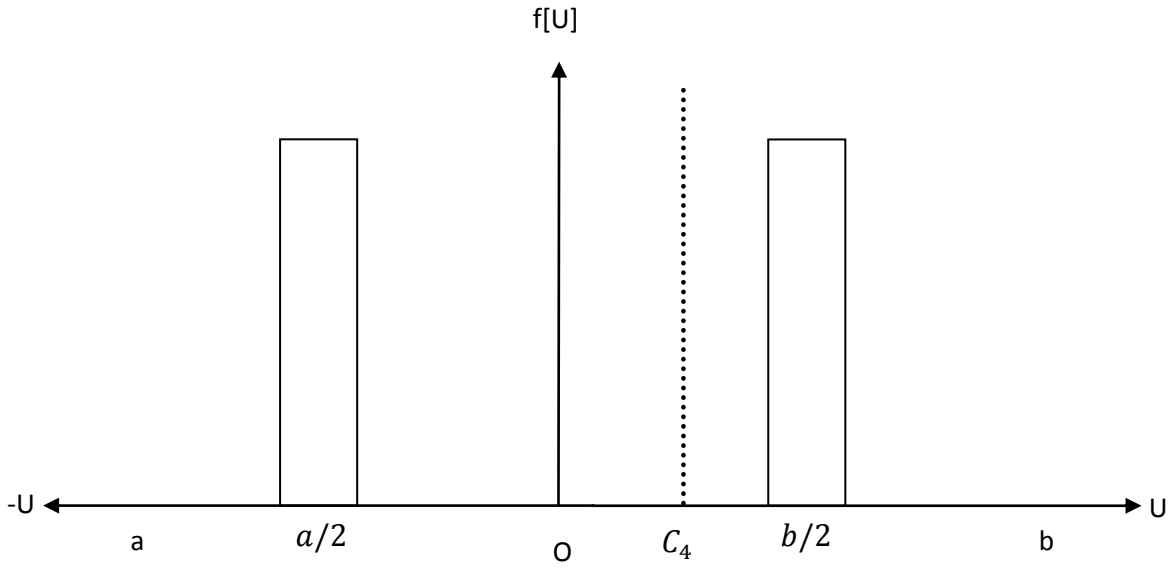


Diagram - 10

Diagram – 10 elaborates the case of bi-polar or 'twin peak' distribution. As usual given the transaction cost of donation C_4, proportion of the population having perceived utility greater than C_4 will sign up as organ donors. However, unlike the case of continuous uniform distribution and normal distribution, strategies to increase organ donation through the reduction in transaction cost and shift in default system might not lead to increase in the number of organ donors as in there might exist gaps in the distribution. Under such a scenario a two step strategy seems more appropriate. First, identify the people who are completely against organ donation and carry out mass awareness campaign with specific target groups. This should be followed by easy access to simplified organ donation forms so that the transaction cost of becoming a donor is reduced sufficiently.

The idea that homophily in itself can polarize opinions is based on a few studies, whereas there are other studies which show that homophily alone is not enough to polarize society. Dandekar et.al(2012) shows that homophily alone, without biased assimilation, is not sufficient to polarize society. So, we bring in another concept of social psychology, biased assimilation. Originally developed by Bacon (1620), biased assimilation refers to the behavioral tendency of human beings to process information in a biased manner, when faced with mixed or inconclusive findings, where people readily accept evidence that support their belief while critically examining evidence that goes against their belief. Lord et.al (1979)

showed that biased assimilation can cause individuals to arrive at a more extreme opinion after being exposed to identical but inconclusive evidence. This result has been replicated in many different settings over the years (Miller et.al 1993, Munro GD et.al 2002, and Taber & Lodge 2006). Thus, in the presence of biased assimilation if a person supporting cadaveric organ donation comes across two similar studies with opposite opinions (one supporting organ donation and the other opposing it) then he is expected to strengthen his opinion regarding organ donation as he will accept the "confirming" evidence at face value while subjecting "disconfirming" evidence to critical evaluation.

Fu and Zhang (2016) through a theoretical model show that in the presence of both homophily and biased assimilation interaction among agents can result in consensus on either extreme positive opinion or, extreme negative opinion, or generate bi-polarization. In our framework since we have two sets of individuals, one group deriving positive perceived utility and the other deriving disutility from cadaveric organ donation, the assumption of homophily and biased assimilation would imply that the utility distribution can take a possible of eight types of forms. Among the eight plausible forms of utility distribution, we have already discussed the case of extreme-negative opinion on both sides i.e. the case of normalized utility distribution. In this section we will discuss the case of extreme-positive opinion on both sides i.e. the case of bi-polar utility distribution and will leave the rest for future discussions.

Presence of a bi-polar utility distribution function from cadaveric organ donation signifies that majority of the population either procures extreme perceived utility from enrolling as an organ donor, or acquires extreme perceived disutility from holding a donor card. This is shown in the following diagram:-

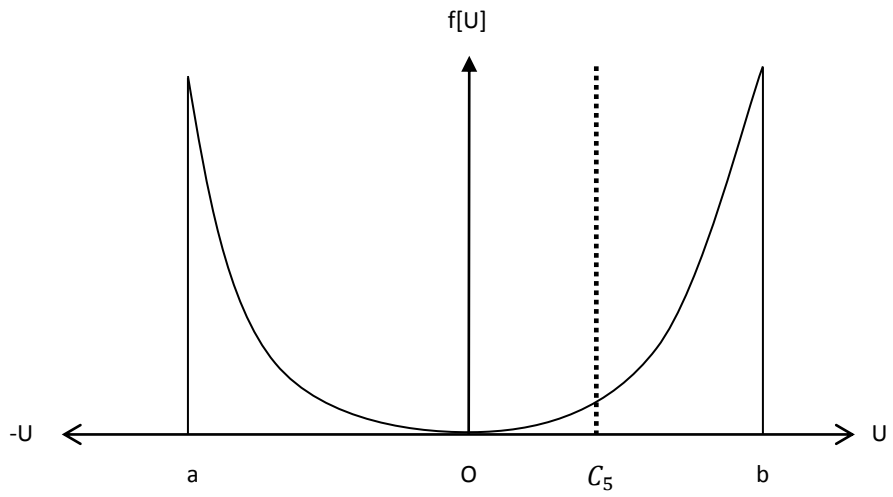


Diagram - 11

Diagram 11 is very similar to diagram 10 expect for the fact that in diagram 11 the utility distribution gets concentrated towards the extreme values. Just like in the earlier case, in this scenario too the strategies to increase organ donation through the reduction in transaction cost and shift in default system might be least effective. Only way to increase the donation rate in such a situation will be a two step strategy as discussed previously.

Chapter 3 - Model under Imperfect Information of transaction cost

3.1. Why is the total cost of becoming an organ donor not trivial?

Introspection has lead me to believe that even though certain sections of the Indian society might be well versed regarding cadaveric organ donation and related concepts, they might not have any idea as to how to enroll themselves as organ donors. Consider the empirical study undertaken by Singh et.al, 2002 which shows that people working in hospitals might possess quality understanding about cadaveric organ donation and thus are more willing to become organ donors. However, the study is unable to say whether these people are equally knowledgeable regarding steps required to be taken to become an organ donor. A number of similar studies portray the same result i.e. hospital staff and nurses largely have a favorable attitude towards organ donation because of their higher knowledge (Ahlawat et.al, 2013, and M. Sque et.al, 2000) but again we lack information as to whether these people are equally well informed regarding the process of becoming an organ donor. An informal discussion with a number of general physicians, while writing this thesis, revealed that while these doctors were quite knowledgeable regarding the medical aspects of organ donation and transplantation, they were non-donors and unfamiliar with the formalities involved in organ donation including a lack of knowledge about who had to be approached. Thus, knowledge of organ donation and transplantation and its benefits can often be associated with imperfect information regarding what is to be done to become a donor. Thus, the total cost of becoming an organ donor in India consists of two potentially significant components: a) procedural costs or transaction cost i.e. those involved in accessing and filling up forms; and b) costs of acquiring necessary information about procedures. Further, the scattered nature of the Indian medical system and lack of organ donation networks implies that accessing forms and obtaining necessary procedural information might be a time consuming and uncertain process. Thus, with all these considerations in place it seems that the total cost associated with enrolling as an organ donor in India is unlikely to be trivial.

3.2. Model under Imperfect Information

In our earlier analysis we had assumed the presence of a uniform transaction cost for organ donation, which is perfectly observed by all. However, unavailability of information regarding organ donation in the public domain, along with scarcity of sources through which such information are available, suggests that in India, an average individual might not know the actual transaction cost of donating organs. This implies that people will often face difficulty in trying to estimate the actual transaction cost involved in enrolling as an organ donor. Further, since different individuals will estimate the transaction cost of organ donation according to the limited information available to them, we might very well have a probability distribution of transaction cost for each individual. For simplicity we will assume that such distribution to be continuous in nature and identical for all individuals.

The prevailing uncertainty about organ donation and the associated transaction cost will cause the expectation of the transaction cost for a representative individual to be different from the actual transaction cost.

$i.e,\ E_i(C_0) = \overline{C_0} + \gamma_i$; where $\gamma_i \geq 0, or\ \gamma_i < 0$ ……(4)

$\bar{C_0}$ is the actual transaction cost,
$E_i(C_0)$ is the expectation of the transaction cost by the i-th individual, and
γ_i is a premium which is formed on the basis of information available and the belief of the i-th individual regarding the transaction cost of organ donation[6].

It is to be noted that the difference in the expectation of transaction cost by an individual and the true value of the transaction cost arises because of the presence of this premium γ_i. When $\gamma_i > 0$, the expectation of the i-th individual will be greater than the real transaction cost. Whereas, when $\gamma_i < 0$, the i-th individual's expectation of the transaction cost will be less than the actual transaction cost.

Given this framework, our earlier analysis appears as a special case where $\gamma_i = 0$, that is the existence of perfect information regarding organ donation in the economy causes the whole distribution of transaction cost for each individual to collapse around the original transaction cost, leading the expectation of transaction cost to equal the actual transaction cost.

[6] Since we are assuming that individuals have identical distribution for transaction cost, we will have $\gamma_1 = \gamma_2 = \gamma_3 = \ldots\ldots\ldots\ldots = \gamma_n = \gamma$

Pledging to donate one's organ is a major decision, and in the absence of perfect information we expect people will tend to overestimate the true value of the transaction cost, i.e. people will tend to attach significant probabilities to the mass of distribution greater than the actual transaction cost. This means our probability distribution of transaction cost will look similar to as in Diagram 12.

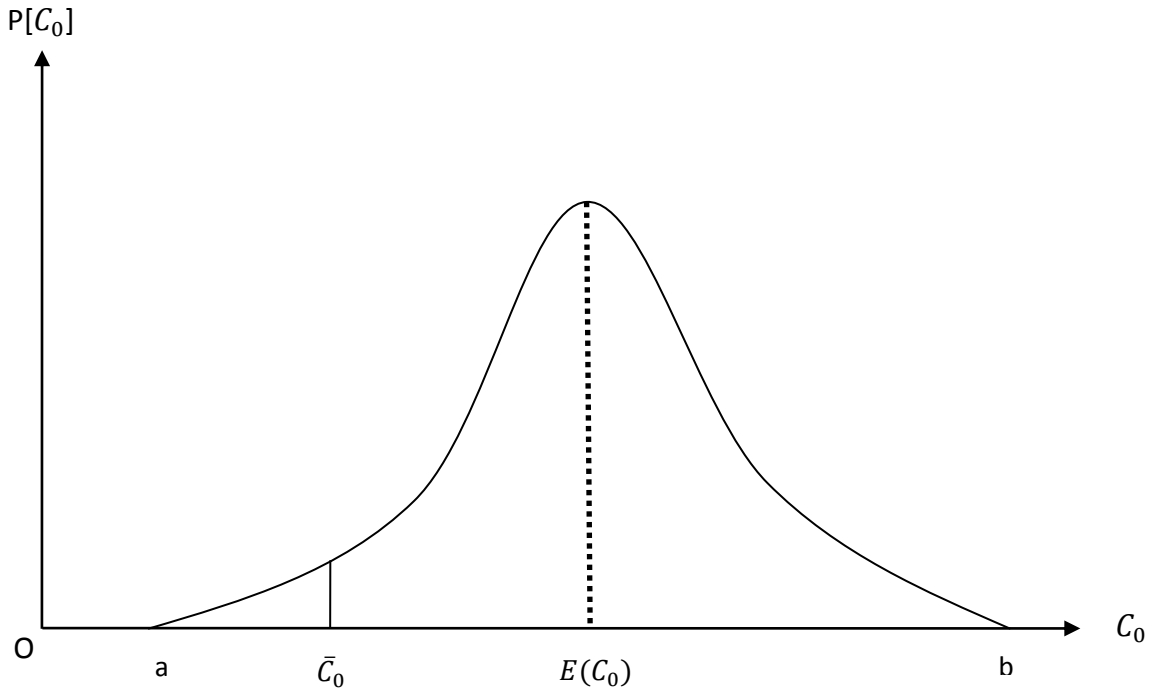


Diagram - 12

Because people will tend to overestimate the transaction cost of organ donation, majority of the distribution function will lie to the right of the true value given by $\bar{C}_0$. This implies the expectation of transaction cost $E(C_0)$ will be greater than the actual transaction cost.

$$i.e,\ E_i(C_0) = \overline{C_0} + \gamma_i > \bar{C}_0; \gamma_i > 0 \quad \text{.....(5)}$$

In this framework, an individual will agree to become an organ donor when perceived Net benefit derived from organ donation is positive.

$$i.e, \quad Perceived\ Net\ Benefit = Percieved\ Total\ Benefit - Percieved\ Total\ Cost > 0$$

The perceived total benefit from organ donation is nothing but the utility derived from organ donation. Whereas the total cost from becoming an organ donor will consist of two parts:

Cost expended in seeking information regarding organ donation, and the expected transaction cost of donating organs which will be a function of both the actual transaction cost and the premium γ which has been previously defined.

$So,\ Perceived\ Net\ Benefit\ =\ [U(e)\ +\ \bar{U}] - [PIC(e) + E(C_0)]$ ……..……..(6)

Here 'e' denotes the individual's effort given to procure information regarding organ donation and the process of becoming an organ donor.

Perceived Total Benefit from organ donation has two parts: $U(e)\ and\ \bar{U}$. $U(e)$ is the utility obtained from organ donation and is dependent on the change in effort 'e'. This is because perceived utility from organ donation is a function of knowledge regarding organ donation and its associated benefits. Thus, increasing 'e' will increase 'K', which will in turn raise the utility obtained from organ donation. We assume that $U(e)$follows the law of diminishing marginal utility, which means that an increase in 'e' will lead to an increase in $U(e)$ but at a diminishing rate.

$\bar{U}$ denotes the fixed quantity of perceived utility which is independent of effort 'e'. $\bar{U}$ depends on the autonomous factors like degree of Altruism (A), Religion (R), Perception of the medical and organ allocation system (P) etc. Thus, if a person has high sense of altruism then $\bar{U}$ will be high, whereas if a person is selfish then $\bar{U}$ will be low. Similarly if a person believes that the present medical and the organ allocation system is 'fair' then $\bar{U}$ will be positive otherwise $\bar{U}$ is negative. For the purpose of our analysis we will assume $\bar{U}$ is always positive.

Thus, $\frac{\delta(PTB)}{\delta e} = PMB > 0, and\ \frac{\delta^2(PMB)}{\delta e^2} < 0$ ……(7)

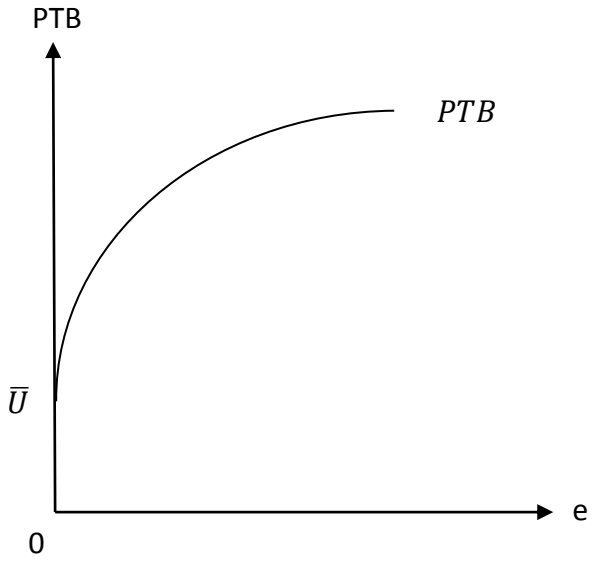


Diagram – 13.1

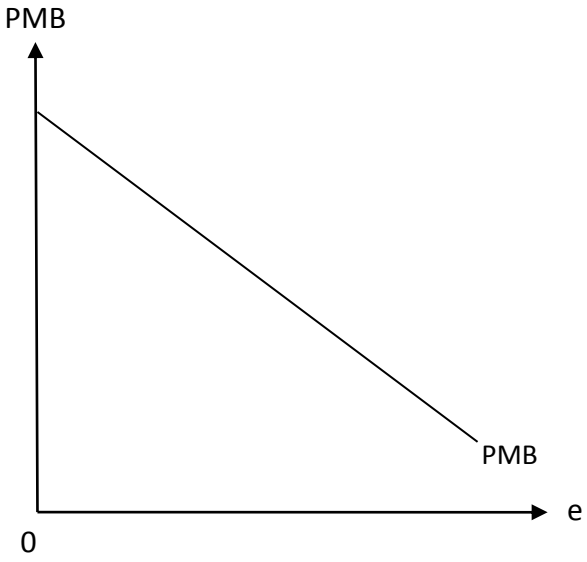
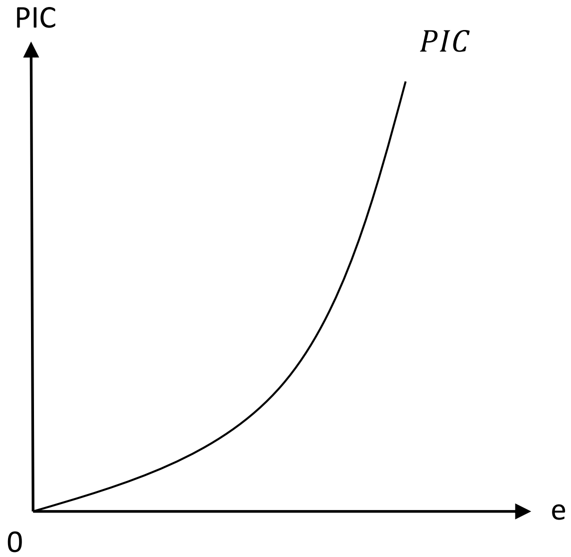


Diagram – 13.2

Diagram - 13

$PIC(e)$ denotes perceived information cost, which is to be incurred in procuring information regarding organ donation and the process of becoming an organ donor, and is a function of the individual's effort 'e'. PIC is positively associated with 'e' i.e. if effort given to seek information rises then PIC will increase, and if effort given falls then PIC will decrease. Here we assume that perceived marginal information cost (MIC) is increasing with effort.

$$\frac{\delta(PIC)}{\delta e} = PMIC(e) > 0, \quad \frac{\delta^2(TIC)}{\delta e^2} = \frac{\delta(PMIC)}{\delta e} > 0 \quad \text{.....(8)}$$



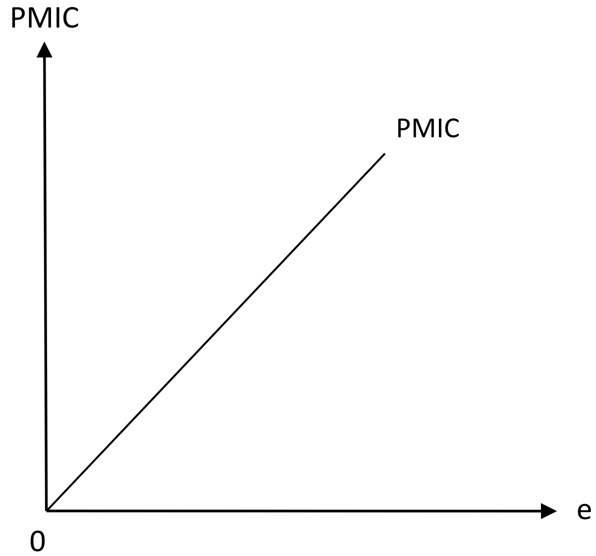


Diagram – 14.1

Diagram – 14.2

Diagram - 14

$E(C_0)$ is the expectation of transaction cost, and by equation 2 we assume that the expectation is greater than the actual transaction cost i.e. $E(C_0) > \bar{C}_0$, because $\gamma > 0$. As already mentioned γ is a premium and is formed by an individual's perception and knowledge of organ donation[7]. So, as effort given by an individual to acquire more information about organ donation and its process increases, uncertainty about the value of transaction cost should decrease. This is because as an individual gives more effort, he gains valuable insight into organ donation and formal intricacies associated with requesting a donor card, and accordingly revises his expectation of transaction cost. In other words an increase in 'e' should bring about a fall in γ. Thus, continual increase in 'e' will cause γ to converge to zero and expectation of transaction cost to converge to actual transaction cost. Lastly, we assume that $\gamma(e)$ decreases at an increasing rate with an increase in 'e'.

From equation (2) we have,

$$E(C_0) = \overline{C_0} + \gamma(e)$$

$$\frac{\delta E(C_0)}{\delta e} = \gamma' < 0, \frac{\delta^2 E(C_0)}{\delta e^2} > 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(9)}$$

[7] It is to be noted that a single premium can correspond to different range of variability of the perceived net benefit function.

$$\lim_{e\to\infty} \gamma \;=\; 0, \qquad and \;\; \lim_{e\to\infty} E(C_0) \;=\; C_0$$

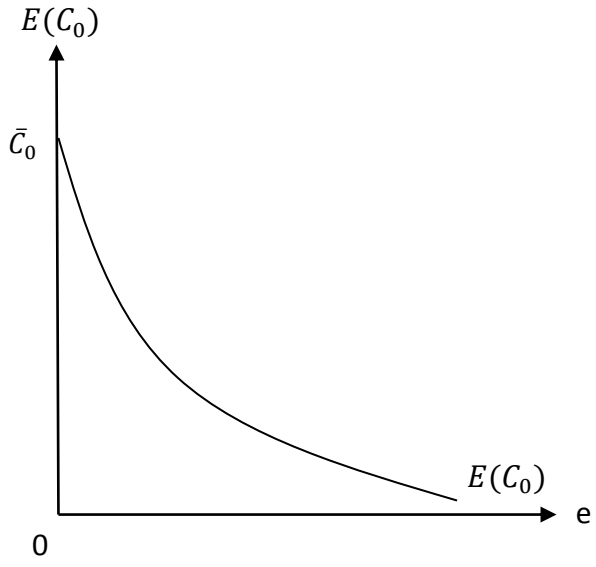


Diagram – 15.1

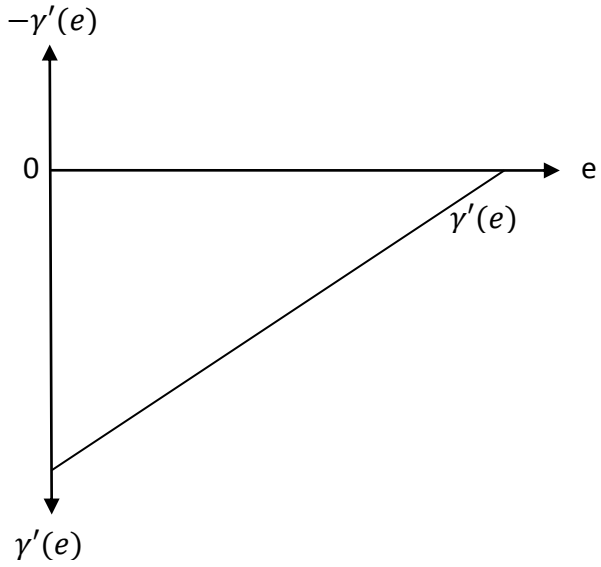


Diagram – 15.2

Diagram - 15

It is to be noted $\gamma'(e)$ shows the marginal decrease in the expectation of transaction cost following an increase in effort 'e'. Now, $\gamma'(e)$ is a negative value function i.e. $\gamma'(e) \leq 0, for\ all\ \ e \geq 0$.Also $\gamma''(e) > 0$, this means the function $\gamma'(e)$ will have positive slope with respect to e but will lie in the negative quadrant as shown in diagram 4.2.

Thus, re-writing equation (3) as

$Net\ Benefit \;=\; U(e) + \;\bar{U} \;-\; PIC(e) - \;[\overline{C_0} \;+ \gamma(e)]$……(10)

It is to be noted that if there exists perfect information about the transaction cost of organ donation i.e. if all individuals can observe the actual transaction cost of becoming an organ donor then $TIC(e) = \;\gamma(e) = \;0$. This implies,

$Net\ benefit \;=\; \bar{U} - \;\bar{C}_0$

Now, in order to obtain the optimal effort 'e' we differentiate equation (10) with respect to 'e' and equate it with zero.

$$\frac{\delta(NB)}{\delta e} = U'(e) - PMIC(e) - \gamma'(e) = 0$$

$$\Longrightarrow MB = NMC \quad \text{……..……..(11)}$$

where, $MB = U'(e)$, and $NMC = PMIC(e) + \gamma'(e)$

Marginal benefit (MB) is nothing but an increase in perceived utility following an increase in effort 'e'.

Net Marginal Cost (NMC) equals the sum of Perceived Marginal Information Cost (PMIC) and the term γ'. It is to be noted that while PMIC > 0, $\gamma' < 0$. This implies that we cannot say whether NMC is positive or negative for a given level of effort 'e', but by intuition we can graph the NMC function.

First, we consider the Perceived Information Cost (PIC). PIC is positive in both first and second order derivative, and if we assume that PIC is a quadratic function then Perceived Marginal Information cost will be linear as we have shown in the earlier diagrams. For a moment let us assume that the functional form of PIC is

$$PIC = e^2$$

Then, MPIC will be given by

$$MPIC = 2e > 0$$

And, $\frac{\delta(MPIC)}{\delta e} = 2 > 0$

Now, let us consider the function $\gamma(e)$. As we already know, $\gamma'(e) < 0$, and $\gamma''(e) > 0$. If we assume that $\gamma(e)$ is a quadratic function then the functional form of $\gamma(e)$ we be like

$$\gamma(e) = \frac{1}{e^2}$$

$$\Longrightarrow \gamma'(e) = -\frac{2}{e^3} < 0$$

$$\Longrightarrow \gamma''(e) = \frac{6}{e^4} > 0$$

Thus, $NMC = MPIC + \gamma'$

$$\Longrightarrow NMC = 2e - \frac{2}{e^3} \quad \text{.....(12)}$$

Now we can plot the graph of NMC

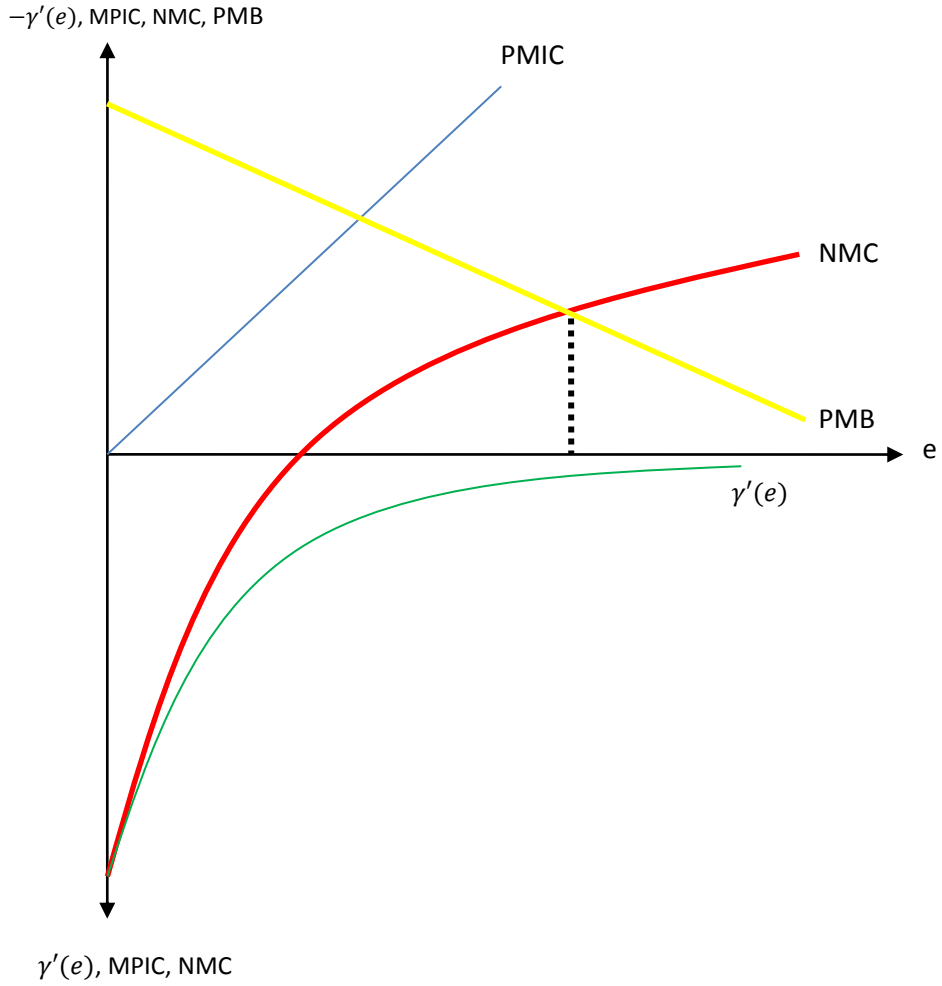


Diagram - 15

Now, that we have approximated the shape of the Net Marginal Cost (NMC) in diagram 15 given quadratic functions for both PMIC and $\gamma'(e)$, the optimal effort is given by the intersection of MNC and PMB.

It is to be noted that an individual despite maximizing his effort might not become an organ donor because of negative net benefit from organ donation. This can happen when the fixed term $\overline{C_0}$ is very high. This implies that the presence of an excessively large transaction cost might deter an individual from giving effort in the first place.

Chapter 4 – Conclusion and further extension

4.1. Policy Prescription

Given the model the government can apply a number of policy instruments to increase the organ donation rate in the economy. These policy instruments include:-

1. **Reduction in the actual transaction cost.**

   Reduction in the transaction cost, $\overline{C_0}$, will have no implication for the marginal analysis because $\overline{C_0}$ is independent of 'e' and thus optimum effort will remain the same. Whether a reduction in the transaction cost will cause an individual to sign up as an organ donor will depend solely on the particular individual's net benefit function. If perceived gross benefit exceeds perceived total cost following a fall in the transaction cost, then the individual will enroll as an organ donor, otherwise not. But, given other things a decrease in transaction cost surely increases an individual's net benefit and provide incentive for individuals, whose perceived net benefit was previously negative, to give effort in the first place.

   Since, different individuals will have different perceived net benefit from organ donation we will have a distribution of perceived net benefit for the economy, and a reduction in the actual transaction cost will raise the proportion of the population willing to sign up as an organ donor.

2. **Reduction of expectation in the transaction cost through advertisements and public awareness campaigns.**

   If the government attempts to reduce the expectation in transaction cost through advertisements and public awareness campaigns then there will be namely three effects. First, since information becomes readily available in the public platform, an individual gains more information with the same unit of effort. This means perceived marginal information cost falls for each level of effort 'e'. This implies that the Perceived Marginal Information Cost (PMIC) curve will swivel rightward from $PMIC_0$ to $PMIC_1$ in diagram

17. Second, dissemination of knowledge regarding organ donation and the process of becoming an organ donor through advertisements and public awareness campaigns will also reduce the factor $\gamma(e)$, causing expectation of transaction cost to become closer to the actual transaction cost. This implies that the marginal decrease in the expectation of transaction cost will increase for each unit of effort 'e'. Thus, the $\gamma'(e)$ curve will rotate rightward from $\gamma'(e)_0$ to $\gamma'(e)_1$. Since, both the PMIC and $\gamma'(e)$ curves rotate rightward Net Marginal Cost (NMC) curve will also rotate rightward.

Third, it is to be taken into account that advertisements and public awareness campaigns would also increase an individual's perceived marginal benefit from effort 'e'. This is because each unit of effort 'e' will fetch more knowledge than earlier, thereby increasing the utility obtained from 'e'. This implies that the Perceived Marginal Benefit (PCB) curve will rotate rightward from $PMB_0\ to\ PMB_1$.

Thus, the rightward swiveling in both the PMB and NMC curve will result in an increase in the effort from $e_0$to e_1.

This analysis is given in the following diagram.

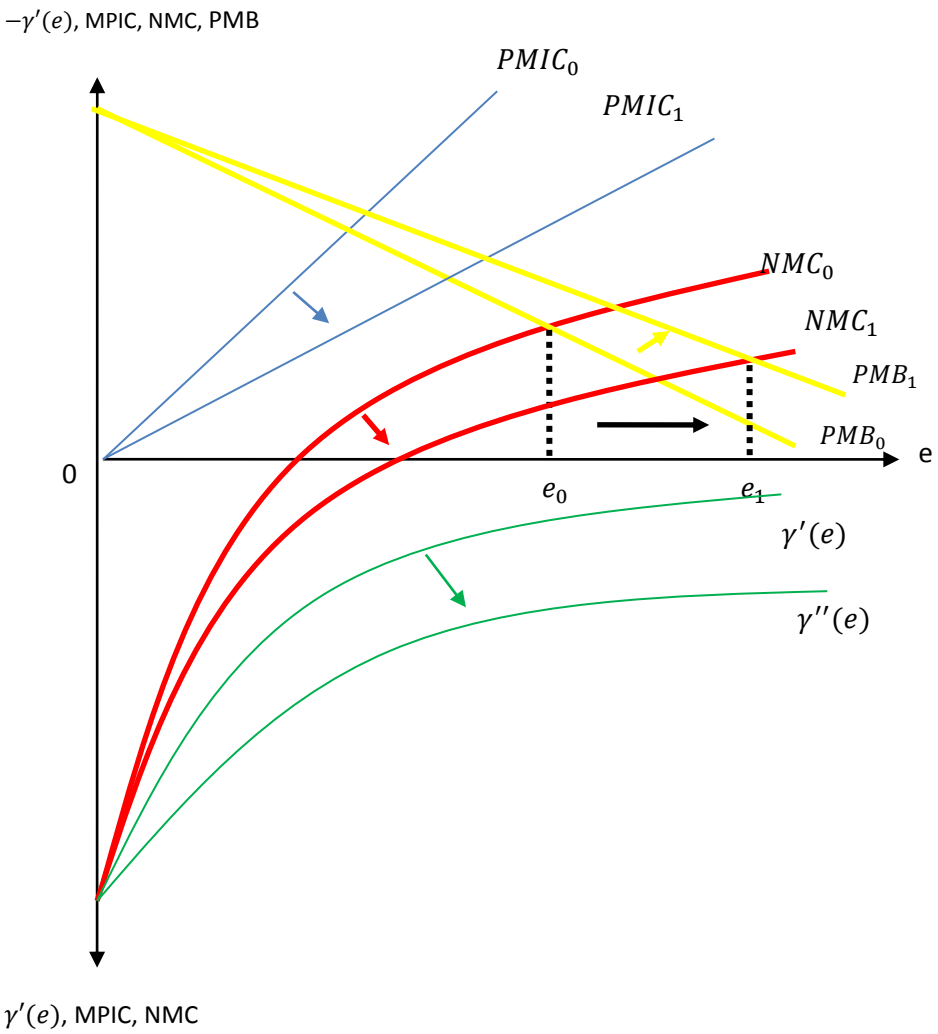


Diagram - 17

Using comparative statics we can show that advertisements and public awareness campaigns will lead to an increase in the perceived net benefit of an individual. Given the initial Perceived Marginal Information Cost - PMC_0, the initial Perceived Marginal Benefit - PMB_0, and γ_0, the level of effort that maximises Perceived Net Benefit (PNB) is e_0. Now, following advertisement and public awareness campaigns the Perceived Marginal Information Cost becomes PMC_1 ($< PMC_0$), Perceived Marginal Benefit changes to PMB_1 ($> PMB_0$), and the premium becomes γ_1 ($< \gamma_0$). The new optimum level of effort is given by e_1.

$So, \quad PNB\ (PMC_0, PMB_0, \gamma_0, e_0) < \ PNB\ (PMC_1, PMB_1, \gamma_1, e_0)$

$and, \quad PNB(PMC_1, PMB_1, \gamma_1, e_0) < \ PNB\ (PMC_1,\ PMB_1, \gamma_1, e_1)$*[By definition]*

$\Rightarrow \quad PNB\ (PMC_0, PMB_0, \gamma_0, e_0) < \ PNB\ (PMC_1,\ PMB_1, \gamma_1, e_1)$*[By transitivity]*

Thus, decreasing the expectation of transaction cost through advertisements and public awareness campaigns should lead to an increase in the number of organ donors in the economy.

3. Increase in the autonomous component of utility $\bar{U}$ by government initiatives.

Increase in the autonomous component of utility $\bar{U}$ by amplifying people's sense of altruism and developing people's perception of the medical and organ allocation system through government initiatives like mass awareness campaigns should have the exact same impact as a fall in the actual transaction cost $\bar{C}_0$. This means given all other things a rise in $\bar{U}$ will increase the perceived net benefit and cause a larger section of the population to sign up as organ donors.

It is our observation that in India, filling up a donor card is fairly simple and straightforward. So, if an individual has a registration form it shouldn't take him much time to fill it up. But difficultly arises in knowing from where to get the application form in the first place. Further, availability of registration form from multiple sources adds skepticism to the process. The prevailing uncertainty about organ donation result in high variability in the transaction cost and forces people to incur heavy information cost. This deters people from becoming organ donors even when the people concerned might obtain positive perceived utility from organ donation. Thus, attempt should be taken to reduce this variability in transaction cost by taking the concept of organ donation to the people rather than expecting people to sign up as donors. This could be achieved by advertisements about organ donation in social media platforms like Facebook (clicking on which will redirect to an organ donor registration form), advertisement in regional TV channels along with helpline number, distributing organ donor forms to people in health centers, and requesting people like doctors, who already has prior knowledge regarding organ and its benefits, to become organ donors.

It should be noted that all the above mentioned strategies are a combination of the policy prescriptions discussed above. This is because these strategies not only eliminate the cost of directly visiting a transplant centre but also remove the uncertainty about organ donation.

Among the strategies discussed, perhaps the most potent and unexplored is the strategy of approaching people like doctors, medical students, and nurses for becoming organ donors. This is because these people not only have prior knowledge about organ donation and its benefits but also might be more willing to become organ donors given that they are in a profession that helps people. In this context we would like to suggest a nudging strategy that should increase the number of organ donors in the country. Every year hundreds of medical students from thousands of medical colleges all over the nation become doctors after completing their MBBS degree. These medical students after having completed their internship (which is an obligatory part of their coursework) are required to visit a Medical Council of India (MCI) office in their respective regions to collect their actual registration number and provisional degree certificate. Such a visit to a MCI office is compulsory as otherwise they won't have the license to practice their profession. I suggest a simple intervention during this phase that can be vital in increasing the donation rate in the country. It's my suggestion that the donor cards be given to the students at the last day of their internship, and they be requested to give their consent regarding organ donation at the time of collecting their certificates from the MCI offices. The students can easily deny donating their organs but they must submit the donor form which was given to them, whether blank or filled up, to receive their certificates from the MCI office. By norm such a strategy appears to be in line with libertarian paternalism as the medical students are free to choose whether to donate or not to donate their organs. Such a strategy also appears to be extremely beneficial for people who are willing to become organ donors but cannot do so because of lack of information and uncertainty. Finally, the impact of such a strategy can be intensified by including a cognitive perspective taking nudge statements like "If you needed an organ transplant would you have one? If so please help others" along with the donor registration form.

Although application of any single policy instrument might increase the perceived net benefit of an individual from organ donation, in order to get the maximum benefit from a strategy to increase organ donation in a country like India, it should judiciously mix all the policy instruments.

4.2. Directions for future research

India has an explicit consent system of organ donation where if an individual wants his organs to be donated after death, then he has to sign up an organ donor card. In reality this

donor card is of little value as it is not a legal document and only signifies a person's willingness to be a donor. In India, at the time of organ donation the family of the patient will make the final decision on whether to donate organs or not. So it might very well happen that despite being signed up as an organ donor the individual's family might end up refusing to donate the organs. In our framework, there is an implicit assumption that an individual's wish regarding organ donation is always respected and honored by the family members. If we are to include the role of family members in our analysis then a two stage framework seems more logical. In the first stage, an individual decides whether to enroll as an organ donor or not. In the second stage, the individual concerned expires and the family members are left to decide whether or not to donate the organs. In the last stage, the family members take the decision, given the individual's wish to donate or not to donate. Although the framework seems fairly simple but the problem arises with the difference in the time horizon in two stages. In the first stage, an individual has all his life to decide whether to take a pledge to donate his organs after death. Whereas in the second stage, the family members have very limited time to decide whether to honor the individuals wish or not, as otherwise the organs to be donated becomes useless. Thus, incorporating the kin's decision in cadaveric organ donation would not only require further analysis into the family member's utility function from permitting organ donation but also consideration of the time horizon in which the decision is taken.

Now, given that in India sometimes the family members might play an important role in making the final decision regarding organ donation, it becomes imperative to check through an empirical analysis the significance of the family member's decision on the organ donation rate in the economy. This can be done by obtaining data regarding the number of people originally pledging to donate organs versus the number of donation that couldn't take place because of objection from the family members.

Throughout our analysis the policy prescriptions suggested to increase the organ donation rate in the economy was based on the assumption that it is possible to observe the utility obtained by individuals from becoming organ donors. However such utility distribution can only be obtained after conducting a contingent valuation survey. Contingent valuation survey in case of organ donation would refer to a method of the estimating the value that people would place on organ donation. Such a survey would not only help us to understand the importance of organ donation in the economy but also enable us to know which policy prescription to apply. Thus, conducting a contingent valuation survey appears to be fruitful for application of future research.

Lastly, we have seen that hiking the sense of altruism at certain points of time, like the introduction of cognitive perspective nudge taking statements along with organ donor registration form, can increase an individual's chances of signing up as an organ donor, but which stimulus will work most effectively is a question that we have left out for future research. Thus, it will indeed be interesting to conduct a study which will identify the best possible stimulus to increase the donation rate in the economy.

4.3. Conclusion

This paper attempts to provide an insight into the human mind when faced with a decision to donate organs. With special reference to the Indian scenario, our framework predicts that given other things, an individual will choose to donate his/her organs only when the individual's perceive utility from donation exceeds the total cost associated with becoming an organ donor. Our framework also assists us in devising various strategies to increase the number of organ donors in the economy, such as reduction in the cost of consent. Similarly, reducing the uncertainty of transaction cost associated with becoming an organ donor, and application of appropriate interventions can nudge people into signing up as an organ donor. Finally, we have also devised a nudge strategy of our own which we believe can be beneficial in increasing the donation rate in the economy with least cost.

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