14.03 Exam 1 Fall 2000

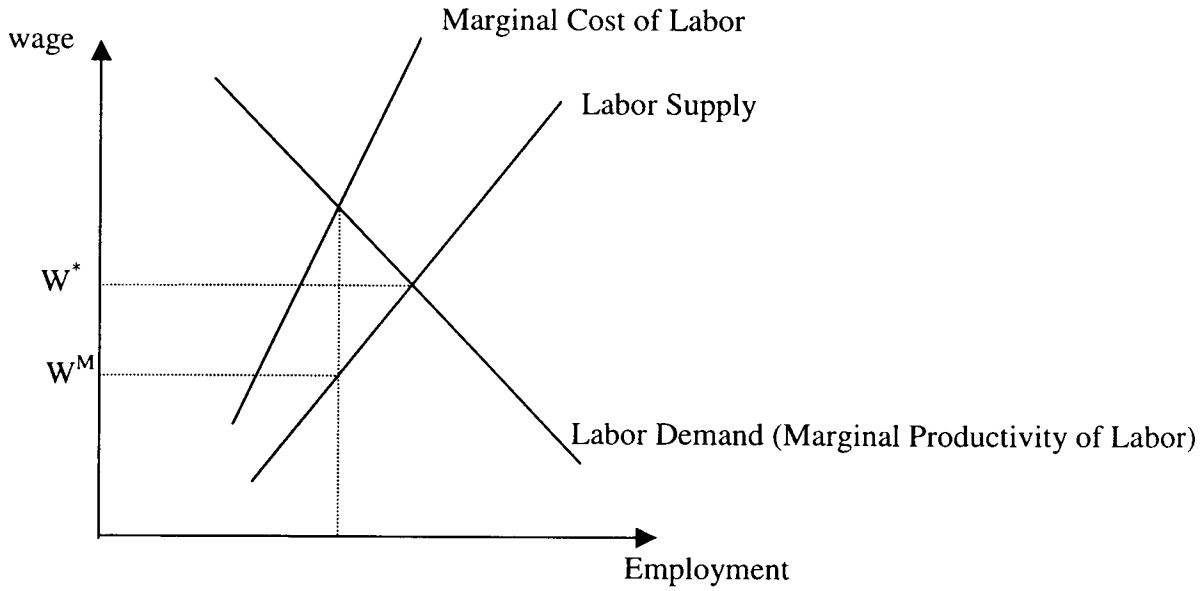
SOLUTIONS

Part I: 5 points each

True, False, or Uncertain AND WHY. You must explain your answer with one or two sentences and/or graphs. Answers without justification receive zero points. 5 points each.

1. A consumer with convex, 'well-behaved' indifference curves is indifferent between two bundles of X and Y: (4,1) and (2,9). She therefore prefers the bundle (3,8) to either of the first two.
   TRUE. The convexity of indifference curves implies that every bundle on the straight line connecting (4,1) and (2,9) is preferred (or indifferent in the case of perfect substitutes) to these two bundles. You can verify that (3,8) is above that line (since 3=(4+2)/2, but 4>(9+1)/2), so that by the non-satiation axiom (more is better) the bundle (3,8) is preferred to both of them.

2. If employers have monopsony power in the labor market in Hawaii, lowering the minimum wage in Hawaii will reduce employment.
   UNCERTAIN (but FALSE could be a good answer too). Refer to the attached graph. Lowering the minimum wage can increase employment if the initial minimum wage is above W^*, but it can reduce employment if the initial minimum wage is below W^* and above the Monopsony level W^M.



3. Ivan spends his entire income on two goods. One of them is a Giffen good. If the price of the Giffen good rises and the price of the other good remains constant, his demand for the other good must fall.

TRUE. Notice that Ivan's choices are restricted to two goods by assumption. In addition, by budget exhaustion he is spending all of his income on the two goods. When the price of the Giffen good rises, the quantity demanded rises by definition. Since he is spending a larger fraction than before on the Giffen good, he has less income left to buy the other good. Therefore the quantity demanded of the other good has to drop.

4. The "new goods bias" is unlikely to be an important element of the bias in the Consumer Price Index, since very few consumers purchase new goods at the initially high prices at which they are offered. [Your answer should define the new goods bias and be specific about why this statement is or isn't a valid evaluation of why it is important!].
FALSE. The "new goods bias" has two components.

First best answer: The value of the new goods to the consumers is represented by the consumer's surplus (i.e. the area below the Hicksian demand, and above the market price, which measures how much the consumer would be willing to pay for that good, minus what he actually pays). The market price gives the valuation of the new good only for the marginal consumer; for all other consumers the market price is a lower bound to the surplus. Therefore, if we want to measure how much the cost of obtaining the same level of utility has increased due to a new good(ideal index), we should take into account the fact that some consumers would have paid much more than the market price for the new goods (think of a new drug that cures cancer). The fact that few people buy a new good initially is not relevant to this argument. The new good may still generate substantial consumer surplus for some consumers. And this surplus will not be captured by a price-based index such as Laspeyres or Paasche. Of the indexes we discussed in class, only the Ideal Index (which requires the Expenditure function) would fully capture the utility increase associated with introduction of a new good.

Second answer, also acceptable though less preferred: Since the CPI basket is updated infrequently (about every ten years), the new goods often enter the basket only when their price has dropped considerably from their initial levels (cell phones are a good example). Consequently, the CPI fails to capture the decrease in the cost of living as the price of the new good declines – often substantially – prior to introduction into the CPI basket.

5. In the first period, $P_x = 5$ and $P_y = 10$ and the consumer buys 10 units of X and 5 units of Y. In the second period, $P_x = 12$ and $P_y = 5$ and the consumer buys 6 units of X and 7 units of Y. By the Weak Axiom of Revealed Preference, the consumer is at least as well off in the second period.

FALSE.

Notice that the second period bundle was affordable at the first period prices: its cost was also 100. Since the consumer bought the first bundle when the second was available, the first bundle is revealed preferred by WARP. We can conclude that the consumer is definitely not better off in the second period, and probably, although not surely, worse off.

6. Julie was maximizing her utility subject to her budget constraint. Then prices changed, but her income stayed fixed. After the price change, she chose a new bundle, and she found herself better off. Therefore the new bundle costs more at the old prices than the old bundle did.

TRUE. Julie chose a bundle that made her better off in the second period. Since in the first period she was maximizing her utility under her budget constraint, if she could have chosen a bundle that would have made her better off, she would have done it. The only reason why she would not have done so is that the second period bundle was not affordable at the first period prices. Therefore the statement is true

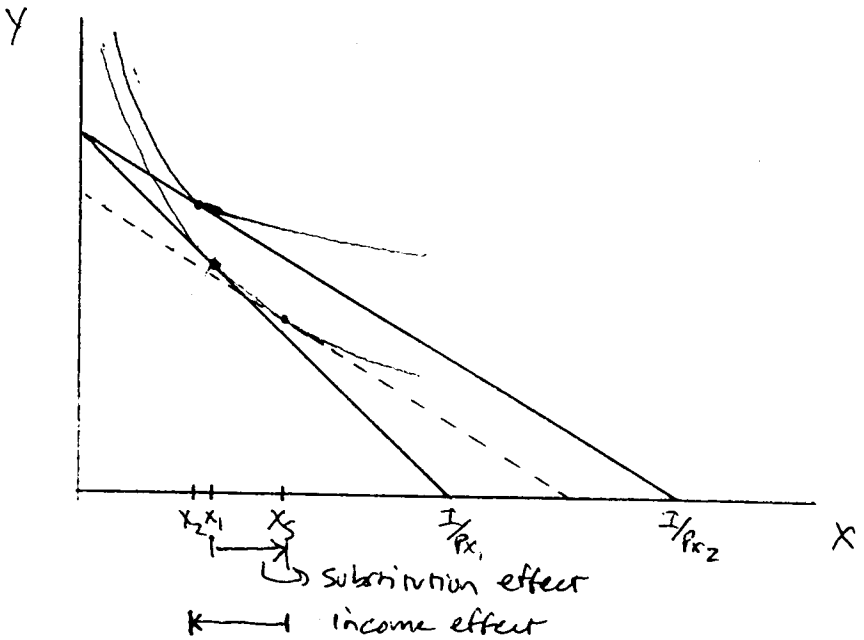
Notice that we cannot necessarily apply Revealed Preference here. To apply WARP, we would need a case where both bundles were available in period 2. Assuming the new bundle was chosen in period 2, we'd know that the new bundle is Revealed Preferred to the old bundle and therefore Julie is better off. Moreover, since the new bundle was not available initially (or else it would have been chosen over the old bundle by WARP), it must have lay outside the budget set, i.e. have cost more than the old bundle. But, take a case where the new bundle is available in the second period but the old bundle is not. Here, Revealed Preference would tell us nothing about whether Julie was worse or better off, even if the new bundle cost more. Therefore, to make a conclusion here, you need to rely on axiomatic utility theory.

Part II: 9 points each

1. The key to this question is the statement that service may vary between stores and over time. If service had remained constant at both stores over time, then the price index would be biased upward due to outlet bias, since the price index does not take the Kmart prices into account. *But the fact that quantities remained the same at both stores in spite of the price decline at Kmart suggests that service fell at Kmart.* Hence we cannot conclude that the price index is necessarily biased upward.

2. A full-credit answer includes a statement of the Slutsky equation and an indication that $\frac{\partial d_x}{\partial p_x} < 0$ if and only if $\frac{\partial h_x}{\partial p_x} < x\frac{\partial d_x}{\partial I}$. You should note that the term on the left-hand side of this inequality is the substitution effect, which is nonpositive. Hence a sufficient condition for Marshallian demand to be downward sloping is that the good is normal, i.e. $\frac{\partial d_x}{\partial I} > 0$.

   Your diagram should illustrate a Giffen good, and indicate both the substitution effect (corresponding to the budget constraint rotating about the original indifference curve) and the income effect (corresponding to the shift in the budget constraint).



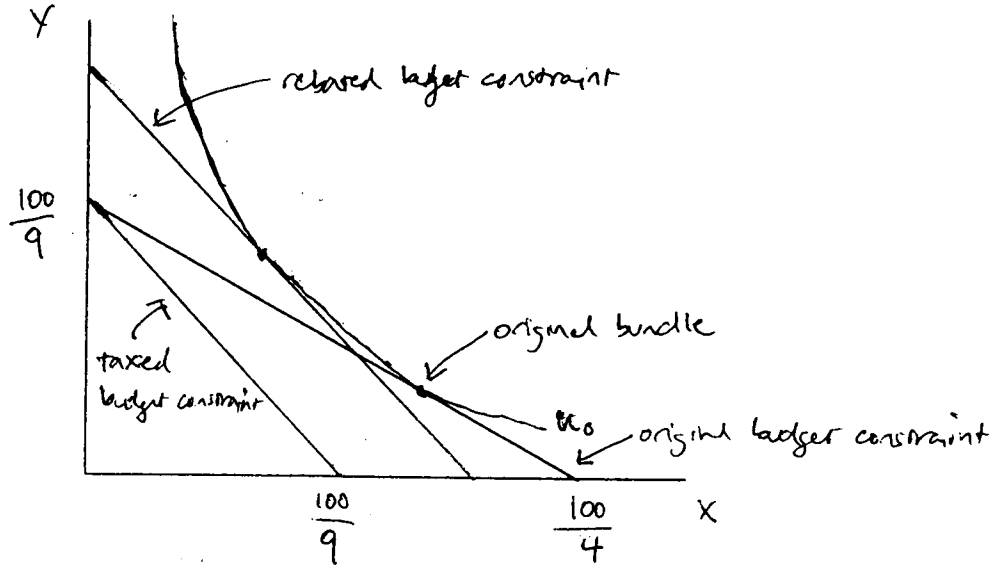
Part III: 16 points each

1.

a. (4 points) $V(p_x, p_y, E(p_x, p_y, U)) = U \Rightarrow \dfrac{-p_x - p_y - 2.5p_x^{1/2}p_y^{1/2}}{E(p_x, p_y, U)} = U$

$\Rightarrow E(p_x, p_y, U) = \dfrac{-p_x - p_y - 2.5p_x^{1/2}p_y^{1/2}}{U}$

b. (3 points)



c. (6 points) Rebate = $E(p_x + t, p_y, V(p_x, p_y, I)) - E(p_x, p_y, V(p_x, p_y, I))$

$= E(9,9,V(4,9,100)) - E(4,9,V(4,9,100)) = E(9,9,-7/25) - 100 = 2025/14 - 100 \approx 44.64$

Tax revenue = $th_x(p_x + t, p_y, V(p_x, p_y, I)) = 5h_x(9,9,-7/25)$

Use Shephard's Lemma to get $h_x(p_x, p_y, U) = \dfrac{\partial E(p_x, p_y, U)}{\partial p_x} = (-1/U)(1 + 1.25p_x^{-1/2}p_y^{1/2})$

Hence tax revenue = 1125/28 ≈ 40.18, and the DWL is approximately 4.46.

d. (3 points) Since $\dfrac{p_x}{p_y} = \dfrac{4}{9} = \dfrac{p_x + t_x}{p_y + t_y} = \dfrac{9}{20.25}$, this is equivalent to a proportional sales tax on all goods, which means that the DWL is zero.

2.

a. (3 points) (See picture on next page)

b. (3 points) Cash plan students can afford the cafeteria plan bundle, but choose another bundle instead. Hence the cash plan students are better off by revealed preference.

c. (3 points) If the groups have identical preferences, then we would expect cafeteria plan students to consume at the kink point (15,15). The exact axiom that is violated is diminishing MRS. If both groups are maximizing utility, then since both are at interior solutions we know that at their chosen bundles the indifference curve is tangent to the budget constraint. But by diminishing MRS we can't have the indifference curve tangent to the budget constraint at two different points.

d. (3 points) This resolves the paradox because it means that cafeteria food and normal food are two different goods, with cafeteria food having less value. Hence a student given $15 worth of cafeteria food may still purchase additional food, even if they would have spent less than $15 on food had they been given cash instead. To see this clearly, take an extreme example: a student on the Cafeteria plan who won't eat any cafeteria food. This student effectively has a budget of $15 cash per day. In this case, it's reasonable that she would spend $5 per day on food.

e. (4 points) The Dean is incorrect. The fact that meals are trading at $3 means that at least *some* students value them at less than $5, their nominal 'in kind' value. Since no student would be willing to pay more than $5 for a cafeteria meal (because that is the cash price), the average valuation of cafeteria meals must be less than $5. Hence on average, students would prefer to get $5 cash rather than a free cafeteria meal. We can conclude that some value is destroyed by providing cafeteria meals 'in-kind' rather than giving cash and selling cafeteria meals for $5 each.