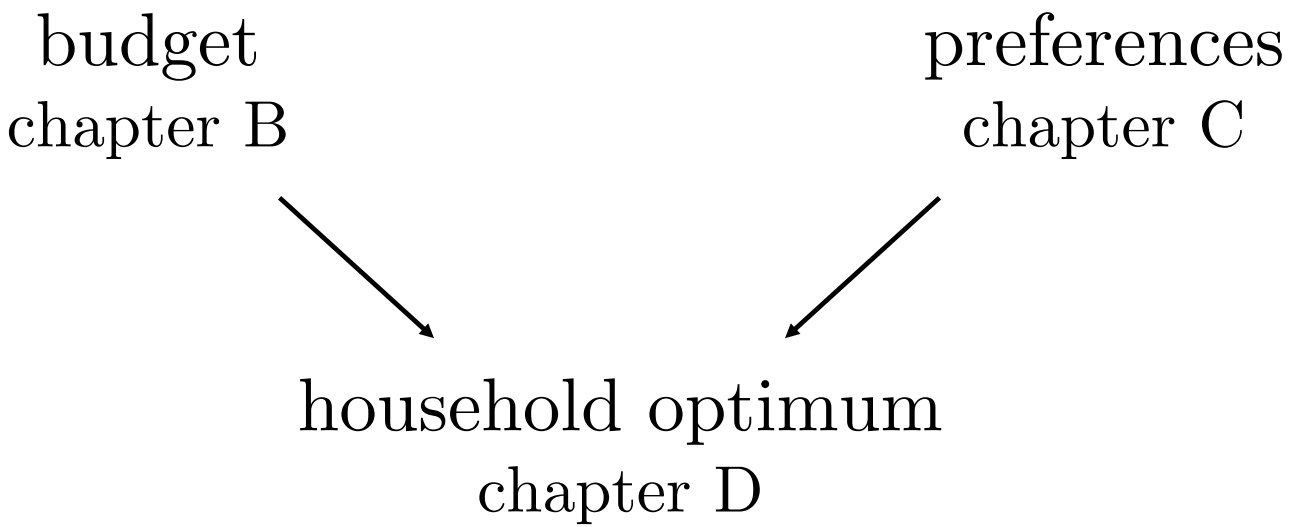
Microeconomics

Budget

Harald Wiese

Leipzig University

Survey household theory



Objective:

- on bundles of goods (chapter D)
- on labor supply (chapter F)
- on saving (chapter F)
- taking uncertainty into account (chapter G)

Structure

Introduction

- Household theory
  - **Budget**
  - Preferences, indifference curves, and utility functions
  - Household optimum
  - Comparative statics
  - Decisions on labor supply and saving
  - Uncertainty
  - Market demand and revenue
- Theory of the firm
- Perfect competition and welfare theory
- Types of markets
- External effects and public goods

Pareto-optimal review

Overview

- Budget as money income: 100 Euro
- Budget as endowment:
  - 7 bananas
  - 8 apples

  Applications:
  - labor supply
  - saving and
  - uncertainty

Let us start with money income ...

Budget as money income

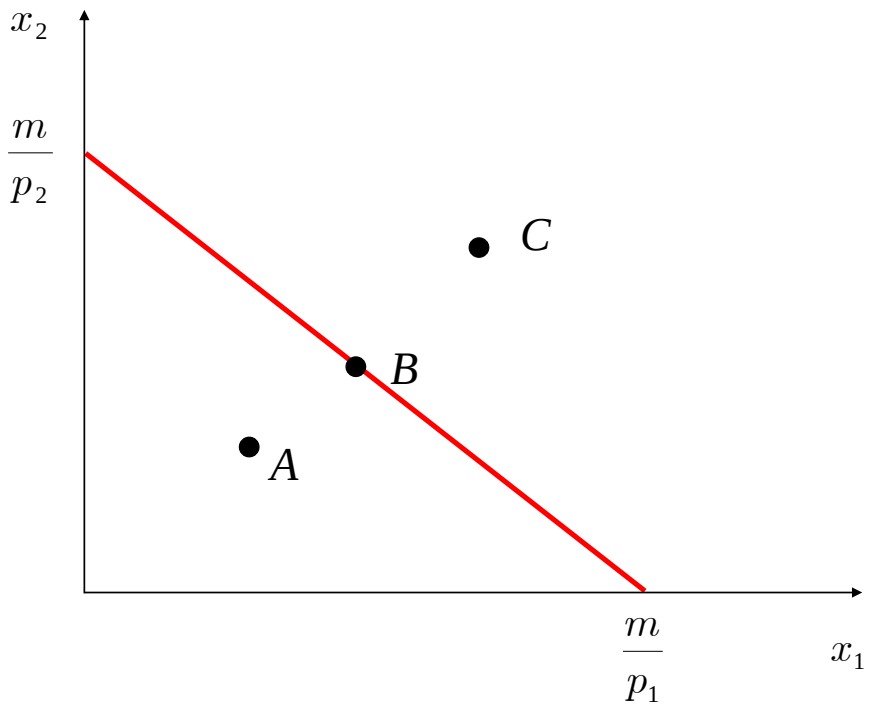
Budget constraint

- Good 1 and good 2
- Quantities: x_1 and x_2 (or y_1 and y_2)
- Prices: p_1 and p_2
- Money income: m
- Budget constraint is given by:

$$p_1 x_1 + p_2 x_2 \leq m$$

Budget equation

$$p_1 x_1 + p_2 x_2 = m$$



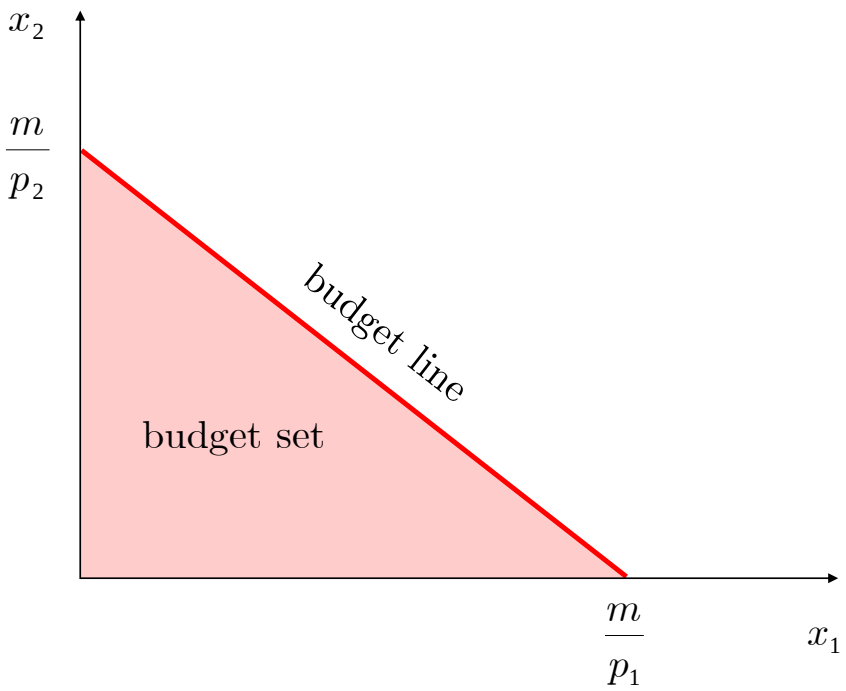
Problem

Interpretation of axis intercepts?

Problem

Which bundles can the household afford?

The budget equation



Problem

Change of the budget line if

- price p_1 doubles;
- both prices double;
- m increases;
- both prices and m doubles?

Problem

Budget line for $m = 100$, $p_1 = 1$, $p_2 = 2$

Slopes

in economic parlance

Economists call the first derivative of

- the cost function: marginal cost
- the profit function: marginal profit
- the revenue function: marginal revenue

no matter whether you think of the discrete (difference quotient) or the continuous derivative.

Marginal profit is the additional profit that is made by selling one additional (small) unit of output.

Slopes

discrete versus continuous

Very often we talk about dicrete units:

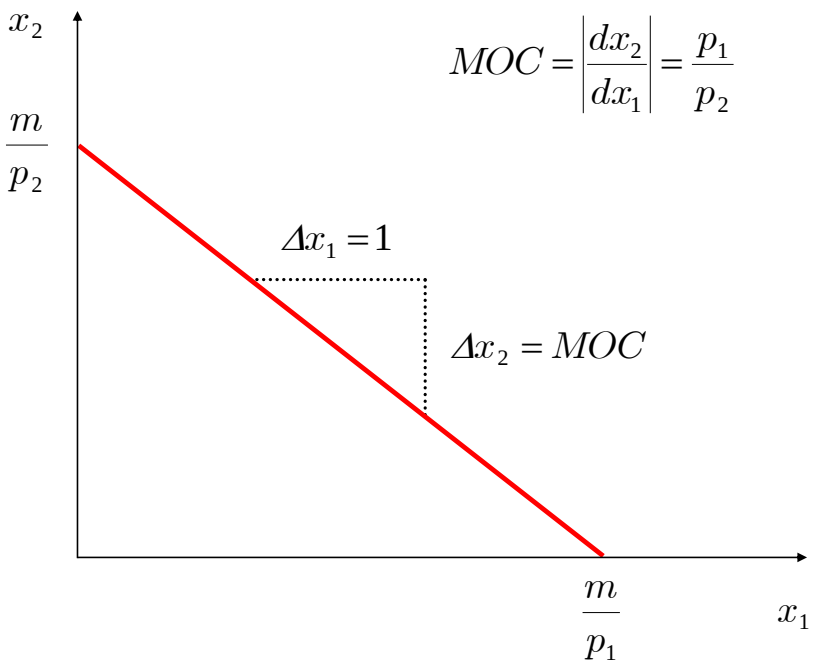
- an increase of the price by one small unit,
- an increase of the R&D expenses by one Euro

even if we work with derivatives
that are easier to calculate

Marginal opportunity cost

- **Opportunity cost**:
  Things (e.g., goods) one has to forgo due to an action (e.g., consumption of another good)
- **Marginal opportunity cost** ($= MOC$):
  How many units of good 2 does one need to forgo due to consumption of one additional unit of good 1?

Marginal opportunity cost



Problem

MOC at $p_1 = 6$ and $p_2 = 2$

- You buy one additional unit of good 1 and therefore need to...
- gradient triangle

$$\frac{\Delta x_2}{\Delta x_1} = \frac{\frac{m}{p_2} - 0}{0 - \frac{m}{p_1}} = -\frac{p_1}{p_2}$$

Marginal opportunity cost

Solving the budget equation for x_2 yields

$$x_2 = f(x_1) = \frac{m}{p_2} - \frac{p_1}{p_2} x_1$$

and hence

$$\frac{df}{dx_1} = \frac{dx_2}{dx_1} = -\frac{p_1}{p_2}$$

and therefore

$$MOC = \left| \frac{dx_2}{dx_1} \right| = \frac{p_1}{p_2}$$

Taxes I

- Poll tax („lump sum“ tax): independent of income or consumption
- income tax:
  - $T(m) =$ tax at income m
  - $\frac{T}{m} =$ average tax
  - $\frac{dT}{dm} =$ marginal tax
- Quantity tax: depending on the number of units bought or sold
- Sales tax: depending on the expenses for a particular good

Taxes II

Problem

Consider the budget equation $p_1 x_1 + p_2 x_2 = m$. State the new budget line if

- a poll tax T,
- a quantity tax t_1 for good 1, and
- an income tax with average tax rate t

is raised. How high is the government's tax income?

Rationing

Problem

To prevent alcohol abuse, the government of Michail Gorbatschow constrains the supply of alcohol and then even of sugar, which was used to make alcohol. Every household was allowed to consume only a particular quantity at the predominant price.
x-axis: sugar
y-axis: other goods

Problem

Black market with higher price for sugar.

Quantity discount

Problem

The first 500 m^3 water cost p_1,
every additional cubic meter up to 750 the lower price p_2, and
starting at $750m^3$ the cost per cubic meter are only p_3.
We have $p_1 > p_2 > p_3$.
x-axis: water in cubic meters
y-axis: bread

Budget as endowment

- Endowment: Budget as a bundle of goods
- Quantities of the endowment: ω_1 and ω_2
- Budget constraint is given by:

$$p_1 x_1 + p_2 x_2 \leq p_1 \omega_1 + p_2 \omega_2.$$

Problem

State the budget equation if the household spends the whole budget on the two goods.

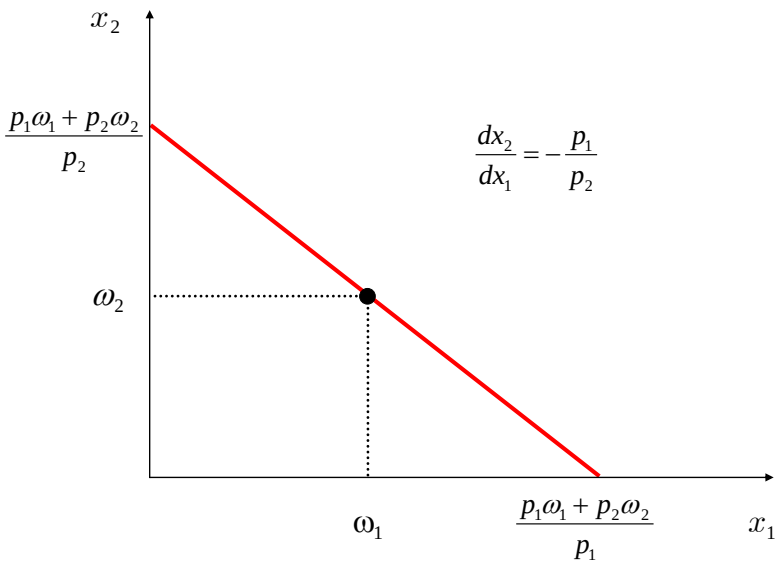
Problem

Slope of the budget line?

Problem

Does ω lie on the budget line?

Budget as endowment



Problem

Change of the budget line if

- price p_1 doubles
- both prices double
- ω_1 increases

Problem

Budget line with $(\omega_1, \omega_2) = (40, 30)$, $p_1 = 1$ and $p_2 = 2$!

Central tutorial

Problem B.4.1.
A household can just afford 2 units of good 1 and 3 units of good 2, or 3 units of good 1 and 1 unit of good 2. How many units of good 2 can the household afford if the whole income is spent for this good?

Problem B.4.2.
Rita spends her whole income for 3 units of good 1 and 5 units of good 2. The price of good 1 is twice as high as the price of good 2. Her income doubles and the price of good 2 doubles. The price of good 1 remains the same. How many units of good 1 can she afford at most if she consumes five units of good two as before? Produce a graph.

Central tutorial II

Problem B.4.3.
A household has an income of 100 and consumes two goods – good 1 with a price of 10 and good 2 with a price of 20. If the household consumes more than 4 units, the price per unit decreases to 5. Determine the budget constraint graphically and analytically!

Problem B.4.4.
A two-person household consuming two goods 1 and 2 has a (gross) income of 60. The (net) prices are $p_1 = 2$ and $p_2 = 4$. The state raises a 10% income tax t_m, a poll tax $T = 2$, a 10% sales tax τ_1 for good 1, and a quantity tax $t_2 = 1$ for good 2. State the budget equation!

Central tutorial III

Problem B.4.5.
A household won five (indivisible) refrigerators at a lottery. He can exchange each refrigerator for two (indivisible) microwaves. Selling refrigerators or microwaves is excluded, but the household can scrap them for free or collect only some of them. Draw the budget set of the household!