Content Articles in Economics

In this section, the *Journal of Economic Education* publishes articles concerned with substantive issues, new ideas, and research findings in economics that may influence or can be incorporated into the teaching of economics.

HIRSCHEL KASPER, Section Editor

Identifying Voucher Plans without Welfare Losses

Raymond Jackson

The traditional doctrine in the economics of consumer choice and public policy is that income transfers are more efficient in raising individual utility than a price subsidy of equal cost. A similar impression is often unintentionally conveyed to students concerning the use of vouchers or in-kind transfers—the increase in individual utility derived from a voucher or in-kind gift can be attained by a lower cost transfer of income (Browning and Browning 1989; Frank 1997; Mansfield 1994; Salvatore 1986; Sexton 1995; Stiglitz 1988). The indifference curve analysis, always applied to food stamps, shows that a cash grant of equal cost allows the consumer to reach a higher utility level. Although the possibility of the equivalency of cash grants and vouchers is often mentioned in passing, the conditions for this outcome are not explicitly stated, and students are apt to conclude that, in general, any reasonable public policy based on vouchers is inferior to one relying on cash grants.

Because vouchers are a major feature of public policy regarding food and housing and may soon emerge as critical components in programs attempting to improve the quality of primary and secondary education and the availability of medical insurance, the advantages as well as the limitations of voucher programs must be examined carefully. Frequently, the efficiency case against vouchers in a comparison with income transfers is either incorrectly stated or overstated. This misconception results from textbook authors relying almost exclusively on a graphical analysis to show the superiority of income transfers. In this article, I clarify the debate by deriving the very accessible algebraic relations under which

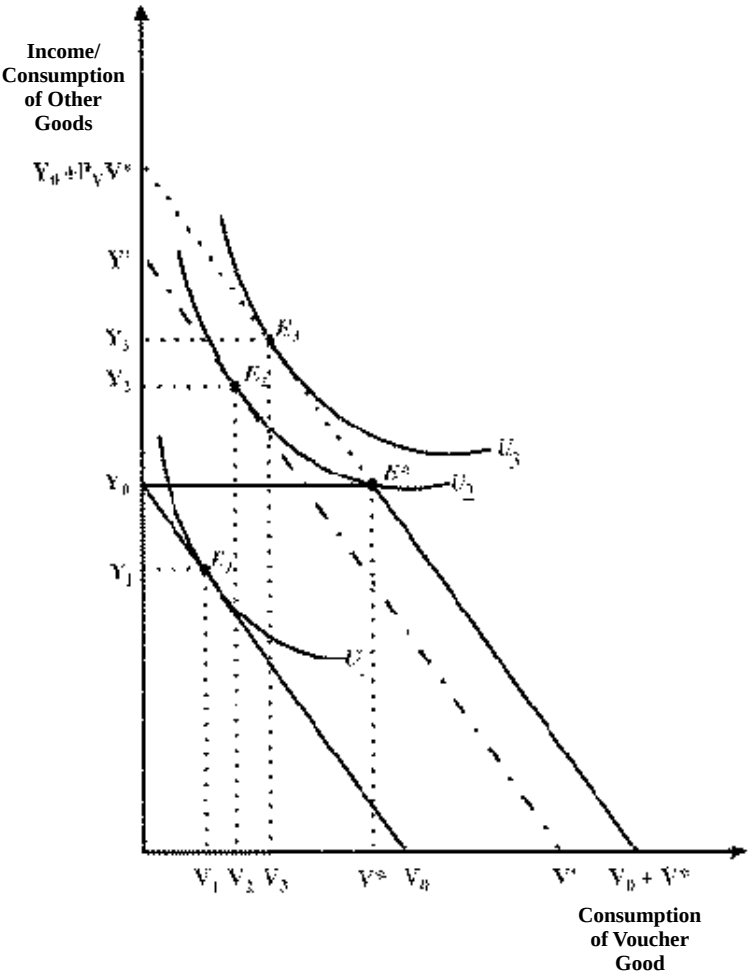
Raymond Jackson *is a professor of finance at the University of Massachusetts–Dartmouth (e-mail: rjackson@umassd.edu).* *The author is grateful for the constructive comments of the associate editor and anonymous referees.*

a voucher is equivalent to an income transfer and generates no welfare loss and also when the conventional view of the superiority of income transfers holds.

VOUCHERS AND WELFARE LOSSES: THE GRAPHICAL ANALYSIS

A variation of the widely adopted graphical depiction of the welfare loss associated with vouchers is shown in Figure 1. The voucher good V is on the horizontal axis, and the vertical axis can be interpreted either as the expenditure on all other goods or as income Y. The consumer's initial budget constraint, determined by her or his income Y_0 and the voucher good's market price P_V, is shown

FIGURE 1
Welfare Loss from Voucher when $V^* > V_1$ and $E_Y > 0$



in Figure 1 as line Y_0V_0, where $V_0 = Y_0/P_V$. Utility is maximized at E_1, the tangency point of the budget constraint and indifference curve U_1, with the consumer purchasing V_1 of the voucher good and spending Y_1 on other goods.

Now let the consumer be offered a government-issued voucher for V^* units with $V^* \geq V_1$. For simplicity, the voucher is made available at zero cost. The revised budget constraint is the kinked line Y_0E^* $(V_0 + V^*)$ with the kink point E^* exactly V^* units to the right of Y_0. To demonstrate economic inefficiency, a participant in the voucher program is typically shown to be hung up at point E^* and maximizing utility on indifference curve U_2 by consuming V^* units of the voucher good and, in the zero cost voucher case, spending Y_0 on other goods.

A higher utility level can be attained through an income transfer of P_VV^*, the market value of the voucher. In Figure 1, the budget constraint with this income transfer is determined by the revised income level of $Y_0 + P_VV^*$ on the vertical axis and $V_0 + V^*$ units of the voucher good on the horizontal axis. Utility maximization is now at tangency point E_3, and indifference curve U_3 is reached instead of U_2. At this superior equilibrium point, V_3 units of the voucher good are purchased, and Y_3 is spent on other goods.

The monetary value of the welfare loss from the voucher program relative to an income transfer can be measured by comparing the cost of the voucher program to the cost of an income transfer producing equivalent utility. A budget constraint parallel to Y_0V_0 in Figure 1 is drawn tangent to U_2, the utility level achieved with the voucher, at point E_2. Denoting this derived budget constraint as Y' V', the loss in individual welfare is the vertical distance between total expenditure under the voucher program of $Y_0 + P_VV^*$ and the lower expenditure of Y' yielding equivalent utility. An income transfer of $Y' - Y_0$ allows the consumer to purchase V_2 units of the voucher good and spend Y_2 on other goods while raising utility by as much as a voucher costing P_VV^*.

The good in Figure 1 is deliberately shown to have a positive income elasticity of demand because consumption increases with increasing income. It is not necessary, as is frequently implied in the graphical analyses of some writers, that the voucher good must be inferior with a negative income elasticity to demonstrate a welfare loss.

The voucher program may be supported and its inefficiency tolerated if the social welfare function requires that at least V^* units of the voucher good be consumed by participants rather than V_2 units with the lower cost income transfer program. The problem is there is no assurance that each participant will, in fact, use V^* units. An incentive exists for a secondary market in vouchers to develop because a recipient is willing to sell or trade a voucher with face value P_VV^* for as little as $Y'–Y_0$ in extra income or value.

VOUCHERS AND WELFARE LOSSES: AN ALGEBRAIC ANALYSIS

Normal Goods

Whether or not voucher programs result in welfare losses depends on the key relationship between the implicit increase in income generated by the voucher

and the income elasticity of demand for the voucher good. In graphical terms, a voucher plan without a welfare loss provides a participant with an incentive to consume at least V^* or more of the voucher good. In this case, the utility maximizing consumer is at a tangency point of an indifference curve and the revised budget constraint and not caught at the E^* kink. The plan is then economically efficient in the sense that an income transfer of equivalent cost does not yield greater individual utility. Vouchers are redeemed at face value by the recipient, and administrative costs of policing the program are low.

Policymakers seeking to ascertain whether a welfare loss is being generated by a voucher plan must determine whether recipients would voluntarily choose V^* or more units of the voucher good if provided with additional income equal to $P_V V^*$, the cost of the voucher. In this case, the recipient is at a tangency point and not caught at E^*. From the definition of the elasticity of income,

$$E_Y = (\Delta V/V_1)/(\Delta Y/Y_0), \tag{1}$$

where V_1 is the current level of consumption of the voucher good and Y_0 current income. From equation (1) the increase in voucher good consumption ΔV is

$$\Delta V = E_Y V_1 (\Delta Y/Y_0), \tag{2}$$

and a voucher plan without welfare losses requires $V_1 + \Delta V \geq V^*$ implying that

$$V_1 [1 + E_Y (\Delta Y/Y_0)] \geq V^*. \tag{3}$$

If equation (3) holds then, from the consumer's view, the voucher increases his or her income by its market value $P_V V^*$. Substituting $P_V V^*$ for ΔY yields the following policy rule for determining the required market value of the voucher relative to income to avoid a welfare loss and to achieve at least the targeted level of consumption $V^*$of the voucher good relative to current usage:

$$P_V V^*/Y_0 \geq [(V^*/V_1) - 1]/E_Y. \tag{4}$$

When this constraint is met, the voucher is economically efficient in that the consumer maximizes utility at a tangency point at or to the right of the kink point E^*. No welfare loss will be associated with using vouchers rather than an income transfer, and at least V* units of the voucher good are consumed. Note that the policy rule in equation (4) requires that $E_Y > 0$; the voucher good must be normal.

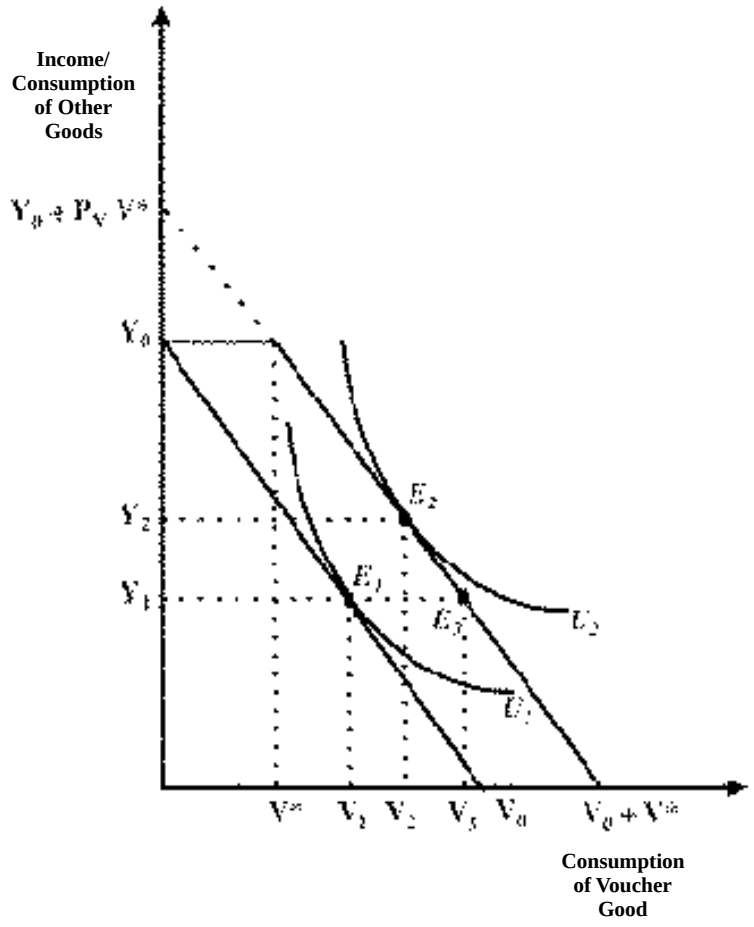
There are two reasons why use of a voucher satisfying equation (4) results in a point of tangency rather than an intersection with a higher indifference curve and the voucher augmented budget constraint. First, calculating ΔV in equation (2) by using a given income elasticity of demand E_Y places the new equilibrium point on the income-consumption curve. A point on the income-consumption line represents a utility maximizing bundle of goods given income and relative prices. All points determined by ΔV are therefore tangent to the highest valued indifference curve possible. Second, the condition that $V_1 + \Delta V \geq V^*$ used to derive equation (4) requires the tangency point implied from the income–consumption line to be at or to the right of E^* in Figure 1. Any point to the left of E^*, such as E_3, is associated with a pure cash transfer of $P_V V^*$and unattainable with a voucher.

Discarding the assumption that the vouchers are distributed at zero cost to the

participant, the numerator in equation (4), $P_V V^*$, can be understood as the resulting net implicit increase in income after deducting for the voucher's acquisition cost.

The equivalency of a voucher and with an income transfer is shown in Figure 2. The consumer is initially at equilibrium point E_1 purchasing V_1 units of the voucher good and spending Y_1 on other goods. A voucher for V* units is distributed at zero cost with $V^* < V_1$. The new tangency equilibrium in Figure 2 is at E_2 with V_2 voucher goods consumed derived from the voucher for V* units and an additional $V_2 - V^*$ units purchased out-of-pocket. Because $V^* < V_1$, the implied income elasticity of demand in Figure 2 need only be positive to insure that the monetary value of the voucher satisfies equation (4).

FIGURE 2
No Welfare Loss from Voucher when $V^* < V_1$ and $E_Y > 0$



Inferior Goods

One should not assume that a voucher program inadvertently applied to an inferior good necessarily yields a welfare loss because it promotes less, rather than more, consumption of the voucher good. The rule in equation (4) still holds, but the direction of the inequality is reversed because its derivation involves division by a negative income elasticity. For an inferior good, the voucher is efficient if

$$P_V V^*/ Y_0 \leq [(V^*/V_1) - 1]/ E_Y. \quad (5)$$

In Figure 3, a voucher program is applied to a good with a negative income elasticity with no resulting loss in welfare. The consumer is initially at equilibrium at E_1 purchasing V_1 voucher good units and spending Y_1 on other goods. Following equation (5), V^* is portrayed as less than V_1 because a welfare loss in the presence of a negative income elasticity E_Y can only be avoided if $(V^*/ V_1) < 1$ given that the monetary value of the voucher must exceed zero. The new tangency equilibrium is at E_2 with V_2 units consumed and Y_2 spent on other goods. The recipient consumes less than V_1 of the voucher good at V_2 deriving V^* from the voucher and purchasing an additional $V_2 - V^*$ units. The implied income elasticity of demand in Figure 3 is negative but not so negative that the monetary value of the voucher relative to income exceeds the right-hand side condition of equation (5) .

TESTING FOR WELFARE LOSSES

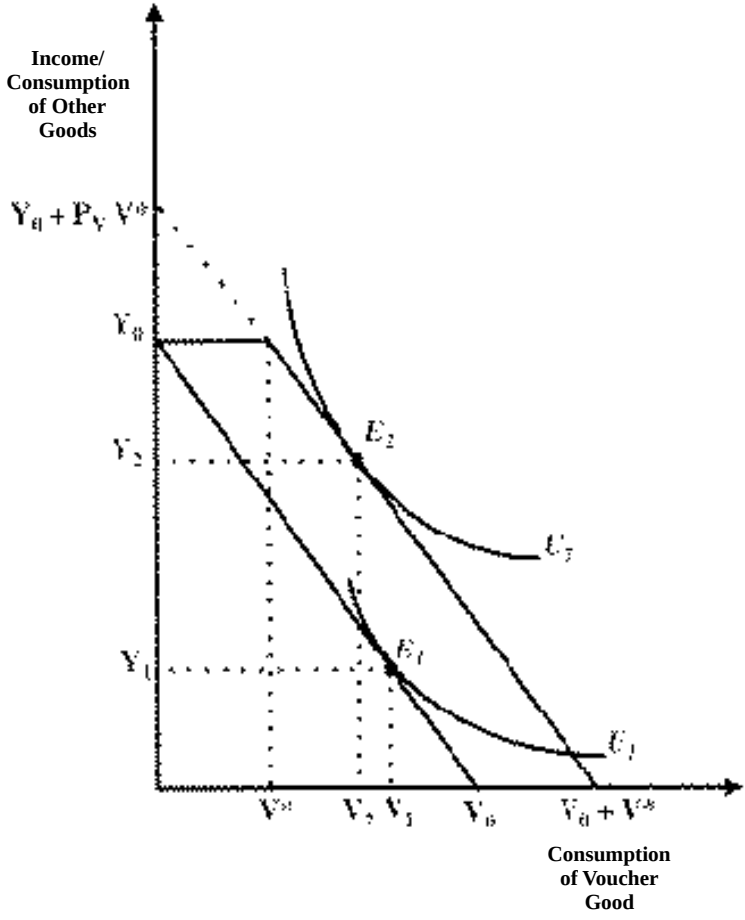
The policy rule of equation (4) suggests that voucher programs that are modest in scope are unlikely to generate welfare losses of the type illustrated in Figure 1. If the government agency offers a voucher valid for V^* "free" units and V^* is less than current consumption V_1, then $(V^*/V_1) - 1 < 0$, and equation (4) is satisfied as long as the voucher good is normal, $E_Y > 0$. A straightforward empirical validation that a voucher program yields no welfare loss is evidence that the recipient purchases additional units of the voucher good beyond V^* at the market price. This conclusion is valid whether the income elasticity of demand is positive or negative. In both Figure 2 and Figure 3, the resulting tangency equilibrium associated with no welfare loss occurs when $V_2 > V^*$ or when the voucher recipient buys $V_2 - V^*$ units at a price P_V. If a more expansive voucher is established where $V^* > V_1$, then the income elasticity of demand must be sufficiently high so that the implied monetary value of the voucher satisfies the constraint of equation (4).

Gifts

This principle can be extended to in-kind transfers. The gift-giving traditions associated with Christmas, birthdays, anniversaries, Valentine's Day, and other calendar and noncalendar gift events never generate welfare losses compared to cash transfers if the gift good is normal, $E_Y > 0$, and $V^*/ V_1 \leq 1$, the number of

units transferred as a gift, is less than or equal to the recipient's current purchase of the good. The significant annual deadweight loss of holiday gift giving estimated by Waldfogel (1993) may be exaggerated because it neglects to distinguish between "practical" or normally consumed gift goods and the odd ones destined for permanent storage or a garage sale. A welfare loss is indeed possible when multiple gifts of a practical sort (e.g., perfume, socks, ties) are received from friends and relatives so that the sum produces a total V^* greatly exceeding V_1. A welfare loss is certain if the planned purchase of the gift good is zero unless the recipient's utility function is transformed by the nature of the gift-giving event or by direct experience with the good itself.

FIGURE 3
No Welfare Loss from Voucher when $V^* < V_1$ and $E_Y < 0$



Examples of Normal and Inferior Goods

The following are applications of the rules for efficient voucher programs for normal goods and inferior goods. Consider a hypothetical voucher program to encourage dental visits by children. The income elasticity for this health service is positive and estimated by Manning and Phelps (1979) to be +0.87. Assume public health policy targets an increase in visits by at least 20 percent. Eligible participants are now purchasing five visits at market rates, and the government agency decides to achieve its target 20 percent minimum increase by distributing, at zero cost to the recipient, vouchers for six "free" visits in the following year. Setting $E_Y = .87$ and $V^*/V_1 = 1.20$ in the policy rule of equation (4) yields the efficiency condition that $P_V V^*/Y_0 \geq .23$ or that the monetary value of the voucher must be at least 23 percent of the participant's income. If the monetary value is less, the recipient is forced into a nontangency equilibrium at the kink point E^*, and the program generates welfare losses.

To apply equation (5) to an inferior good, consider an income elasticity for pork products of – 0.20 (Lipsey, Steiner, and Purvis 1987). A voucher equivalent to 90 percent of current consumption distributed "free" to recipients may not produce welfare losses. The voucher for pork products will be efficient as long as its market value is less than 50 percent of the recipient's income even though final consumption of the good after the voucher is distributed is lower than the original level.

INCREMENTAL CONSUMPTION EQUAL TO THE VOUCHER QUANTITY

It would be a mistake to assume that because the condition $V^*/V_1 \leq 1$ and $E_Y > 0$ always yields a point of tangency between the revised kinked budget constraint and an indifference curve, the voucher program participant will actually consume an additional V^* units of the voucher good. Recalling that $\Delta Y = P_V V^*$ and using equation (2), the outcome where $\Delta V \geq V^*$ requires that

$$P_V V^*/Y_0 \geq (V^*/V_1)/ E_Y. \quad (6)$$

If the voucher rule of equation (4) is satisfied but equation (6) is not, then consumer utilization of the voucher good will increase but by less than V^*. There are no welfare losses because the modified budget constraint is tangent to an indifference curve. When both equations are satisfied, there is no welfare loss, and the government agency can expect that the recipient of a voucher for V^* units will increase her or his consumption by at least V^* units. This result is illustrated in Figure 2 where a voucher recipient's revised budget constraint reaches a tangency point with an indifference curve (not drawn) at E_3. At E_3, spending on other goods is maintained at the prevoucher level Y_1, and consumption of the voucher good is at V_3 where $V_3 = V_1 + V^*$.

Using the demand for physicians' services as an example, consider a voucher program for the uninsured that distributes "free" to program participants a voucher valued at 30 percent of the recipient's normal annual payment to doctors from

her or his income. The long-run income elasticity for physicians'services is estimated to be +1.15 (Houthakker and Taylor 1970). The medical voucher program generates no welfare loss because equation (4) is satisfied whenever $V^*/V_1 \leq 1$, $E_Y > 0$, and $P_V V^*/Y_0 > 0$. Applying equation (6) with $E_Y = 1.15$ and $V^*/V_1 = .30$ suggests that the target 30 percent increase in the use of physicians'services will be reached only if the monetary value of the voucher is at least 26 percent of the recipient's current income.

CONCLUSION

The textbook implication that income transfers are always superior to vouchers relies heavily on a strong dose of graphical suggestion. The readily derived algebraic relationships linking efficiency, the size of the voucher, and the income elasticity of demand for the voucher good reveal a much more complex economic picture. Vouchers can also be technically efficient under certain conditions for inferior goods, as well as for normal goods despite discouraging consumption of the voucher good. Income transfers will certainly be superior to a voucher program when the income elasticity of the good is low or negative, and the proposed voucher is large relative to current consumption or exceeds it.

The algebraic relations can be used to distinguish what is suggested by the graph and what is in fact the economic reality. Texts that purport to apply economics to an important policy issue such as vouchers should define the alternatives in this more precise but accessible approach.

REFERENCES

Browning, E. K., and J. M. Browning. 1989. *Microeconomic theory and applications.* Glenview, Ill.: Scott, Foresman.

Frank, R. H. 1997. *Microeconomics and behavior.* 3rd ed. New York: McGraw-Hill.

Houthakker, H. S.,and L. D. Taylor. 1970. *Consumer demand in the UnitedStates*. Cambridge:Harvard University Press.

Lipsey, R. G., P. O. Steiner, and D. D. Purvis. 1987. *Economics.* 8th ed. New York: Harper and Row.

Manning, W. G.,Jr., and C. E. Phelps. 1979. The demand for dental care. *Bell Journal of Economics* 10 (Autumn):503–25.

Mansfield, E. 1994. *Microeconomics: Theory and application*. 8th ed. New York: Norton.

Salvatore, D. 1986. *Microeconomic theory and applications*. New York:Macmillan.

Sexton,R. L. 1995. *Microeconomics.* Englewood Cliffs, N.J.: Prentice-Hall.

Stiglitz, J. E. 1988. *Economics of the public sector.* 2nd ed. New York: Norton.

Waldfogel, J. 1993. The deadweight loss of Christmas. *American Economic Review* 83 (December): 1328–36.