Intermediate Microeconomics

Public Goods

Professor Marko Terviö

Department of Economics
Aalto BIZ

Fall 2020
ECON-2100

Classification of goods

► Does one's consumption of the good reduce its value to others? If so, it's a rival good

► Can individual consumers be excluded from consuming the good? If so, it's an excludable good

. . . good	Excludable	Non-Excludable
Rival	Private	Common
Non-Rival	Club	Public*

Do not confuse public goods with goods produced by public sector.

*Sometimes called *pure public goods* to emphasize the distinction

Producing non-excludable goods creates a positive externality

**Aalto University
School of Business**

Marko Terviö
Intermediate Microeconomics

**2/14
Fall 2020
Public Goods**

Public goods

▶ Non-excludability of outputs likely to lead to too little production.

Who's going to pay when you don't have to?

▶ Non-excludability of inputs is likely to lead to overuse.

Why not use it all, before others do?

▶ Non-rivalry means that efficient price is zero.

Just charging the average cost would leads to underuse.

Partial solutions

▶ Excludability may be achieved at a cost (a kind of DWL)

▶ Fixed cost may be paid from public funds (tax may cause DWL)

▶ Altruism, social punishments (if small groups)

Examples: Lighthouse, roads (rival if congested), broadcasts, R&D

Aalto University
School of Business

Marko Terviö
Intermediate Microeconomics

3/14
Fall 2020
Public Goods

Public goods: Aggregation of Preferences

▶ What is the efficient quantity of public good? Everyone gets the same quantity (non-rival & non-excludable)

▶ A separate but related issue: How is the cost divided?

▶ One-or-None decision: production efficient if $\mathrm{TB} \geq \mathrm{TC}$ (sum of individual valuations) $\geq$ cost

▶ General case: Aggregate demand $P^d(q) = \sum_i P_i^d(q)$
Efficient quantity: $\underbrace{P^d(q)}_{\mathrm{MB}(q)} = \mathrm{MC}(q)$

Produce if total benefit $\mathrm{TB}(q) = \int_0^q P^d(z)\mathrm{d}z \geq \mathrm{TC}(q)$

Aalto University
School of Business

Marko Terviö
Intermediate Microeconomics

4/14
Fall 2020
Public Goods

Example: Three housemates

Yes or no decision: buy streaming service for common TV?

Cost would be 120 €/year

Valuations €/year			
Case#	1	2	3
Ann	70	45	100
Bob	45	45	35
Cecilia	30	5	35
TB	145	95	170
CS	25	-25	50

Suppose "house constitution" stipulates equal cost sharing.

What will they decide if purchases require i) majority ii) unanimity?

Aalto University
School of Business

Marko Terviö
Intermediate Microeconomics

5/14
Fall 2020
Public Goods

Example: Two countries

Demand for i.e. Marginal Benefit from R&D in country $i = A, B$.

R&D is never a bad, but can be useless beyond a point
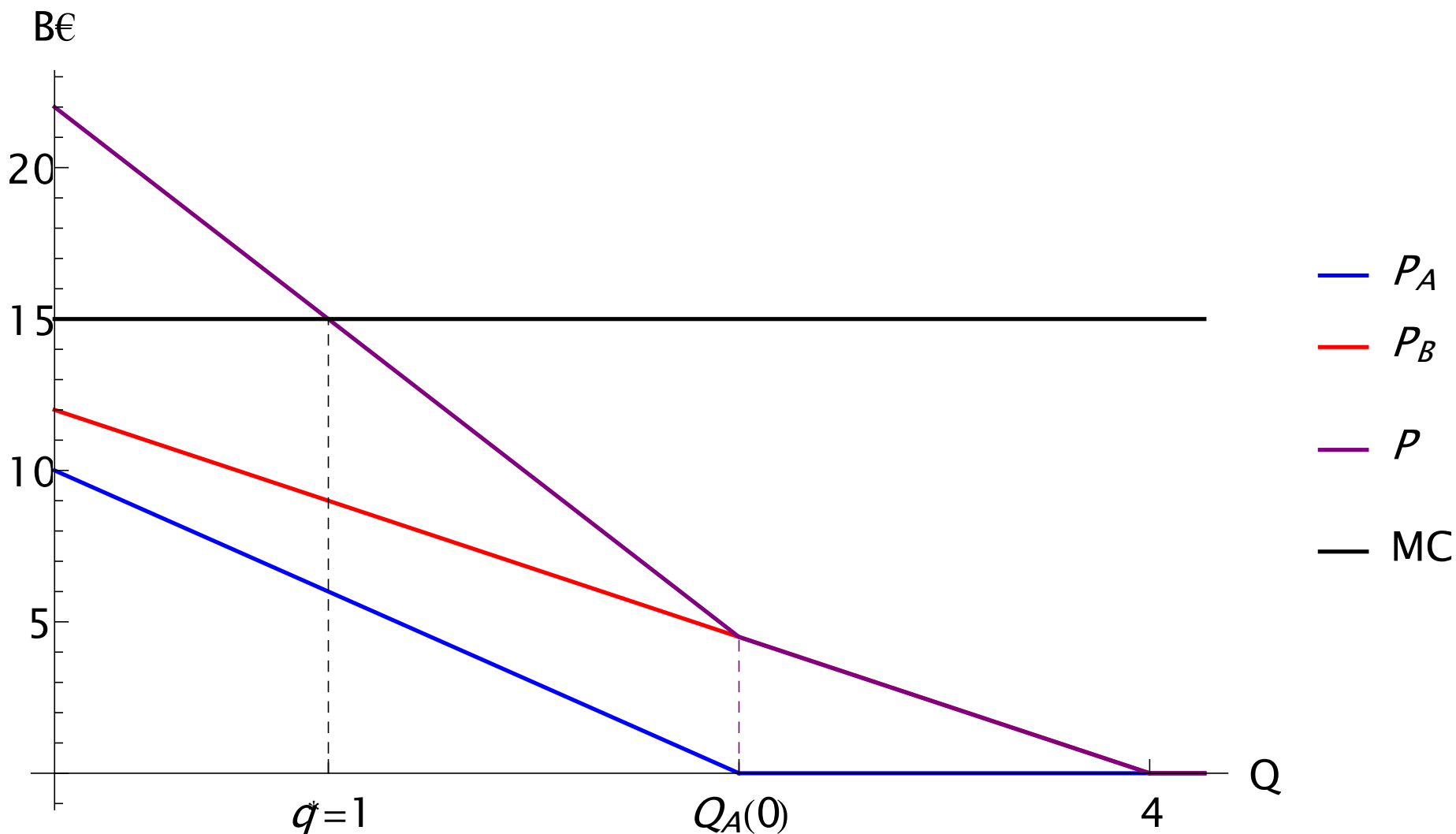
$P_A(q) = 10 - 4q$

$P_B(q) = 12 - 3q$

Aggregate demand i.e. aggregate marginal benefit

$$
\begin{aligned}
P(q) =& P_A(q) + P_B(q) & = 22 - 7q \text{ if } P_A(q) \geq, P_B(q) \geq 0 \\
=& 0 + P_B(q) & = 12 - 3q \text{ if } P_A(q) < 0, P_B(q) \geq 0 \\
=& 0 & \text{ if } P_A(q) < 0, P_B(q) < 0
\end{aligned}
$$

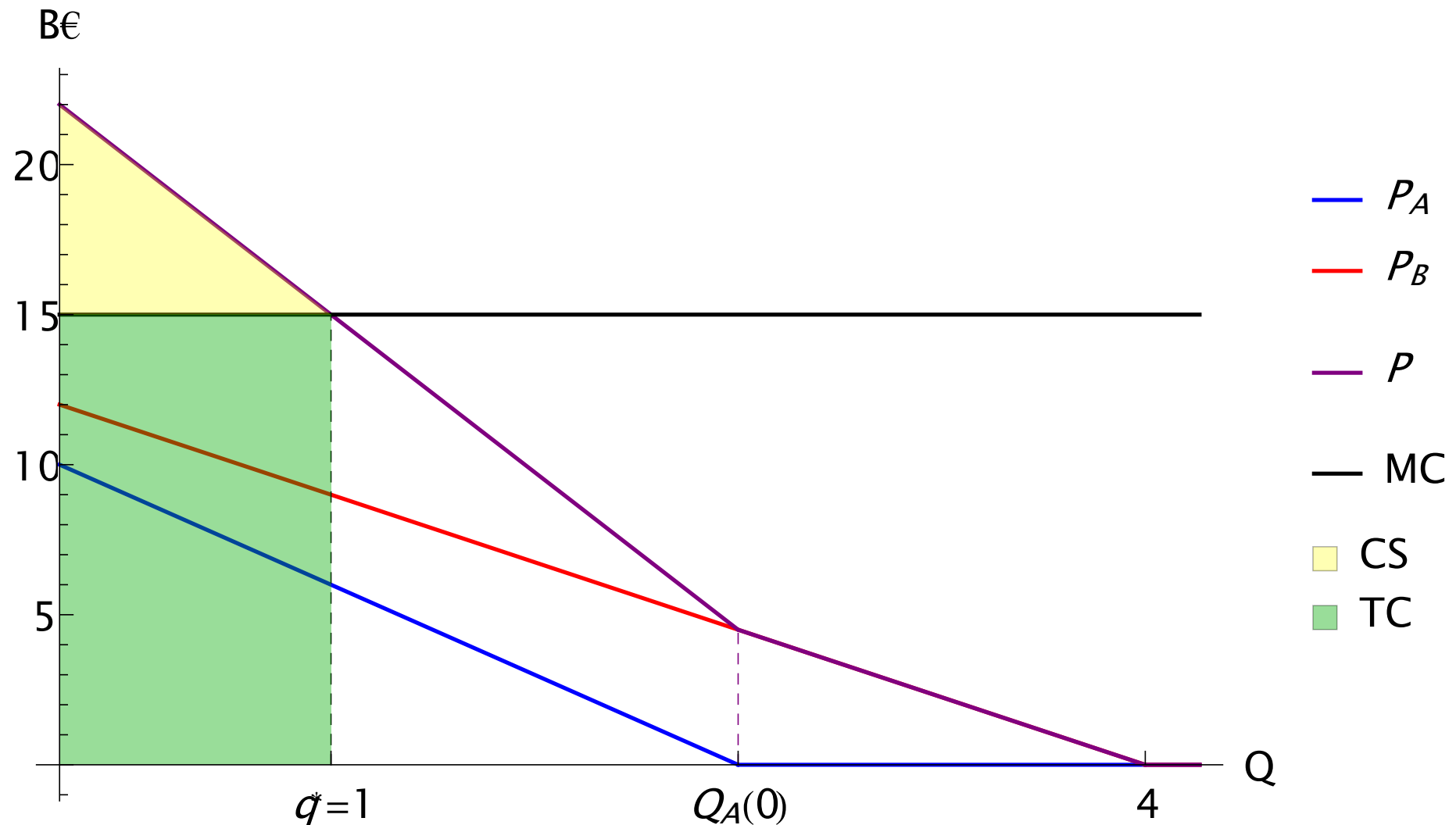*A* does not benefit from additional q beyond $Q_A(0) = 2.5$

Constant MC of R&D. Consider high $\mathrm{MC} = 15$ and low $\mathrm{MC} = 3$

Aalto University
School of Business

Marko Terviö
Intermediate Microeconomics

6/14
Fall 2020
Public Goods

How much should be produced? High MC example

$$P(q) = \text{MC} \Leftrightarrow 22 - 7q = 15 \Rightarrow q^* = 1.$$

Aalto University
School of Business

Marko Terviö
Intermediate Microeconomics

7/14
Fall 2020
Public Goods

How much should be produced? High MC example

$$TB = 18.5, \quad TC = 15, \quad CS = 3.5$$

Aalto University
School of Business

Marko Terviö
Intermediate Microeconomics

8/14
Fall 2020
Public Goods

How much should be produced? Low MC example
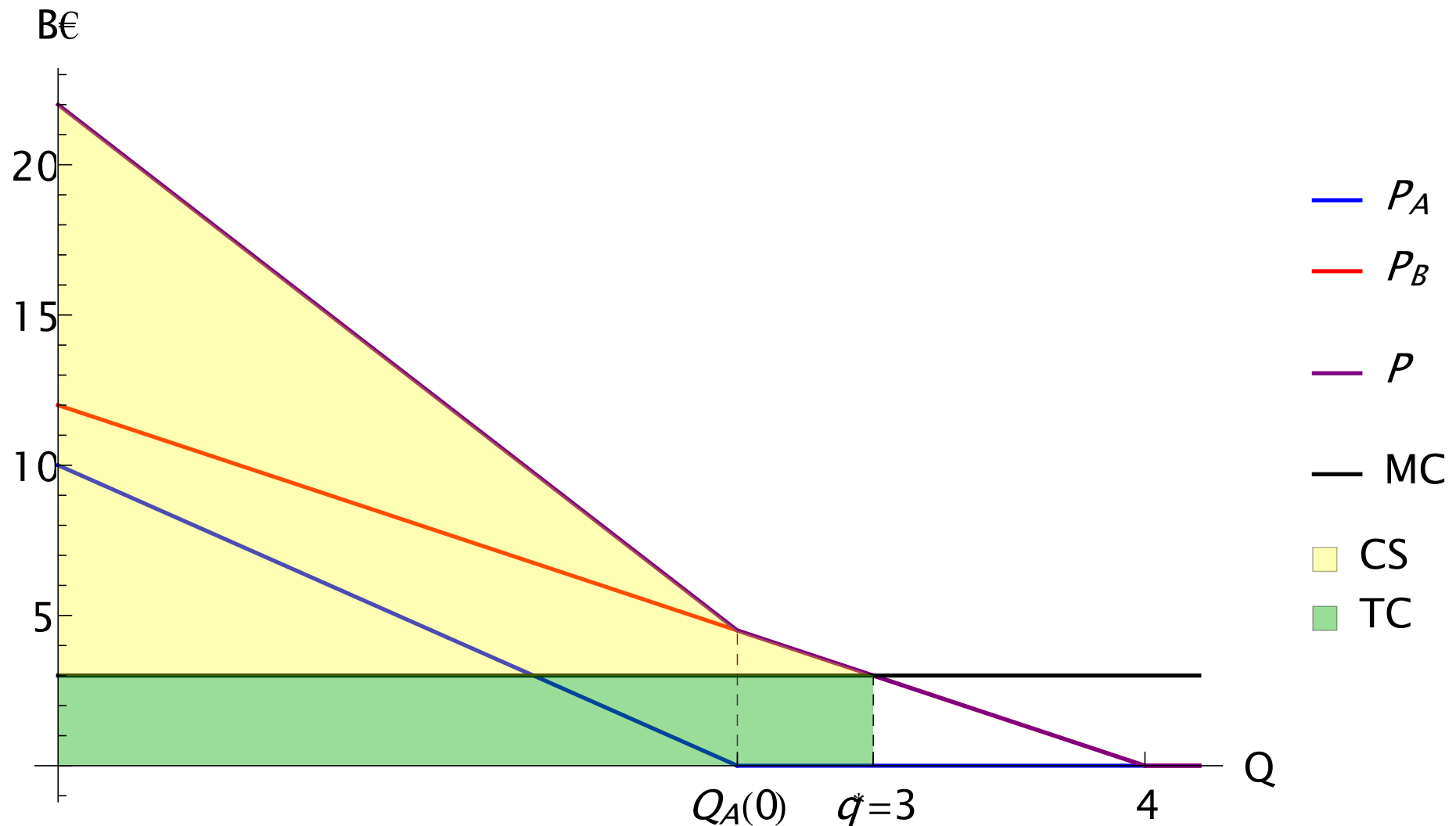
$P(q) = \text{MC} \Leftrightarrow 12 - 3q = 3 \Rightarrow q^* = 3. \ \text{TB} = 35, \text{TC} = 9, \text{CS} = \text{TB} - \text{TC} = 26$

Aalto University
School of Business

Marko Terviö
Intermediate Microeconomics

9/14
Fall 2020
Public Goods

How to find out valuations for the public good?

Naive method #1. Ask people to report their valuation, cost sharing unrelated to report

- ▶ Expect net benefit from production → maximize overstatement
- ▶ Expect net loss from production → maximize understatement

Naive method #2. Ask people to report their valuation, payment increasing in reported benefit

- ▶ Understate reported benefit (unless extremely high valuation)

Invest into making the good excludable →
DWL from underconsumption

Problems tend to grow in the number of people. Consider cleaning at a three person dorm or at a park for three thousand people.

Aalto University
School of Business

Marko Terviö
Intermediate Microeconomics

10/14
Fall 2020
Public Goods

Failures in reaching effiency

▶ Competitive market for a private good results in efficiency

▶ Monopoly / large market power results in underproduction, DWL

▶ Hard to get efficiency in public good production for large groups

▶ Regulation of monopolies is a public good

▶ Implementation of public policy requires delegation

Voters $\rightarrow$ representatives $\rightarrow$ (layers of) officials

▶ Monitoring politicians, informed voting decisions are public goods

$\rightarrow$ Rational ignorance

Aalto University
School of Business

Marko Terviö
Intermediate Microeconomics

11/14
Fall 2020
Public Goods

Market failure, government failure

► Causes of failure:

  - Asymmetric information

  - Externalities

  - Market power

► Market failure: too little production of a good, or too much of activity with negative externalities

► Government failure: use of government power for private or subgroup gain

► Optimal level of government power?
  Trade-off between likelihood for types of failure

Aalto University
School of Business

Marko Terviö
Intermediate Microeconomics

12/14
Fall 2020
Public Goods

Political economy

A few concepts from the economics of politics, "political economy"

▶ Influencing politics (voting, lobbying) are public goods within an interest group

▶ Concentrated vs dispersed interest

▶ Efficient vs inefficient transfers

▶ Logrolling

▶ "Voting with feet" (Tiebout model)

▶ Voting paradox, agenda-setting power, Arrow's impossibility theorem

Aalto University
School of Business

Marko Terviö
Intermediate Microeconomics

13/14
Fall 2020
Public Goods

Voting paradox

Example: three voters, majority decision to pick one alternative

- ▶ Ann: television > party > nothing

- ▶ Bob: nothing > television > party

- ▶ Cindy: party > nothing > television

Agenda-setting power: the ordering of voting can determine the winning alternative

Rank preferences cannot in general be aggregated to an aggregate decision-maker that behaves as if a rational person

Important exception: one-dimensional single-peaked preferences