



Public and Private Choices in Organ Donation

Marlies Ahlert

Department of Economics, Martin-Luther-University Halle-Wittenberg, Germany
(eMail: marliesahlert@aol.com)

Abstract Organ donation and allocation form a particularly instructive case of health care provision. On the one hand, due to the necessity of resource pooling, there is a clear collective good aspect. On the other hand, there is a strong moral case in favor of purely private organization of cadaveric organ donation, and allocation in private clubs. But can such clubs ever be successful? Simple decision theoretic modeling relying on both, standard expected utility theory and prospect theory is applied to model the decision making of individuals under different institutions of organ donation and allocation. Conclusions on an equilibrium club size are derived. Empirical data on frequencies of organ transplantation and results from questionnaires on the willingness to donate are used to derive some conclusions about the likely success or failure of different institutional forms of organ allocation.

Keywords Health economics, organ allocation, donor clubs

1. Introduction and overview

It is an often overlooked advantage of private over public organization of health care provision that it does not need to impose uniform moral values on individuals in society. This advantage is particularly important whenever matters of life and death are involved. Post mortem organ donation is such a case. In view of the diversity of ethical preferences in society interpersonal respect could best be expressed by leaving the organization of organ donation and allocation to private clubs. If private club organization could conceivably succeed it would have very strong moral arguments on its side. However, this may be a big if. At least if we avoid extreme assumptions about intrinsic motivation to donate – which seem already refuted by the fact that presently so few individuals seem to care for getting an organ donor card – it is unlikely that a purely private organization of organ donation and allocation will be viable. Public involvement seems unavoidable

and therefore also the moral issues going along with it.

In section 2, I will present arguments in favor of a purely private organization of cadaveric organ donation and allocation in private clubs. Those who become members of such a club declare before their own need for an organ transplant is diagnosed their own willingness to donate organs in case of their brain death. They do so exclusively or at least with priority in favor of other members of the club who might be able to use donated organs for securing their survival. Nobody is forced to join and different clubs with different bylaws might form such as to enable individuals to live according to their fundamental moral views. Therefore if a purely private club of cadaveric organ donation and allocation could in fact succeed the true liberal should support the private over public solutions of the problem of organ donation and allocation. However, as I will argue in sections 4, 5, and 6 of the present paper – after introducing a basic framework for modeling the relevant individual decisions in section 3 – it is unlikely that private donor clubs¹ will succeed. As I will demonstrate in sections 4 and 5 in detail the differential advantage – if it exists at all – of a club member over a non-member may be perceived as being so small in the initial phase of club formation that the selfish incentive to become a member is negligible. Threshold problems may be so severe that the helping hand of the state is needed to gain access to a pool of organs large enough to motivate people to join in view of the advantages of membership rather than intrinsic motives to help others. In section 6, I will discuss possibilities of equilibrium club formation under the assumption that an initial club, as formed by intrinsically motivated donors, is large enough to overcome threshold problems. The discussion of the theoretical models will be followed by a rather brief look at empirical data on organ transplantation (from Germany) and at results from questionnaires addressing issues concerning the willingness to donate as well as attitudes towards different aspects of institutional rules for organ allocation (section 7). Schemes of organ allocation and donation that respect public values favoring purely need-based health care – or an ‘ethics of care’ – but provide some incentives to declare the willingness to donate during lifetime will be briefly sketched in the final section of the paper (section 8).

2. The desirability of purely private organ donation in a liberal order

It is not only the general principle of subsidiarity that should induce adherents of a liberal society to favor private over public organization of organ donation and allocation. There are some more specific normative

¹ E.g. the American internet platform of LifeSharers; see www.lifesharers.com.

reasons. First of all the vastly diverging religious convictions relating to cadaveric donation do not easily fit under any single public rule. The only conceivable 'overlapping consensus' (see on this Rawls 1993) is one in which everybody is agreed to let everybody else have her or his way as far as possible. Within the context of the Western liberal culture it has been granted even by the foes of organ transplantation that the voluntary and deliberate 'opting in' of a person who during lifetime explicitly declares her willingness to donate in case of a brain death diagnosis should be respected post mortem (whereas in countries like Japan the relatives would have a say, too, regardless). Fundamental convictions concerning the death of an individual must be respected in a free and tolerant Western society whenever possible. Private organization of donation and allocation of cadaveric organs allows for respecting such norms in relevant sub-communities to the maximum extent.

It should be noted in particular that diverging conceptions of the meaning and criteria of 'death' can co-exist under a private club organization of the donation and allocation of cadaveric organs. Only those people who become members of a club of cadaveric donors have to accept brain death as the criterion of death. Only they have to accept that this is the relevant condition permitting the removal of their organs. Others could use other definitions of death (from a legal point of view heartbeat death would do as well as a sufficient criterion, though brain death might be and in fact is needed in any event as a criterion for stopping treatment in intensive care units).

Secondly, clubs of organ donors who donate in view of improving their own chance to receive an organ, should they ever need one will avoid the 'latent moral scandal' of present schemes of allocation: Of two equally needy and equally suitable potential recipients the one who explicitly rejected organ donation in case of his own death may be preferred over the one who had been a voluntary cadaveric donor almost all her or his lifetime. If one cannot be treated why the one who showed the behavior that contributes to the problem? Inviting others to a free ride may be classified as simple kindness in trivial cases but it becomes in itself morally doubtful in matters of life and death. Whenever free riders increase tragic scarcity by their behavior we cannot take it lightly that this behavior is rewarded or at least not discouraged by our social institutions. The club solution would naturally tend to support norms of reciprocity and thereby not only secure fairness but also avoid the moral wrong of inducing immoral behavior.

Thirdly, the traditional argument against pure club solutions in health care provision has always been that there may be people who are too poor to join. However – if in the initial formation of the club, we neglect those who are already chronically ill – everybody is endowed with organs and can conceivably serve as a cadaveric donor. So, as far as the initial endow-

ment is concerned, there is no need of an initial redistribution to get the scheme going or to render it symmetrically accessible to everybody and to reach an efficient equilibrium outcome as the result of private contracting.

Finally, we know a lot about clubs in general and private insurance in particular. We know that these schemes can work rather well and that people are so used to them that transaction costs would not be insurmountable.

Unsurprisingly the scheme of a club organization of donation and allocation of cadaveric human organs has been proposed at least as early as 1967, or more precisely ten days after the first successful heart transplant, in the *Washington Post* by none lesser than Joshuha Lederberg (1967).² The proposal has been independently reiterated from an economic theory of clubs perspective and been worked out in some detail later on (see Kliemt 1993, Breyer and Kliemt 1994). The aforementioned club LifeSharers has in fact been founded.

I shall argue that what seems desirable and plausible to happen at first theoretical glance is not very likely to happen at closer inspection. Even if club formation would not actively be prevented by laws like the German law of transplantation (*Transplantationsgesetz*, TPG) a purely private club scheme despite its liberal moral credentials of inter-personal respect would have many difficulties to get off ground. Unless there are enough people around who are not only intrinsically motivated to donate but also intrinsically motivated to donate with priority for those who donate themselves (i.e. the intrinsically motivated must not – as most presently are – be motivated by altruism or beneficence but also by the wish to prevent free-riding as well) plausible assumptions about individually rational choice making suggest that people would not join the club. Therefore the state may be needed to provide a public solution to the problem of cadaveric organ donation and allocation. At least in Germany, the whole process will then automatically be subjected to principles of public law and the influence of politics. Both will in all likelihood continue to team up to preclude reasonable dealings with scarcity as suggested by the principle of reciprocity.

3. A basic modeling framework

In the world of self-ownership envisaged here human organs are treated as private property of the people who are in command of the body of which

² This bit of information, largely forgotten then, has been dug out by Bettina Schöne-Seifert in the mid nineties and unselfishly passed on to the club of those who are interested in the club organization of organ procurement.

the organs are a part. In such a world it seems natural to assume that the living owners of organs should have the right to specify whether they intend to donate their organs after their brain death or not. Though quite a lot of theory would be needed to argue in detail what the fall back position would be if a deceased did not specify anything it seems rather natural to assume that the organs be buried (cremated or whatever) along with the rest of the cadaver. If that is accepted as a premise of the argument then the most natural rule would be an 'opting in' rule for organ donation requiring explicit consent of the deceased as a condition of explantation. But would citizens under such a rule opt into clubs of post mortem organ donors? The simple modeling framework proposed next will serve as a basis of models that might be used to answer that question.

Here I assume that individuals evaluate different states of health or the lack thereof according to a value function v . The function v is interpreted on the one hand as a cardinal utility function over states of health (with and without adequate treatment) and on the other hand as a value function of prospect theory (Kahneman and Tversky 1979). In either case the value function v captures also how every individual evaluates the contingency of being made to serve as an organ donor herself.

I distinguish three states of health with respect to the need of an individual for an organ transplant:

G indicates 'good' health and no need for an organ transplant

K indicates bad health and the state in which the patient needs an organ transplant but cannot get access to it at all or has to wait for a long time before receiving a suitable transplant.

T refers to a state of health in which the patient needs a transplant and receives it swiftly.

Relying on the value function v the following plausible assumption about the ranking of alternatives can be formulated

$v(K) < v(T) < v(G) = 0$, where $v(G) = 0$ is a normalization of the scale.

Implicitly it is also assumed that the representative individual will evaluate her health states independently of how the donation and allocation of cadaveric organs is institutionally organized.

Finally, by every individual a value $v(S)$ is assigned to the state of affairs S in which he or she is required to serve as an organ donor. For individuals who are intrinsically motivated by beneficence the value $v(S)$ of serving as a cadaveric donor may be positive regardless of some fears that they might have. Other individuals might be indifferent as towards

anything happening after their own brain death and assign to S a value of zero. Those who endorse some fears about the quality of brain death diagnosis or fear to be 'kept on' unduly to serve as a donor will evaluate that state of affairs S in which they are as a matter of fact used as a brain dead cadaveric donor negatively.

In a stylized way I compare two types of institutional rules of organ allocation. The first (egalitarian) institution, based on some rule E , requires all patients to be treated equally according to their medical needs and independently of how they behaved when their own need to receive a transplant could not be or at least has not been foreseen yet. In the present context the crucial aspect of the egalitarian scheme is that it does not differentiate between recipients according to prior declarations to donate.

The second (reciprocal) institution, based on some rule R , requires that the allocation of organs to recipients discriminates between individuals who have been and are still willing donors and those who are not. Dependent on the length of time in which somebody has served as a willing donor the rule R gives, c.p., priority to those who have been willing to donate for a longer time than others (including non-donors as the limiting case with zero declaration time).

Though the reciprocity rule could and from a moral point of view presumably should be implemented by the state or state sponsored institutions like Eurotransplant as well, it is assumed here that R is realized in form of one or several private clubs that do in fact deny access to the club good to non-members or only grant it with lowest priority to those who are not members of the club.

If clubs of the kind sketched here emerge and succeed in attracting sufficiently many members, then the likelihood of receiving an organ in case of need should be significantly higher for club members than for those who did not become members of the (or a) club.

The probabilities for receiving an organ in case of one's need are influenced by several factors. Not only institutional rules of allocation like E and R matter but also the number of cases in which brain death is diagnosed and, most importantly, the willingness of hospitals with intensive care units to co-operate in the process of singling out potential donors. But it is not only relevant whether or not a patient gets access to an organ at all. The quality of the treatment depends also crucially on the quality of the organ (along with HLA-matching, etc.). As a matter of simplification I distinguish only between adequate treatment and inadequate treatment. If the patient is in need of an organ then adequate treatment will result in T while after inadequate treatment the state K will emerge. Adequate treatment basically amounts to short waiting time (being a strong indicator of prolonged survival time of the graft) and good tissue match between donated organ and recipient's tissue as well as an adequate size of the organ.

The conditional probability of adequate treatment if needy under rule E is p_E while p_R refers to the likelihood of being treated adequately as a club member and $p_{\text{non}R}$ to the likelihood of receiving an adequate treatment as a non-member under R .

I assume that the probability of being in need of an organ transplant is independent of the willingness to donate. Since problems like self-selection of bad risks and the like are not particularly relevant to the present argument it seems justified to avoid any such complications, at least initially. The probability that an individual becomes needy of an organ transplant is assumed to be equal for all individuals. It is denoted by p^b .

For an individual that has declared his or her willingness to donate in case of death the conditional probability to serve as a donor, given she is not needy herself, is p^s .

It is assumed, initially, also that those who are in need of an organ transplant will in case of their own brain death not be suitable as organ donors. Finally, since under the narrow opting in rule – as opposed to other commonly used weaker rules – not only lip service is paid to the supreme value of the autonomy of the deceased individual, the probability of being made to serve as a cadaveric donor against one's will and intentions may plausibly be assumed to be zero.

With the preceding definitions and assumptions in hand we can now formulate a model for the individual decision to donate or not to donate – or rather the declaration thereof – in standard expected utility and in prospect theory. So let me turn to these tasks next.

4. The decision to donate in standard expected utility

I refer to the option of an individual not to declare his or her willingness to donate under rule E with $(\text{non}D/E)$. The expected utility U of an individual who chooses not to declare the willingness to donate in case of death under rule E can then be calculated in the following way

$$\begin{aligned} U(\text{non}D/E) &= (1 - p^b) v(G) + p^b p_E v(T) + p^b (1 - p_E) v(K) \\ &= p^b (p_E v(T) + (1 - p_E) v(K)), \text{ due to } v(G) = 0 \end{aligned} \quad (1)$$

Analogously, under rule R , the expected utility of an individual who does not choose to declare her willingness to donate is

$$\begin{aligned} U(\text{non}D/R) &= (1 - p^b) v(G) + p^b p_{\text{non}R} v(T) + p^b (1 - p_{\text{non}R}) v(K) \\ &= p^b (p_{\text{non}R} v(T) + (1 - p_{\text{non}R}) v(K)), \text{ due to } v(G) = 0 \end{aligned} \quad (2)$$

Since we assumed that $v(T) > v(K)$ holds good it is obvious that the size of the probability factor of $v(T)$ determines the relation between the expected utilities in (1) and (2). We have:

$$U(\text{non}D/R) < U(\text{non}D/E) \Leftrightarrow p_{\text{non}R} < p_E$$

Those who are not willing to donate are treated less well under rule R than under rule E . In the extreme $p_{\text{non}R}$ will even be zero if all willing donors under the narrow opting in rule become members of exclusive clubs. Only if the formation of clubs increases the number of willing donors so drastically as to create an excess supply and if the rules are not too exclusive, an individual that is not willing to donate might have a long run advantage under rule R compared to rule E .

However, under practically all plausible circumstances it is quite obvious that rational individuals who are themselves not willing to donate or do not want to think about it should oppose an institutional set up in which reciprocity is implemented including especially the founding of clubs. In case of a purely private organization of organ allocation such opposition would naturally be less relevant. We would tend to ignore it in that case as not the opposition's business whereas in the case of public organization everybody should 'naturally' have a say in the matter, at least in principle. It is quite important to note also that individuals who have the desire to avoid engaging the issue of their own declaration to donate organs should tend to oppose reciprocity rules in general regardless of whether they be implemented publicly or privately.

Let us assume for the next step of the argument that some private club for organizing the donation and allocation of cadaveric organs has been founded and operates on some priority rule or other. How compares the expected utility of joining the club with that of staying out, from the point of view of an individual weighing the options?

As in relation (2) the expected utility of an individual who has not declared her willingness to donate is:

$$U(\text{non}D/R) = p^b (p_{\text{non}R} v(T) + (1 - p_{\text{non}R}) v(K))$$

The expected utility of joining the club that implements R , $U(\text{join}/R)$ contains two components. One component is the expected utility generated from the institution R if the voluntary donor later on becomes needy of an organ transplant: $U(D/R)$. The second component is formed by the expected utility if the act of the removal of organs from the cadaver in case of brain death diagnosis is as a matter of fact performed. Many individuals

for rational or irrational reasons seem to attach a negative value $v(S)$ to S . Under R then $v(S)$ can be interpreted as the price of gaining access to organs of club members. Assuming still that those who are ill themselves cannot donate their other organs post mortem club members are called to pay the price with the probability $(1-p^b)p^S$. Adding up the two components yields the expected utility relevant here

$$\begin{aligned} U(\text{join}/R) &= U(D/R) + (1-p^b)p^S v(S) \\ &= p^b(p_R v(T) + (1-p_R)v(K)) + (1-p^b)p^S v(S) \end{aligned} \quad (3)$$

Comparing the expected utilities of joining and not joining we get:

$$\begin{aligned} U(\text{non}D/R) &\leq U(\text{join}/R) \\ \Leftrightarrow p^b(p_{\text{non}R} v(T) + (1-p_{\text{non}R})v(K)) \\ &\leq p^b(p_R v(T) + (1-p_R)v(K)) + (1-p^b)p^S v(S) \\ \Leftrightarrow p^b(v(T)(p_{\text{non}R} - p_R) + v(K)((1-p_{\text{non}R}) - (1-p_R))) \\ &\leq (1-p^b)p^S v(S) \end{aligned} \quad (4)$$

$$\Leftrightarrow p^b(v(T) - v(K))(p_{\text{non}R} - p_R) \leq (1-p^b)p^S v(S) \quad (5)$$

Here $(v(T) - v(K))$ is positive and $(p_{\text{non}R} - p_R)$ negative. If $v(S)$ is positive, then the above inequalities are fulfilled independently of the size of the other values or the order of magnitude of the probabilities. This implies that all intrinsically motivated individuals will declare their willingness to donate. If $v(S)$ is negative, the analysis becomes slightly more complicated. For this case it may be helpful to take a closer look at an equivalent representation of relation (5) in which all factors are positive:

$$p^b(v(T) - v(K))(p_R - p_{\text{non}R}) \geq (1-p^b)p^S(-v(S)) \quad (6)$$

Note first that after introducing an institution with reciprocity R , individuals who were not willing to donate before may have an incentive to reconsider their rejection decision. Assume for a comparative analysis of incentives that p^b , the probability to become needy, is fixed. Let the difference $(v(T) - v(K))$ be constant also. Then $(p_R - p_{\text{non}R})$ exerts a strong influence. The larger p_R relative to $p_{\text{non}R}$ the easier can advantages of membership compensate anxieties related to being called upon as a donor.

The policy implication is obvious, to induce people to join the club the differential advantage of club members in getting access to a transplant if needed should be widely publicized. May be these differences have to be measured in terms of average waiting time or expected survival rate or life expectancy in order to influence the individuals' perception.

If we assume that an increase in medical knowledge among the public at large can influence the value functions v of individuals such as to decrease anxieties concerning brain death diagnosis and explantation procedures – an assumption that is far from self-evident –, spreading medical information more widely would be good policy. Even if the value of $v(S)$ may remain negative it still might decrease in size. Moreover, medical progress and additional information about progress in transplantation medicine will in any event tend to increase the difference $(v(T) - v(K))$ and thereby provide a motive to declare the willingness to donate.

5. Analysis of the potential donor's decision within prospect theory

The preceding results and policy recommendations seem intuitively quite robust. But in view of the many problems of standard expected utility reformulations of factual rather than ideally rational decision making it is reassuring that they can also be reproduced in principle by analogous arguments as formulated within prospect theory (see as locus classicus, of course, Kahneman and Tversky 1979).

Prospect theory formulates individually rational decision making under uncertainty in a way that relies on a specific form of the value functions v . Starting from the status quo of the decision maker to which an initial standardization assigns the value zero, that function is concave for events that are positively evaluated in comparison to the status quo and convex for events that are evaluated negatively relative to the status quo. According to prospect theory negative events are generally assigned twice as much weight than positive ones in the evaluation of possible changes of the status quo. As far as probabilities are concerned, Kahneman and Tversky model the probability assessment by a function π that assigns probabilities close to zero disproportionate weight – 'flattening' the curve – while probabilities close to one are perceived as being more distant to certainty than they in fact are. Midrange probabilities are perceived more 'realistically'. The classical studies by Kahneman and Tversky focused on prospects with monetary payoffs. There are generalizations of their theory to problems of medical treatments (cf. Bleichrodt, Pinto and Wakker, 2001, and Lenert, Treadwell and Schwartz, 1999) where s-shaped value functions for health states are revealed, too.

Keeping these general remarks in mind let us turn to relation (6) of the preceding section and reformulate it in terms of prospect theory. Let us

assume that the representative decision maker imagined here, when making the declaration decision, does not need a transplant, this means she is in state G . To keep things reasonably simple I consider a variant of relation (6) which does not require a separation of product probabilities and can be formulated relying on π as:

$$(v(T) - v(K)) (\pi(p^b p_R) - \pi(p^b p_{\text{nonR}})) \geq \pi(p^s (1 - p^b)) (-v(S)) \quad (7)$$

The situations of being in need of a transplant and then being treated either adequately or inadequately are perceived and evaluated from the reference point or status quo. By assumption the status quo is characterized by not having declared the willingness to donate and health G . Both probabilities $p^b p_R$ and $p^b p_{\text{nonR}}$ are small. According to the flat shape of π differences of those two probabilities are perceived in sub-proportional ways. This implies that any (increase of the) difference $(v(T) - v(K))$ is multiplied by a very small positive factor, close to zero. This in turn renders the left side of inequality (7) very small. On the other hand, for a voluntary donor who joins the club in a situation where the club is not very large, the probability to be called upon in fact as a donor tends to be closer to midrange probabilities. If so, which depends of course on the likelihood of brain death occurring, the donation probability might be perceived rather unbiased. This value is multiplied by a negative value $v(S)$ (perceived twice as large as gains) that expresses strong anxieties concerning the reliability of brain death diagnosis and removal of cadaveric organs. Then $(-v(S))$ is perceived as a comparably large positive number and relation (7) is even more unlikely to hold than under expected utility theory.

All this amounts to a strengthening of the results of the expected utility analysis. Again the question of possible policy interventions arises. As far as this is concerned, after the preceding more extensive discussion, again some very brief remarks should be sufficient. If prospect theory should represent real or factual as opposed to merely ideal individual decision making faithfully it is clear that there are possibilities to influence the decision making on both sides, that of the advantage of joining the club and that of the price that has to be paid. On the one hand, the difference in life quality between getting and not getting a transplant swiftly if it is needed has to be made clear to the decision maker, i.e. to enlarge the perceived difference in quality of treatments between T and K . Of course, sometimes this difference means life or death.

The perceived probability difference $(\pi(p^b p_R) - \pi(p^b p_{\text{nonR}}))$ is crucial. It depends on the allocation rules that are implemented within and outside the club. If subjects consider this difference from the status quo of not

being in need of an organ, the difference will be close to zero. If, however, an individual is hypothetically put into a situation where she needs an organ, this change of the status quo will change the perception to $(\pi(p_R) - \pi(p_{\text{nonR}}))$. This term will be perceived as substantially positive and could induce an individual to think about her decision. On the other hand, to induce a change of mind in an individual who has not been willing to declare herself a voluntary donor a presumably rather large ' $-v(S)$ ' must not only be considerably reduced but probably almost completely be eliminated before the individual would join the club. It does not seem very likely that such influencing of individual evaluations is possible at acceptable costs (financial and social).

6. Comparative static analysis of equilibrium club formation

In this section I develop a simple model to examine conditions for an equilibrium club size. At first, I will construe an extreme case of club formation in a given time interval under quite strict assumptions. Secondly, the extreme case will be used as a reference scenario in a comparative static analysis with more realistic assumptions.

6.1 The reference model

Assume that a single club of willing organ donors forms. Denote the size, i.e. the number of members of the club by C .

The basic inequality (6) describes the conditions for an individual's decision to join an existing donor club of size C . In general the probabilities p_R and p^S depend on the set of individuals in the club and on the rules of allocation of organs to club members and non-members, respectively. We assume that the probability of adequate treatment of club members if they are needy does depend only on the number of club members and not on the distribution of types of possible donors and that the same holds for the probability to serve as a donor, too. Bearing this in mind let $p_R(C)$ denote the probability that a club member will receive appropriate treatment in a club of size C , given she is in need of an organ, and let $p^S(C)$ be the probability that a club member has to serve as a donor in C , given she was not in need of an organ herself. The probability p_{nonR} , of getting treatment as a non-member, varies systematically with the degree of exclusiveness of the club, and also with the number of donors outside the club (living donors or individuals who reject the club institution but are willing to serve as cadaveric donors unconditionally).

We can rewrite (6) in a form that describes the decision rationale as dependent on the club size:

$$\left[p^b / (1 - p^b) \right] \left[(p_R(C) - p_{\text{nonR}}) / p^S(C) \right] \geq -v(S) / (v(T) - v(K)) \quad (8)$$

The reference model is based on assumptions that are most favorable for the club's success and we will use its results as a benchmark situation. We assume, first, that all individuals with a positive $v(S)$ join the club immediately when it is founded. This leads to an initial club of size C_0 . Second, we assume that the rules of the club exclude non-members from receiving an organ. Since all cadaveric donors with positive $v(S)$ are members p_{nonR} will be equal to zero in the extreme case under consideration. The probability difference of adequate treatment if needy, which is crucial for the decision of individuals to join the club is then equal to $p_R(C)$. Therefore the next inequality applies

$$\left[p^b / (1 - p^b) \right] \left[p_R(C) / p^S(C) \right] \geq -v(S) / (v(T) - v(K)) \quad (9)$$

Moreover, for the purpose of construing the reference model we neglect the existence of a waiting list as formed before the club was founded. We also assume that there are no capacity constraints imposed by the number of brain death diagnoses, surgical facilities, ICU's, etc. Therefore the number of needy who are members of the club will be proportional to the club size and the number of realized donations per time unit will be proportional to the club size, too.

This means that $p_R(C)$ is equal to some positive constant. The probability $p^S(C)$ to serve as a donor is constant, too, independently of the size C of the club. The quotient $p_R(C) / p^S(C)$ is then equal to some constant q_0 .³

For any given $q > 0$, there will be a number of individuals $D(q)$ who are willing to join the club, if the quotient $p_R(C) / p^S(C)$ that the club offers is larger or equal to q . Taking into account that the club is of size C_0 initially, there are then $C(q) = C_0 + D(q)$ members in the club. This cumulative number $C(q)$ of individuals is increasing in q . The function $D(q)$ determining it has an inverse function $q(D)$ which starts at point $(C_0; 0)$, is monotonically increasing, and either hits the horizontal line $\text{const.} = q_0$ (case 1 and Figure 1) or hits the vertical line at N where N is the total number of individuals that could declare their willingness to donate (case 2 and Figure 2). In each case we will have some equilibrium club size C^* .

³ The proportionality argument presupposes no selection effects and equivalent distributions of types of patients and donors for all club sizes.

Figure 1 Case 1

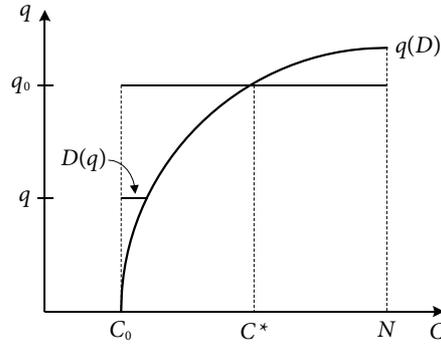


Figure 2 Case 2

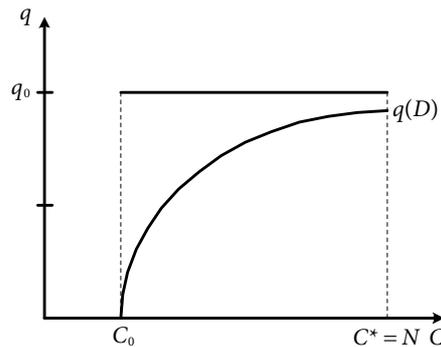


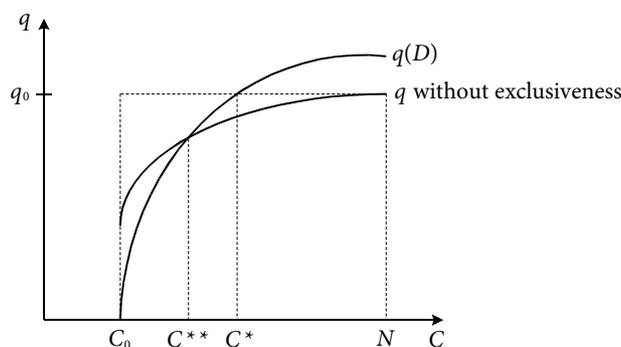
Figure 1 shows a situation with an equilibrium club size C^* derived by the condition $p_R(C^*)/p^S(C^*) = q(C^*)$. Since p_R/p^S is constant and q is assumed to hit the line $\text{const.} = q_0$, there is a unique equilibrium club size.

Figure 2 shows a more ‘optimistic case’ where individuals are less reluctant to join, so that the optimal club contains all individuals, $C^* = N$.

6.2 *A scenario without exclusiveness*

As a first relaxation of the assumptions of the reference model consider the possibility that club members do not exclusively donate their organs to club members but only with some priority. Then non-members will have a chance that their need is satisfied regardless. The assumption of non-exclusiveness implies a higher demand for donated organs. If there are no capacity constraints imposed by the number of brain death diagnoses this

Figure 3



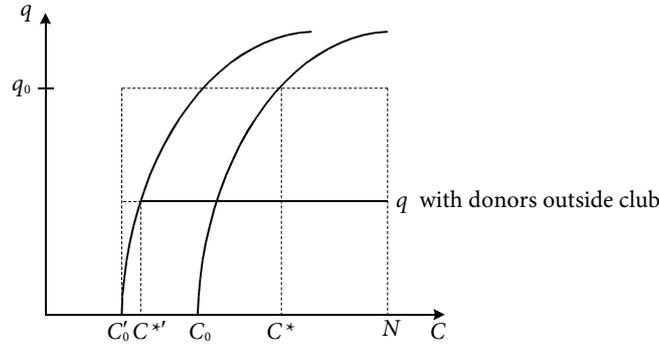
will lead to a comparatively higher $p^s(C)$. If the organ supply in the club is at its capacity constraint with respect to numbers of available organs, non-exclusiveness leads, depending on the priority rules, at least potentially to a smaller $p_R(C)$. Of course, both effects can jointly apply. On top of that, the probability p_{nonR} is larger than zero in this scenario.

Considering the term $[(p_R(C) - p_{\text{nonR}})/p^s(C)]$ all three effects influence it in the same direction, i.e. the incentive to join the club decreases. In case 1, this leads to a smaller equilibrium club size C^{**} (cf. Figure 3). In case 2 the equilibrium club size can remain N or be smaller than N – depending on the specific shapes of the curves.

6.3 A scenario with donors outside the club

From questionnaires (cf. Ahlert, Gubernatis, and Klein 2001 and Ahlert and Klein 2004) it became obvious that quite some people who are willing to donate unconditionally have strong objections against any form of reciprocity. They seem to feel that an institution that offers them some advantage in return for their willingness to donate does not express appropriate esteem for their motives. Ascribing to them such a ‘base’ motive as their own future interest in receiving an organ may in fact crowd out their willingness to donate (Mr. Titmuss sends his regards to Mr. Arrow). These people might be willing to donate for everybody according to need but not be willing to join a club that does take into account factors other than medical need. In this case the initial club size would be $C'_0 < C_0$. The probability p_{nonR} is positive, i.e. the difference $(p_R(C) - p_{\text{nonR}})$ will be smaller than in the reference situation. Since the curve $q(D)$ starts now at the point $(C'_0; 0)$ left of $(C_0; 0)$. As the curve $[(p_R(C) - p_{\text{nonR}})/p^s(C)]$ is below the corresponding one in the reference situation the equilibrium club size, $C^{*'} is smaller than C^* (cf. Figure 4).$

Figure 4



In case 2, we have a maximal club size of $N - (C_0 - C'_0)$, which is smaller than N , too.

If we also give up the assumption of exclusiveness of the club all effects work in the same direction.

6.4 A model of the initial situation of club formation

How should the pre-existing waiting list be taken into account in club formation? Let us first assume that an exclusive club rule is adopted and that a waiting list of size W exists prior to club formation. Let us assume that, say for political reasons, all individuals on the list have to be admitted to the club. Without modelling the decisions of patients who are already on a waiting list, it seems plausible that all of them will join the club. They clearly are in need of receiving an organ and will be willing to do almost everything to get one – including their own willingness to donate organs in case of their own death. Donors who are intrinsically motivated to join the club or to donate unconditionally have already taken into account the existence of a waiting list in their decision making. Probability considerations do not play any role for them, since their value $v(S)$ is positive.

Compared with the benchmark situation not much seems to change. There merely will be a club size of $C_0 + W$. However, we have to give up the assumption of homogeneous individuals in the club. This influences the decision of an individual who is not intrinsically motivated to join the club as compared to the reference situation. Denoting the probabilities in this model with a subscript ‘ W ’, p_{nonRW} is still equal to zero because of exclusivity. $p_W^S(C)$ defines the probability to serve as a donor if C members who were not on the waiting list have joined the club. $p_W^S(C)$ might be slightly higher than in a reference situation, because of better matching possibilities and the aim to decrease W . The probability $p_{RW}(C)$ to re-

ceive an organ as a willing donor who was not on the old waiting list depends on the allocation rule that is used in the club. If this rule gives strict priority to those who have actively declared their will before they became needy, the probability $p_{RW}(C)$ is equal to $p_R(C)$ or even slightly higher, if we now assume that some individuals who are themselves on the waiting list might serve as donors. Under a strict priority rule that makes membership of those who are already on a waiting list more or less nominal, the effects together imply that there will be nearly no change in the incentive structure to join the club.

In case of a less strict priority rule in allocating organs within the club, the waiting list will decrease faster, the advantage of being a club member, however, decreases, too, and thus the equilibrium club size. This effect will hold as long as there is an existing prior waiting list. Of course, the dynamics of the reduction of an existing waiting list over time depends to a large extent on quantitative aspects of the process. Empirical data and, probably simulations⁴ are needed, to derive quantitative results. From our static approach we conclude that the stricter the priority for willing donors in the allocation rule in the club the less negative is the effect of the inclusion of an existing waiting list on the equilibrium club size. To conclude, over the long haul interests may be served better by the stricter rule while the immediate interests of those who are on a waiting list will be served better under a softer rule. But is purely private club formation likely?

7. Empirical data

The aim of this section is to deliver some empirical data that suggest estimates for some of the variables defined in the models above and that lead to some evidence about the acceptance of different institutional rules in organ allocation.

7.1 Perception of probabilities to serve as a donor

Table 1 shows data from Germany for the years 1995 to 1998.⁵ The table is organized such that the sets of cases in the first six rows are stepwise restricted from τ to ε , i.e. $\varepsilon \subset \delta \subset \gamma \subset \beta \subset \alpha \subset \tau$. τ denotes the set of all cases of death in Germany. Among these, α is the set of cases of death in hospitals. Among the cases of death in hospitals β are the cases where a

⁴ like the original ones performed by Thomas Wujciak (1993a,b) in developing together with Gerhard Opelz the present Eurotransplant allocation algorithm

⁵ Sources: Deutsche Stiftung Organspende Nord, Statistisches Bundesamt, Statistische Landesämter

Table 1 Cases of death and explanations

		1995	1996	1997	1998
τ	cases of death	884588	882843	860389	852382
α	cases of death in hospitals	424910	414129	395444	399376
β	brain deaths < 65 years	9168	9081	8963	8738
γ	willing donors	1485	1403	1470	1557
δ	potential donors	1306	1258	1294	1335
ε	explantations	831	852	861	869
ratio	$\# \gamma / \# \beta$ in %	16.198	15.450	16.401	17.818
ratio	$\# \varepsilon / \# \alpha$ in %	0.196	0.206	0.218	0.218
ratio	$\# \varepsilon / \# \delta$ in %	63.629	67.727	66.538	65.094
μ	estim. willing donors in τ	143286	136399	141112	151877
ratio	$\# \varepsilon / \# \mu$ in %	0.580	0.625	0.610	0.572
η	estim. willing donors in α	68698	63982	64856	71161
ratio	$\# \varepsilon / \# \eta$ in %	1.210	1.331	1.328	1.221

brain death diagnosis has been made and patients are younger than 65 years. Data on willingness to donate are only collected in cases where the patient or her relatives have declared the willingness to donate. This subset is denoted by γ . There are many reasons, especially medical ones why an explantation is not possible though brain death was diagnosed. The cases of willing donors without contraindication are called potential donors and form the subset δ . Finally, the subset ε contains all cases where explantations are made. We denote the cardinalities of these sets by $\#$ and use these cardinalities to calculate relative frequencies (ratios).

The number of willing donors among all death cases $\# \mu$ is not observed. Therefore, we estimate $\# \mu$ by proportionality calculations. We assume that the proportion of willing donors in a certain population is equal to the proportion of willing donors among the cases of brain death, i.e. equal to the ratio $\# \gamma / \# \beta$. This is calculated in Table 1 for the years where data were available.⁶ If we multiply this ratio by $\# \tau$ we receive an estimate for the number of willing donors among all cases of death. The number of willing donors that die in hospitals $\# \eta$ is not known either. We estimate the number $\# \eta$ in an analogous way by multiplying $\# \alpha$ by $\# \gamma / \# \beta$. In addition we calculate estimates for the relative frequency of explantations in cases where a willing donor dies ($\# \varepsilon / \# \mu$) and the relative frequency of explantations in cases where a willing donor dies in hospital ($\# \varepsilon / \# \eta$) which is, of course, an necessary condition for the operation to take place.

⁶ There might be a bias towards willing or potential donors in cases of brain death diagnosis, i.e. $\# \gamma / \# \beta$ might be larger than the ratio in the whole set of cases of death.

The first conclusion that can be derived from the data in Table 1 is an estimate $\# \gamma / \# \beta$ of the percentage of willing donors in the population. The value of $\# \gamma / \# \beta$ is about 18%.⁷ If we apply this to the model of club formation in section 6, we receive an upper bound for the initial club size C_0 by $C_0 = 0.18N$, where N is the number of individuals in the German population that could possibly serve as a donor. It is an upper bound, since we cannot assume that all willing donors would join the club and since the share of donors under the cases of brain deaths in hospitals might be higher than in general because of cases where relatives of the deceased rather than they themselves during lifetime agreed to the donation.

The second conclusion is related to the probability to serve as a donor. As I have argued in sections 4 and 5, the decision of a not intrinsically motivated individual to declare her willingness to donate depends on the perception of the probability to serve as a donor if she has declared her willingness to donate. The estimate $\# \varepsilon / \# \mu$ for the relative frequency of explantations among willing donors that died has a value of about 0.6%. The estimate $\# \varepsilon / \# \eta$ for the relative frequency of explantations from willing donors that died in hospitals has a value of about 1.3%. Whereas the observed frequency of explantations from cases of death in hospitals is about 0.2%.

Let us now compare these frequencies to their perception by individuals. In a questionnaire on organ donation Ahlert and Klein (2004) asked 91 students that attended a public finance class including some lectures on health economics to give an estimate for the number of cases in the following problem:

Question 1 Among 10,000 cases where a willing donor dies there are cases where organs are explanted (cf. question 28 in Ahlert and Klein 2004).

The estimated number of cases according to Table 1 is $10000 \cdot \# \varepsilon / \# \mu \sim 60$ cases. The distribution of the answers is given in Table 2. The results show that only about 10% of the respondents estimate the probability to serve as a donor roughly in the correct order of magnitude (estimated number between 1 and 100), whereas it is extremely over-estimated by most of the other subjects.

Now return to inequality (7):

⁷ This share coincides with the observation in Ahlert and Klein (2004) where 20 % of the respondents said that they were willing to donate.

Table 2 Distribution of answers to Question 1

Intervals of numbers of explanations	1-100	101-500	501-1000	1001-3000	3001-5000	5001-7500	7501-10000
Number of respondents	9	8	18	11	22	7	14
Percentage of respondents	10%	9%	20%	12%	25%	8%	16%

No answer: 2; 1. Quartile: 1000, Median: 3000, Mean: 3577, 3. Quartile: 5000.

Table 3 Distribution of answers to Question 2

Intervals of numbers of explanations	1-20	21-40	41-60	61-80	81-100	101-500	501-1000	>1000
Number of respondents	18	2	7	2	15	27	11	6
Percentage of respondents	20%	2%	8%	2%	17%	31%	13%	7%

No answer: 3; 1. Quartile: 50, Median: 100, Mean: 438.9, 3. Quartile: 500

$$(\nu(T) - \nu(K)) (\pi(p^b p_R) - \pi(p^b p_{\text{nonR}})) \geq \pi(p^s (1 - p^b)) (-\nu(S))$$

Let us consider the right hand side. The interpretation of Table 1 implies that the perceived value should be about $0.006 \cdot (-\nu(S))$. The respondents would on average perceive the term as $0.358 \cdot (-\nu(S))$. The more detailed analysis of the answers to the questionnaire shows that the overestimation in perception does not differ significantly between the subgroups of willing donors and subjects who have not declared their willingness to donate. There is also no significant difference between subjects that feel anxious with respect to being a willing donor (with $\nu(S)$ strongly negative) and those who do not (with $\nu(S)$ weakly negative or positive). Therefore, in order to encourage someone to declare her willingness to donate, the perceived advantage of the declaration has to be large enough (left hand side of (7)) or the evaluation of being a donor $\nu(S)$ has to be changed from negative to positive.

Another question is related to the percentage of explanations among cases of death in German hospitals.

Question 2 Among 10,000 cases of death in German hospitals there are ... cases where organs are explanted (cf. question 27 in Ahlert, Klein 2004).

The estimated number according to Table 1 should be $10000 \cdot \# \varepsilon / \# d \sim 20$ cases.

The distribution of the answers is given in Table 3. It shows that the frequency is overestimated, too. Interestingly, the answers of willing donors are significantly closer to the empirically true frequency than the answers of the other subjects, whereas we do not find a significant difference between these groups with respect to the overestimation in question 1 (cf. analysis of questions 27 and 28 in Ahlert and Klein 2004). A speculative explanation would be that willing donors might underestimate the number of willing donors because this makes their own contribution more necessary or valuable. They estimate the number in question 2 more correctly since the low number reflects the need of transplants and again the value of their contribution. The other subjects, not willing to contribute, may overestimate the supply of transplants, since this might help them not to feel obliged to contribute and to avoid guilt feelings.

7.2 *Value judgments on some types of incentives*

One could think of different incentives that might induce people to declare their willingness to donate though they might not be intrinsically motivated. I will concentrate on two possible types of incentives here. The first one consists in a chance to abridge the waiting time and thereby enhance the quality of treatment. If a willing donor is in need of an organ herself, she would *ceteris paribus* receive an organ more swiftly than someone who has not declared her willingness to donate organs. The second one is a monetary incentive, for instance a permanent reduction of the regular payments for health care insurance or some kind of subsidy.

Results from the questionnaire (Ahlert and Klein 2004) suggest that shorter waiting time is a very strong incentive for yet non willing subjects to declare their willingness to donate. It is also received with strong acceptance by willing donors. There would be no effective crowding out of intrinsic motivation, i.e. willing donors would not withdraw their declaration if such a procedure would be implemented. In general this incentive is judged to be just and very acceptable by the subjects.

The idea to exclude patients that are not willing to donate themselves, in contrast, though as such providing a stronger selfish incentive to declare one's own willingness to donate, is less potent to induce individuals to declare their willingness to donate. Exclusion is in general judged as being very unjust and extremely unacceptable. Many subjects think that it must

not be implemented politically on any account. The observed very strong rejection of such a proposal is particularly interesting in view of the fact that imposing the disadvantages of longer waiting times on patients who were not willing donors is deemed acceptable.

A reduction in payments for health care insurance induces some positive incentive on the willingness to donate, but this incentive is weaker than the incentive through abridging waiting time. We also presented procedures to the subjects where a subsidy is paid once, for instance to the potential donor when she declares her willingness or (after an explanation has taken place) a payment to her relatives or to somebody who has been defined by the donor before she died. The subjects judge the last two procedures as making sense and being quite acceptable. There is no general positive judgement about the first procedure, only a weak acceptance could be observed.

Of course, an enlargement of the subject pool with respect to number of subjects and non-student subjects as well as deeper investigations into the motivations of organ donation are needed. This will help us to understand the decision making process when declaring the willingness to participate in alternative schemes of organ procurement. But from the preceding results it is obvious that schemes that rely on some strict form of exclusion are rejected by the public at large. According to the questionnaire evidence, in the public sphere some priority rule enhancing the likely waiting time of potential recipients (as suggested in Gubernatis and Kliemt 2000) would presumably be the most workable public reform to increase the supply of cadaveric human organs. A purely private club model may be based on a rule of strict exclusion since the public would not have a legitimate say but it would not be workable, regardless. A private club would not get anywhere close or beyond the relevant thresholds from which on selfish individuals would have an incentive to join, nor would it attract the more or less unselfish who are typically motivated by beneficence and justice. There is a role for the state to play in organizing organ procurement and therefore public rather than merely private values will be involved.

8. Concluding remarks

Only if we understand the value judgments and convictions concerning health care in general we can conceivably get into a position to predict the public choice dynamics of public health care provision in the future. Politically it is very important to know what will be acceptable to public opinion and voters.

Even though the scheme of reciprocity might seem most natural to economists it is not for the pedestrian voter or the proverbial man on the street. As we know from the questionnaires (Ahlert, Gubernatis, and Klein

2001) people often strongly resent schemes which relate the chance of receiving lifesaving treatment to past behavior. The conditioning of help is generally rejected. Once in need of a transplant previous behavior including the willingness to donate one's own organs should not count too much (Ahlert and Klein 2004). Another closely related reasoning seems to be the following one: though it is acceptable in principle to provide some incentives for health relevant behavior it is unacceptable to generate such incentives by withholding access to fundamental care (as in the case of organ allocation the withholding of organs would be).

According to German law, organ allocation should pay attention exclusively to medical criteria. It is quite clear that withholding access to a publicly controlled supply of organs for reasons of reciprocity and the provision of incentives is not admissible as a medical criterion. That reciprocity rules are motivated by concerns like preventing moral hazard or, more positively formulated, increasing organ supply does not matter. The individual patient and his medical needs should matter. If discrimination between patients is necessary because of scarcity then the doctors or institutions like Eurotransplant should discriminate according to medical needs but not otherwise. The results of the questionnaire of Ahlert and Klein (2004), however, indicate that a weak scheme of reciprocity reducing relative waiting time based on a non-medical criterion of prior willingness to donate may be acceptable.

The membership figures of purely private institutions that organize reciprocity in organ donation in countries that allow for that will remain below the relevant thresholds. Only a fraction of those who carry a donor card will join the club initially. The threshold from which on a significant incentive to declare the willingness to donate would emerge for not intrinsically motivated people to donate will not be reached.

This threshold problem would not exist if the reciprocity rule would be implemented in the existing algorithm that is applied in organ allocation. For instance if willingness to donate would be included into the priority ranking used in Eurotransplant that is based on weighted points along different dimensions, like waiting time, HLA (tissue) match and others (EKTAS, cf. De Meester et al. 1998) by granting additional points to willing donors, this rule would create significant differential advantages right from the start. It would avoid the unfairness of present schemes and provide an incentive to declare the willingness to donate organs being certain of a greater likelihood of receiving a cadaveric organ or receiving it more swiftly (should one need one in the future). Of course this scheme has to be organized within the public domain and therefore problems of public choice and values of the public at large get involved. As our preliminary empirical studies show such a procedure could have a positive effect on numbers of donors and would have a wide public support. The higher

weights for prior willingness to donate basically amount to an abridgment of the likely waiting time but not to an exclusion of those who did not opt in.

We may also ask whether there might be other alternatives for the public to improve the incentives for people to become an organ donor. Providing all with equal access to organs but imposing lower health care costs on all those who are willing to contribute in kind (their organs) may be such a way. The alternative of forcing individuals to acknowledge important information from transplantation medicine and make one of several possible decisions concerning organ donation afterwards may be another one. This would draw individuals' attention to the problem and make them think about their own evaluation of likelihoods and life qualities of possible states of health, instead of ignoring the problem. Such an enhancement of general awareness would in all likelihood also put some more pressure on hospitals to participate in the process of brain death diagnosis and organ procurement, i.e. on those members of the medical sector who are responsible for the shortage of cadaveric human organs but are not willing to take the blame.

References

- Ahlert, M. and Klein, R. (2004), *Incentives to Donate Organs. Results from Questionnaires*. Working Paper, Martin-Luther-University Halle-Wittenberg.
- Ahlert, M. and Kliemt, H. (eds.) (2001), Making choices in organ allocation, *Analyse und Kritik* 23.
- Ahlert, M., Gubernatis, G. and Klein, R. (2001), Common sense in organ allocation, in: M. Ahlert and H. Kliemt (eds.), *Making Choices in Organ Allocation, Analyse und Kritik*.
- Bleichrodt, H., Pinto, J.L. and Wakker, P.P. (2001), Making descriptive use of prospect theory to improve the prescriptive use of expected utility, *Management Science* 47: 1498–1514.
- Breyer, F. and Kliemt, H. (1994), Lebensverlängernde medizinische Leistungen als Clubgüter?, in: K. Homann (ed.), *Wirtschaftsethische Perspektiven*, Duncker & Humblot.
- De Meester, J., Persijn, G.G., Wujciak, T., Opelz, G. and Vanrenterghem, Y. (1998), The new eurotransplant kidney allocation system, *Transplantation* 66: 1154–1159.
- Gubernatis, G. (1998), Transplantationsgesetz – Signal und Versorgungsauftrag der Gesellschaft an die Medizin, *Deutsche Medizinische Wochenschrift* 123: A11–A12/A13–A14.
- Gubernatis, G. and Kliemt, H. (2000), A superior approach to organ allocation and donation, *Transplantation* 70: 699–707.
- Happich, M. and Mazurek, B. (2002), Priorities and prospect theory, *European Journal of Health Economics* 3: 40–46.
- Kahneman, D. and Tversky, A. (1979), Prospect theory: An analysis of decisions

- under risk, *Econometrica* 47: 263–291.
- Kliemt, H. (1993), 'Gerechtigkeitskriterien' in der Transplantationsmedizin – Eine ordoliberalere Perspektive, in: E. Nagel and C. Fuchs (eds.), *Soziale Gerechtigkeit im Gesundheitswesen. Ökonomische, ethische, rechtliche Fragen am Beispiel der Transplantationsmedizin*, Springer.
- Lederberg, J. (1967), Heart transfer poses grim decisions, Moribund Patient's Trust is at stake, *The Washington Post*, December, 10.
- Lenert L.A., Treadwell, J.R. and Schwartz, C.E. (1999), Associations between health status and utilities – implications for policy, *Medical Care* 37: 479–489.
- Rawls, J. (1993), *Political Liberalism*, Columbia University Press.
- Richtlinien für die Organvermittlung zur Nierentransplantation (2000), *Deutsches Ärzteblatt* 97: 7.
- Wujciak, T. and Opelz, G. (1993a), A proposal for improved cadaver kidney allocation, *Transplantation* 56: 1513–1517.
- Wujciak, T. and Opelz, G. (1993b), Computer analysis of cadaver kidney allocation procedures, *Transplantation* 55: 516–521.