

ANSWER KEY 1 BUDGETS

W & L INTERMEDIATE MICROECONOMICS
PROFESSOR A. JOSEPH GUSE

- (1) Draw the budget set for the following parameters. $m = 20$, $p_{beer} = 1$, $p_{pizza} = 5$. The units for the two goods are pints and pies respectively.

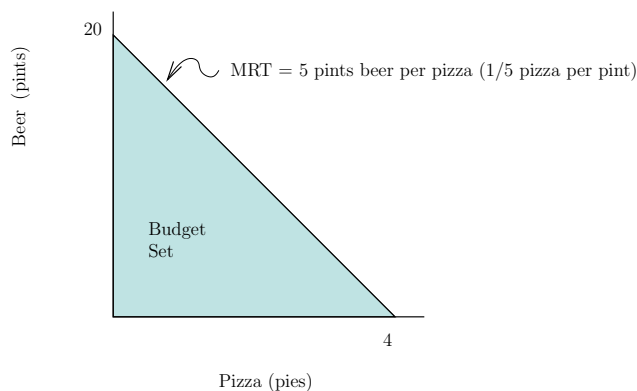


Figure 1. **ANSWER.** The consumer's budget set for pizza-beer consumption bundles. Note that key features are labeled: the axes with the name of their respective good and units, the intercepts, the slope of the line (the MRT). The budget set itself is indicated by the shaded region. Note that the decision to put beer on the vertical axis and pizza on the horizontal is arbitrary. There is nothing especially 'horizontal' about pizza or beer. It does not matter which way you choose as long as the picture is well-labeled. Note further that scale for each axis need not be the same. You may represent one pint of beer as an inch and 1 pizza as a meter or vice versa as long as you are consistent. The slope of the line as visually represented has no meaning without labels indicating units. Similarly the numeric value reported for the MRT is unit dependent. Here we have 1 pizza pie worth 1 pint of beer at the given prices. But if we had used mL as the unit for beer, we would report an MRT of 480: 1 pie per 480mL of beer.

- (a) From any *interior* (= not intercept point) consumption bundle on the *budget line* how many beers must be forgone for each additional pizza? **ANSWER.** 5 beers per pizza as indicated by the slope of the budget line in Figure 1.
- (b) How many pizzas must be given up for each additional beer? **ANSWER.** $\frac{1}{5}$ pizzas per beer as indicated by the *inverse* slope of the budget line in Figure 1.
- (c) Show in a new picture how the budget set changes when the price of beer increases to 2. **ANSWER.** See Figure 2
- (d) Show in a new picture how the budget set changes when this consumer's income decreases to 15 **ANSWER.** See Figure 2

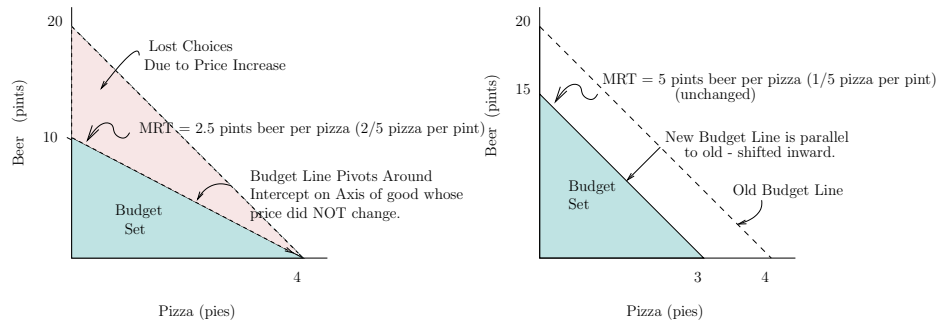


Figure 2. The diagram on the left show the change in the budget set if the price of beer doubles from \$1 to \$2 per pint. The diagram on the right shows the change in the budget set if income decreases from \$20 to \$15.

- (2) Suppose that there is uniform inflation by which I mean all prices increase by the same rate r , so that the new prices (p'_1, p'_2) after the inflation are given by $p'_1 = p_1(1 + r)$ and $p'_2 = p_2(1 + r)$. Show how the budget set changes. If you wanted to restore the consumers budget set to what it was before the inflation without changes the prices, what could you do? **ANSWER.** Set the new level of income equal to $m' = (1 + r)m$. That is raise it by the same rate as the prices increased. This will restore the budget set to exactly the same set of consumption bundles as before the inflation. Note that a (2-good) budget set can be described by 3 parameters: the two prices and the income. In Figure 3, the budget lines are labeled by the parameter triples they are meant to represent. We exhibited a special property of budget sets: multiplying all the parameters that describe the set by the same factor ($(1 + r)$ in this case) preserves the elements of the set exactly as they were. This property is called “homogeneity of degree zero”.

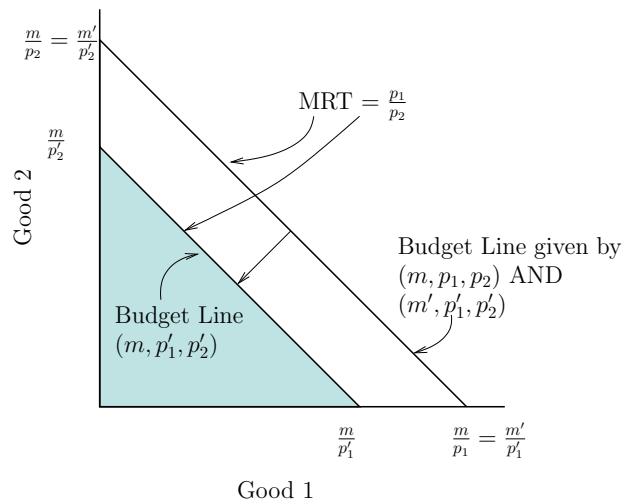


Figure 3. The outer budget line represents the frontier of the set of choices before the inflation event. The inner budget line afterwards. Notes that the shift is parallel exactly as though income decreased. The slope of a budget line is determined by the *ratio* of the price not their absolute magnitudes; Since both prices increased at the same rate, their ratio and the slope of the budget line remained constant.

- (3) Malcom eats roast beef and smokes Camels. Roast beef is \$4 per pound and Camels are \$3 per pack. He currently chooses to consume 5 pounds of beef and 5 packs of cigarettes per week.

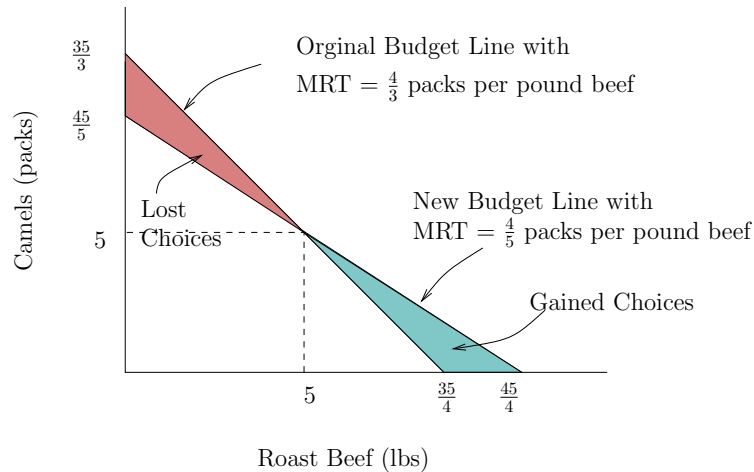


Figure 4. Malcom's Budget for Beef and Cigarettes before and after the change in the the price of beef and income.

- (a) Draw Malcom's budget set. What is Malcom's weekly income? **ANSWER.** Assuming Malcom's preferences are monotonic (so that he must choose a point on his budget line), his weekly income must be $4 \times 5 + 3 \times 5$ or \$35.
- (b) If Malcom wanted to smoke more cigarettes at what rate would have to give up beef? **ANSWER.** From Figure 4, we can see that Malcom must give up $\frac{4}{3}$ packs of cigarettes per pound of beef. Therefore the answer to the inverse question is the inverse rate : $\frac{3}{4}$ pounds per pack.
- (c) Suppose that Malcom's income increases to \$45 and the price of cigarettes simultaneously increases to \$5 per pack. Draw his new budget set. Not knowing anything about Malcom's preferences except what was revealed by his original choice, is it possible to say whether Malcom is better off or worse off with the new budget set? Explain. **ANSWER.** In general, it may be difficult to say whether or not a consumer is better or worse off after such a change in which some choices are lost and others are gained. However we can use a little logic to make a more precise judgement in this case. As we see from Figure 4, the new budget line goes exactly through Malcom's original choice on the old budget line. In other words, Malcom can still afford to keep doing exactly what he was doing before. Therefore the budget line change could not have made him worse off. That is all we can say with certainty. However there is a good chance that he may be strictly happier. We will examine this situation in detail when we discuss income and substitution effects.
- (4) Consider a set of prices and income given by (p_1, p_2, m) and fix a consumption bundle (x_1, x_2) on the resulting budget line. Suppose that the price of good one increases from p_1 to p'_1 . Write down expression for a new level of income m' so that the resulting new budget line goes through (x_1, x_2) . (Hint this is what occurred in the previous problem.) **ANSWER.** $m' = p'_1 x_1 + p_2 x_2$.
- (5) *Bulk Pricing* Suppose a consumer has an income of \$100 to spend on chocolate bars and ice-cream cones. She faces a constant price of \$1 for chocolate bars. However, the price of ice cream depends on how much you buy. The first 10 ice cream cones cost the consumer \$2 each, but every cone after that is \$0.50 each. Draw the budget set. **ANSWER** see Figure 5.

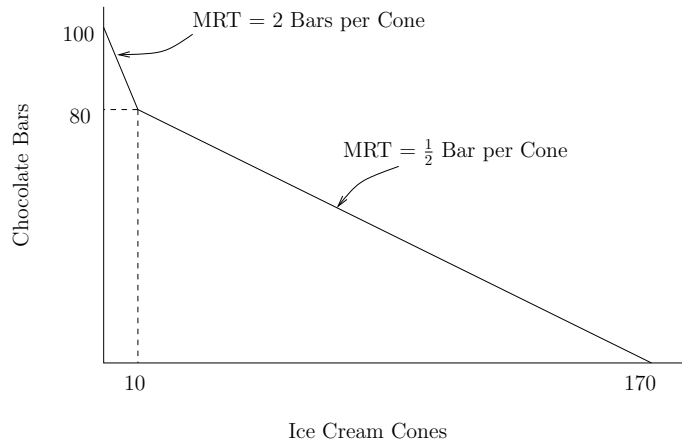


Figure 5. Budget for Ice Cream and Chocolate. Note that bulk pricing discount generates a inward-kinked budget line. In terms of Chocolate, the price of ice-cream as indicated by the slope of the budget line changes from 2 bar to $\frac{1}{2}$ bar after the 10th cone.

- (6) *Food Stamps*. William has \$250 to spend on food and a composite good. The price of food is \$1 per unit. The price of the composite good is \$1 per unit.
- (a) Draw William's budget set. **ANSWER.** The shaded region labeled "(a)" in Figure 6.
- (b) Suppose that the government gives William \$100 in food stamps and strictly enforces a rule which prohibits Will from using his food stamps for any purchases other than food. Draw the new budget set. Describe the MRT of food for other goods along the budget line. **ANSWER.** The shaded regions labeled "(a)" and "(b)" in Figure 6. The marginal rate of transformation for the first \$100 in food is \$0 in other consumption. This is due to the fact that William cannot convert food stamps into anything but food. Therefore is he is at a point where he would be consuming less tahn \$100 in food, it must correspond to a situation where either he is not spending all of his food stamps or he is throwing away food. Therefore the sacrifice in terms of other consumption to increase his food consumption is nothing.
- (c) Suppose that the rule prohibiting non-food purchases is difficult to enforce and William can sell his food stamp for \$0.50 on the dollar. Draw his budget set. **ANSWER.** The combined shaded regions labeled "(a)", "(b)" and "(c)" in Figure 6. Now along the region of his budget line where he consumes between 0 and \$100 in food his MRT is $\frac{1}{2}$ dollar in other consumption per dollar of food.

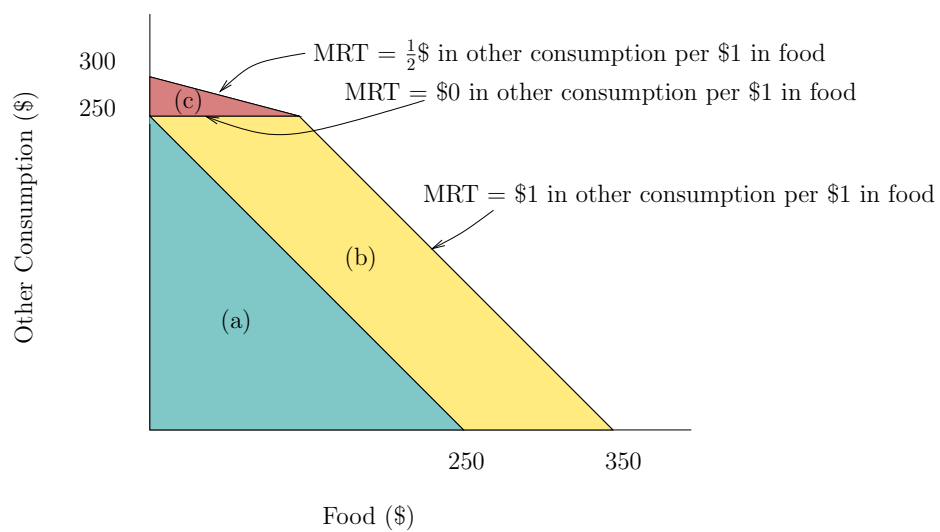


Figure 6. William's budget for food and other consumption with (c) and without (b) a secondary market for food stamps.

(7) *Additional Practice From Workbook* (Optional) 2.2, 2.5, 2.8, 2.11, 2.12