5.5 a. The Lagrange method yields

$$\frac{y}{x+1} = \frac{p_x}{p_y},$$

or $p_y y = p_x x + p_x$. Substitution into the budget constraint yields

$$x = \frac{I - p_x}{2p_x} \quad \text{and} \quad y = \frac{I + p_x}{2p_y}.$$

Hence, changes in p_y do not affect x, but changes in p_x do affect y.

b. The indirect utility function is

$$V = \frac{(I + p_x)^2}{4p_x p_y},$$

which yields an expenditure function of

$$E = \sqrt{V4p_x p_y} - p_x.$$

c. Clearly the compensated demand function for x depends on p_y whereas the uncompensated function did not. By Shepherd's Lemma:

$$x^c = \frac{\partial E}{\partial p_x} = V^{0.5} p_x^{-0.5} p_y^{0.5} - 1.$$

5.6 Year 2's bundle is revealed preferred to Year 1's since both cost the same in Year 2's prices. Year 2's bundle is also revealed preferred to Year 3's for the same reason. But in Year 3, Year 2's bundle costs less than Year 3's but is not chosen. Hence, these violate the axiom.

6.5 a. Composite commodity $= p_2x_2 + p_3x_3 = p_3(kx_2 + x_3)$.

b. The relative price equals

$$= \frac{p_2 + t}{p_3 + t} = \frac{kp_3 + t}{p_3 + t}.$$

The relative price is less than 1for $t = 0$. The relative price $\to 1$ as $t \to \infty$. Hence, increases in t raise the relative price of x_2.

c. Although it might seem like increases in t would reduce expenditures on the composite commodity, the theorem does not apply this directly. As part b shows, changes in t also change relative prices.

d. Rise in t should reduce relative spending on x_2 more than on x_1 since this raises its relative price. However, see the Borcherding and Silberberg analysis.