BUEC 311: Business Economics, Organization and Management
Consumer Behaviour

Fall 2021

Outline

1. Motivation: Consumer decision making

2. The theory of consumer choice.
   - Preferences and utility.
   - The budget constraint.
   - Determining consumer choice.

3. Applying the theory.
   - Designing promotions.
   - Deriving demand curves.

4. Deviations from the theory.
   - Behavioural economics.

Motivation: Consumer Decision Making.

- How do you decide to buy the things that you do?

The Theory of Consumer Choice

- One possible explanation for consumer choice: random decision making.
  - Consumers act blindly and make decisions without any thought.
- An alternative explanation for consumer choice: individuals make systematic decisions.
  - But then, what drives systematic decision making?

The Theory of Consumer Choice

- Economists rely on the *Theory of Consumer Choice* to understand how consumers make decisions.

- This model of behaviour relies on three main premises.
  1. Consumers have *preferences* that determine the satisfaction they get from the consumption of goods and services.
  2. Consumers face *constraints* that limit their choices.
  3. Consumers seek to *maximize* the level of satisfaction they obtain from consumption given the constraints that they face.

The Theory of Consumer Choice: Preferences

- Economists assume that consumers have a set of *tastes* or *preferences* that they use to guide them in choosing between goods.
- These tastes may differ substantially among individuals due to differences in culture, experience, etc.
  - E.g. Hershey's chocolate.

The Theory of Consumer Choice: Preferences

- The standard model of consumer behaviour assumes preferences satisfy three key conditions:
  1. Completeness
  2. Transitivity
  3. More is Better (Non-satiation)

- With these three properties, we can say a lot about how consumers make decisions.

Condition 1: Completeness

- Completeness: Requires that for a consumer facing a choice between any two bundles of goods, A and B, then either:
  - The consumer prefers A to B.
  - The consumer prefers B to A.
  - The consumer is indifferent between A and B.

- This condition ensures that consumers can rank *all possible bundles of goods* in terms of their desirability.
  - Implication: consumers must be able to decide on preferences for all possible options; indecision is not possible.
  - Is this reasonable?

Condition 2: Transitivity

- Transitivity: Requires that if a consumer strictly prefers A to B, and strictly prefers B to C, then they also strictly prefer A to C.
- Also applies to weak preferences and indifference relationships.
- Transitivity ensures that individuals are rational in their choices.
  - But are people rational?

Condition 3: More is Better

- More is Better: Requires that consumers always prefer more of a good to less.
- Condition is also referred to as "non-satiation".
- Do people always want more?

The Theory of Consumer Choice: Preferences

- The three conditions are very useful for understanding how consumers make decisions.
- To see this, consider the case of Taylor, who loves fast food.
- Taylor has to decide how many Burgers (B) and Tacos (T) to consume per month.

The Theory of Consumer Choice: Preferences

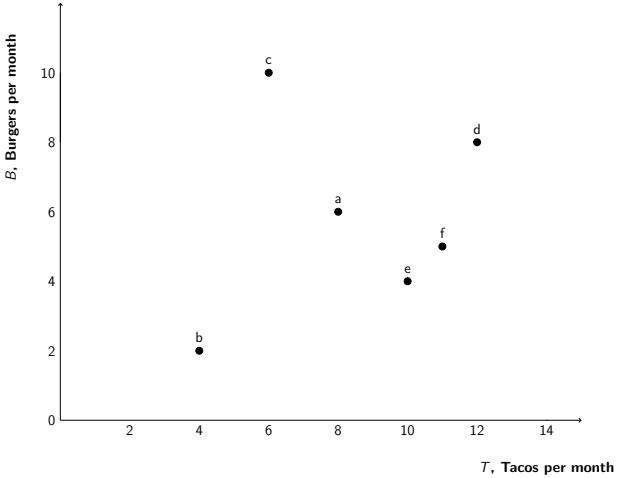

Figure: Taylor's Possible Choices

The Theory of Consumer Choice: Preferences

- Which bundles are preferred to a?

The Theory of Consumer Choice: Preferences

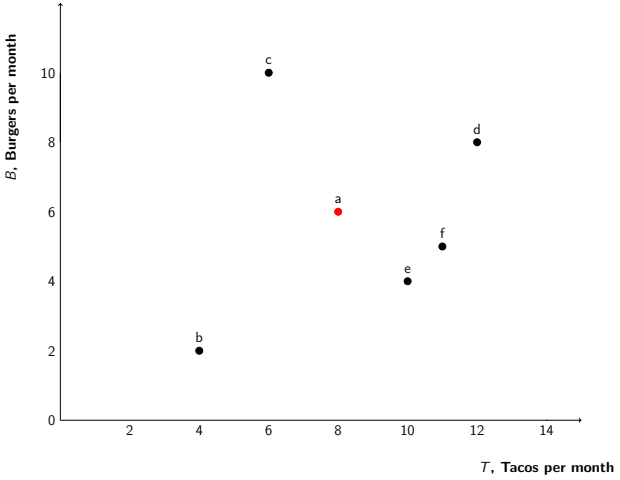

Figure: Taylor's Possible Choices

The Theory of Consumer Choice: Preferences

- We can use the three conditions to understand which bundles are preferred to *a*.
- First: More is better.

The Theory of Consumer Choice: Preferences

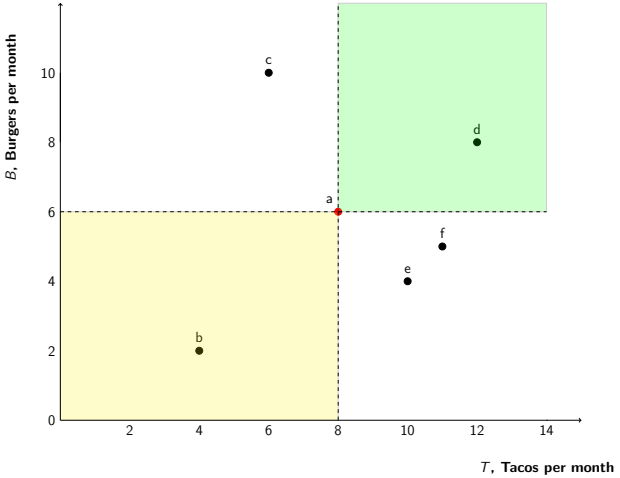

Figure: Taylor's Possible Choices

The Theory of Consumer Choice: Preferences

- More-is-better tells us that d is preferred to a, and a is preferred to b.
- We still need to determine how a compares to c, e, and f.
- To do this, we can exploit the fact that Taylor's preferences are Transitive and Complete.
  - This means Taylor can compare and rank all possible choices.
- Suppose, to start, that we ask Taylor to tell us all bundles that are just as good as a.

The Theory of Consumer Choice: Preferences

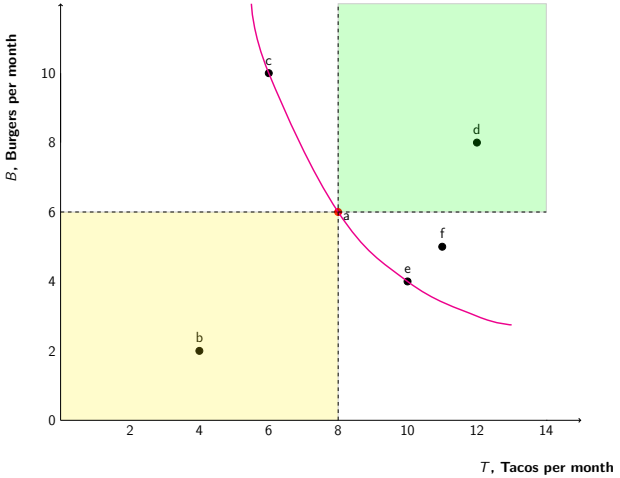

Figure: Taylor's Possible Choices

The Theory of Consumer Choice: Preferences

- On the figure, the set of choices that Taylor is indifferent between is known as a *indifference curve*.
- An indifference curve depicts the set of all bundles of goods that a consumer views as being equally desirable.
- We can repeat exercise to ask Taylor about all sets of indifferent choices.
  - Result is an indifference map; a set of indifference curves that describes sets of goods that are viewed as equally desirable.

The Theory of Consumer Choice: Preferences

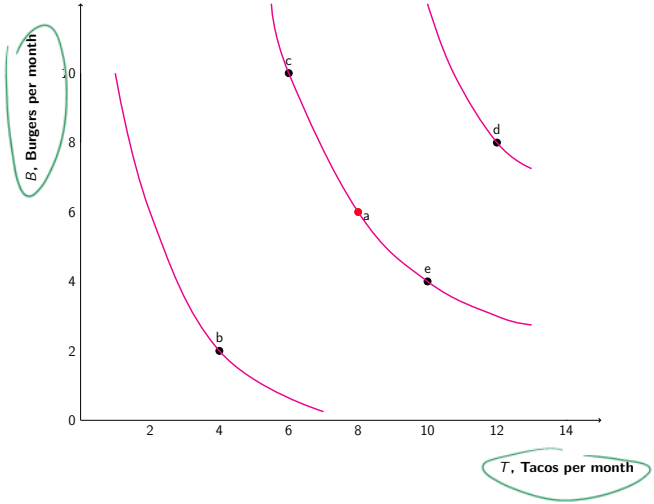

Figure: Taylor's Indifference Map

The Theory of Consumer Choice: Preferences

- Indifference maps must satisfy the following four properties:
  1. Bundles on indifference curves farther from the origin are preferred to those on indifference curves closer to the origin.
  2. An indifference curve goes through every possible bundle.
  3. Indifference curves cannot cross.
  4. Indifference curves slope downward.

The Theory of Consumer Choice: Preferences

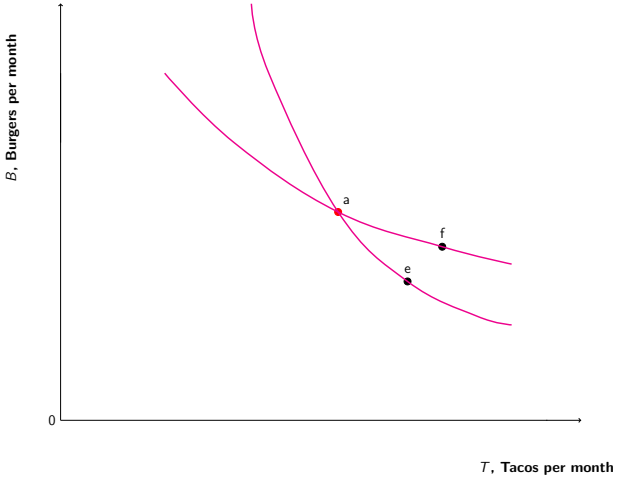

Figure: Impossible indifference curves

The Theory of Consumer Choice: Preferences

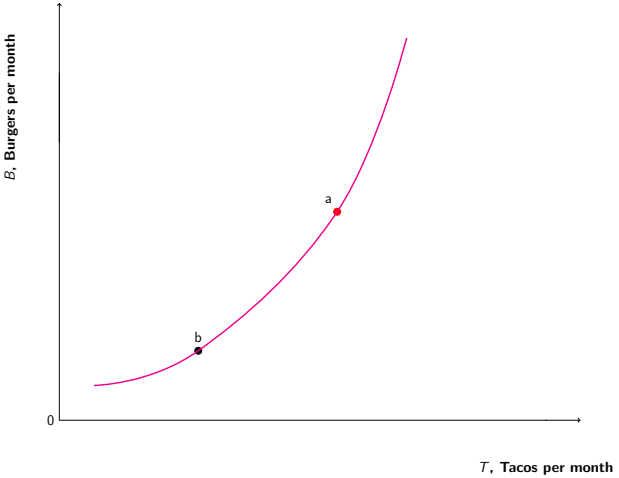

Figure: An impossible indifference curve

The Theory of Consumer Choice: Preferences

- Indifference curves contain a lot of information.
- The slope of the indifference curve reflects how willing consumers are to trade one good for another.
  - This is known as the *marginal rate of substitution*

Definition (Marginal Rate of Substitution)

The rate at which a consumer is willing to substitute one good for another.

- In our example, Taylor's marginal rate of substitution (MRS) is

$$MRS = \frac{\Delta B}{\Delta T}$$

The Theory of Consumer Choice: Preferences

- The curvature of the indifference curve also contains useful information.
  - Curvature tells us how a consumer's willingness to substitute between goods changes as the relative quantity of each good changes.

- If an indifference curve is convex ("bowed in" towards the origin), preferences exhibit a *diminishing marginal rate of substitution*.

- If an indifference curve is concave ("bowed out" from the origin), preferences exhibit an *increasing marginal rate of substitution*.

The Theory of Consumer Choice: Preferences

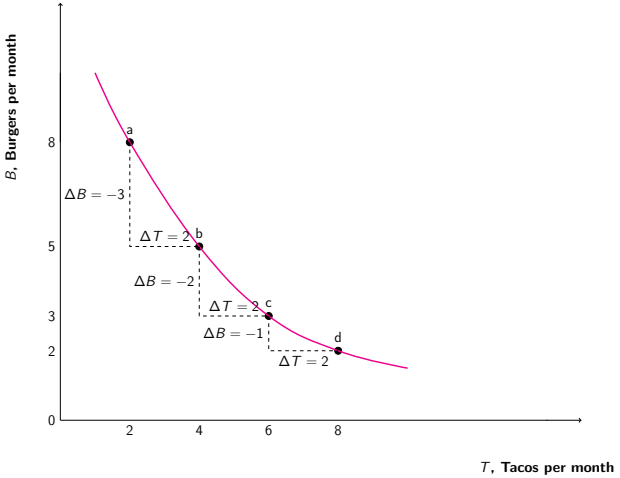

Figure: Convex Preferences

The Theory of Consumer Choice: Preferences

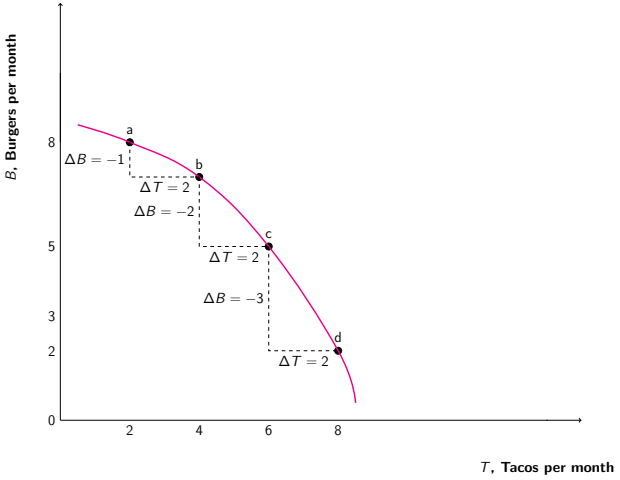

Figure: Concave Preferences

The Theory of Consumer Choice: Preferences

- Empirical evidence suggests that most people have convex indifference curves for most pairs of products.
- In one extreme case, preferences exhibit a constant marginal rate of substitution, meaning goods are *perfect substitutes*.
  - Perfect substitutes are goods that are essentially equivalent from the consumer's point of view.
- At the other extreme, goods are always consumed in fixed proportions.
  - In this case, goods are known as *perfect complements*.

The Theory of Consumer Choice: Preferences

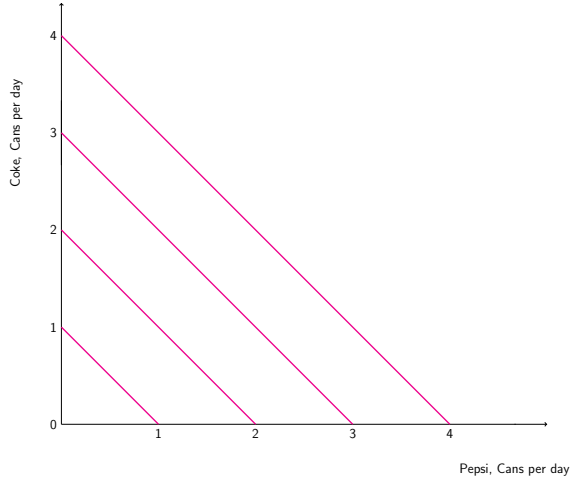

Figure: Perfect substitutes

The Theory of Consumer Choice: Preferences

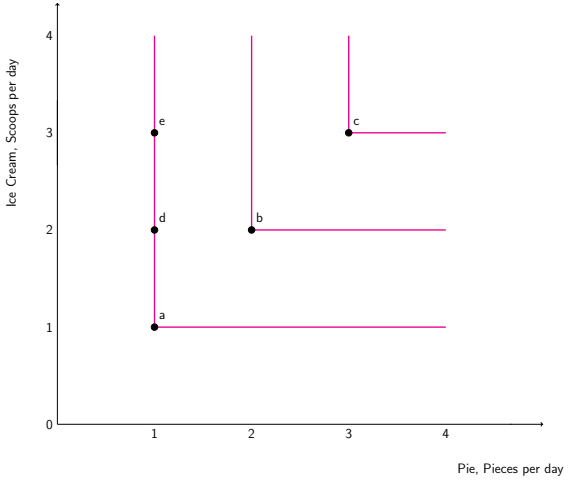

Figure: Perfect Compliments

The Theory of Consumer Choice: Preferences

- Typically, preferences lie between the two extremes, meaning that goods are *imperfect substitutes*.

The Theory of Consumer Choice: Preferences

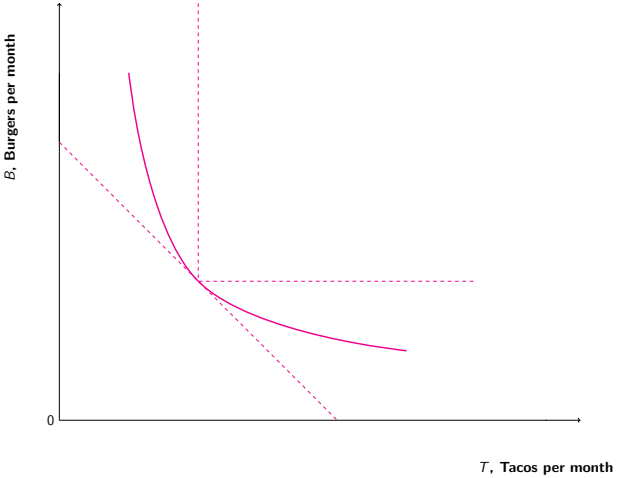

Figure: Imperfect Substitutes

The Theory of Consumer Choice: Utility

- Our model of consumer behaviour assumes that consumers can compare bundles of goods and services to decide which gives them the greatest satisfaction.
- We can summarize these preferences by giving each bundle of goods and services that can be consumed a numerical value that reflects the relative ranking of the bundles.
- These numeric values describe the *utility* from consumption.
- The idea of describing preferences with utility is quite old.
  - Goes back to the 19th century and the work of John Stuart Mill and Jeremy Bentham.

The Theory of Consumer Choice: Utility

- The idea of utility is quite powerful because it lets us summarize the information contained in an indifference map succinctly using a *utility function*.

- The utility function describes the level of utility obtained from consuming goods and services:

$$U = U(B, T)$$

where U is the level of utility obtained from consuming B and T respectively.

- Given a utility function, $U(-)$, if a consumer prefers bundle (B_1, T_1) to bundle (B_2, T_2), then $U(B_1, T_1) > U(B_2, T_2)$.

The Theory of Consumer Choice: Utility Example

- Suppose Taylor's utility function for burgers and tacos is given by:

$$U = \sqrt{(B \times T)}$$

  and suppose Taylor faces a choice between consuming 4 burgers and 25 tacos, or 9 burgers and 9 tacos.
- Then the utility Taylor receives from consuming 4 burgers and 25 tacos is 10 $(= \sqrt{(4 \times 25)})$.
- And the utility Taylor receives from consuming 9 burgers and 9 tacos is 9 $(= \sqrt{(9 \times 9)})$.
- Thus, Taylor prefers the first bundle of goods.

The Theory of Consumer Choice: 2 Points about Utility

1. Utility functions do not exist in any fundamental sense.
   - They constitute an economic model of consumer behaviour
2. Utility is an *ordinal* measure.
   - An ordinal measure only contains information about relative rankings.
     - E.g. 5 star vs 1 star Google review.
   - Cardinal measures are based on absolute numerical comparisons.
     - E.g. 10 kg vs 20 kg.

The Theory of Consumer Choice: Utility

- We can use the utility function to understand how preferences change as consumption bundles change.
- The extra utility (ΔU) that a consumer gets from consuming an additional unit of a good (e.g. $\Delta B = 1$ or $\Delta T = 1$) is the *marginal utility* from that good.
- Marginal utility (MU) tells us how utility changes as we increase (or decrease) consumption of one good, holding consumption of all other goods constant.
  - It is the *slope* of the utility function holding consumption of other goods constant:

$$MU_B = \Delta U / \Delta B$$

The Theory of Consumer Choice: Marginal Utility

- As an example, again suppose Taylor's utility function is given by $U = \sqrt{B \times T}$, and suppose that Taylor consumes 10 burgers.
- What happens to Taylor's utility and marginal utility is they consume 6 tacos instead of 7?

The Theory of Consumer Choice: Marginal Utility

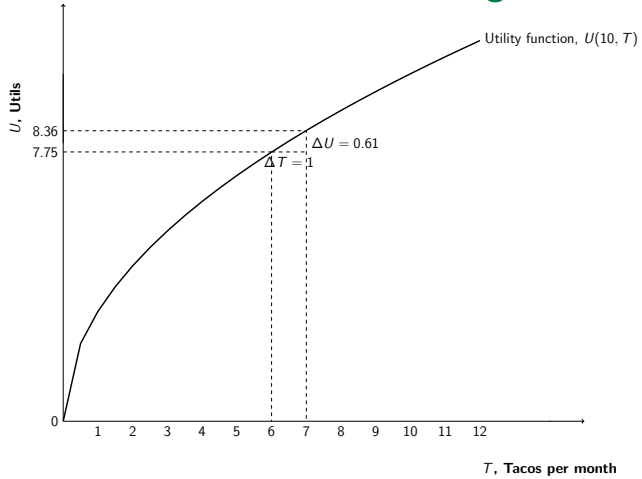

Figure: The effect of a one taco increase

The Theory of Consumer Choice: Utility

- Recall: The marginal rate of substitution tells us the rate at which a consumer is willing to substitute one good for another.

- Given that marginal utility tells us how much consumer satisfaction changes if consumption changes by one unit, we can re-express MRS in terms of marginal utility.

$$MRS = \frac{\Delta B}{\Delta T} = -\frac{MU_T}{MU_B}$$

The Theory of Consumer Choice: An Application of Utility

- The idea that we can understand consumer choice by exploiting utility functions has been quite powerful in practice.
- A good example of this is the work of Dan McFadden (Nobel Prize, 2000) examining the potential usage of the Bay Area Rapid Transit (BART) system in the early 1970s.

The Theory of Consumer Choice: An Application of Utility

- McFadden and his research team collected data on the travel behaviour of several hundred individuals in the San Francisco Bay Area in 1972, prior to BART's introduction.
- They applied the theory of consumer choice to predict what the travel behaviour of these individuals would be in 1975, after BART's introduction.
- The data suggests the theory did a good job of predicting consumer behaviour.

The Theory of Consumer Choice: An Application of Utility

TABLE 1—PREDICTION SUCCESS TABLE, JOURNEY-TO-WORK
(PRE-BART MODEL AND POST-BART CHOICES)

Cell counts	Predicted choices				
Actual choices	Auto alone	Carpool	Bus	BART	Total
Auto alone	255.1	79.1	28.5	15.2	378
Carpool	74.7	37.7	15.7	8.9	137
Bus	12.8	16.5	42.9	4.7	77
BART	9.8	11.1	6.9	11.2	39
Total	352.4	144.5	94.0	40.0	631
Predicted share (percent)	55.8	22.9	14.9	6.3	
(Standard error) (percent)	(11.4)	(10.7)	(3.7)	(2.5)	
Actual share (percent)	59.9	21.7	12.2	6.2	

The Theory of Consumer Choice: The Budget Constraint

- Understanding preferences is the first step in determining consumer choice behaviour.
- The second step is understanding the constraints consumers face when making decisions.
- The most important constraint individuals face in the standard theory of consumer choice is the limitations imposed by a budget.

The Theory of Consumer Choice: The Budget Constraint

- For simplicity, let's again consider the case of Taylor, who spends all of their money on burgers and tacos. Taylor's budget constraint is then:

$$p_B B + p_T T = Y$$

where p_B is the price of burgers, p_T is the price of tacos, and Y is income.

- We can re-express Taylor's budget constraint in terms of B:

$$\frac{p_B}{p_B}B + \frac{p_T}{p_B}T = \frac{Y}{p_B}$$

$$B = \frac{Y}{p_B} - \frac{p_T}{p_B}T$$

The Theory of Consumer Choice: The Budget Constraint

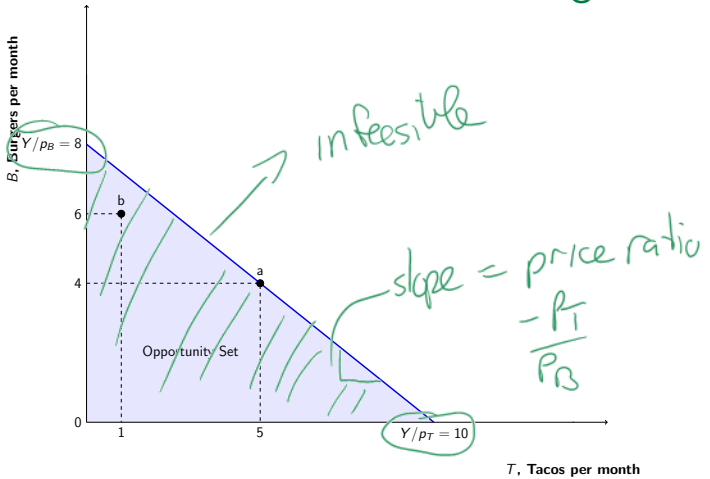

Figure: Budget constraint with $Y = 40$, $p_B = 5$, and $p_T = 4$.

The Theory of Consumer Choice: The Budget Constraint

- The *budget constraint* or *budget line* depicts all possible bundles of goods that can be purchased if the consumer's entire budget is spent on those goods at given prices.

- The *opportunity set* is the set of all possible bundles of goods that a consumer can buy.

The Theory of Consumer Choice: The Budget Constraint

- The budget constraint contains useful information.
- The slope of the budget constraint is known as the *marginal rate of transformation* (MRT).

Definition (Marginal Rate of Transformation)

The trade-off the market imposes on the consumer in terms of how much of one good the consumer must give up to purchase more of another good.

- In our example, the MRT is given by:

$$MRT = -\frac{p_T}{p_B}$$

The Theory of Consumer Choice: The Budget Constraint

- Changes in prices and income change the opportunity set.
- As an example, first consider the effect of a $1 decrease in the price of tacos.

The Theory of Consumer Choice: The Budget Constraint

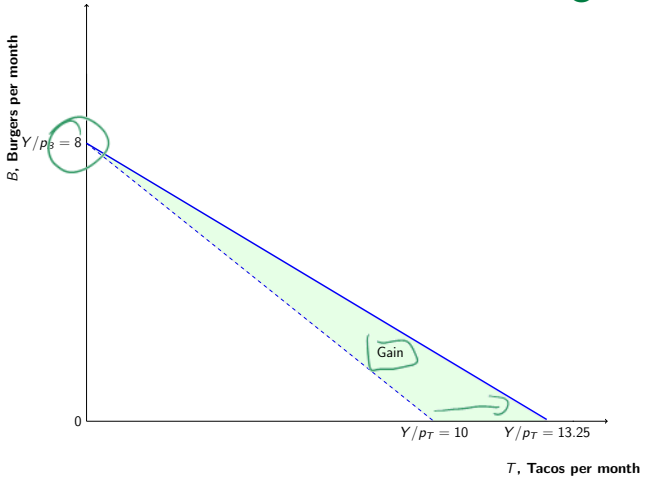

Figure: The effect of a $1 decrease in the price of tacos.

The Theory of Consumer Choice: The Budget Constraint

- Next, consider the effect of a $20 decrease in income.

The Theory of Consumer Choice: The Budget Constraint

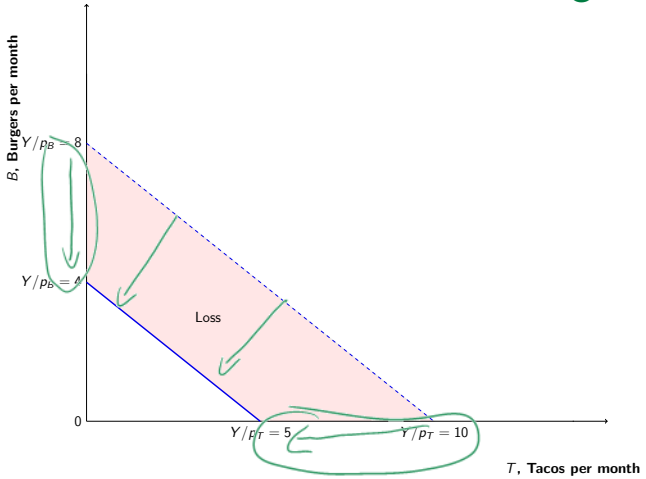

Figure: The effects of a $20 income decrease.

The Theory of Consumer Choice: Determining Choice

- The third step in determining consumer choice behaviour is understanding how consumers maximize their well-being, subject to the constraints that they face.

- Basic idea underlying our theory: Constrained consumer choice.
  - Consumers pick the bundle of goods in their opportunity set that gives them the highest level of utility.
  - Intuition: of all the bundles of goods that they can afford to buy, consumers choose the bundle of goods that makes them the happiest.

The Theory of Consumer Choice: Constrained Consumer Choice

- If consumers choose the bundle of goods that makes them the happiest, their optimal choice must lie on an indifference curve that touches the budget line, but does not cross it.
- Why is this?

The Theory of Consumer Choice: Constrained Consumer Choice

- There are two ways consumers can reach their optimal bundle:
  1. An *interior solution*, where the optimal bundle has positive quantities of all goods, and lies between the ends of the budget line.
  2. A *corner solution*, where the optimal bundle has a quantity of zero for at least one good, meaning the optimal bundle is at one end of the budget line.

The Theory of Consumer Choice: Constrained Consumer Choice

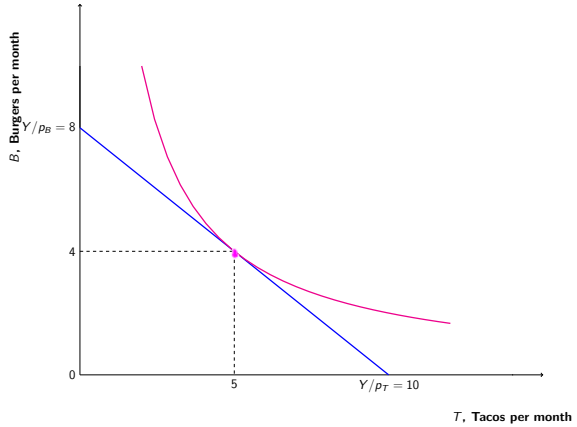

Figure: An Interior Solution.

The Theory of Consumer Choice: Solving for an Interior Solution

- At an interior solution, the consumer's indifference curve is *tangent* to the budget line.
  - This means that the slope of the budget line and slope of the indifference curve are equal.

- This means that $MRS = MRT$ at an interior solution, so:

$$MRS = -\frac{MU_T}{MU_B} = -\frac{p_T}{p_B} = MRT$$

$p_B B + p_T T = Y$

or equivalently:

$$\frac{MU_T}{p_T} = \frac{MU_B}{p_B}$$

The Theory of Consumer Choice: An Interior Example

- Suppose Nate's utility function over strawberry jelly, J, and peanut butter, N, is $U = NJ$. As such, Nate's marginal utility from consuming jelly is $MU_J = N$ and from consuming peanut butter is $MU_N = J$. Strawberry jelly is \$5 per jar, and peanut butter is \$10 per jar. Nate has \$100 to spend on peanut butter and jelly. If he maximizes his utility, how much of each good will he consume?

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$U = NJ \quad MU_J = N = \frac{\partial U}{\partial J}$

$MU_N = J = \frac{\partial U}{\partial N}$

① $10N + 5J = 100$

② $MRS = MRT$

$\frac{MU_J}{P_J} = \frac{MU_N}{P_N}$

$\frac{N}{5} = \frac{J}{10}$

$2N = J$

$100 = 5(2N) + 10N$

$100 = 10N + 10N$

$= 20N$

$N = 5$

$J = 10$

$U = 50$

$N = 4?$
$J = 12?$ $\Rightarrow U = 48 < 50$

$J = 9$
$N = 5.5 \quad U = 49.5 < 50$

The Theory of Consumer Choice: Constrained Consumer Choice

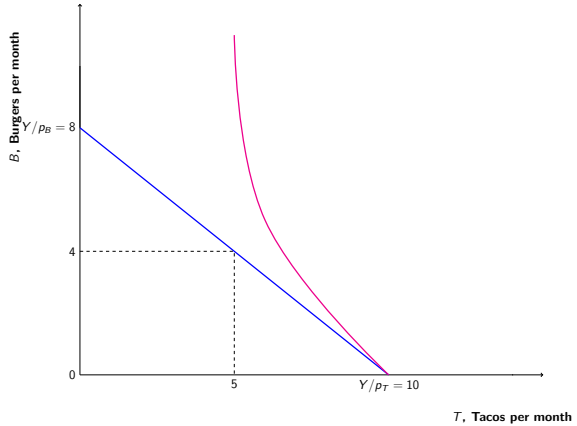

Figure: A Corner Solution.

The Theory of Consumer Choice: A Corner Example

- Suppose Jane's utility function over strawberry jelly, J, and peanut butter, N, is $U = 3N + J$. As such, Jane's marginal utility from consuming jelly is $MU_J = 1$ and from consuming peanut butter is $MU_N = 3$. Strawberry jelly is \$5 per jar, and peanut butter is \$10 per jar. Jane has \$100 to spend on peanut butter and jelly. If she maximizes her utility, how much of each good will she consume?

$MU_J = 1$ $P_J = 5$ $\frac{MU_J}{P_J} = \frac{MU_N}{P_N} \Rightarrow \frac{1}{5} \neq \frac{3}{10}$

$MU_N = 3$ $P_N = 10$

Check corners
$N = 10 \Rightarrow U = 30$ $J = 20 \Rightarrow U = 20$

- Suppose Jane's utility function over strawberry jelly, J, and peanut butter, N, is $U = 3N + J$. As such, Jane's marginal utility from consuming jelly is $MU_J = 1$ and from consuming peanut butter is $MU_N = 3$. Strawberry jelly is \$5 per jar, and peanut butter is \$10 per jar. Jane has \$100 to spend on peanut butter and jelly. If she maximizes her utility, how much of each good will she consume?

Suppose that Sara is contemplating the upcoming ski season. Their utility function for skiing and all other goods is given by U=x*s+2*x, such that their marginal utility for skiing is given by U_s=x and their marginal utility for other consumption is U_x=s+2. Assume that Sara has $600 of disposable income to allocate across these goods, and that the price of a daily lift ticket is $100. Use a price of $1 for the indexed other goods (i.e. the budget constraint has intercept at x=600 and s=6.) How much will Sara ski this year, and how much will they have left for other goods?

$MRS = MRT$

$\frac{MU_s}{P_s} = \frac{MU_x}{P_x}$

$\frac{x}{100} = s+2$

$x = 100(s+2)$

BC

$P_s S + P_x X = 600$

$600 = 100s + x$

$600 = 100s + 100(s+2)$

$600 = 100s + 100s + 200$

$400 = 200s$

$s = 2 \qquad x = 400$

Applying the Theory: Designing Promotions

- We can exploit the predictions of our model of consumer behaviour to understand how firms can use promotions to influence consumer decisions.

- We will consider two common promotions:
  1. Buy one, get one free (BOGOF).
  2. Buy one, get the second at half price.

Applying the Theory: Designing Promotions

- With a BOGOF promotion, a consumer gets a free unit after buying one unit (or some other number of units).
- The effect for consumers is a change in the budget line.
  - A BOGOF creates a kink in the consumer's budget constraint.
- Whether or not the promotion works depends on consumer preferences.

Applying the Theory: A BOGOF Example

- As an example, consider the case of Sal's Pizzeria. Sal is interested in trying to get his customers to buy more pizzas. As such, he decides to run a "buy two get one free promotion."
- Q: Will this promotion allow him to sell more pizzas?
- A: It depends.

Applying the Theory: A BOGOF Example

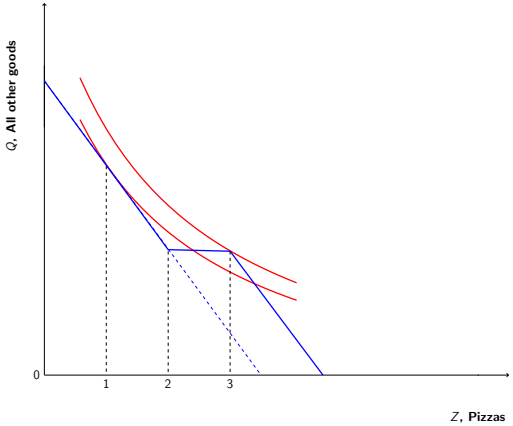

Figure: A BOGOF Promotion

Applying the Theory: A BOGOF Example

- The BOGOF promotion works in this case because the new budget line crosses the pre-promotion indifference curve.
  - This causes some customers to re-optimize their consumption bundle to increase their utility.
- However, BOGOF does not work with all consumers.

Applying the Theory: A BOGOF Example

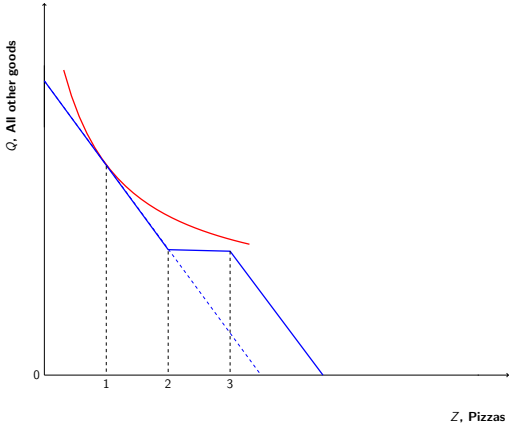

Figure: A BOGOF Promotion

Applying the Theory: Designing Promotions

- If a BOGOF promotion does not work, a manager can use an alternative promotion to induce consumers to participate.
- One option: a pricing promotion that rotates the budget line.
- As an example, consider the effects of a half-price promotion, where the consumer gets the 2nd and 3rd pizzas for half price.

Applying the Theory: A Half-Price Promotion

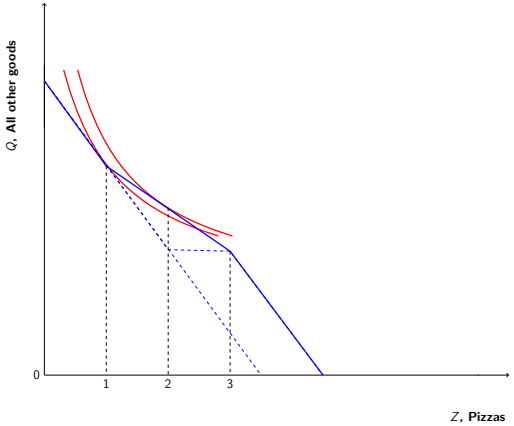

Figure: A Half-Price Promotion

Applying the Theory: Designing Promotions

- Examples illustrate an important point: properly designed promotions can be used to increase sales by exploiting the theory of consumer choice.

- Two additional points to remember:
  - Properly exploiting promotions requires knowledge of consumer preferences.
  - Promotions are costly. Only use if benefits $>$ costs.

Applying the Theory: Deriving Demand Curves

- We can also use the theory of consumer choice to show how the quantity demanded of a good changes as its price changes.
- The theory says that an individual chooses their optimal bundle of goods by picking the point on the highest indifference curve that touches the budget line.
- Any price change causes the budget line to rotate, meaning the consumer chooses a new optimal bundle.
- By varying one price and holding income and other prices constant, we can can determine how the quantity demanded changes as the price changes.
  - This is the information needed to draw a demand curve.

Applying the Theory: Deriving Demand Curves

- As an example, consider Kelly, who spends money on pizza (Z) and all other goods (Q).
- By seeing how Kelly's consumption changes as the price of pizza changes, we can determine the demand curve.

Applying the Theory: Deriving Demand Curves

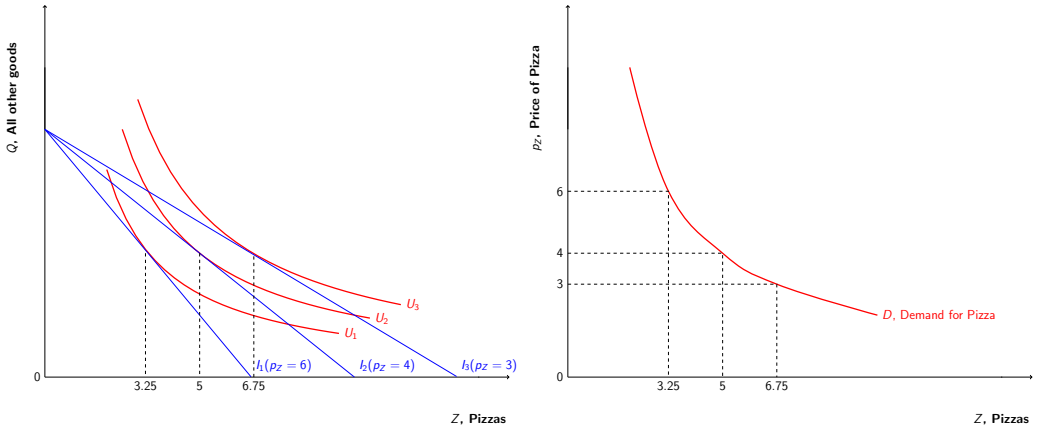

Figure: Deriving Demand Curves

Deviations from the Theory: Behavioural Economics

- Standard theory of consumer choice assumes that individuals are rational and seek to maximize their utility.
- Behavioural economics seeks to understand the implications of departures from these assumptions using insights from psychology, and empirical research on our cognitive and emotional biases.
- Goal: Refine the standard model to better predict economic decision making.
- Three key findings:
  1. Transitivity
  2. Endowment effects
  3. Salience

Deviations from the Theory: Transitivity

- Key assumption of the standard model: preferences are transitive.
- Research suggests most adults exhibit transitivity for most economic decisions.
- Two cases where this finding fails:
  1. Novel goods.
  2. Children.
- Do these failures matter?

Deviations from the Theory: Endowment Effects

- Standard model assumes that individuals value a good the same regardless of whether or not they own it.
- Empirical evidence suggests that most people place a higher value on a good if they own it then they do if they are considering buying it.
- Does this matter?

Deviations from the Theory: Salience

- Standard model assumes that individuals consider all possible information when making a decision.
- Empirical evidence suggests that people are more likely to consider information if it is presented in a way that grabs their attention, or if it takes relatively little thought or calculation to understand.
- Does this matter? How?

Consumer Behaviour: Takeaways

1. The theory of consumer choice is a model of consumer behaviour based on the idea that individuals make their consumption decisions to maximize their well being subject to the constraints that they face.

2. The model can be use to predict consumer behaviour.

3. While the model typically works very well, its usefulness can be limited by human psychology.