

40 | MARKET FOR KIDNEYS

Purpose: To show the effects of government rules that govern the market for kidneys for transplant, and how a freer market might affect outcomes.

Computer file: **transplant.xls** or **transplant_mac.xlsm**

Instructions and background information:

We use the concepts of producer and consumer surplus, adapted to deal with a hypothetical market for transplanted kidneys, to understand how current government policies affect the market. We then explore the implications of changes in the current policies to see what the welfare consequences might be. Who gains from some hypothesized policy alternatives, and by how much? Who are the losers, if any, and what are the costs?

Current U.S. laws make it a crime to buy and sell kidneys for transplant. The two main sources of transplanted kidneys, therefore, are donated kidneys from a live donor, usually from a friend or relative, and kidneys from cadavers that are harvested with the prior permission of the deceased person, or with the permission of relatives. Notice that while live donor transplantation works for kidneys, it doesn't work for all organs, for the simple reason that people are usually born with two kidneys, but they can get along fine with just one.

Economists analyze the effects of the current legal arrangements by using a standard supply and demand model, applied in this case to the buying and selling of kidneys. When they couple the supply and demand model with the ideas of consumer and producer surplus, they can then measure, at least in principle, the social welfare consequences of our current policies on trading kidneys, and what the result of changing those policies might be.

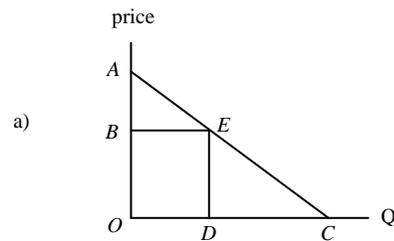
Most economists don't see any special problems with applying the supply and demand model to transplanted kidneys. The basic model, they claim, is appropriate. That is not to say that most economists believe the kidney market should be completely unregulated, but that the regulations that may be needed don't destroy the integrity of the arguments that underlie using the model. For example, we wouldn't expect lay people to understand all of the medical risks in donating or selling a kidney, but that problem might be overcome by setting up a system of "informed consent" not unlike what already exists for other medical procedures.

Nor would we expect the transplant recipient to be able to judge the quality of a kidney that will be transplanted. Few if any people needing a kidney would want one from a person suffering from kidney disease, or from HIV. Yet discovering whether a kidney is healthy or not is hard and expensive to determine, and so we might want regulations and procedures to protect us.

With all that said, let's take a look at a hypothetical market for kidneys for transplant. On the demand side we have people who must replace failed or failing kidneys. In the U.S. that's about 70,000 people a year. The demand curve for these kidneys, showing the number of kidneys demanded at each price, would be negatively sloped. At higher prices, fewer kidneys would be demanded.

The supply curve for kidneys would show the number of kidneys willing to be provided at each price of kidneys. The curve will generally be positively sloped, suggesting that at higher prices more prospective donors will step forward to sell their kidneys. A special aspect of kidney supply is that some kidneys are donated for free – they are part of the market supply even at a zero price. In the U.S. in recent years, the total number of free kidneys has been about 20,000 per year.

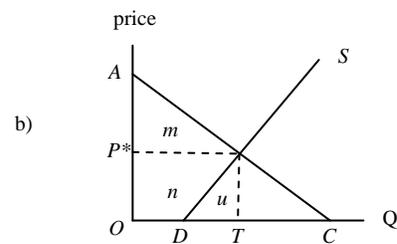
Diagram a) at the right shows a demand curve for kidneys. The distance OC is the current demand for kidneys, and corresponds to the approximately 70,000 transplants needed. The distance OA is the maximum amount anyone would be willing to pay for a transplant.



One way to think about the demand curve for kidneys is to imagine arranging all of the people who need transplants in order, from the highest value recipient to the lowest. The people who place a lower value on receiving a transplant lie lower down on the demand curve – they're willing and able to spend less than people who value a transplant more highly.

If OD is the current number of kidneys donated, then the total maximum value of transplanted kidneys is the sum of the areas ABE (a triangle) and $OBED$ (a rectangle). This is the maximum amount willing to be paid by those recipients who placed the highest value on getting a transplant. Notice that the actual value (willingness to pay) for the current supply of kidneys will very likely be less than the area in the diagram. This is because under the current rules for transplanting kidneys – these rules are usually called protocols – many kidneys are provided to people whose willingness to pay puts them lower down on the demand curve than the section denoted by AE . The protocols typically specify, for example, that people over the age of 70 will not receive transplants, even if someone is willing to donate one. And that rule holds even if the person is willing to pay more than anyone else for a kidney. You can see the potential here for a black market to develop. In fact, such a market exists that enables people to buy transplants, often outside the U.S.

Diagram b) at the right shows a supply curve for transplants. The distance OD , corresponding to OD in diagram a), is the current supply of kidney transplants. At a price greater than zero, some people are willing to sell a kidney, and the positive slope of the supply curve shows that at higher prices more kidneys are forthcoming.



If kidneys are sold in a market, then the equilibrium price would be P^* , as shown in the diagram, and the number of kidneys transplanted would be T .

The recipients' surplus would be area m . This is the result of taking the difference between the total value of kidneys ($m+n+u$) and the cost of those kidneys in the market ($n+u$).

What about the sellers of kidneys? If all of the kidneys in the market are the result of sales at an equilibrium price P^* , then the sellers' surplus will be the area n . This is the difference between the revenues from kidney sales ($n+u$, or price times quantity), and the opportunity cost of the kidneys supplied, which is area u .

The recipient and donor surplus under the market allocation scheme is definitely larger than under the government system of allowing only voluntary donations. If we are prepared to allow the market allocation scheme to include voluntary kidney donations (at a zero price), then we can make an even stronger statement: That the social welfare from the market in kidneys is increased compared to the current legal system that bans sale of organs.

You might reasonably ask why, if the questions are this simple, doesn't the government repeal its current restrictions and just allow the market to work, perhaps subject to the testing and informed consent restrictions mentioned above? There seem to be two kinds of arguments against allowing the free market. The first is that prospective donors are in some sense being unfairly exploited ("Only the poor will choose to sell their organs."). Another is that people shouldn't be allowed to sell certain things, that this would be immoral. There are readings in this section of the course that take up each of these issues.

Open the file **transplant.xls**. What you see are demand and supply curves for kidneys for transplants in a hypothetical market. You're asked to compute the values of the concepts just introduced: The value of the organs to recipients, the cost to sellers, and the donor (producer) and recipient (consumer) surplus. As with most economic ideas, it's more important to understand the concept than to know how to compute it. But being able to compute the values will give you confidence in using the concepts when you need them, and also illustrate the practical importance of the ideas for public policy.

Here are some things to watch for and learn as you do the problems:

- 1) Having a market in kidneys will always increase the amount of total surplus which is the addition to social welfare from transplanting kidneys.
- 2) The ability of people to donate kidneys for free, even if the market were allowed to operate makes the analysis a little tricky, but the final result still holds. The market will outperform a system of quotas.

Here are some hints to help you get the answers quicker:

- 1) Note that many of the answers ask for values in "millions of dollars." This means that if a calculated answer comes out to be \$20,000,000., then in the answer sheet you need to enter \$20.
- 2) You'll need a calculator to do the computations. The area of a right triangle is $(1/2) \times \text{base} \times \text{height}$.
- 3) Draw a sketch of the graphs on a piece of scrap paper, and label the crucial points by referring to the worksheet display of the graph. You'll need to know where the supply and demand curves intersect the price axis. Set quantity to zero to find these numbers.
- 4) Use Goal Seek whenever it's appropriate – don't estimate using the mouse pointer! For question 2) you'll need to find the number of kidneys that are donated by volunteers. Use Goal Seek to find the value of quantity that makes the supply price equal to zero by changing quantity. Be sure to set the starting quantity to be greater than the amount where the supply curve crosses the quantity axis. Otherwise Goal Seek may become confused by the kink in the supply curve.

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Questions

- 1) Set all variables to their baseline values. Using Goal Seek, how many kidney transplants are demanded when the government bans the purchase and sale of kidneys?
[Hint: Use Goal Seek to find the demand for kidneys when price is zero.]
- 2) Set all variables to their baseline values. In the case where the government bans the purchase and sale of kidneys, how many kidneys are donated?
- 3A) Think for a bit about the kidneys that are donated under the current government policy that bans purchase and sale. Those kidneys may or may not be matched to the recipients who value them most highly. (Go on to question 3B.)
- 3B) What's the maximum amount the recipient who is willing to pay the most would pay for a kidney? [Hint: This is the intercept of the demand curve on the price axis.]
- 4) Assume, for the sake of argument, that the currently donated organs do actually end up with the recipients who value them most highly. What's the recipients' (buyers') price when the current number of donations are made?
- 5A) Continuing on from question 4, assume that all of the donated kidneys find their way to the recipients who value them most highly (which is not the way the world really works). Go on to Question 5B.
- 5B) What is the recipients' total surplus in millions of dollars?
[Hint: Be sure to get the units of measurement (millions of dollars) correct here.]
- 6) Set all variables to their baseline values. If a free market in kidneys was set up as the only way in which they are distributed, what would be the equilibrium price for kidneys?
- 7) At the market equilibrium price of kidneys, how many kidneys would be transplanted?
- 8) At the market equilibrium quantity of kidneys, what is the total value to recipients in millions of dollars?
[Hint: This is the total amount recipients would be willing to pay. Be sure to get the units correct (millions).]
- 9) If all kidneys need to be purchased on the market (no free donations allowed), what is the cost to recipients of the equilibrium quantity of kidneys in millions of dollars?
- 10) In the free market for kidneys, what is the amount of consumer (transplant recipient) surplus in millions of dollars?

- 11) In the free market for kidneys, what are the total receipts of kidney sellers from the sales of their organs in millions of dollars? [Hint: No free donations of kidneys are allowed at this point.]
- 12) What is the (opportunity cost) to kidney sellers in millions of dollars?
- 13) What is the producers' surplus from the sale of kidneys in millions of dollars?
- 14) Compared to the situation in which purchase and sale of kidneys is banned, what is the total surplus, in millions of dollars, from allowing a market in kidneys?
- 15A) The important idea now is to understand the GAIN in surplus or welfare that can come from a free market in kidneys, compared to the case where sales are banned. This question asks you to make that calculation. [Go on to question 15B.]
- 15B) Compared to the situation in which only donated kidneys are transplanted, what's the gain in surplus, in millions of dollars, from having a free market in kidneys? [Hint: Refer to the answer to question 5B.]