

**Addressing the Shortage of Kidneys for Transplantation:
Purchase and Allocation through Chain Auctions**

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Abstract

Transplantation is generally the treatment of choice for those suffering from kidney failure. Not only does transplantation offer improved quality of life and increased longevity relative to dialysis, it also reduces End-Stage Renal Disease Program expenditures, providing savings to Medicare. Unfortunately, the waiting list for kidney transplants is long, growing, and unlikely to be substantially reduced by increases in the recovery of cadaveric kidneys. Another approach is to obtain more kidneys through payment to living “donors,” or vendors. Such direct commodification, in which a price is placed on kidneys, has generally been opposed by medical ethicists. Much of the ethical debate, however, has been in terms of commodification through market exchange. Recognizing that there are different ethical concerns associated with the purchase of kidneys and their allocation, it is possible to design a variety of institutional arrangements for the commodification of kidneys that offer different sets of ethical concerns. We specify three such alternatives in detail sufficient to allow an assessment of their likely consequences and we compare these alternatives to the status quo in terms of the desirable goals of promoting human dignity, equity, efficiency, and fiscal advantage. This policy analysis leads us to recommend that kidneys be purchased at administered prices by a non-profit organization and allocated to the transplant centers that can organize the longest chains of transplants involving willing-but-incompatible donor-patient dyads.

Introduction

End-stage renal disease (ESRD) requires treatment either with dialysis or the transplantation of a kidney to prolong life. Most ESRD patients, when fully informed, prefer transplantation to dialysis because it offers a higher quality of life, substituting the complications of life-long use of immunosuppressive drugs for the physically and emotionally debilitating sessions on dialysis machines. Also, the medical (and real resource) costs of transplantation are on average less than those of dialysis over the patient's lifetime. Further, as the medical costs of dialysis and of the first three years post-transplantation are covered by Medicare for patients of all ages, switching a patient from dialysis to transplantation on average reduces federal expenditures. Thus, kidney transplantation offers higher quality of life, lower medical and social costs, and fiscal savings.

The shortage of organs for transplantation strictly limits the opportunity for realizing these gains in the United States. The current waiting list for transplants has more than 85,000 people, but donated organs allow only about 17,000 transplants per year (see Figure 1). While approximately 4,500 people die each year while waiting for a kidney transplant, an additional 33,000 join the list. If these rates continue, then the length of the waiting list will grow. Unfortunately, if the current epidemic of obesity contributes to higher rates of diabetes and hypertension, which are important risk factors for ESRD, then the number of people joining the waiting list each year will increase.

INSERT FIGURE 1 ABOUT HERE

Kidney donations come from two sources: cadavers and live donors. Currently, about 60 percent of kidney transplants come from cadaveric donors, the vast majority of whom suffer brain death within hospital intensive care units. Many people signal their intention to donate organs upon death, typically at the time they obtain drivers' licenses. More commonly, next-of-kin authorize the donation for deceased who have not indicated an intention to donate. Indeed, the almost universal practice among organ procurement organizations has been not to honor the intentions of the deceased to donate without the approval of their next-of-kin. This practice has led many states to adopt first-person consent laws and the creation of donor registries intended to force the honoring of donor intentions.

A variety of initiatives have been undertaken to increase the supply of cadaveric kidneys for transplantation. These include: the establishment of the National Minority Organ/Tissue Transplant Education Program to increase the rate of donation by minorities (Callendar et al. 2003); the formation of the Organ Donation Breakthrough Collaborative with the goal of bringing the rate of recovery of organs in hospitals up to the rates achieved by the most effective hospitals (Shafer et al. 2006); efforts to increase the retrieval of organs from donors suffering from cardiac death as well as brain death (Childress and Liverman 2006); making a second transplant waiting list available for the so-called expanded criteria kidneys recovered from older and sicker donors to encourage their use (Schold et al. 2006); and the provision of financial subsidies to donor families, such as contributions to funeral expenses in Pennsylvania (Ubel et al. 2000). The Institute of Medicine has also considered, but not yet endorsed, the recovery of organs after cardiac death outside of the hospital setting (Childress and Liverman 2006).

Although commendable and valuable at the margin, these efforts alone will not prevent the waiting list from growing. Of the approximately 2.3 million deaths annually in the United States, only between 11,000 and 14,000 produce eligible donors under the standard criteria currently employed (Sheehy et al. 2003). Accidents, along with strokes, are currently the primary causes of donor death, but the steady and substantial decline (22 percent) in highway fatalities since 2005 (NHTSA 2010) suggest that this source of donors will decline in the future, exacerbating the gap.

The 40 percent of kidneys transplanted from living donors come overwhelmingly from family members or close friends, although they sometimes come from strangers who answer appeals from ESRD patients or occasionally from so-called altruistic (“Good Samaritan”) donors, who seek to make a non-directed donation to the waiting list, rather than to a specific patient. Because the presence of certain antigens accumulated over the life courses of the patient and potential donor, they may be incompatible in the sense that the patient’s body would reject the donor’s kidney so that the attempted graft would fail. Thus, some patients cannot accept kidneys from willing donors.

In recent years two efforts have been made to get around the problem of willing-but-incompatible donors. The first, paired exchanges, match incompatible pairs of patient-donor dyads for which donations across the dyads are possible. That is, the donor from one dyad can and does provide a kidney to the patient in the other dyad and vice-versa (Delmonico et al. 2004). The second, chain exchanges, begins with a cadaveric or altruistic live donation. A kidney is first given to the patient in an incompatible dyad. In return, the willing-but-incompatible donor in the dyad donates to the patient in another incompatible dyad. This process can continue until no appropriate incompatible dyads

are available and the last donation goes into the pool of cadaveric donations. Chains of as many as thirteen transplants have occurred (Willingham 2009). Currently, only kidneys from altruistic live donors are being used to seed chains.

Despite these efforts to increase cadaveric and live donations, the shortage of transplant kidneys is large and likely to grow. What might induce considerably greater supply that would reduce, or close, the gap?

Economists naturally think of addressing shortages through either the establishment of markets where they do not exist or the perfection of markets that exist but do not function well. Well-functioning markets allow price to rise so that the gap between supply and demand cannot persist. A number of proposals focus on cadaveric supply. Along these lines, David Kaserman and A. H. Barnett (2002) propose a spot market for cadaveric organs in which the next-of-kin of potential cadaveric donors would negotiate a price with agents who would then sell the kidneys to the transplant system. Alternatively, Richard Schwindt and Aidan Vining (1986) propose a forward market in which payments at administratively-set prices would be made now in return for a commitment to donate in the future, after death. These sorts of markets, or market-like institutions, however, might not create substantially more supply of cadaveric donations than the current system: the pure market system would likely interfere with the relatively effective pure donation system already in place and the forward market would have a limited impact because of the low probability, probably less than 1 percent, that the contracted donor would die in the right way, in the right place, in a “timely” manner to facilitate a donation. This would result in a very low forward price.

Markets, or market-like institutions, that focus on procuring live kidney donations almost certainly offer a larger potential for increasing supply significantly. However, markets involving live participants, which inevitably involve the direct commodification, or monetization, of kidneys, have been largely ruled out by the overwhelming majority of medical ethicists. Mark Cherry (2005) has characterized this as a “global consensus” that organ markets should be prohibited. Aside from the concern with commodification itself, which many see as an affront to human dignity, critics have voiced concerns about the exploitation of the poor, the unfair advantage of the wealthy, the undercutting of altruism, and, drawing on the study of blood donation by Richard Titmuss (1971a), a decline in the quality of donated kidneys. Cherry, however, along with a few other ethicists and transplant professionals, has challenged the consensus on two grounds. He challenges it directly by emphasizing the human lives lost from prohibiting commodification and indirectly by noting that the actual consequences of commodification depend crucially on the institutional arrangements through which it is implemented.

In this article, we assess the direct commodification of live kidneys through their pricing, which we will refer to simply as commodification. We apply two important concepts from policy analysis to assess the desirability of the commodification of kidneys from live donors. First, in contrast to many ethical treatments of the topic, we explicitly recognize that there are competing values at stake. Whether or not one ultimately supports or opposes commodification, one should assess all the impacts in terms of relevant social values. Indeed, even within the conventional ethical analysis, a more nuanced assessment of the bases for ethical concern help identify values that are differentially affected by different mechanisms for commodification. Second, also in

contrast to much of the ethical debate, we specify concrete alternatives for commodification in sufficient detail to allow us to predict their consequences plausibly and hence assess their implications for the promotion of social values. Vague institutional arrangements may allow a purely deontological assessment; they cannot support a broader approach that predicts and values the consequences that are likely to result.

We begin by unpacking the ethical arguments against commodification. We attempt to show how some are relevant to monetary incentives to elicit supply and others to pricing to allocate supply. We then turn to the legal framework that currently prohibits commodification in the United States. After discussing the goals for assessing commodification, we define several specific alternatives for commodification that differ in terms of how they elicit supply, how they allocate supply, and the institutional arrangements for reconciling these processes. We conclude with an argument for a specific alternative that involves a non-profit entity purchasing kidneys at an administered price and allocating them through a bidding process in which the bids are in terms of the length of transplantation chain that can be assembled.

Ethical Debate

The ethical debate surrounding kidney exchanges has been largely framed in a simplistic two-sided manner: those against markets in organs versus those in favor. As James Stacey Taylor points out, however, “there is no such thing as *the* market for human body parts” (2005: 16, original emphasis). Kidney exchanges could be organized through

variety of different institutional arrangements, each of which would elicit different ethical concerns. For example, proposals for “mutual insurance pools” do not require that organs be monetized, but rather that people exchange a commitment to donate upon death in return for priority in allocation if a transplant is needed before death (Schwindt and Vining 1998; Vining and Schwindt 1988).

INSERT TABLE 1 ABOUT HERE

Table 1 illustrates a simple framework for clarifying the ethical issues that arise around the various potential institutional supply and demand relationships. According to this framework, supply (kidney providers or their agents) involves either donation or some form of sale; demand (kidney recipients or their agents) involves either supplication or purchase. As a result, there are four potential relationships (which we discuss in detail below). Table 1 summarizes two aspects of these supply-demand relationships. First, it labels the archetypal institutional arrangements associated with these distinct relationships: altruism, allocation by payment, monetary solicitation, and market.

Second, the table summarizes the distinct ethical issues and concerns that arise in each of these different supply-demand relationships. The donor-suppliant (altruism) relationship raises the potential for *relational coercion*; the donor-purchaser (allocation by payment) relationship involves *commodification* and raises the potential for *inappropriate advantage*; the vendor-suppliant (monetary solicitation) relationship involves *commodification* and raises the potential for a range of ethical problems that are best summarized as *exploitation*; and, finally, the vendor-purchaser (market relationship) raises the potential for an even wider range of ethical concerns, including *commodification*, *exploitation*, and *inappropriate advantage*. Whether one views kidney

exchanges as morally permissible depends on how one weighs the social values underlying these ethical concerns.

Commodification

The term “commodification” has many layers of meaning, particularly when applied to the human body. The most straightforward definition describes exchanges “in which material goods and economic services are literally bought and sold” (Radin 1996: 13). Under this narrow definition, the three types of kidney exchange arrangements that include monetary payment—allocation by payment, monetary solicitation, and market transaction—involve commodification. A broader definition would include what John Evans (2003) and Ingrid Schneider (2009) call “indirect commodification,” or non-monetary incentive schemes aimed at increasing donation. Indeed, because of the incentives available through paired kidney exchanges and donor chains, some argue that indirect commodification already occurs in the current altruistic system (Taylor 2005). Additionally, definitions of commodification easily become entangled with concerns about objectification and subordination when describing human bodies (Radin 1996: 163). We use the term commodification to refer only to monetized exchanges, but regardless of how one chooses to define it, commodification may raise ethical concerns related to two key social values: human dignity and altruism.

The argument related to human dignity derives largely from the work of Immanuel Kant. Kant instructs us to “treat persons as ends in themselves, never as means” and to “express respect for the value, that is, the dignity of humanity” (Kerstein

2009: 577). His adherents argue that any form of monetized kidney exchange would violate both of these constraints and therefore be morally impermissible. F. Daniel Davis and Samuel J. Crowe (2009: 597) argue that “[i]n deference to their inherent dignity, human beings should never be treated as mere means to an end...nor should they or their bodies—or their body parts, their organs—be treated as possessing an instrumental value, fixable in the terms of some price.” Renee Fox and Judith Swazey express concern that “organs are being thought of as ‘just organs,’ rather than as living parts of a person” (1992: 207). Though Samuel Kerstein does not treat Kant’s moral constraints as absolutes, he cautions that “organ purchasers might violate moral constraints by expressing disrespect for the sellers’ dignity and, especially, by treating them as means” (2009: 583). Commodification of organs has also been deemed “morally analogous to slavery” because it regards the human body as property to be bought and sold (Cherry 2005: 4).

Many ethicists also argue that commodification of organs weakens the altruistic inclinations that motivate donation. Richard Titmuss warns that treating blood or other organs as a “commercial commodity” would “abolish the moral choice of giving to strangers,” effectively replacing social relationships with economic ones (1971b: 97). Fox and Swazey contend that “[n]owhere is the tendency to discount the gift dimension [of transplantation] more patently (and to [them] distressingly) apparent than in the movement toward the ‘commodification’” of organs (1992: 207). Davis and Crowe (2009: 598) argue that the “ethic of gifting” is not only essential to protecting organ providers and recipients, “but also serve[s] to align the practices of organ transplantation with the ultimate and proximate ends of medicine;” any regulated market or market-like

institution, they maintain, “would entail the dissolution of the ethic of gifting” (ibid.: 599).

Other ethicists, however, have argued that there are inconsistencies underlying the arguments in support of prohibitions based on concerns for altruism and human dignity (Cherry 2005; Dworkin 1994; Price 2000; Radin 1996; Taylor 2005). Counterarguments to prohibition based on altruism are relatively straightforward. As members of the International Forum for Transplant Ethics write, “nobody believes in general that unless some useful action is altruistic it is better to forbid it altogether” (Radcliffe-Richards et al. 1998: 227); further, one could even argue that commodification may increase altruism because people could choose to donate rather than sell their kidney. Counterarguments to the Kantian line of reasoning rely heavily on arguments from analogy. Namely, Kant’s moral constraints have not prevented commercial exchange of certain organs and tissues in the United States. A woman can legally sell access to her uterus through surrogate motherhood, a man can sell his sperm, and most healthy individuals can sell their blood plasma. If, as the Kantian argument goes, a person is morally prohibited from serving as a means to an end, then all of these exchanges are morally prohibited. One could even extend the argument to apply to all of wage labor (Radin 1996: 37).

Despite the ethical objections of some, market exchanges for sperm, blood plasma and surrogate motherhood are legally permitted in the United States. As Benjamin Hippen thoughtfully points out, moral opposition does not and should not equate to legal prohibition. In a morally pluralistic society, he writes, individuals should be free to “[actualize] their moral commitments in market relationships, whether by participation in or abstention from the buying and selling of organs” (2006: 51).

Inappropriate Advantage

Inappropriate advantage is a demand-side concern that occurs when ability to pay determines organ allocation. Allocation by payment or through market transactions would result in inappropriate advantage for the wealthy; the purchase price would be set too high for low- and middle-income patients, allowing only the rich or very well-insured access to transplantation (Cherry 2005; Dworkin 1994; Taylor 2005). Those who view equity as an important social value would be concerned about the inequitable distribution of health outcomes that such an allocation system would cause (Daniels 1998; Evans 1998). As Norman Daniels notes, however, health care services in the United States are largely allocated by ability to pay already, contributing to a system that, in his view, “is, in general, unjust” (1998: 243). Citing the 1987 Oregon state legislature’s decision to cut Medicaid funding for organ transplants in favor of other, more cost-effective services, Daniels argues that “it might be better to ration by ability to pay for transplants than for other kinds of health care” if doing so “reduce[s] injustice in the system as a whole” (1998, 244–245). He does not deny that allocating organ transplants by ability-to-pay raises equity concerns, but points out that such concerns also apply to the U.S. healthcare system as a whole.

Exploitation

Exploitation of the economically disadvantaged is a supply-side concern that arises when organ providers, as “vendors,” receive monetary payment for a kidney. This

concern may occur in either a market system or a system of monetary solicitation and derives from respect for personal autonomy. Whether legal prohibition of kidney sales does more to respect personal autonomy than permitting them, however, is the subject of much debate.

Many observers worry that markets would coerce the poor into selling their kidneys, resulting in loss of autonomy for the most economically disadvantaged (see Hinkley II 2005; Hughes 2009; Jafar 2009; Kerstein 2009). Poverty, according to this view, acts as a “constraining option,” that is, a choice autonomously made by an individual at one time that results in impaired autonomy in the future (Taylor 2005: 73). While some argue that this would only become a problem in unregulated markets (Kuntz 2009; Taylor 2005), Kerstein (2009), for one, maintains that even regulated exchanges that involve monetization could result in constraining options. As evidence, he offers the psychological suffering experienced by kidney vendors in Iran, which has a regulated market, and the coercive nature of debt repayment in poverty-stricken regions, which is how, he argues, many payments would be spent (Kerstein 2009: 575-576). Similarly, Paul Hughes compares kidney vendors to people “who are compelled by duress to commit a crime,” arguing that because the latter are not considered criminally responsible for their actions, the former should not be considered capable of making a morally responsible choice (Hughes 2009: 609).

There are others who find these objections insufficient grounds for prohibiting payments to kidney providers. Some, notably Mark Cherry (2005) and Gerald Dworkin (1994), argue that prohibiting payments on such grounds is a paternalistic way of trying to protect the poor from difficult decisions. Prohibition reduces the options available to

potential kidney providers, imposing “an unnecessary and unwise limitation on the basic right of self-determination” (Hippen 2006). From this perspective, autonomy becomes impaired, then, not by permitting the poor to participate freely in the exchange, but by denying them the opportunity to choose to do so (Cherry 2005; Dworkin 1994; Hippen 2006; Taylor 2005).

Issues of autonomy also bring up questions concerning economic justice. For example, if poverty prohibits the poor from being able to participate rationally in a market or market-like exchange for kidneys, it would seem to follow “that poor people should not be allowed to enter the army, to engage in hazardous occupations...to become paid subjects for medical experimentation” (Dworkin 1994: 157). Such a prohibition would likely seem unjust, despite the fact that those who decide to work in dangerous occupations often are driven by their economic circumstances to do so, creating a potential impairment to autonomy.

This is an example of what Margaret Radin (1996: 124) calls “the double bind,” a dilemma that ideal justice commands that we resolve, but that cannot be resolved until we change the circumstances that created it. If we extend the autonomy-based argument against payment to kidney providers, then achieving full autonomy should be a prerequisite for participating in any market-like exchanges. Yet, while full autonomy may be an ideal towards which we should strive, it is likely untenable in the short term, and its realization would first require “wealth and power redistribution” (ibid.: 124). Radin writes that we must then decide “whether we should permit commodification while we try to [change the surrounding circumstances]” (ibid.: 126).

According to some, however, the question should not be whether to permit commodification, but whether there is just cause for prohibition. Hippen (2006) asserts that “[m]arket proponents need only insist on the *moral permissibility* of a market in organs and the lack of a moral justification for a legal ban, not a *moral endorsement* of participation in such a market” (51). Moreover, members of the International Forum for Transplant Ethics (Radcliffe-Richards et al. 1998: 227) insist that “the burden of proof remains against the defenders of prohibition.” Until that burden is met, they argue, the perfect should not be made the enemy of the good.

Relational Coercion

In the United States, because live donors cannot sell organs, their motivation for donation is generally assumed to be altruistic. This assumption appears most valid for those who donate kidneys for transplantation to unidentified strangers (Hanto 2007)—there were 141 such donors in 2009 (OPTN 2010a). As live donation involves some risk to the donor—relatively small for kidneys but larger for liver and lung lobes—transplant centers are cautious in accepting non-directed donations. Usually, the centers attempt to rule out donations that they deem are not motivated by “pure” or “real” altruism, such as those prompted by depression, low self-esteem, or publicity-seeking, before accepting a donation (Truog 2005).

The assumption of altruism also appears generally valid for strangers who make directed donations to specific patients, usually in response to their supplication through public solicitations. The solicitations can take a variety of forms, including listing as a

patient on MatchingDonors.com, a web site provided by a nonprofit corporation created in 2004. Because those with more resources are better able to engage in solicitation, the same sorts of concerns about inappropriate advantage raised with respect to the purchase of organs also come into play for live directed donations.

The most common type of live donation occurs when a family member or friend of a patient donates an organ. In these cases the patient supplicates to those with whom he or she has a personal relationship. Volunteering in response to a personal request that would not otherwise be done has been labeled a “conscience good” that the volunteer feels morally obligated to provide (Freeman 1997). Thus, the personal connection may change the motivation for donation from the purely altruistic to a mixture of altruism and obligation.

The obligation may be morally tainted when the potential donor perceives coercion arising from his or her relationship with the patient. The danger of such relational coercion is recognized by the transplant community: “If a potential donor chooses to not proceed with the evaluation or donation process, the center may state that the donor did not meet the program’s criteria for donation to help avoid *difficult social situations*” (OPTN 2008a: 2, emphasis added). In other words, transplant centers are encouraged to provide incorrect information about potential donors to avoid the risk of coercion.

The concern about inappropriate advantage may also be raised with respect to relational donation. Those with larger families and more extensive networks of friends have a greater opportunity of finding an appropriate donor. Those with more of these

types of social capital have greater opportunity for finding donors. Although this greater opportunity is generally not viewed by ethicists as an inappropriate advantage, it does remind us of the importance of a broad perspective on wealth in assessing distributional consequences.

Ethical Concerns and Policy Goals

Assessing alternatives to the current prohibition of the commodification of kidneys should take account of the ethical concerns that have been raised. In particular, any alternative should seek to protect human dignity by minimizing exploitation and facilitating altruism and to promote equity by minimizing inappropriate advantage. However, these concerns by themselves are too narrow. A broader perspective, more appropriate for policy analysis, also takes into account the utilitarian goal of obtaining the largest possible value from the available resources. This efficiency goal could be assessed by cost-benefit analysis that monetized all the real resource costs and impacts of alternative policies. As Medicare currently pays for over 80 percent of costs associated with ESRD, and paid over \$24 billion in ESRD-related benefits in 2007, or 5.8 percent of the entire Medicare budget (U.S. Renal Data System 2009), changes in net federal government expenditures serve as a reasonable proxy for real resource costs—they are also politically relevant in this time of fiscal distress. The primary impacts relevant to efficiency are changes in morbidity and longevity, which are conventionally captured in changes in quality-adjusted life years (QALYs). However, as patients who receive transplants from live donors expect to experience 8.9 discounted QALYs as compared to

the 5.4 QALYs for patients on dialysis, an average net gain of 3.5 QALYs (Matas and Schnitzler 2003), the increase in the number of successful live-donor transplants serves as a reasonable proxy for QALY gains.

In summary, a comprehensive comparison of alternatives should take account of human dignity (minimizing exploitation), equity (minimizing inappropriate advantage), efficiency (maximizing number of successful live-donor kidney transplants) and fiscal advantage (minimizing net government expenditures). Rather than privileging any particular goal, good policy analysis considers all the relevant goals and makes explicit tradeoffs among them. It applies the ethical analysis that William T. Bluhm and Robert A. Heineman (2007: 35) call “prudent pragmatism,” which involves “weighing and balancing conflicting values that define hard cases of policy choice” and focusing attention “on the special characteristics of the situation at hand.” This approach recognizes that, even with agreement on the moral assessment of abstract categories, analysis must determine which categories apply to the circumstances at hand.

The Status Quo: Commodification Prohibited

The National Organ Transplantation Act of 1984 (PL 98-507) provides the legal framework for the transplantation of solid organ (kidneys, livers, hearts, pancreases, lungs, and intestines) in the United States. It effectively nationalized donated cadaveric organs. These organs are procured by nonprofit organizations with monopolies over their local areas. The federal government reimburses the costs these organizations bear in indentifying potential cadaveric donors, preparing the donors for organ removal,

removing and transporting the organs, and preparing recipients for receiving transplants. All donated cadaveric organs are allocated according to organ-specific rules developed and implemented by the Organ Procurement and Transplantation Network (OPTN), a chartered entity administered under federal contract by a nonprofit organization, currently the United Network for Organ Sharing (UNOS).

As hearings were being held on the proposed legislation that would eventually become the National Organ Transplantation Act, a controversy arose over a proposal for creation of a market for live kidneys. A physician named H. Barry Jacobs made public his intentions to establish the International Kidney Exchange, which would have allowed healthy people around the world to sell kidneys to those in need of transplants (Healy 2006: 35). An outcry from many professional associations and medical ethicists prompted the bill sponsors to add a provision banning the sale of organs in interstate commerce. Specifically, Section 274e(a) states: “It shall be unlawful for any person to knowingly acquire, receive, or otherwise transfer any human organ for valuable consideration for use in human transplantation if the transfer affects interstate commerce.”

The OPTN did not originally have responsibility for overseeing live donation. However, it became involved in the late-1990s when it approved allocation variances that allowed two organ procurement organizations to experiment with list exchanges, in which live donors whose kidneys were not compatible with their intended recipients could obtain cadaveric kidneys for them in return for a live donation back to the cadaveric pool. These list exchanges fell out of favor for a number of ethical and practical reasons (Ross and Zenios 2004) and have been replaced by paired exchanges in

which the kidney is traded across pairs of incompatible donor-patient dyads. With concerns that these trades might be interpreted as valuable consideration, the OPTN requested, and Congress obliged, in clarifying section Section 274e(a) by adding: “The preceding sentence does not apply with respect to human organ paired donation” (PL 110-144). In 2004 the Department of Health and Human Services directed the OPTN to develop data reporting requirements and guidelines for live donations. The Department subsequently formalized these responsibilities (HHS 2006).

Paired Donation

Paired donation was first proposed over two decades ago as a way to overcome the problem of willing-but-incompatible donors (Rapaport 1986). By the end of 2003, UNOS Region 1 had produced four paired exchanges in New England (Delmonico et al. 2004), and by March of 2004, the Washington Regional Voluntary Living Donor Registry had produced ten in the Washington, D.C., area (Gilbert et al. 2005). Since then, paired donation has drawn wide support and the OPTN (2010a) reports that the number of paired exchanges grew to 304 in 2009. In order to expand the pool of possible exchanges and increase the ability of these programs to make more and better matches, a number of voluntary networks have developed. These networks include nonprofit organizations such as the Paired Donation Network, the Alliance for Paired Donation, and the National Kidney Registry; programs operated by organ procurement organizations, including the New England Program for Kidney Exchange (NEPKE) of the New England Organ Bank, and the Washington Regional Voluntary Living Donor

Registry of the Washington Regional Transplant Community; and certain transplant centers, such as those at Johns Hopkins Hospital and UCLA, that serve as coordination centers for paired donation.

In response to the success of the regional paired exchange programs and the potential for further donor pool expansion, the OPTN has begun developing a national program (OPTN 2008b). The OPTN/UNOS Board of Directors approved a proposal for a national pilot program in June of 2008, the interim implementation of which is scheduled to begin in the fall of 2010 (OPTN n.d.). Four regional networks—the Alliance for Paired Donation, Johns Hopkins Hospital, NEPKE, and UCLA Medical Center/California Pacific Medical Center—will participate in the initial phase, enrolling patients and potential living donors in the pilot exchange program (OPTN 2010b). The pilot program will include two- and three-way exchanges (OPTN 2008b).

Donor Chains

Many transplant programs, including those participating in the national paired donation pilot project, have extended their efforts beyond exchanges among two- and three-way dyads, working also to facilitate non-directed altruistic donor chains. A non-directed altruistic donor chain begins with a non-directed donation to the patient in an incompatible patient/donor dyad. In exchange for the patient receiving the non-directed donation, the willing-but-incompatible donor in the dyad donates to the patient in another incompatible dyad. This process continues until no appropriate incompatible dyads are available, at which point the last willing-but-incompatible donor donates to the cadaveric

pool or functions as a bridge donor, postponing donation until a compatible recipient is available. Figure 2 shows a visual representation of how these chains work. By the end of 2009, the longest chain yet achieved involved 13 transplants (Willingham 2009).

Thus, a single non-directed donation can result in multiple transplants.

INSERT FIGURE 2 ABOUT HERE

Commodification Alternatives

The commodification of kidneys would require legislation either to establish or to permit intermediary organizations to purchase and allocate kidneys. The intermediary organizations would perform two functions. First, they would provide credible assessment of the qualities of the kidneys being offered and their suitability for transplantation into specific patients. Kidneys differ in obvious characteristics such as size, function, and the presence or absence of diseases relevant to graft success. They also differ in a number of characteristics—blood type, genetic antigens, and life-course acquired antigens—that must be assessed for vendors relative to specific patients. Genetic similarity in terms of six human leukocyte antigens can affect graft success. Transplant compatibility, with a few exceptions, follows blood-type compatibility (A to A, B to B, O to A, B, O, and A, B, O to AB). Patients sensitized to life-course-acquired antigens in the vendor kidney are generally precluded from receiving it. Some of these characteristics, such as blood type and genetic antigens, are time-invariant and relatively inexpensive to assess. Other characteristics, such as the presence or absence of diseases and life-course-acquired antigens, can change with time and are relatively more

expensive to assess. Put another way, from an economic perspective, kidneys are very heterogeneous goods.

Second, the intermediaries would be necessary for facilitating the determination of the purchase price and the allocation of purchased kidneys. Even in an unregulated market intermediaries would be needed to facilitate transactions by linking patients to compatible vendors and by holding escrow accounts to make commitments credible. Each of these functions is complicated by the possibility of changes in the vendor, or even in the patient, that could preclude an initially compatible transplant.

We consider specific alternatives for commodification that determine purchase price and allocation in different ways. The Open-Entry Market would regulate brokers who facilitate exchange at market prices between vendors and patients. Cadaveric-Pool Expansion would secure kidneys at administered prices for allocation through the existing cadaveric kidney system. The Demand-Side Chain Auction also would secure kidneys at administered prices but allocate them to the longest transplants chains they could seed. Table 2 summarizes the organizational arrangements, allocation method, and price determination for each of the three commodification alternatives.

INSERT TABLE 2 ABOUT HERE

Open-Entry Market

Markets determine prices and allocation through the interaction of supply and demand. Under the Open-Entry Market, patients would bid for kidneys offered by vendors through intermediary organizations that would serve as brokers. Legislation would create the legal framework for the duties of the intermediaries to patients and

vendors in terms of disclosure and confidentiality of information, liability for harm to patients or vendors, and transparency.

Specifically, we propose the following: First, either for-profit firms or non-profit organizations could enter the market and participate on a fee-for-service basis. Second, participating organizations would have responsibility for fully disclosing the medically-relevant characteristics of kidneys offered by vendors. Third, they would have responsibility for fully informing potential vendors of all the costs and risks that they would bear and the payments that they would receive. Fourth, they would be required to protect the anonymity of patients and vendors by restricting the release of information not needed specifically for medical purposes related to transplantation. Fifth, they would be required to make public on a timely basis the prices paid to vendors to facilitate competition. Sixth, they would have to make public the screening rules they apply in determining how far to evaluate potential vendors. Seventh, the organizations and their chief executive officers would have liability for failure to discharge these responsibilities and requirements.

Although the intermediaries could conduct their own evaluations of potential vendors, it is likely that they would contract this work out to existing transplant centers, which follow professional guidelines established by the OPTN. The evaluation costs would be paid by intermediaries out of the commissions they charged patients based on bids that resulted in extracted kidneys.

In addition to these features, a full description of the Open-Entry Market would require the specification of other individual and interorganizational property rights

(Vining and Weimer 1998). The following four features are most relevant for purposes of prediction and assessment. First, the intermediary would be prohibited from imposing any cost, such as charges for evaluation or pre-transplant preparation, on vendors who withdraw from the process. In other words, those who at some point agree to sell kidneys would have the right to decide not to do so at any time without financial penalty—at no point would kidneys be removed without current consent. Second, the intermediary would have responsibility for arranging for annual medical examinations of vendors who provide kidneys and for submitting data on the health of these vendors on a regular basis to the Scientific Registry of Transplant Recipients, which has begun to collect data on live donors. The intermediary would be required either to provide funds for these tasks in escrow or to arrange for these tasks to be carried out by a transplant center under a long-term contract. Third, as is now the case for live donors, vendors would receive additional points toward priority for cadaveric kidneys in the event that their remaining kidney fails. Fourth, vendors would be given the option of directing payments to qualified charitable organizations. Thus, a vendor could participate in the exchange on a purely altruistic basis. Although we do not restate these features, we propose them as components of the other two commodification alternatives as well.

Cadaveric-Pool Expansion

Unlinking demand and supply requires methods for setting prices and allocating supply administratively. Cadaveric-Pool Expansion would create an organization to carry out these tasks. Specifically, it would have the following features: First, it would

be a legislatively chartered non-profit organization with a monopoly over the purchase of live-vendor kidneys. Second, as with the open entry option, it would have responsibility for ensuring the anonymity and privacy of patients and vendors, for fully informing patients about the characteristics of offered kidneys and vendors about costs, risks, and payments, and for specifying screening rules. Third, it would set purchase prices and allocate procured kidneys according to legislatively specified rules. Fourth, it would be funded through a start-up grant and then through a fee on facilitated transplantations. Fifth, it would be overseen by either the Department of Health and Human Services or its designee, such as the OPTN.

Medicare, as the primary insurer for ESRD patients in the United States, would continue to pay for all costs associated with ESRD treatment, including donor evaluation, surgery, reimbursement costs, post-operative care, and the purchase price paid to vendors. The purchase price would be determined primarily as a function of net savings to the federal government. The Centers for Medicare and Medicaid Services (CMS) would annually determine the financial break-even price that Medicare could pay for a live-vendor kidney transplant for a patient who would otherwise remain on dialysis. That is, how much could vendors be paid so that in an expected value sense the present value of federal net expenditures would be zero. Under this alternative, the break-even price would be based on displacing a single patient from dialysis.

Purchased kidneys would be allocated according to the rules for cadaveric kidneys; that is, they would be added to the cadaveric kidney pool. (See Table 3 for a summary of the cadaveric allocation system.) For allocation purposes, the purchased kidneys would be treated as originating in the locale of the transplant center that

evaluated the vendor. This is consistent with the recent recommendation of the OPTN Living Donor Committee for placement of non-directed living donor kidneys (OPTN 2010c) and it would create an incentive for transplant centers to identify potential vendors.

INSERT TABLE 3 ABOUT HERE

Demand-Side Chain Auction

The Demand-Side Chain Auction would use the same organizational arrangement as the Cadaveric-Pool Expansion, creating the kidney exchange (KEX). It would also employ the same fiscally based rule; however, because it would employ an allocation system that would typically result in multiple additional transplants per vendor, it would set higher purchase prices based on the assumption of two transplants per vendor kidney that would share some of the fiscal gains with vendors. These prices would be adjusted on an annual basis to update predictions about how many transplants on average will result from a single vendor kidney.

Allocation would involve an “auction” among transplant centers in which the currency for bidding is the number of transplants that would result if the kidney were used to seed a chain. The process would operate as follows: First, the transplant center that identifies a potential vendor would submit the kidney characteristics to the KEX. Second, the KEX would post information about the availability of the kidney to participating transplant centers. Third, transplant centers with compatible waitlist patients with willing-but-incompatible donors would bid for the kidney to create single or multiple paired-exchanges. Fourth, the KEX would allocate the kidney based on the

length of the transplant chain the kidney could initiate. Fifth, the last donor in an incompatible dyad in the chain would donate to the cadaveric pool. If two transplant centers were to propose chains of equal length, then the KEX would break the tie based on the sum of sensitivity levels of the patients in the chains. That is, the transplant center whose patients in the chain have the highest sum of calculated panel reactive antibody percentages would win the auction. Remaining ties would be broken by total waiting time of patients in the chain.

Assessment of Alternatives

As summarized in Table 4, we next discuss each alternative in terms of the goals previously set out as important: human dignity, equity, efficiency, and fiscal advantage.

INSERT TABLE 4 ABOUT HERE

Status Quo: Commodification Prohibited

By prohibiting commodification and providing a check against relational coercion, the status quo protects the human dignity of potential live kidney donors in the United States by largely preventing their exploitation. However, review of data on departures from the U.S. kidney waiting list suggest that from 1987 through 2006 over 335 Americans traveled overseas to obtain kidney transplants with the annual number increasing substantially over the last decade (Merion et al. 2008; Budiani-Saberia and Delmonico 2008). Transplant “tourists” often pay brokers between \$15,000 and

\$150,000 for transplant packages. Of this, approximately \$1,000 to \$5,000 might go to the organ vendor, who may be coerced by the broker or be provided with inadequate information regarding the possible physical consequences (Jafar 2009). Most of these cases of transplant tourism have involved the removal of kidneys either from impoverished live vendors or, in the case of the People's Republic of China, the most popular destination, kidneys from recently executed prisoners during this period. Thus, although the status quo prevents exploitation within the United States, it induces some exploitation in other countries.

As noted in the discussion of ethical perspectives, many ethicists argue that by promoting altruism in organ donation the status quo contributes to human dignity. Some others have objected that the restriction on vending organs interferes with autonomy and therefore undercuts human dignity. The Task Force on Organ Transplantation (1986), which was charged by Congress to help develop the initial policies for the OPTN, took an extreme position with respect to cadaveric donation—it opposed creation of a national list of those who express their intention to donate upon death in favor of giving families an opportunity for an altruistic act by not harvesting organs without consent of next-of-kin. Many states have since passed laws that require organ procurement organizations to respect autonomy by honoring the expressed wishes of the deceased with respect to donation.

The allocation of cadaveric kidneys is equitable in that it is based on an objective set of justifiable criteria that are systematically applied. However, opportunities for unfair advantage arise in three ways. First, the local priority in allocation gives the very wealthy an opportunity to increase their chances of receiving a transplant by bearing the

travel and other costs incurred in entering multiple local waiting lists. For example, in mid-year 2010, there were almost six thousand more registrations than candidates on the waiting list. Second, because priority depends on waiting time, wealthier and more educated patients, who are more likely to be listed when they begin dialysis, have an advantage over patients who are not proactive in getting their names on the waiting list. Third, the weight placed on genetic antigen matching tends to disadvantage minorities, especially African Americans, who are less likely to have matches within the donor pool. With the accumulation of evidence that improvements in immunosuppression reduced the value of partial antigen matching in graft success, the OPTN put less weight on antigen matching in revisions to the allocation system in 1994 and 2002 (Weimer 2010).

Access to potential live donors tends to give advantage to those who are younger, because they are more likely to have living relatives and perhaps because they are more sympathetic, and to those with greater social capital. Within the current system, live donation depends primarily on the relationship between the patient and the donor so these disparities in access are inherent. Of course, those who are successful in securing live donations increase the chances that others of the waiting list will receive cadaveric kidneys.

Although since 2005 the OPTN (2008c) has been developing a new kidney allocation system that would base allocation heavily on gains in QALYs, the current cadaveric kidney system has features that promote efficiency, as measured by the maximization of QALYs, only indirectly. Most importantly, there is priority for pediatric patients who, other things equal, have longer life expectancies. (Pediatric patients also have poorer prospects from dialysis than adults, further increasing the quality-adjusted

life years they can be expected to gain.) The weight placed on antigen matching contributes somewhat to efficiency by increasing the probability of graft success so fewer kidneys are wasted in transplantation failures. The local priority in allocation contributes to supply efficiency by creating a strong incentive for transplant centers to invest in organ procurement—kidneys they procure are likely to go their own patients. However, the weight placed on waiting time tends to allocate kidneys to sicker patients who are likely to have smaller potential gains in QALYs.

The live donor transplant system suffers from inefficiency in the sense that many patients with willing-but-incompatible donors do not receive transplants. Efforts to promote paired and chain donations should help reduce this inefficiency somewhat as they facilitate more exchanges by expanding the pool of potential participants. However, a limiting factor is likely to be the number of non-directed altruistic donors, which is unlikely to increase dramatically.

The average fiscal savings from each kidney transplant are substantial. Arthur Matas and Mark Schnitzler (2003) estimated that on average each live kidney transplant saves the federal ESRD Program over \$95 thousand (US 2002 dollars) or, conservatively using the consumer price index, over \$114 thousand in current (2010) dollars. Thus, the fiscal advantage of achieving more live donor kidney transplants is substantial.

Open-Entry Market

Even with the vendor protections in place concerning disclosure of information, the Open-Entry Market would pose some threat to human dignity through the risk of

exploitation of the financially desperate. Brokers would have an incentive to purchase kidneys at the lowest possible price, which would tend to be relatively attractive to potential vendors of limited means. The brokers, especially for-profit entities, would also have a strong incentive to recruit vendors, perhaps adding to the risk of exploitation. Also, the linking of specific buyers to sellers would create a strong incentive to press potential vendors with rare but demanded characteristics. Although within the limits of available data there do not appear to be substantial long-term risks to live donors (Gossmann et al. 2005), there may be post-operative pain that extends a number of weeks and requires analgesics (Clarke et al. 2006).

The Open-Entry Market would almost certainly reduce the number of U.S. residents who engage in transplant tourism. Obtaining a kidney in the domestic market would reduce transaction costs in arranging for a kidney and verifying its quality. It would also allow the patient to have the transplant done at a regulated center that would provide the full range of pre- and post-transplant services. As the interests of vendors, including protection against coercion, are likely to be stronger in the regulated domestic market than in the developing countries that now provide kidneys to transplant tourists, the net impact on vendors as human beings may actually be small.

Would commodification undercut live donations to family or friends? In a recent survey of Philadelphia-area public transit users, researchers found many of the ethical concerns surrounding financial incentives for kidney donation to be unsupported (Halpern et al. 2010). To measure the effect of payment on willingness-to-donate, they asked respondents to express their willingness-to-donate across scenarios in which they varied risk for donor kidney failure, payment amount for kidney, and type of recipient.

Although the study showed that the percentage of respondents willing to act as non-directed donors increased significantly as payment increased, there was no statistically significant difference between respondents' willingness to donate to a family member with payment versus without. Moreover, there was no statistical interaction noted between payment and risk or payment and income, suggesting "that payment is neither an undue nor an unjust inducement..." and does not influence "willingness to donate for altruistic reasons" (ibid. 358).

Participating in the market would require wealth. The higher the equilibrium prices that result, the wealthier one would have to be to obtain a kidney from a vendor. Further, wealthier patients would be able to bid for higher quality kidneys from younger vendors. Although access to much health care in the United States depends on wealth, this is precisely the inappropriate advantage raised by opponents of commodification.

As kidneys would go to those patients with the highest willingness-to-pay and be supplied by vendors with the lowest willingness-to-accept, the Open-Entry Market would achieve efficiency, as understood in welfare economics. For any fixed supply of vendor kidneys, this allocation would not necessarily maximize the number of QALYs gained—some kidneys would likely go to wealthy buyers who received small morbidity or longevity gains, while others might produce large gains by facilitating transplants before the patient begins dialysis. A small positive externality would also result because some patients who otherwise would have qualified for cadaveric transplants would forgo them in favor of purchasing from vendors.

Each transplant resulting from vendor purchases would provide a substantial reduction in costs for the ESRD Program. As already noted, the savings would be on the order of \$115,000 per transplant. Thus, the greater the volume of transaction in the Open-Entry Market, the larger the fiscal advantage produced.

Cadaveric-Pool Expansion

As with a market-determined price, the administered price offered under Cadaveric-Pool Expansion would pose some threat to human dignity through the risk of exploitation of the financially desperate. However, the nonprofit intermediary would not have as strong an incentive to recruit vendors as competitive brokers so the risks of exploitation would likely be lower than for the Open-Entry Market. However, unlike the Open-Entry Market, Cadaveric-Pool Expansion would not have a direct effect on transplant tourism, and therefore would not reduce exploitation in developing countries.

As the kidneys from vendors would be added to the cadaveric pool for allocation according to existing rules, there would be no inappropriate advantage beyond that inherent in the current system.

The number of additional transplants that would be produced by Cadaveric-Pool Expansion is unclear. The number of vendors providing kidneys would depend on the purchase price offered. Although the average fiscal savings per live donation transplant, \$115,000 serves as an upper bound on price under the requirement of fiscal neutrality, the lower bound is less clear for several reasons. First, it is not clear how many potential vendors would have to be evaluated to produce an actual exchange. The OPTN Living

Donor Committee estimates these costs to be between \$15 and \$25 thousand for a full evaluation through donation (OPTN 2010c). Although plausible screening protocols would likely rule out many potential vendors without bearing the costs of a full evaluation, having to review many potential vendors to realize a transplant would substantially reduce the fiscally neutral price. Second, the average operating cost of the intermediary per realized transplant would also have to be covered from the fiscal savings, further reducing the fiscally-neutral price. Nonetheless, it is plausible that the price paid to vendors would be around \$50 thousand dollars, which would likely elicit supply. The survey of Philadelphia commuters seems to support this hypothesis—approximately 30 and 49 percent of respondents would be willing to donate to unidentified waiting list patients in exchange for payments of \$10 thousand and \$100,000, respectively, compared to 17 percent of those receiving no payment (Halpern et al. 2010). Although these survey responses probably overstate actual willingness to become a vendor, they do suggest that there are many people who would at least consider doing so.

As the pricing rule is set to achieve fiscal neutrality, Cadaveric-Pool Expansion would not provide a fiscal advantage relative to the status quo.

Demand-Side Chain Auction

In terms of human dignity, the Demand-Side Chain Auction would have the same impacts as Cadaveric-Pool Expansion. It would involve somewhat less risk of

exploitation than the Open-Entry Market but it would have no direct impact on transplant tourism.

The Demand-Side Chain Auction would not involve inappropriate advantage beyond that in the status quo. Each chain would ultimately provide a kidney to the cadaveric kidney pool. However, as is currently the case, those who can find willing but inappropriate donors would enjoy an advantage in access.

The Demand-Side Chain Auction would potentially provide a very large gain in efficiency in terms of increased QALYs. Each vendor kidney would produce at least one, and possibly many more, chain exchanges beyond the addition to the cadaveric pool. This dual gain, an additional transplant for those waiting for a cadaveric kidney and at least one transplant for those with willing-but-incompatible donors, would allow for a substantially higher price than would be possible under Cadaveric-Pool Expansion.

The pricing would involve a tradeoff between the supply of vendor kidneys and fiscal advantage. It is reasonable to predict that the bidding process would lead to chains that were on average substantially longer than one dyad, so that even if the purchase price were set to break even fiscally for two additional transplants (one in the cadaveric pool and one in the chain), there would likely be substantial fiscal advantage.

Balance of Impacts

Policy analysis inevitably involves weighing the impacts of imperfect alternatives in terms of multiple and competing goals. In some situations an argument can be made

for the importance of achieving one of the goals over all others. For example, constitutionality almost always is treated as a goal that must be achieved. In most situations, however, a prudential approach that compares tradeoffs among the goals is most desirable. Although many participants in the ethical debate over direct commodification, that is, monetization, of kidneys reject it out of hand, we believe that it is worth considering explicitly the values, including gains in longevity and improvements in the quality of life, that are forgone with outright rejection.

Compared to the Status Quo, each of the commodification alternatives grants legal autonomy to potential vendors over the alienation of one part of their bodies but also risks exploitation of the domestic poor. The two alternatives involving administered prices by a chartered nonprofit organization, Cadaveric-Pool Expansion and the Demand-Side Chain Auction, would likely pose less risk of exploitation than the Open-Entry Market for two reasons. First, the intermediary would have weaker organizational incentives to complete transactions. Second, because it is not securing kidneys for particular patients, they would have less incentive to pursue any vendor with particular characteristics.

The complete assessment of exploitation, however, involves an interesting issue of standing. In addition to posing a risk of exploitation to the domestic poor, the Open-Entry Market would also likely substantially reduce transplant tourism, which poses a very real risk to the poor in developing countries, possibly reducing the aggregate exploitation of the poor by U.S. residents. The other two commodification alternatives would contribute only very indirectly to reductions in exploitation from transplant tourism through increasing the domestic supply of kidneys generally available.

Although it is possible that the commodification alternatives could undercut altruistic donation, the little survey evidence available suggests the effect is likely to be small. To the extent that perceptions of fairness in allocation are relevant, the administered price alternatives would be less likely to depress altruistic donation than the Open-Entry Market.

Indeed, one of the major drawbacks of the Open-Entry Market is that many would perceive it as giving an inappropriate advantage to the wealthy. Relative to the Status Quo, it provides a much greater opportunity for the wealthy to obtain access to transplants on a timely basis. Offsetting this advantage is the gain to those on the waiting list that results from the removal of those with higher priority who purchase vendor kidneys. Nonetheless, explicitly privileging the wealthy in access to this scarce medical resource reduces the desirability of the Open-Entry Market.

All of the commodification alternatives offer efficiency gains relative to the status quo. The Open-Entry Market and Cadaveric-Pool Expansion produce an additional transplant, with its expected gains in quality-adjusted life years, for each kidney provided by a vendor. Within a traditional welfare economics framework, transactions within the Open-Entry Market would yield the most efficient allocation of these kidneys because they would go to the patient with the highest willingness-to-pay. Nonetheless, much larger efficiency gains are offered by the Demand-Side Chain Auction—each purchased kidney would result in at least two transplants, and most likely more. It would create a strong incentive to accelerate efforts currently underway to create chains.

Cadaveric-Pool Expansion would offer no fiscal advantage over the Status Quo. The Open-Entry Market would provide fiscal benefits on the order of \$100 thousand for each transplant it produces. The Demand-Side Chain Auction, because offers at least two transplants from each purchase would provide fiscal advantage even at prices on the order of \$100 thousand. With four and five transplant chains, the fiscal advantage per vendor kidney would still be substantial.

Overall, we believe that the efficiency and fiscal advantage gains offered by the Demand-Side Chain Auction make it the most desirable of the commodification alternatives. Further, as we see it as posing only a small risk of exploitation of the poor and little threat to altruistic donation, we do not view it as a substantial risk to human dignity. Although it would advantage those who have more social capital, and therefore greater opportunity to join chains, it would also add to the cadaveric kidney pool so that overall it offers reasonable equity.

Conclusion

Kidney transplantation improves the lives of those suffering from ESRD. It is limited by the availability of kidneys for transplantation. The prospects for increasing the supply of cadaveric kidneys are very limited and certainly inadequate for keeping pace with the growing number of people waiting for transplants. Expanding the number of kidneys donated by the living through commodification deserves consideration.

Unfortunately, much of the ethical debate about commodification has not been specific about the institutional arrangements for implementing it. We hope to contribute to this debate by explicitly separating the supply- and demand-side concerns. Doing so makes clear that the actual consequences of commodification do fundamentally depend on the specifics. Although markets are the most natural way to think about commodification, especially as they solve the pricing and allocation problems by directly linking supply and demand, other institutional arrangements are possible.

We also hope to make a contribution to policy design by identifying a particularly attractive way to allocate kidneys purchased from vendors at an administered price. Specifically, using purchased kidneys to augment the supply of non-directed altruistic donations available for seeding chain exchanges offers multiple transplants per purchased kidney. This leverage not only would facilitate more transplants but also reduce the overall cost of the federal ESRD Program.

Our consideration of commodification illustrates a general approach to policy analysis that seeks a move beyond ethical debates that focus on single values. We do so by identifying relevant goals, proposing specific alternatives, and comparing the alternatives in terms of the goals. Whether or not readers accept our conclusion, we hope the analysis makes clearer the tradeoffs involved in making an informed choice about commodification.

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Table 1
Framework for Analyzing Ethical Concerns about Kidney Exchange

		Organ Recipient or Agent (Demand Side)	
		Supplication	Purchase
Organ Provider or Agent (Supply Side)	Donation	(Altruism) Relational coercion	(Allocation by Payment) Commodification; Inappropriate advantage
	Sale (Vendor)	(Monetary Solicitation) Commodification; Exploitation	(Market) Commodification; Exploitation; Inappropriate advantage

Source: Authors.

Table 2

**A Summary of Alternative Policies for Kidney Procurement and Allocation
(Live Donors)**

	Policy Alternatives			
	Status Quo (Commodification Prohibited)	Open-Entry Market	Cadaveric-Pool Expansion	Demand-Side Chain Auction
Organizational Arrangement	Nonprofit under federal contract (OPTN)	Firms and nonprofits serve as brokers	Nonprofit under federal contract; apply price rule	Nonprofit under federal contract; apply price rule and administer chain bids
Allocation Method	Cadaveric by rule; live at donor direction	Allocate to highest compatible bidder	Add purchases to cadaveric pool	Allocate to transplant center offering longest seeded chain
Purchase Price Determination	Prohibited (altruistic donation only)	Set through bidding	Set according to fiscally-based rule	Set according to fiscally-based rule

Source: Authors.

Table 3
Allocation Rules for Kidneys from Standard Criteria Cadaveric Donors¹

Mandatory National Sharing	
0 mismatches with the two antigens at each of the HLA-A, HLA-B, and HLA-DR loci (six antigens)	Shared nationally with patient with the largest number of allocation points
Geographically-Based Allocation	
Allocation Points: Kidney offered first to patients in centers associated with the local organ procurement organization within blood group based on number of points; if not accepted by local patient, then the kidney is offered to regional patients within blood group based on points; if not accepted by a regional patient, then the kidney is offered to national patients within blood group based on points. Kidneys not allocated locally must be repaid in the future by the receiving organ procurement organization (so-called payback).	
Trait	Allocation Points
0 HLA-DR mismatches	2
1 HLA-DR mismatch	1
Sensitization (PRA \geq 0.80) ²	4
Patient prior organ donor	4
Longest waiting time for blood type ³	1
Each year waiting	1
Patient between ages 11-18 ⁴	3
Patient under age 11 ^d	4

Source: Adapted from David L. Weimer (2010) *Medical Governance: Values, Expertise and Interests in Organ Transplantation* (Washington, DC: Georgetown University Press), Table 6.2, p. 109.

¹ Standard criteria donors either are younger than 50 years old or aged between 50 and 59 years and meet certain health requirements. All other donors are considered extended criteria donors. Patients may opt to join local waiting lists for extended criteria kidneys that are allocated based on time on the waiting list. There is no payback for extended criteria kidneys that are shared beyond the local area.

² Assumes that donor and potential recipient have negative cross-match; that is, they are compatible. PRA is an estimate of the fraction of potential donor kidneys that would be incompatible with the patient.

³ Of the waitlist patients with a given blood type, the one who has been waiting the longest receives a full point, while those with shorter waiting times receive fractions of points. If 20 patients were waiting for a blood type-B kidney, for example, then the patient with the fifth-longest wait time would be awarded 0.80 points.

⁴ For kidneys from donors under age 35, pediatric candidates have priority over all others except those who receive four points for high sensitization.