Topic 2A: Consumer Behaviour

Business Economics, Organization, and Management (BUEC 211)

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Outline

- Motivation: Consumer decision making
- The theory of consumer choice
  - Preferences and utility
  - The budget constraint
  - Determining consumer choice
- Applying the theory
  - Designing promotions
  - Substitute goods, complement goods; deriving demand curves $\rightarrow$ demand elasticities
- Deviations from the theory, Behavioural economics

Motivation: Consumer Decision Making

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- Do you consider such decision to be a **rational** one?

  How might you *define* rationality?

  Ex: Did you buy that coffee this morning because of ~~addiction~~ need?

The Theory of Consumer Preference and Choice

The Theory of Consumer Choice

- One possible explanation for consumer choice: random decision making.

  Consumers act blindly and make decisions without any thought

  A sometimes useful model when consumers are navigating uncertain environments (trial and error)

- An alternative explanation for consumer choice: individuals make systematic decisions to achieve their goals or bring satisfaction.

  But then, what drives systematic decision making? How do we model it? What are these goals? What brings satisfaction?

The Theory of Consumer Choice

Economists rely on a simple Theory of Consumer Choice to understand how consumers make decisions. This theory is surprisingly rich enough to capture important aspects of consumer behaviour.

This model of Behaviour relies on three main premises.

- Consumers have **preferences** that determine the **satisfaction** they get from the consumption of goods and services.
- Consumers face **constraints** that limit their choices.
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Nutshell: **maximize satisfaction subject to constraints**.

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.

- **Important:** we will unfortunately have little to say about *where* preferences come from and how to influence them.
- In this economic model, we take preferences **as given**.

The Theory of Consumer Choice: Preferences

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1. Completeness
2. Transitivity
3. More is Better (Non-satiation)

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3. More is Better (Non-satiation)
4. Convexity (we'll come back to this one later)

Preference Relations

In what follows, we introduce the **preference relation**. For any two consumption bundles A and B, we say

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e.g. (3 Cars, 0 Houses) $\prec$ (1 Car, 1 House)

Condition 1: Completeness

Completeness: Requires that for a consumer facing a choice between any two bundles of goods, A and B, then either:

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- Is this reasonable?

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- What are your opinions on this?

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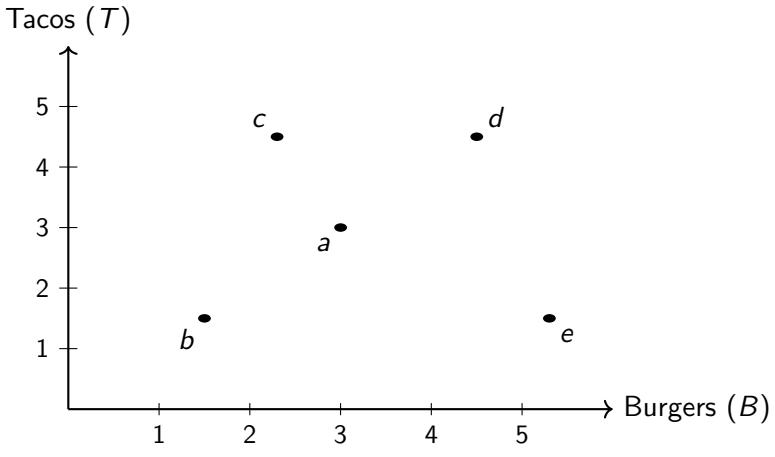
- Do people always want more?
- It is easy to model goods that are "bads" (e.g. pollution) or goods that reach satiation points (e.g. burger consumption per day). We won't emphasize that in this course.

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



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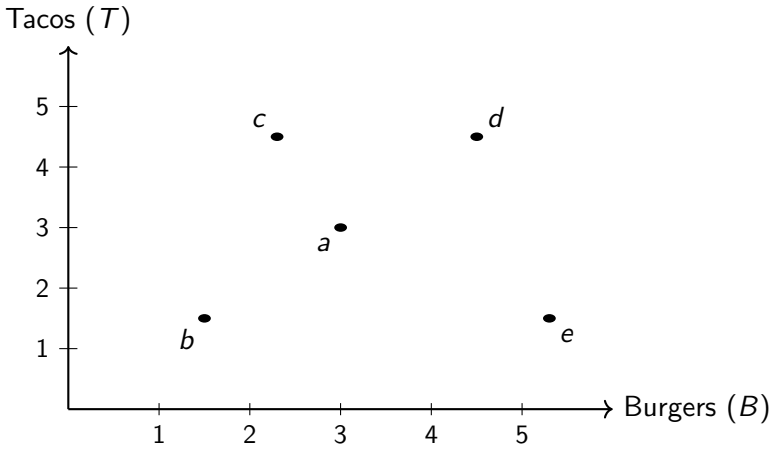

Q: Which bundles are preferred to a?

We can use the three conditions to understand which bundles are preferred to *a*.

First: More is better.

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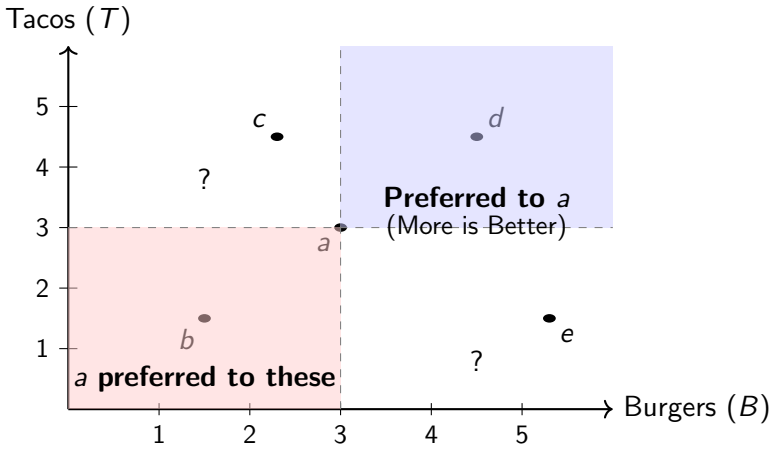

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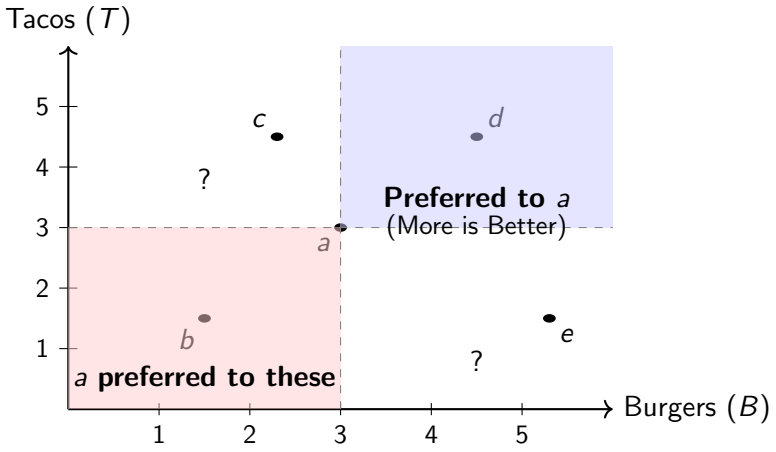

Q: What next? How do we deal with bundles c and e in the white region?

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Suppose, to start, that we ask Taylor to tell us **all bundles for which she is indifferent to** a.

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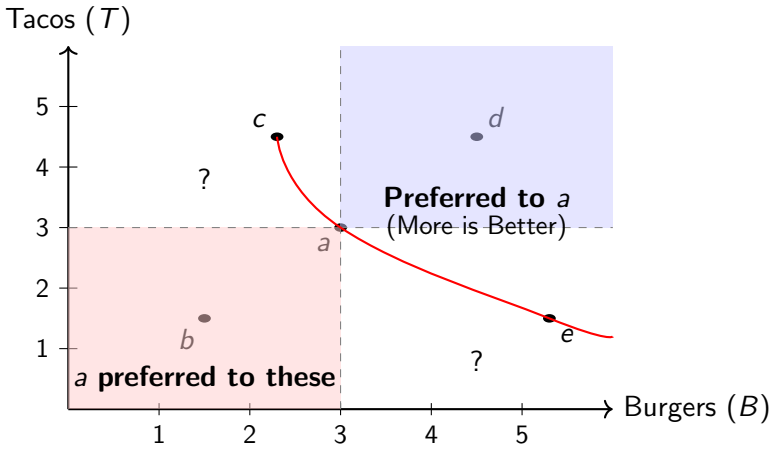

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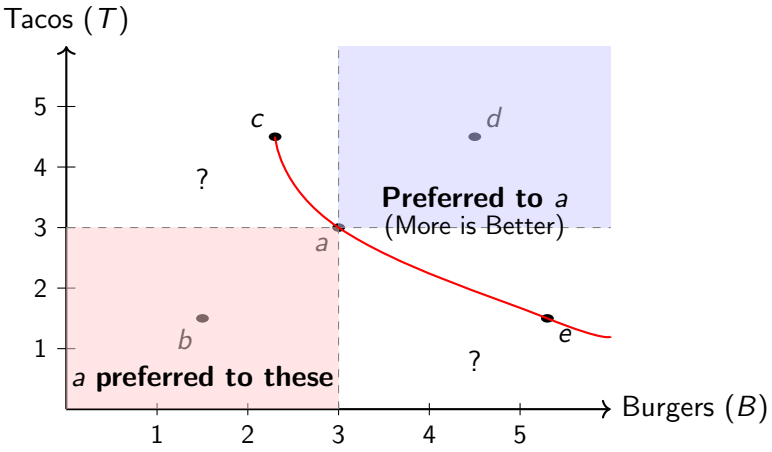


Note: Indifference curves don't stop – they extend beyond c and e.

The Theory of Consumer Choice: Preferences

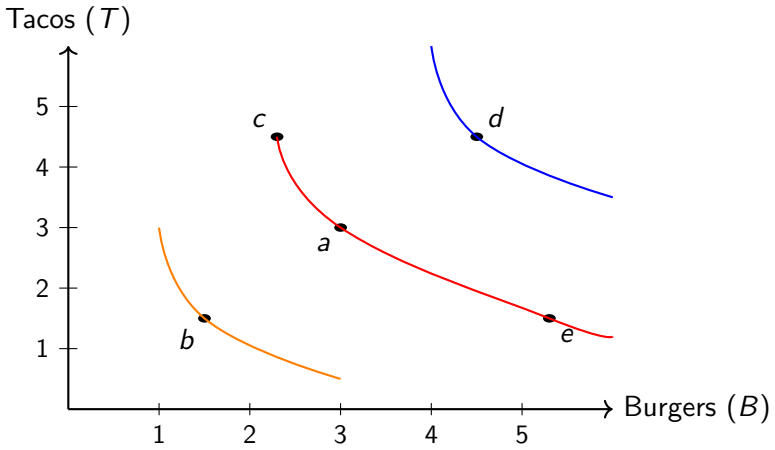
On the figure, the red set of choices that Taylor is indifferent between is known as a indifference curve.

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



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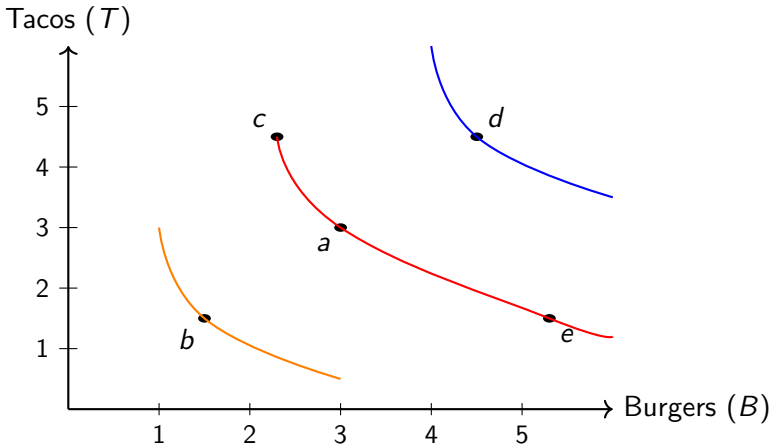

Note: Every bundle on Orange curve $\prec$ bundles on Red curve $\prec$ bundles on Blue curve.
Why?

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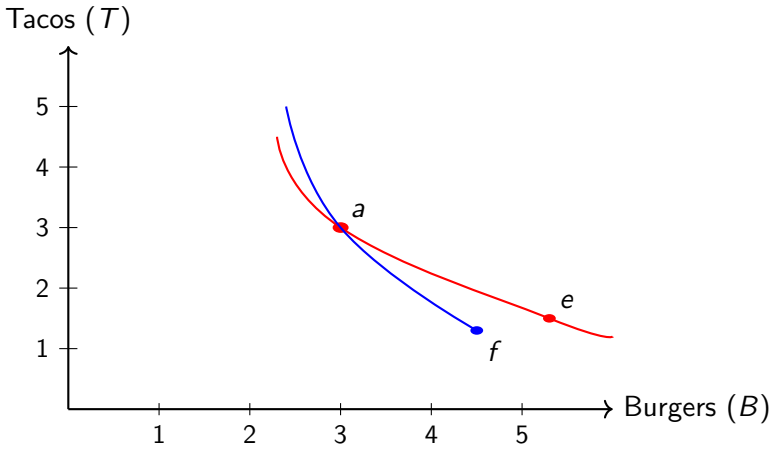
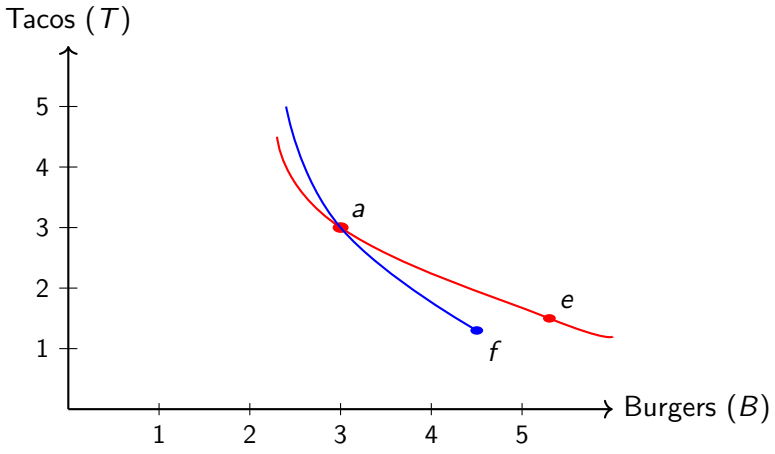
Q: Can you say why?

Indifference Curves Cannot Cross



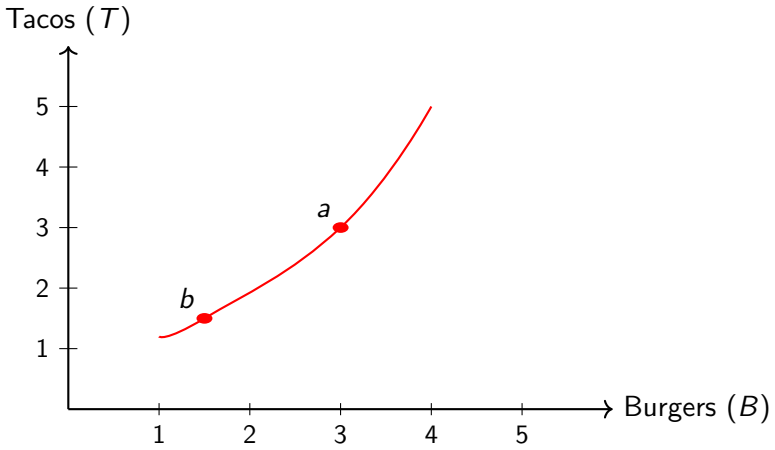
Q: Why is this wrong?

Indifference Curves Cannot Cross



Q: Why is this wrong? Hint: use transitivity and "more is better"

Indifference Curves Do Not Slope Upward



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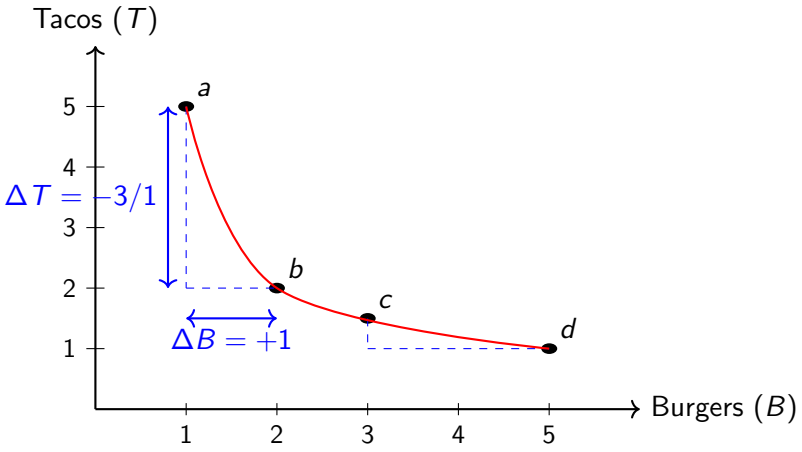
Interpretation: how many tacos do you need to give up for another burger to remain indifferent?

Graphical illustration of MRS



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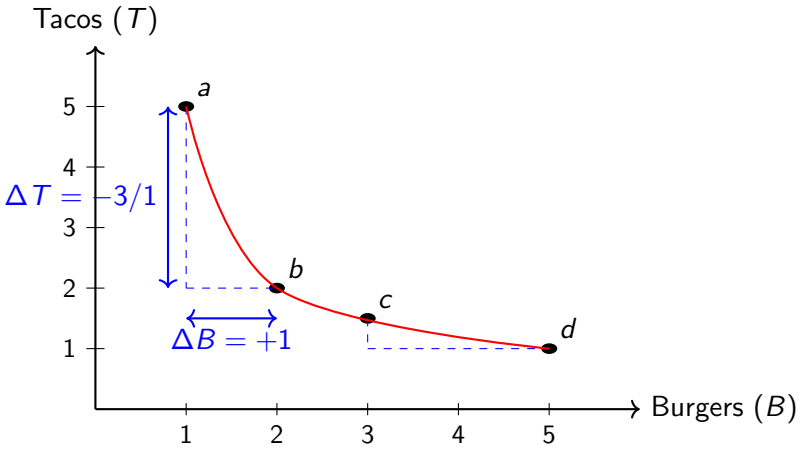

Interpretation: at bundle a, Taylor is willing to trade 3 tacos for one burger and be indifferent. This means $MRS_{BT} = \Delta T/\Delta B = -3/1 = -3$.

Condition 4: Convexity

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** in absolute value.

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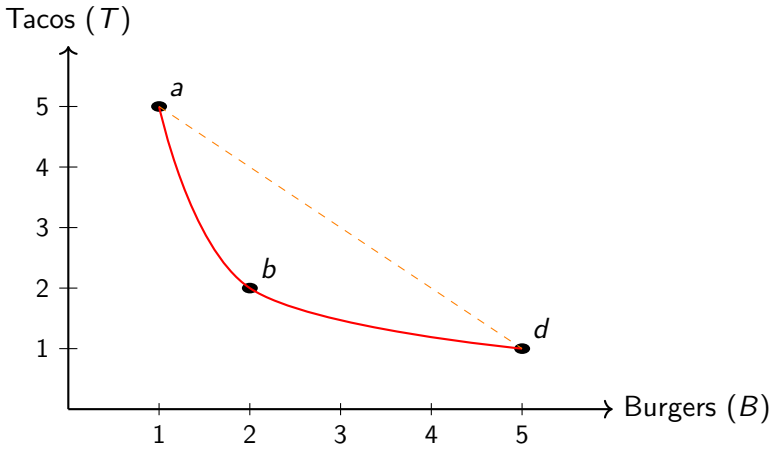
This assumption is not necessary, but captures the fact that consumers like **variety**. Why?

Visualizing Convex Preferences



One way to remember convex preferences: Line segments between bundles **lie above the indifference curve**.

The Theory of Consumer Choice: Preferences

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- 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.

  Ex: Coke and Pepsi

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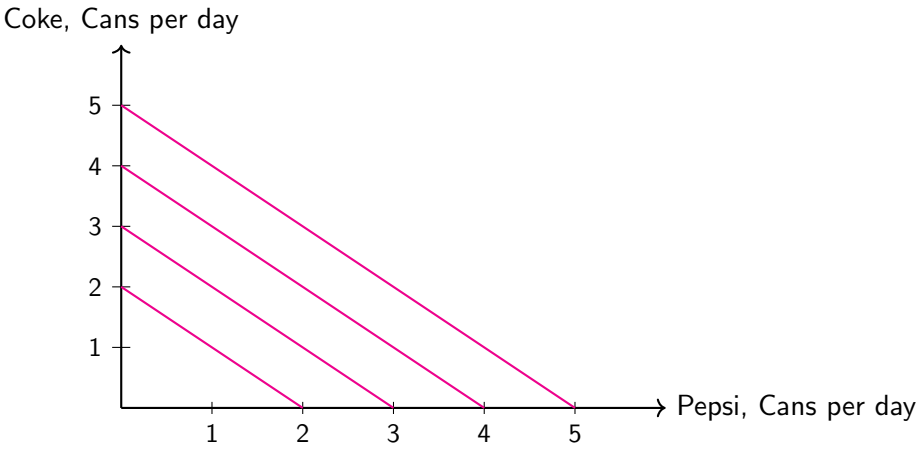
- At the other extreme, goods are always consumed in fixed proportions.
  - In this case, goods are known as **perfect complements**.

  Ex: Left and right shoes

Indifference Curves of Perfect Substitutes



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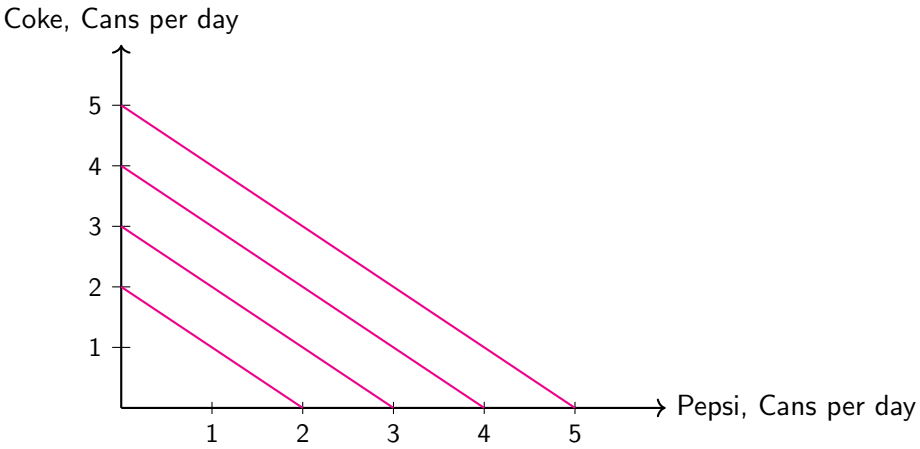
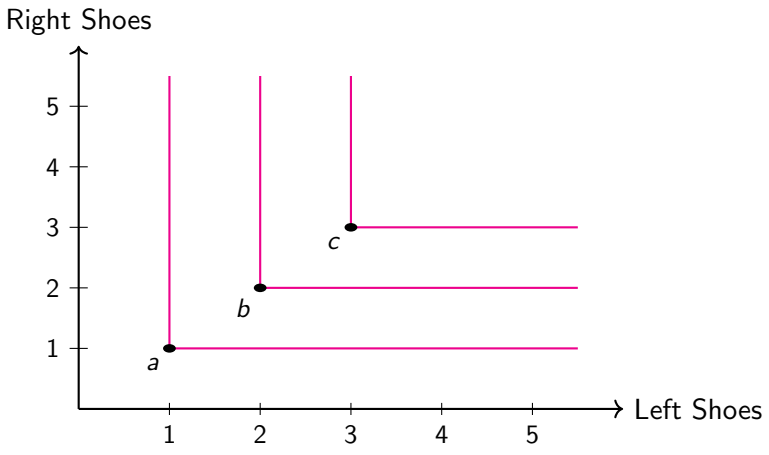


Q: For each indifference curve, *MRS* is constant and equal to what?

Indifference Curves of Perfect Complements



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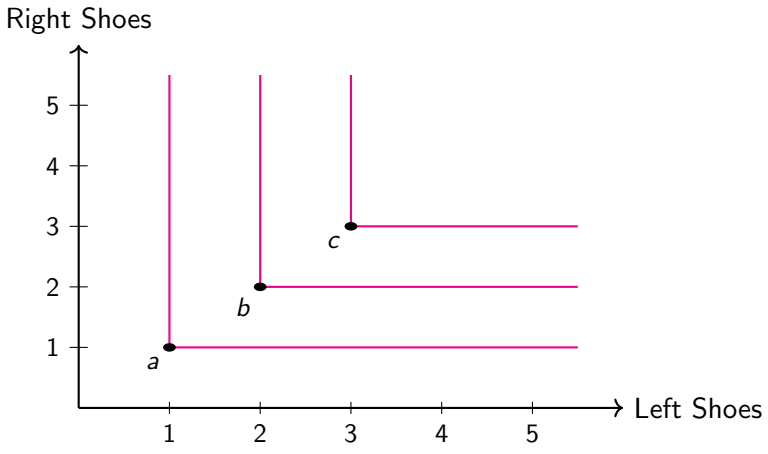
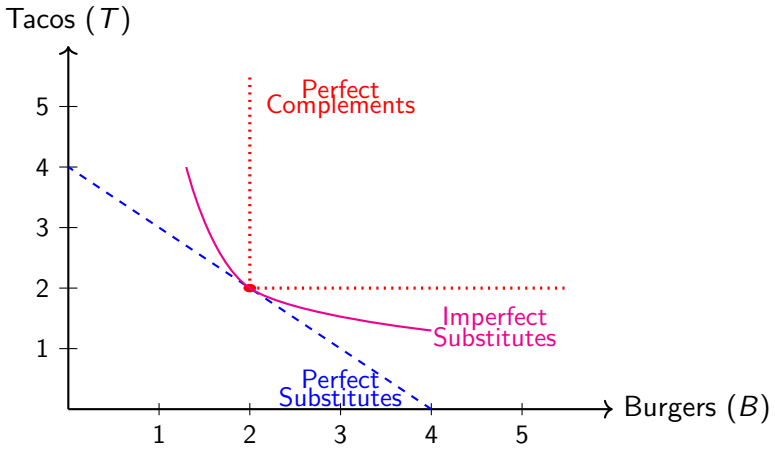


Q: Why are the indifference curves L-shaped?

Comparing Types of Preferences



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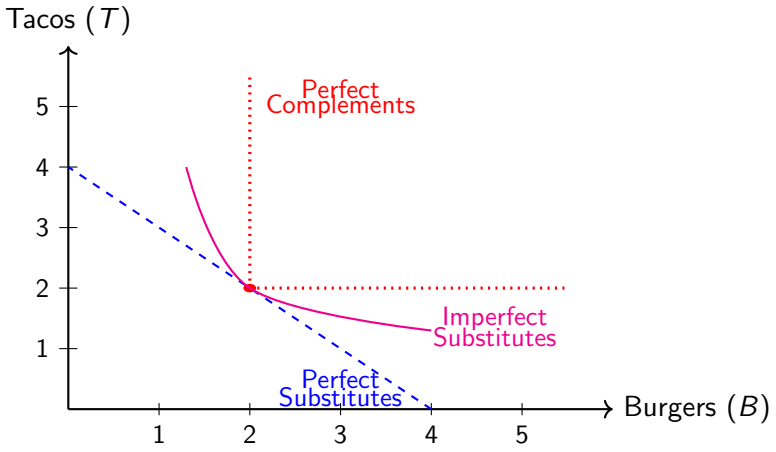

Most goods are **imperfect substitutes**, which lie **in between** the extreme cases of perfect substitutes and complements.

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.

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- Same thing applies with indifference:
  $U(B_1, T_1) = U(B_2, T_2)$ then $(B_1, T_1) \sim (B_2, T_2)$

Utility example

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$\Longrightarrow$ Taylor prefers the second bundle with more equal consumption of burgers and tacos! (Taylor has convex preferences!)

The Theory of Consumer Choice: 2 Points about Utility

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The Theory of Consumer Choice: 2 Points about Utility

Utility "functions" do not exist in any fundamental sense.

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2. Cardinal measures are based on absolute numerical comparisons. e.g. 10 kilograms of sugar vs 20 kilograms.

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Definition: Marginal Utility (MU)

MU tells us how utility changes as we increase (or decrease) consumption of one good, holding consumption of all other goods constant. For example, it is the slope of the utility function for burgers holding the consumption of other goods constant:

$$MU_B = \frac{\Delta U}{\Delta B}$$

Plotting Utility and Marginal Utility

Suppose we hold fixed the consumption of tacos at $T = 3$. Then, we can plot utility against burger consumption:

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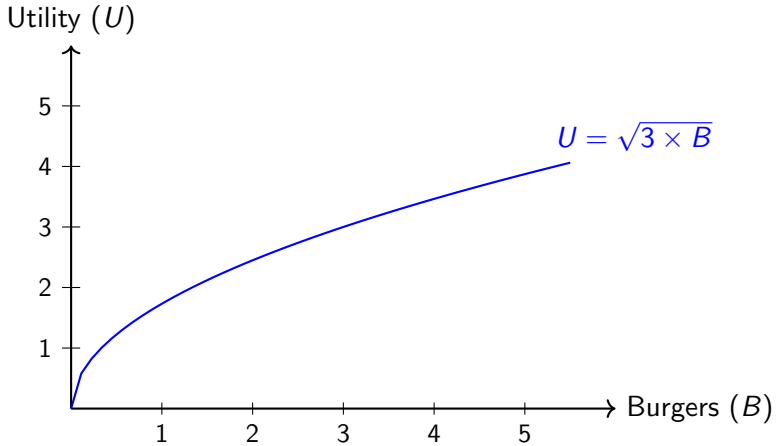

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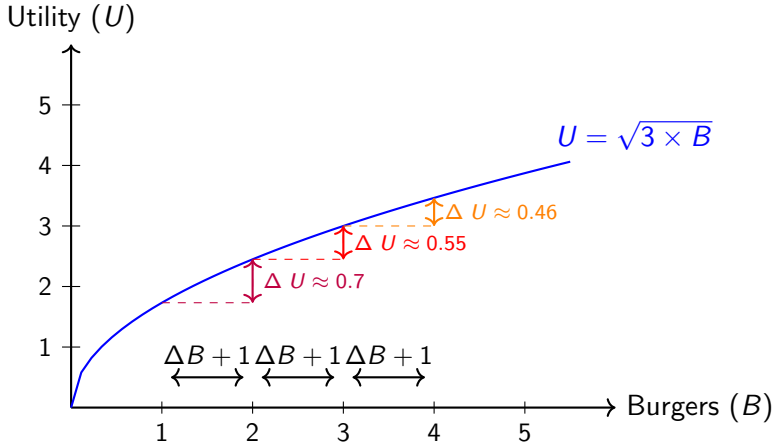

The Marginal Rate of Substitution

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This just means the $MRS_{BT} = \frac{-2}{1} = -2$!

Example: Taylor's MU and MRS

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Taylor has convex preferences: as B increases, $|MRS| = \frac{T}{B}$ falls (see Slide 25)

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 is the limitations imposed by a **budget** – not all bundles are affordable given a consumer's wealth.

The Budget Constraint

- Taylor spends all their wealth on burgers and tacos. Taylor's budget constraint is then

$$P_B B \quad + \quad P_T T \quad \leq \quad Y$$

where

1. P_B and P_T are the price of burgers and tacos
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- In this course, we won't study how consumers **save** wealth.
- Since "more is better", this implies that Taylor will always spend her entire wealth. (The budget constraint will always hold with equality).

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$$P_B B + P_T T \leq Y$$

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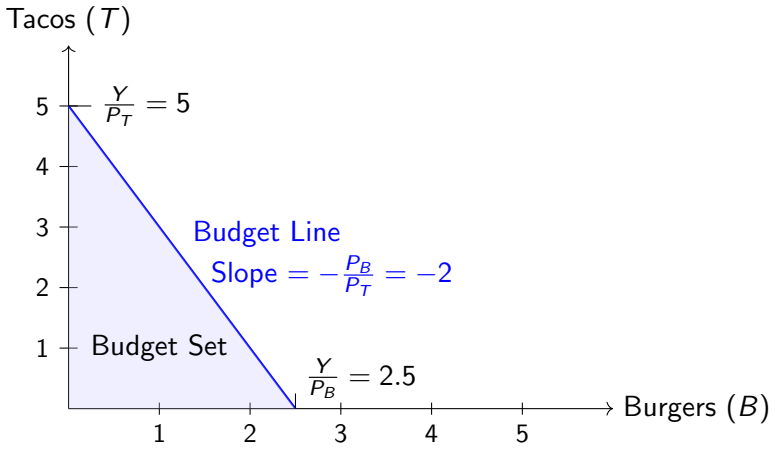
- We can re-express Taylor's **budget line** where T as a function of B

$$T = \frac{Y}{P_T} - \frac{P_B}{P_T} B$$

Important: the slope of the budget line is $-P_B/P_T$. What are the T and B intercepts?

Budget Set Graphically with $P_T = \$1$, $P_B = \$2$, and $Y = \$5$.



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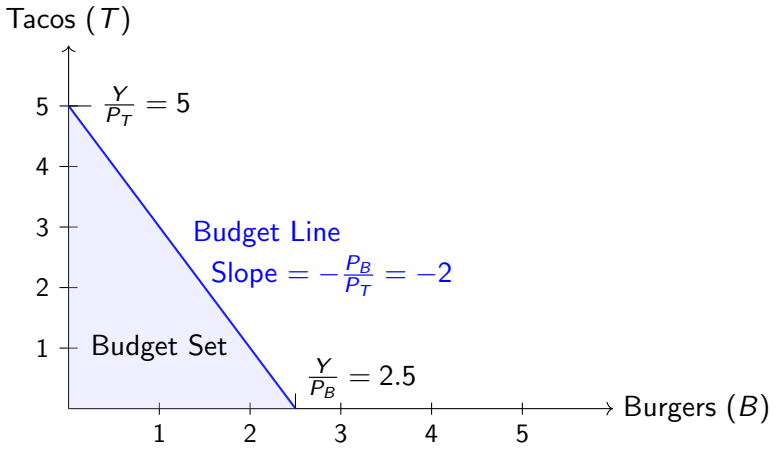

Note: The Budget (or Opportunity) Set contains all affordable bundles. The Budget Line contains all bundles where Taylor spends all her wealth.

The Marginal Rate of Transformation

- The slope of the budget line is what we will call the Marginal Rate of Transformation (MRT).

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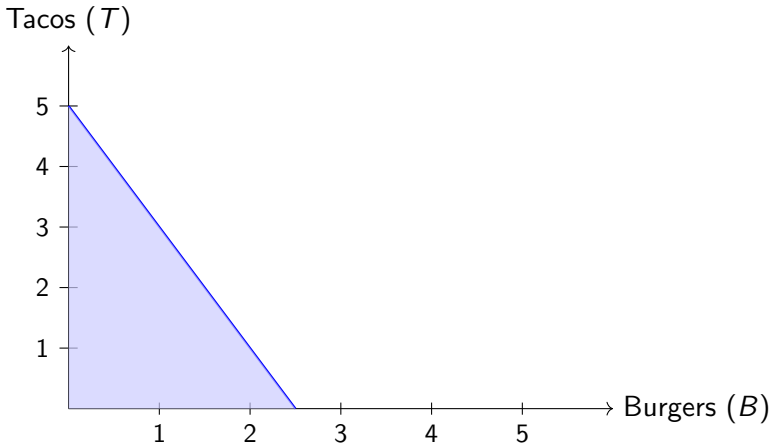
- Taylor spends all her wealth. So, if the $MRT = -2$, Taylor needs to forgo 2 tacos to afford an additional burger.

The effect of a \$1 decrease in the price of burgers (now $P_B = \$1$)



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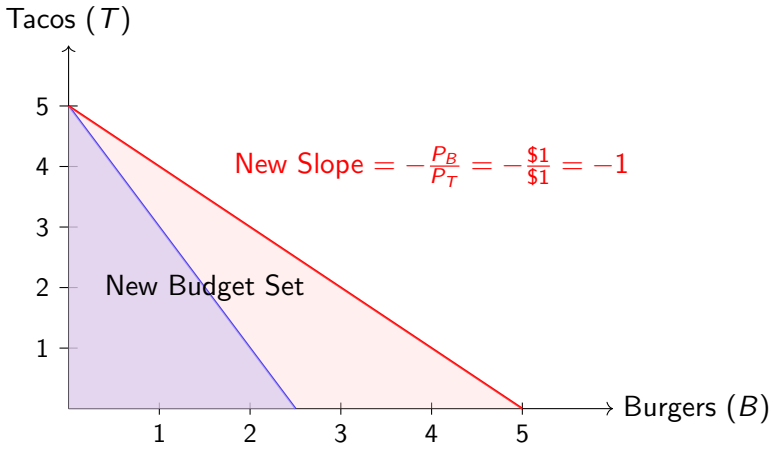

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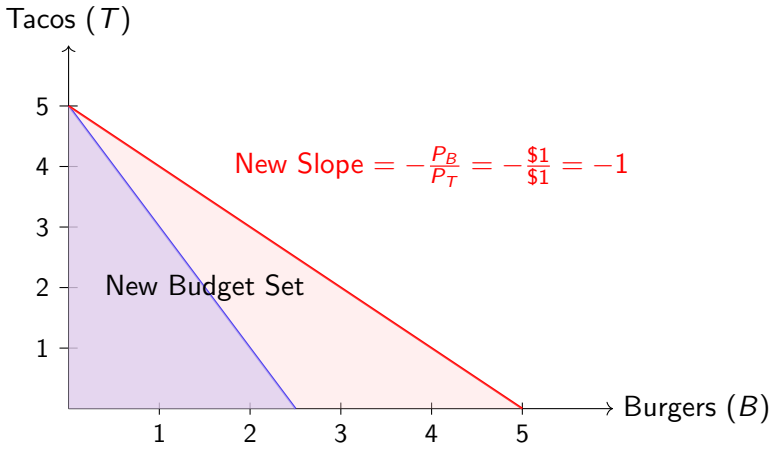

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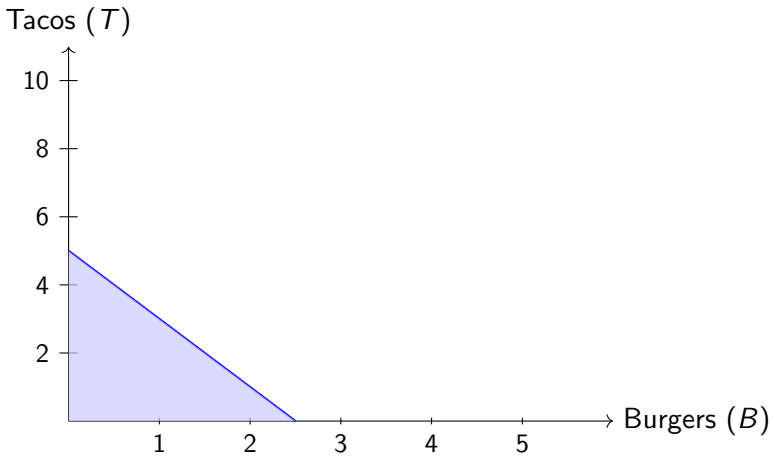

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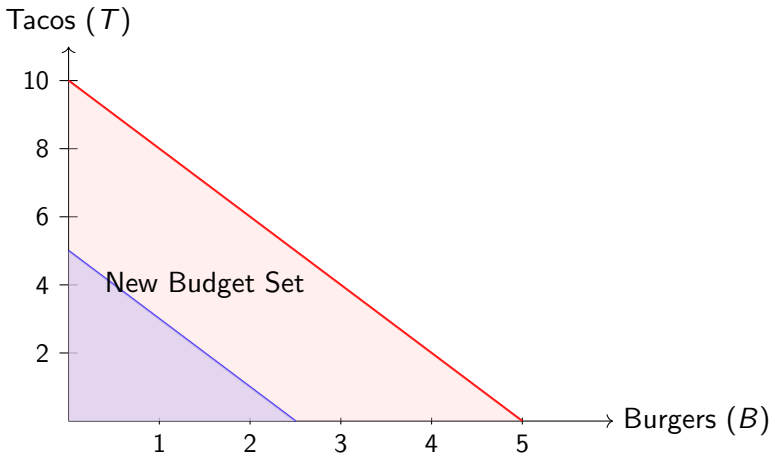

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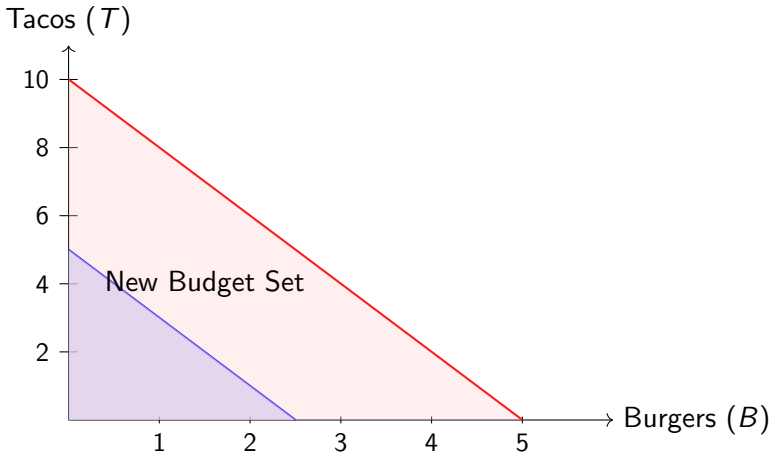

When wealth increases, the budget line shifts outward to include new bundles, but it remains parallel. (The MRT does not change, why is this?)

Determining Choice

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

Constrained consumer choice:

- Consumers pick the bundle of goods in their budget line 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.

Determining Choice

If consumers choose the bundle of goods that makes them the happiest, their optimal (utility-maximizing) choice must lie on an indifference curve that touches the budget line, but does not cross it.

Why is this?

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Why is this? Hint: Consumers think "more is better" *and* they need bundles to be affordable.

Two Types of Solutions

There are two ways consumers can reach their optimal bundle:

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- 1. **An interior solution**, where the optimal bundle has positive quantities of all goods and lies between the ends of the budget line.
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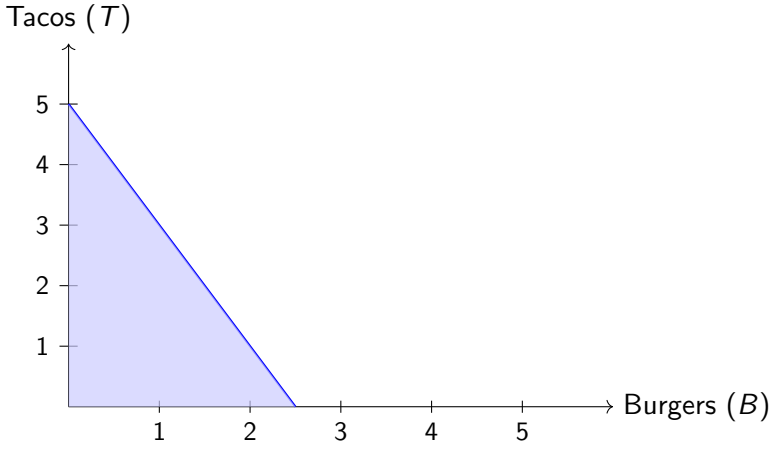
We will start by describing the first.

Interior Solution: At the optimal bundle, $MRS_{BT} = -P_B/P_T$



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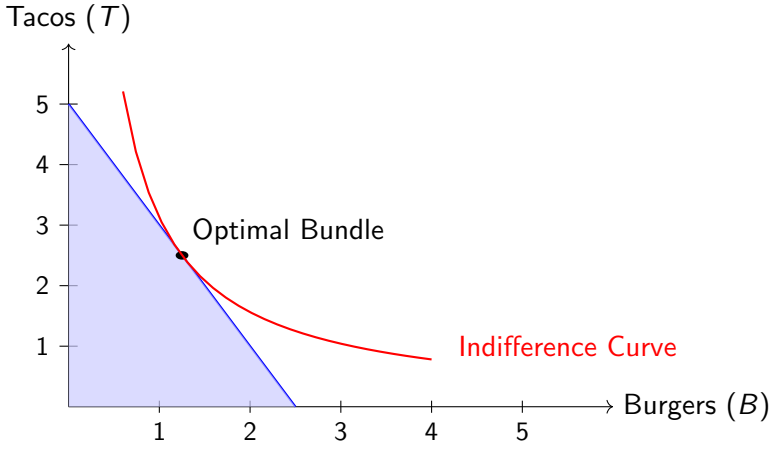

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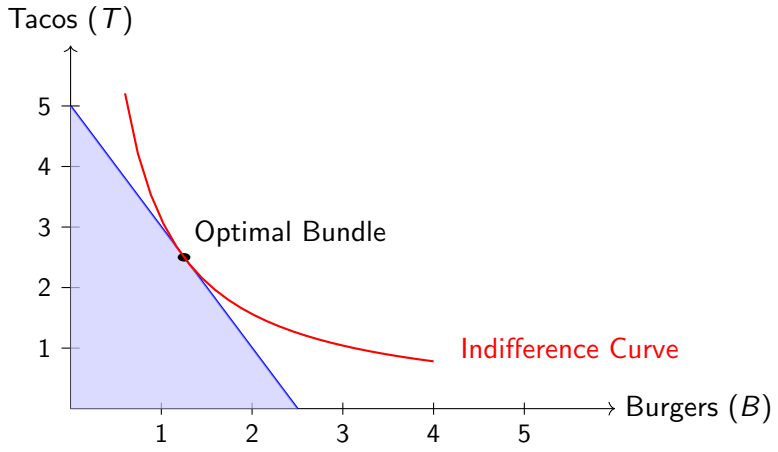

If Taylor consumes both goods, then she consumes such that the *MRS* (the slope of the indifference curve) is tangent to the budget line.

Why does $MRS = -P_B/P_T$?

- 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 implies

$$MRS_{BT} = -\frac{MU_B}{MU_T} = -\frac{P_B}{P_T} = MRT_{BT}$$

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MU per dollar = "Bang for your buck"

Finding an Interior Solution: Example

- Suppose Nate's utility function over jelly J and peanut butter N is $U(N, J) = NJ$. Jelly is \$5 per jar, and peanut butter is \$10 per jar. If Nate spends \$20 on peanut butter and jelly, how much of each good will Nate consume?

Finding an Interior Solution: Example (In Class)

Finding a Corner Solution: Example

- For a Corner solution, a consumer spends nothing on one good (and all income on the other). This is likely to happen with **perfect substitutes** preferences.

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Ex: Suppose Jane's utility function over Coke C and Pepsi E is $U(C, E) = 2C + E$. Coke is \$3 per 250ml, and Pepsi is \$3 per 250ml. If Jane spends \$10 on Coke and/or Pepsi, how much of each good will Jane consume?

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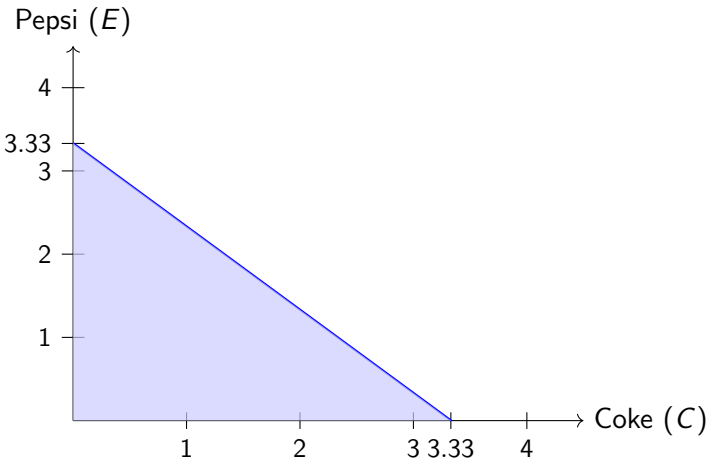
- We will start by solving this graphically.

Corner Solution with Perfect Substitutes



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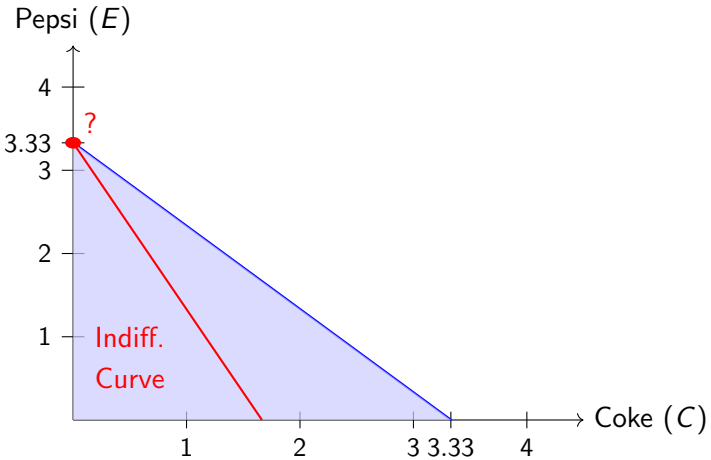
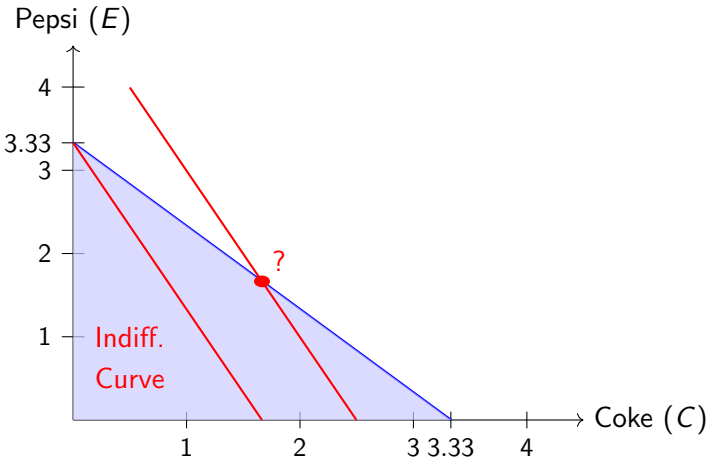


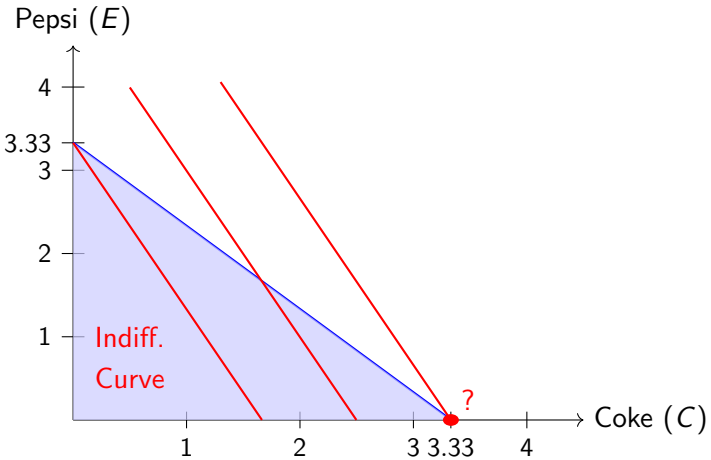
Is this bundle a solution? Why not?

Corner Solution with Perfect Substitutes



What about this bundle? Why not?

Corner Solution with Perfect Substitutes



What about this bundle? Yes, because $MRS_{CE} < -1 = MRT_{CE}$

(Coke yields a higher marginal utility per dollar than Pepsi, so only coke is consumed!)

Finding the Corner Solution Algebraically (In Class)

To solve this problem algebraically, we will find the good with the highest **marginal utility per dollar**.

Finding the Corner Solution Algebraically (In Class)

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Exercise for home: What would Jane choose if her utility function was instead $U(C, E) = C + E$? Hint: start by showing that the marginal utility per dollar is equal for all bundles. Then, ask yourself if the optimal bundle is unique.

Applications to Management

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.

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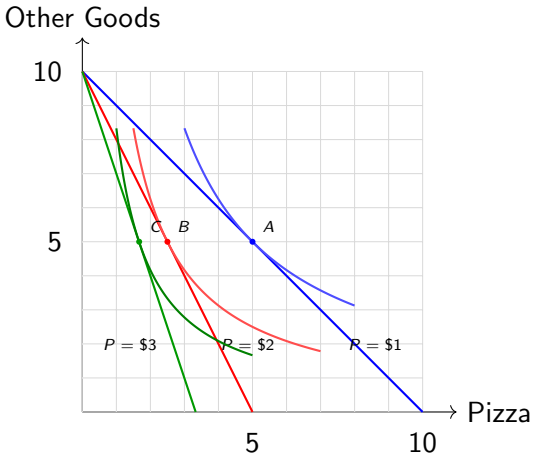
Any price change causes the budget line to rotate, meaning the consumer chooses a new optimal bundle.

By varying one price and holding income and other prices constant, we can determine how the quantity demanded changes as the price changes.

- This is just the definition of the demand function.

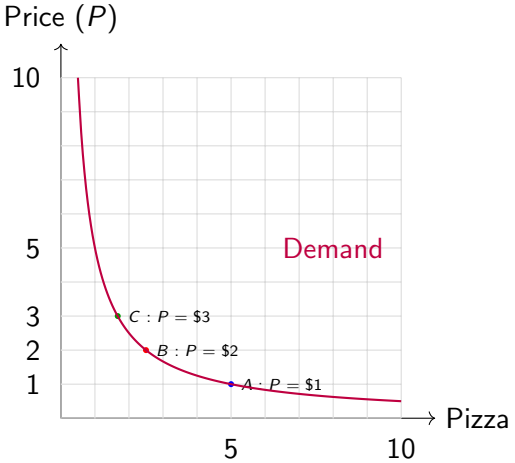
Getting Demand Curves from Preferences, Graphically

Utility Maximization



Optimal bundles at different prices of pizza

Demand Curve



Corresponding demand for pizza

Application: Pricing when there are Substitutable Goods

Q: Suppose you are a pricing manager for Coca Cola. Consumers perceive Coca Cola and Pepsi to be perfect substitutes with identical marginal utilities. Currently, each are priced at \$3 per bottle. Total market income is $Y = 10$ (measured in thousands). Do you have incentive to undercut Pepsi by one cent? Explain using either graphs or math and words, and **assume production costs are zero**.

Note: Assume Coke and Pepsi **split the market in half** if consumers are indifferent between them at current prices.

Application: Pricing when there are Substitutable Goods

S: Suppose $Y = 10$ is the total market expenditure on either Coke (C) or Pepsi (E). Because Coca Cola and Pepsi are perfect substitutes with identical marginal utilities, we can **represent** preferences with the utility function $U(C, E) = C + E$. This means the marginal utilities for **both coke and pepsi** are 1.

Application: Pricing when there are Substitutable Goods

S: We will derive the demand curve. Before, we showed that consumers will spend all of Y on the good with a higher **marginal utility per dollar**. If Coke has a higher marginal utility per dollar, then

$$\frac{1}{P_C} > \frac{1}{P_E} \implies P_C < P_E$$

and demand for Coke will be $D(P_C, P_E, Y) = \frac{Y}{P_C}$

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$$\frac{1}{P_C} > \frac{1}{P_E} \implies P_C < P_E$$

and demand for Coke will be $D(P_C, P_E, Y) = \frac{Y}{P_C}$

(Why? Because consumers can purchase a maximum of $\frac{Y}{P_C}$ cans of coke.)

Application: Pricing when there are Substitutable Goods

S: Otherwise, if Pepsi has a higher marginal utility per dollar, then $D(P_C, P_E, Y) = 0$. If prices are equal (as in the question) then marginal utilities are equal; Coke and Pepsi will share the market: $D(P_C, P_E, Y) = \frac{1}{2}\frac{Y}{P_C}$.

Application: Pricing when there are Substitutable Goods

S: So, if Coke undercuts Pepsi by one cent relative to the current situation, they earn a revenue of

$$P_C \times \underbrace{\frac{Y}{P_C}}_{\text{Demand if Coke undercuts Pepsi}} = 2.99 \times \frac{10}{2.99} = \$10$$

in thousands. Before, they split the market and earned revenue of

$$3 \times \underbrace{\frac{1}{2} \times \frac{10}{3}}_{\text{Demand if Coke splits market}} = \frac{10}{2} = \$5$$

.

$\Longrightarrow$ You should charge lower prices to undercut Pepsi. Doing so can massively increase **market share** because Coke demand is **elastic**.

Application: Pricing when there are Complementary Goods

Let's do the same application but with **perfect complement goods**: Hot Dogs (H) and Buns (B).

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- To see why, it can be easily shown that demand for Hot Dogs is

$$D(P_H, P_B, Y) = \frac{Y}{P_H + P_B}$$

(this will be provided on the formula sheet).

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Q: Are these goods complements?

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Q: Are these goods complements? Yes, because an increase in the price of buns decreases demand for hot dogs.

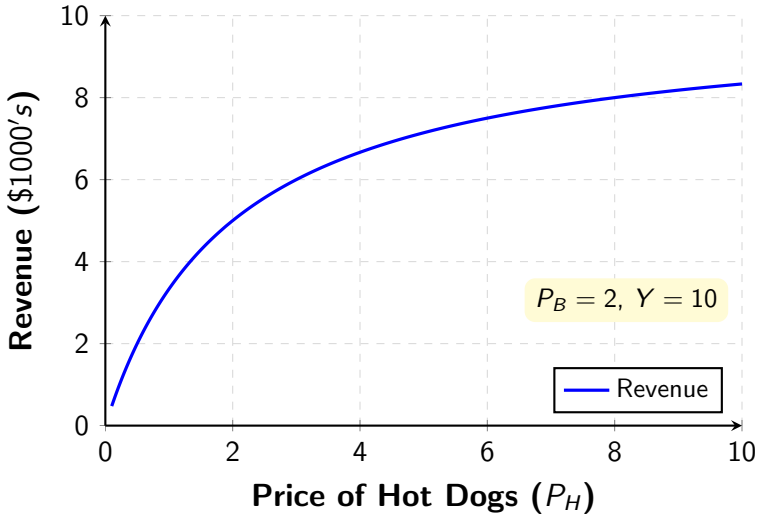
Application: Pricing when there are Complementary Goods

- Now, there is no incentive for hot dog manufacturers to undercut the prices of buns. Total hot dog revenue is **increasing** in price

$$\text{Revenue} = \underbrace{P_H}_{\text{Price}} \times \underbrace{\frac{Y}{P_H + P_B}}_{\text{Quantity demanded}}$$

this means demand is **inelastic**. (Recall Slides 1c!)

Application: Pricing when there are Complementary Goods



Behavioural Economics and Deviations from the Theory

Deviations From the Theory

When does the theory break down?

Behavioural Economics examines:

- Psychological factors
- Cognitive biases
- Departures from rationality

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:

- Transitivity
- Endowment effects
- 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:

- Novel goods
- Children
- Some other experimental evidence over a broad range of goods. Recent studies are able to distinguish when individuals violate transitivity from random deviations in preferences.

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 than 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

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.

The model can be used to predict consumer behaviour.

While the model typically works very well, its usefulness can be limited by human psychology. Still, captures many important aspects of consumer choice.

Producer Behaviour

- Input substitutability and Cost Minimization will look graphically similar to ideas consumer theory.
- For now, review Chapter 4 from the textbook and do posted Consumer Theory problems.