RISK MANAGEMENT IN CIVIL ENGINEERING ADVANCED COURSE

Lisbon, November 17-21, 2008

Traffic risk management and allocation in transport concessions

José Manuel Vassallo

Associate Professor

CENTRO DE INVESTIGACIÓN DEL TRANSPORTE

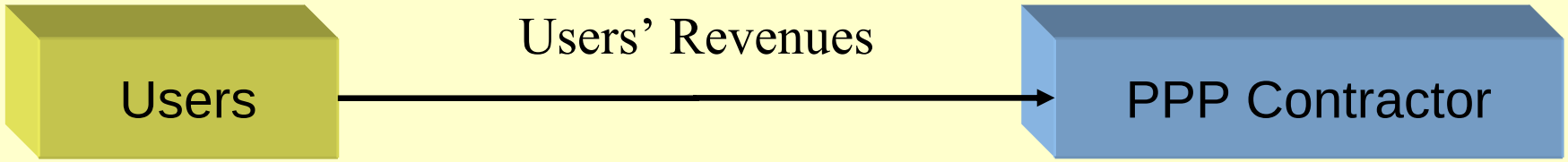
UNIVERSIDAD POLITÉCNICA DE MADRID

The Traffic Risk Problem (I)

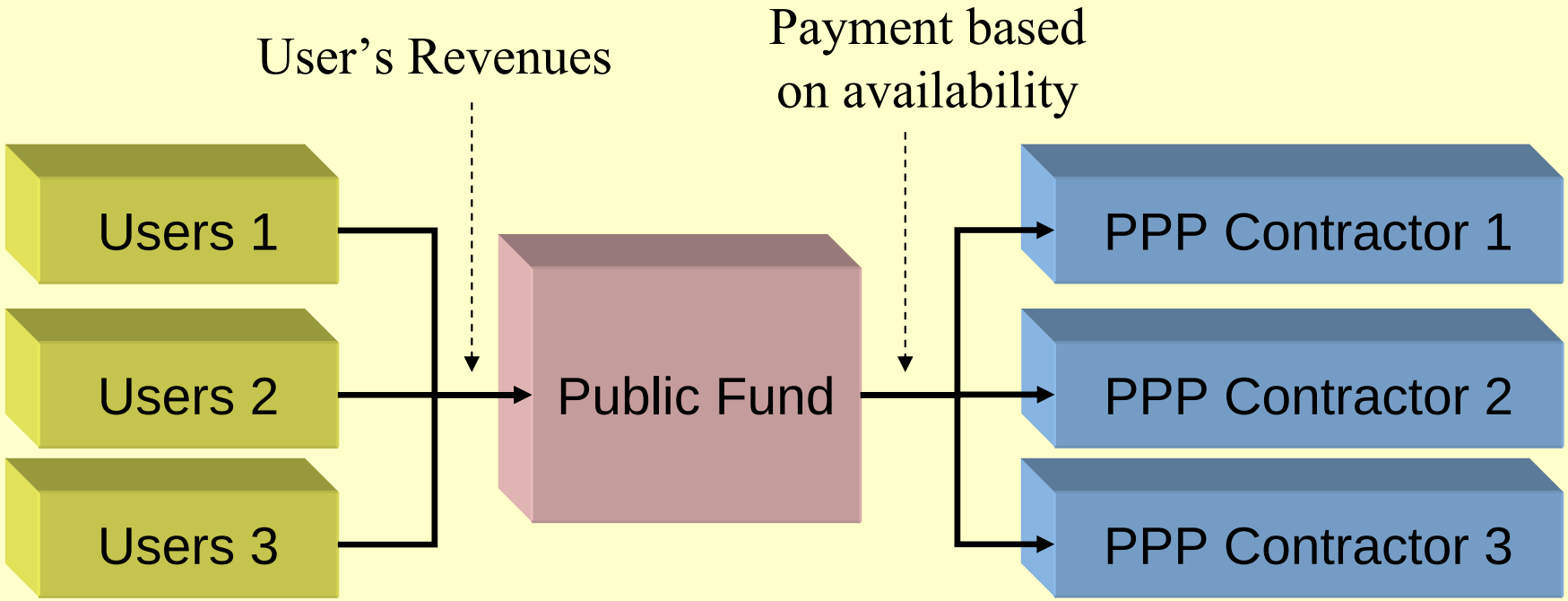
- Who can control traffic risk?
  - The government?
  - The concessionaire?
- Traffic depends on:
  - The evolution of the economy → Difficult to manage
  - Urban development → Difficult to manage
  - Competition → Government in a certain way
  - Quality of service → Contractor in a certain way

The Traffic Risk Problem (II)

Traditional concession approach



Alternative concession approach



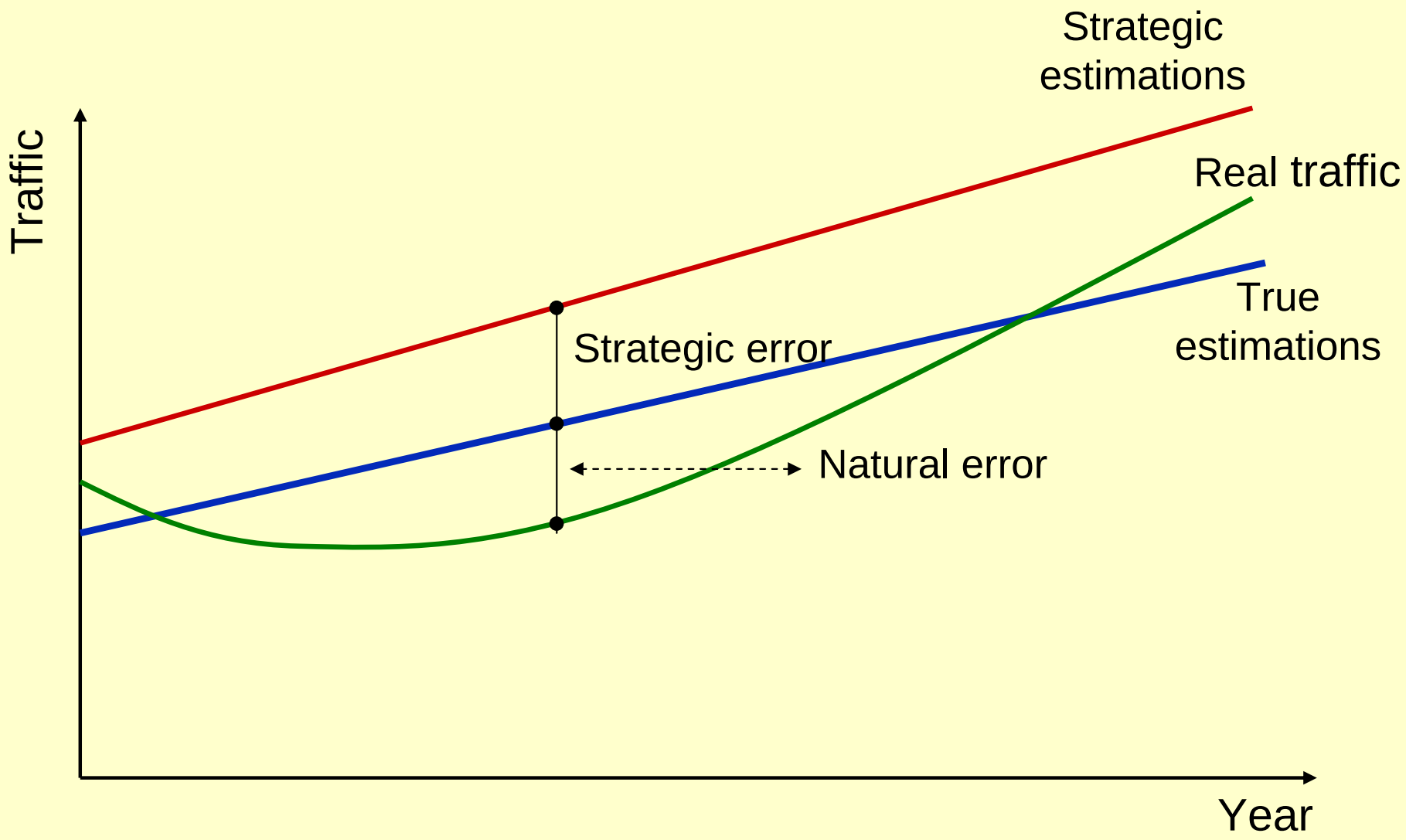
The Traffic Risk Problem (III)

First year traffic forecast deviations in road projects

$$Deviation = \frac{Traffic(year1)}{TrafficForecasted(year1)}$$

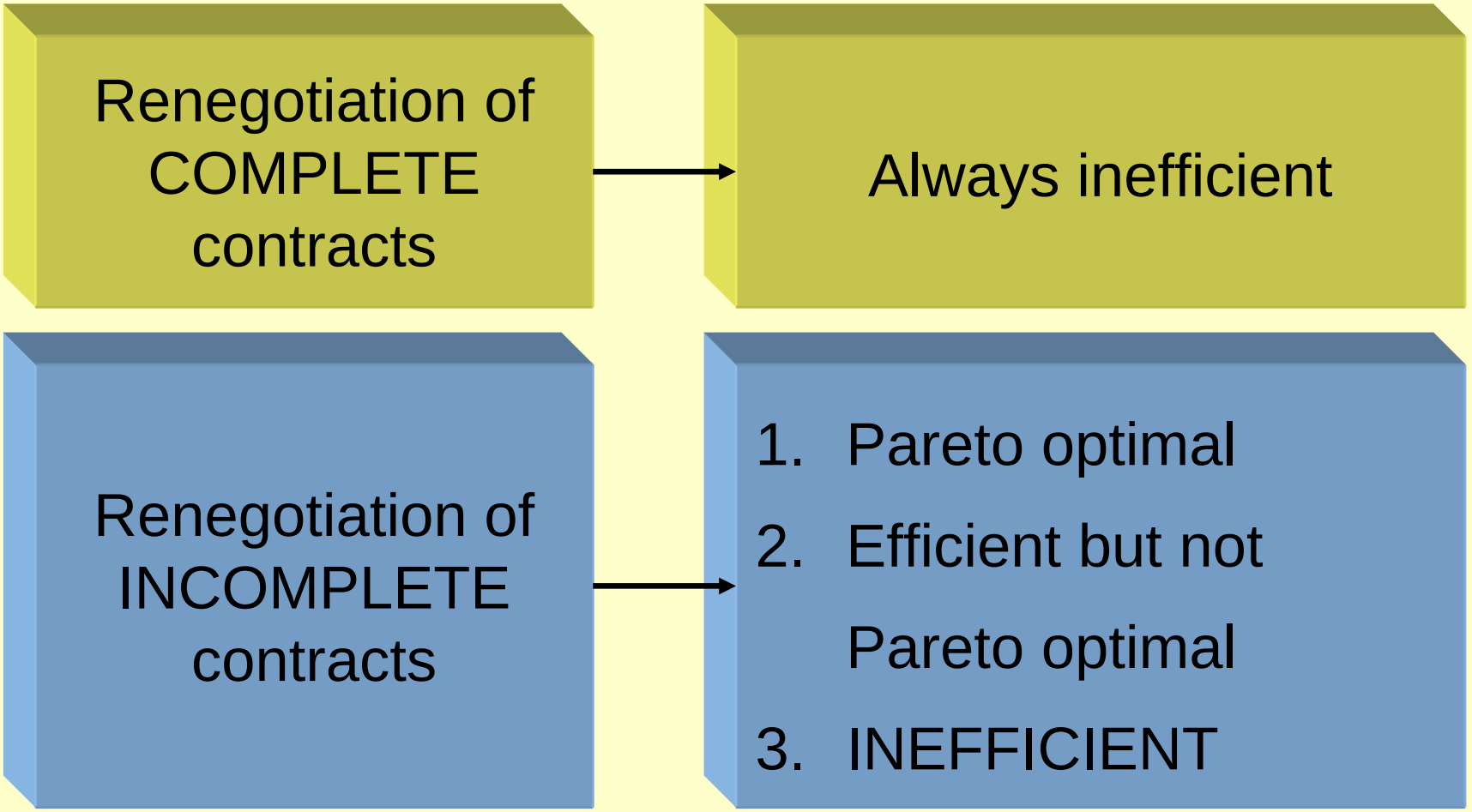
Study	Projects	Main geographical areas studied	Sample size	Mean (Real/Forec.)	Standard Deviation
Standard&Poor's (2004)	**Toll roads**	**North America, North Europe, Asia, South Europe,**	**87**	**0.76**	**0.26**
Baeza (2008)	**Toll Roads**	**Spain**	**14**	**0.57**	**0.26**
Flyvbjerg et al. (2004)	**Mostly Free roads**	**Mostly European Union**	**183**	**1.09**	**0.44**

The Traffic Risk Problem (IV)



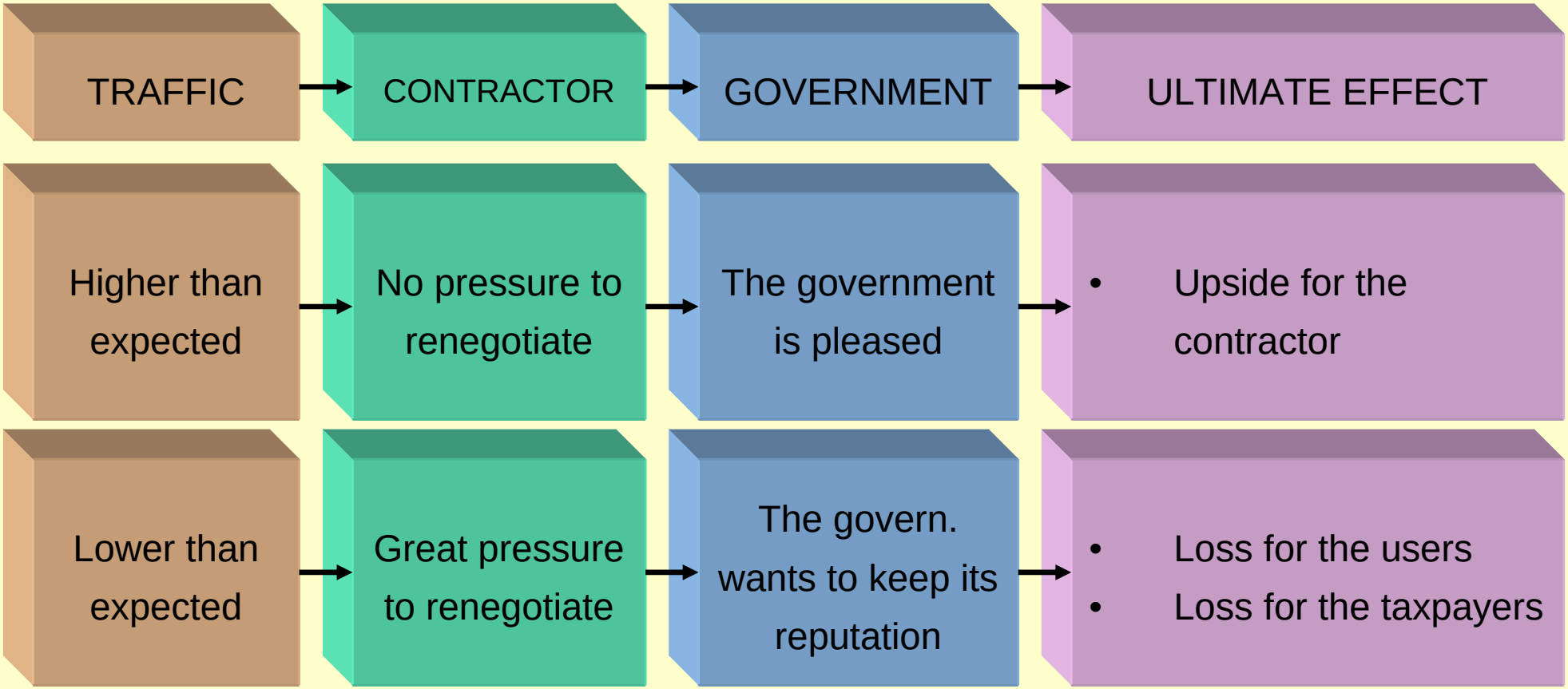
Traffic Risk and Renegotiation (I)

Contracts and renegotiation: What does the literature say?



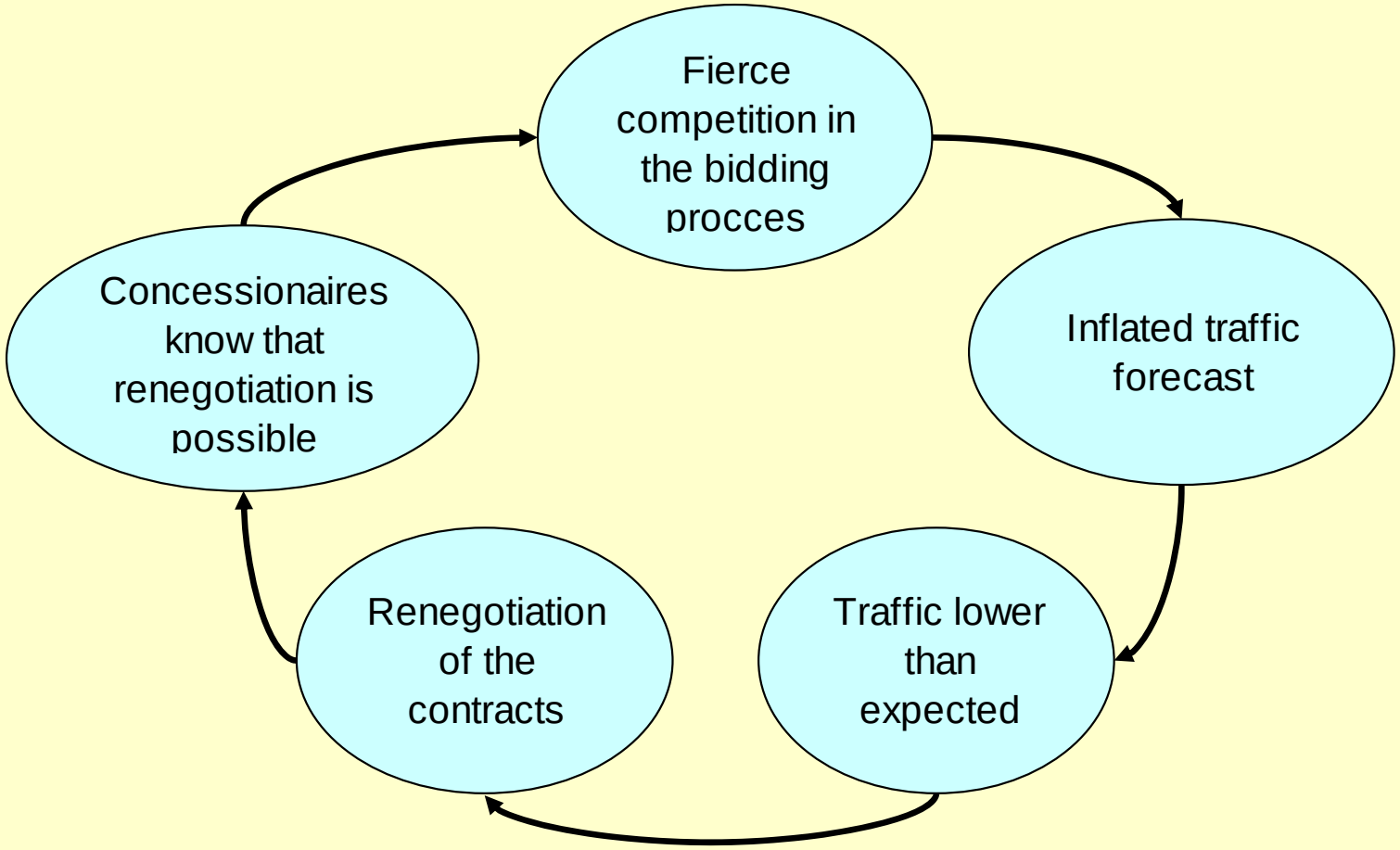
Traffic Risk and Renegotiation (II)

Asymmetric behavior when traffic risk is fully allocated to the PPP contractor



Traffic Risk and Renegotiation (III)

Vicious cycle when contractors know that renegotiation is possible



What options do we have? (I)

- Can PPP contractors manage traffic risk?
  - Not very much
  - However operation costs are related to infrastructure usage
  - And the PPP contractor still has some room to promote demand
- Should the PPP contractors bear traffic risk?
  - The whole traffic risk may be UNFAIR
  - No traffic risk allocation means NO INCENTIVE
  - Long term investors are willing to take risks if they have the possibility of obtaining great UPSIDES

What options do we have? (III)

TRANSFER THE WHOLE TRAFFIC RISK →

- Better INCENTIVE to attract more traffic
- The public sector risk is APARENTLY smaller
- Greater probability of RENEGOTIATION
- The outcome can be UNFAIR

TRAFFIC RISK MITIGATION MECHANISMS

TO TAKE AWAY TRAFFIC RISK FROM PPPs →

- NO INCENTIVE to attract more traffic
- GREATER RISK for the public sector
- Lower probability of renegotiation
- The outcome will be FAIRER

Traffic Risk Mitigation Mechanisms (I)

- Traffic risk mitigation mechanisms can be classified according to:
  - The **trigger variable**
    - Internal Rate of Return (IRR)
    - Revenues
    - Profits
    - Etc.
  - The **compensation mechanism** adopted
    - Subsidy
    - Toll modification
    - Contract length modification

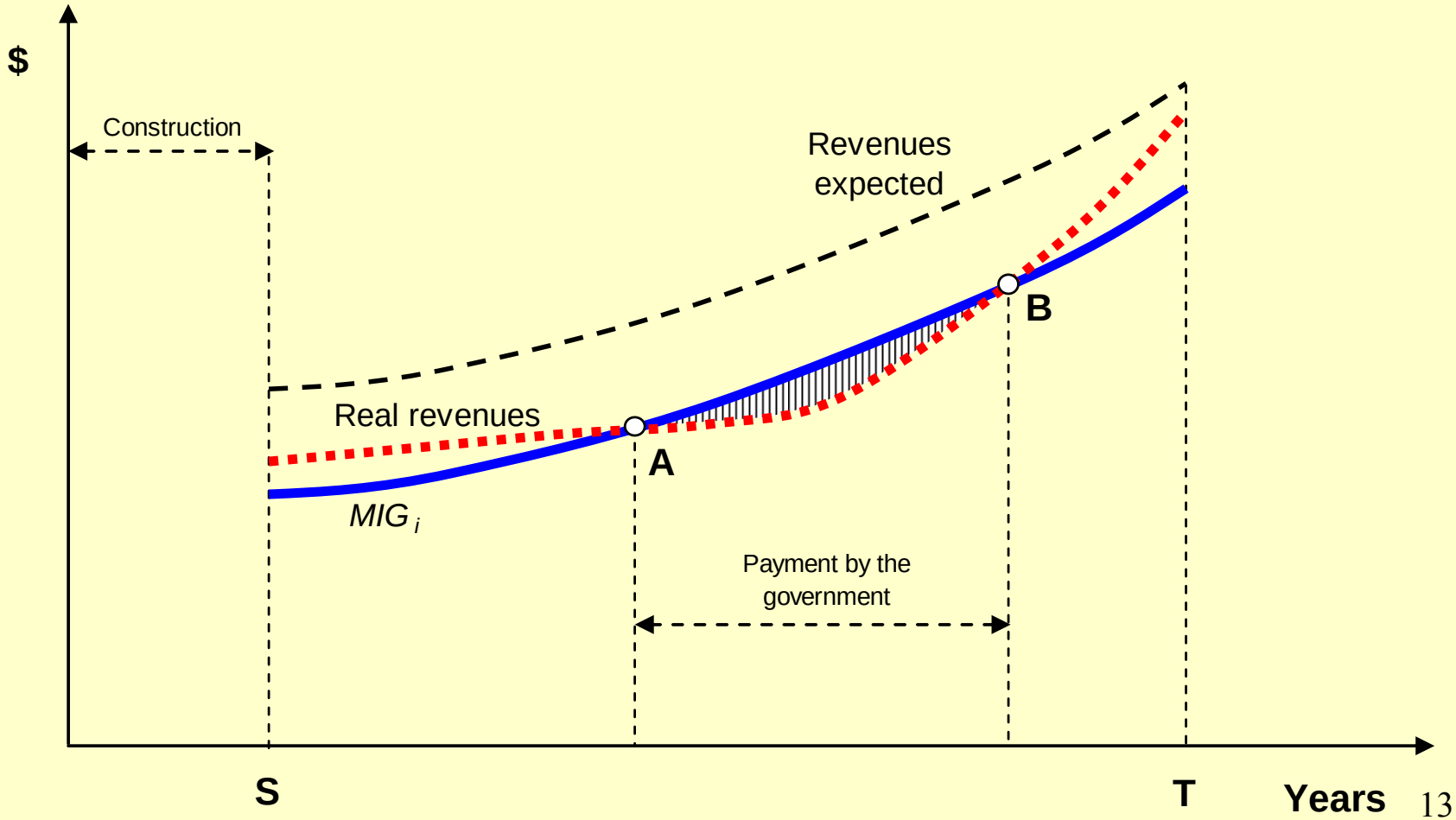
Traffic Risk Mitigation Mechanisms (II)

Classification

RISK SHARING APPROACH		TRIGGER VARIABLE: Annual Traffic or Revenues	TRIGGER VARIABLE: Accumulative Traffic or Revenues	TRIGGER VARIABLE: Profits / IRR
COMPENSATION	Subsidy / payment	Approach 1: Cap and floor limits		Approach 4: Modification of the economic balance of the contract
	Toll	Approach 2: Toll bands		
	Contract Lenght		Approach 3: Flexible duration LPVR	

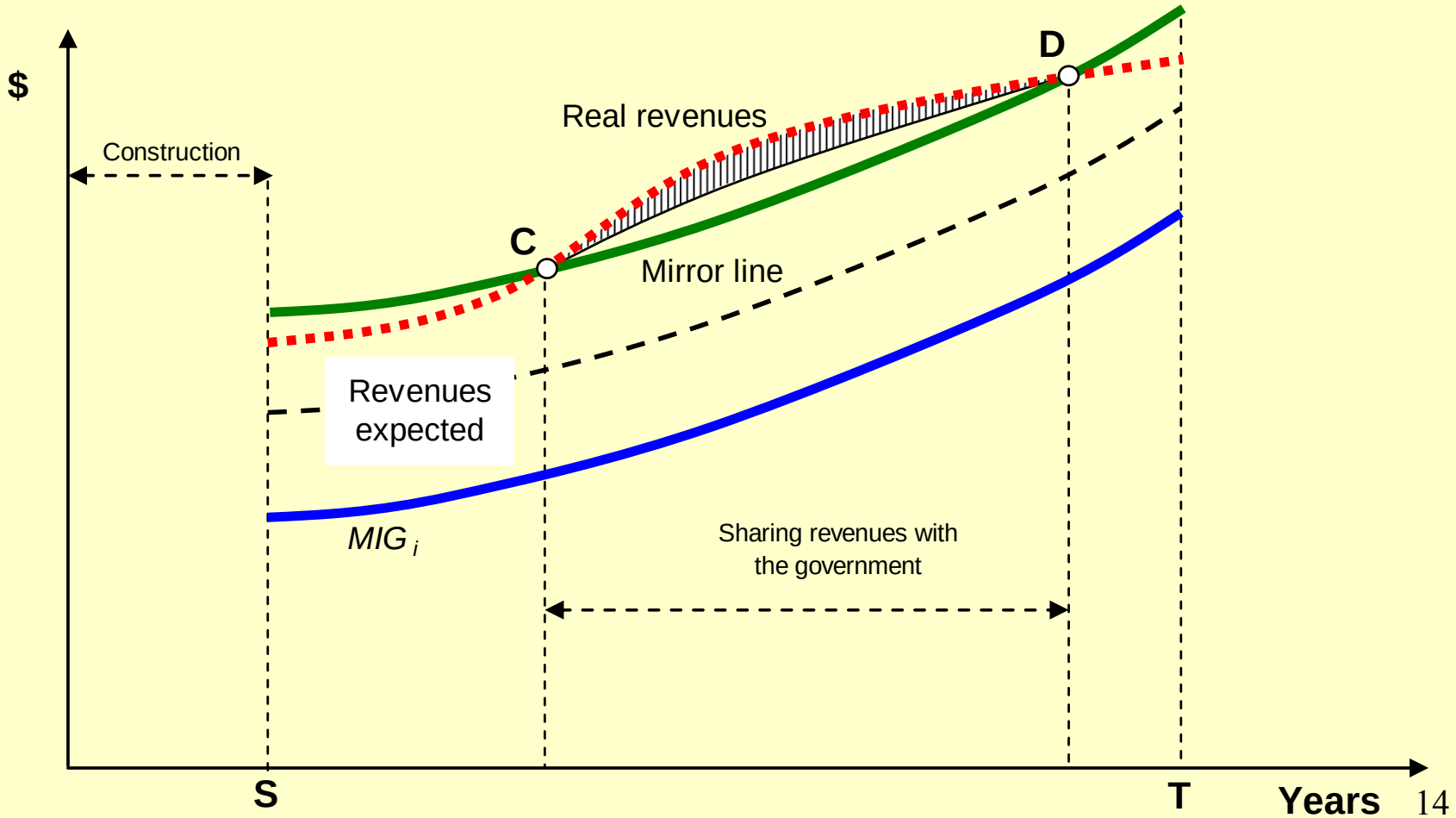
Cap and floor limits (I)

Traffic lower than expected



Cap and floor limits (II)

Traffic higher than expected

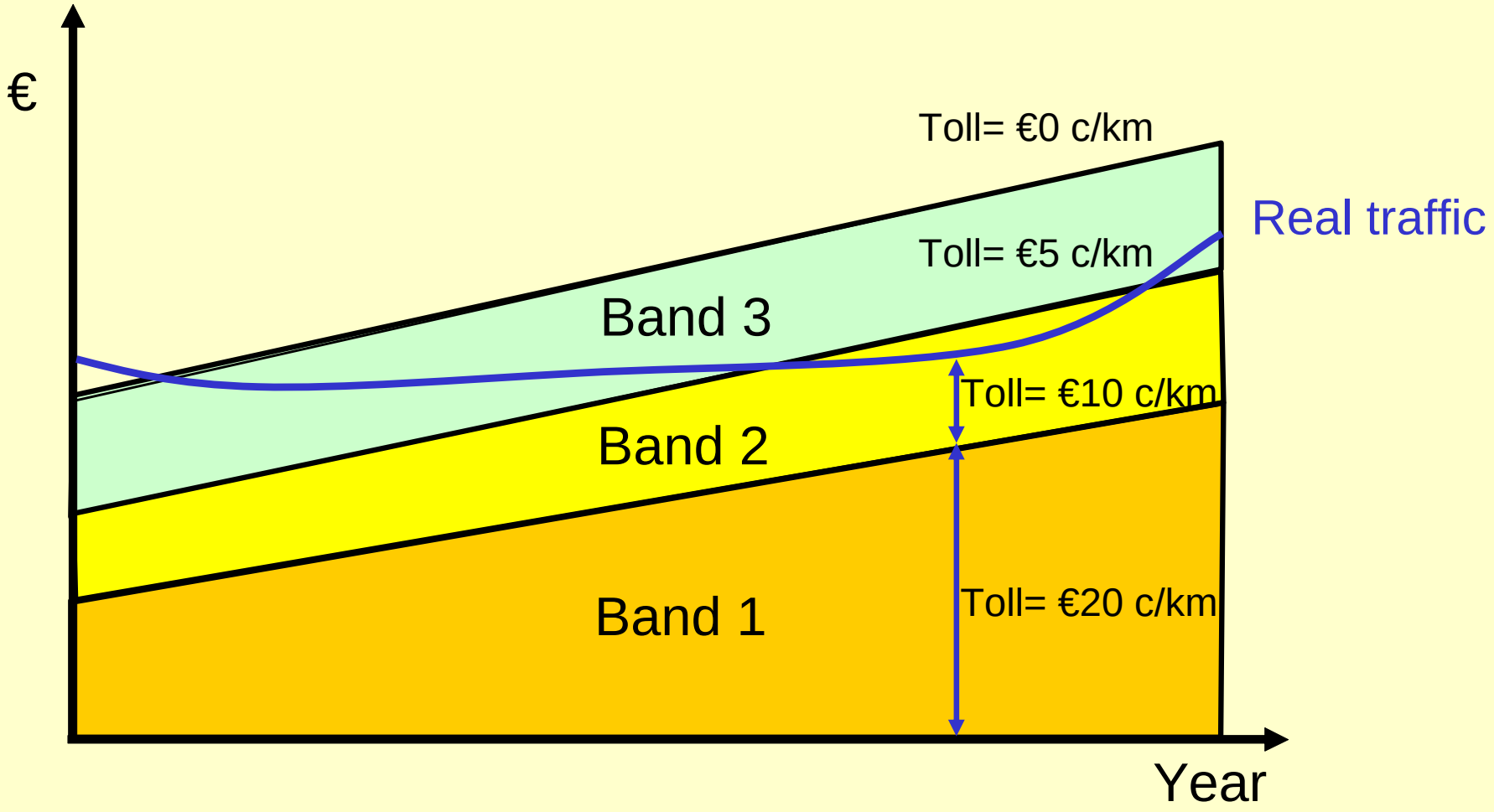


Cap and floor limits (III)

- Main **advantage**:
  - Improvement of the LENDERS' PERCEPTION of the project ⇒ reduction of the financial cost
- Main **drawback**:
  - HIGH CORRELATION in case of an economic crisis so the government may be ultimately bearing an important risk

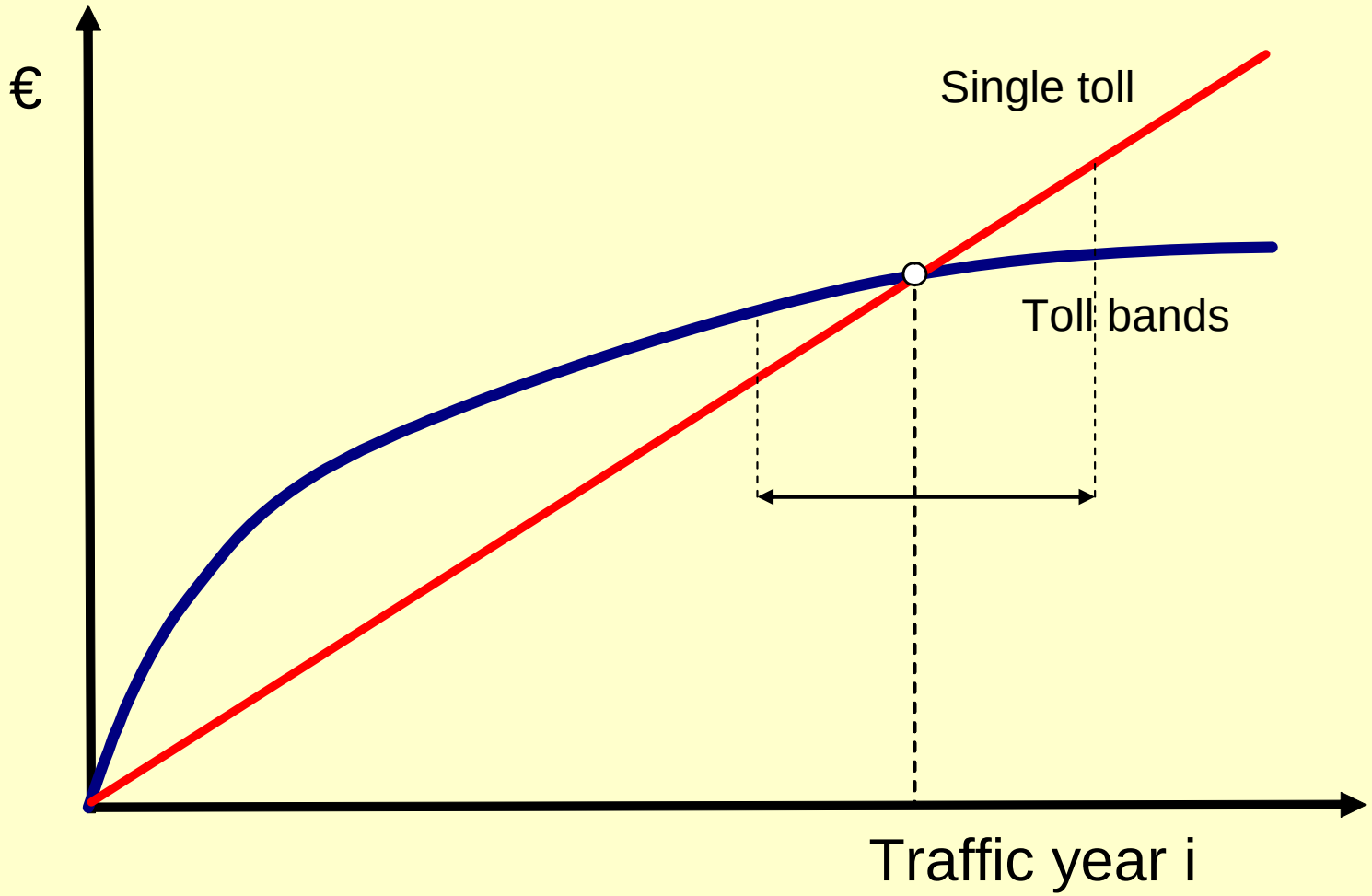
Toll bands (I)

Toll bands approach



Toll bands (II)

Sensitivity analysis



Change in the economic balance

- A provision to change contract terms if a target goal is reached
  - The target goal is often fixed in terms of IRR or PROFITS
  - The compensation is usually NEGOTIATED
- Main **advantage** → flexibility
- Main **drawbacks**:
  - IRR and PROFITS are difficult to monitor by the government
  - A future NEGOTIATION may be costly and tough for the government

Contracts with flexible duration (I)

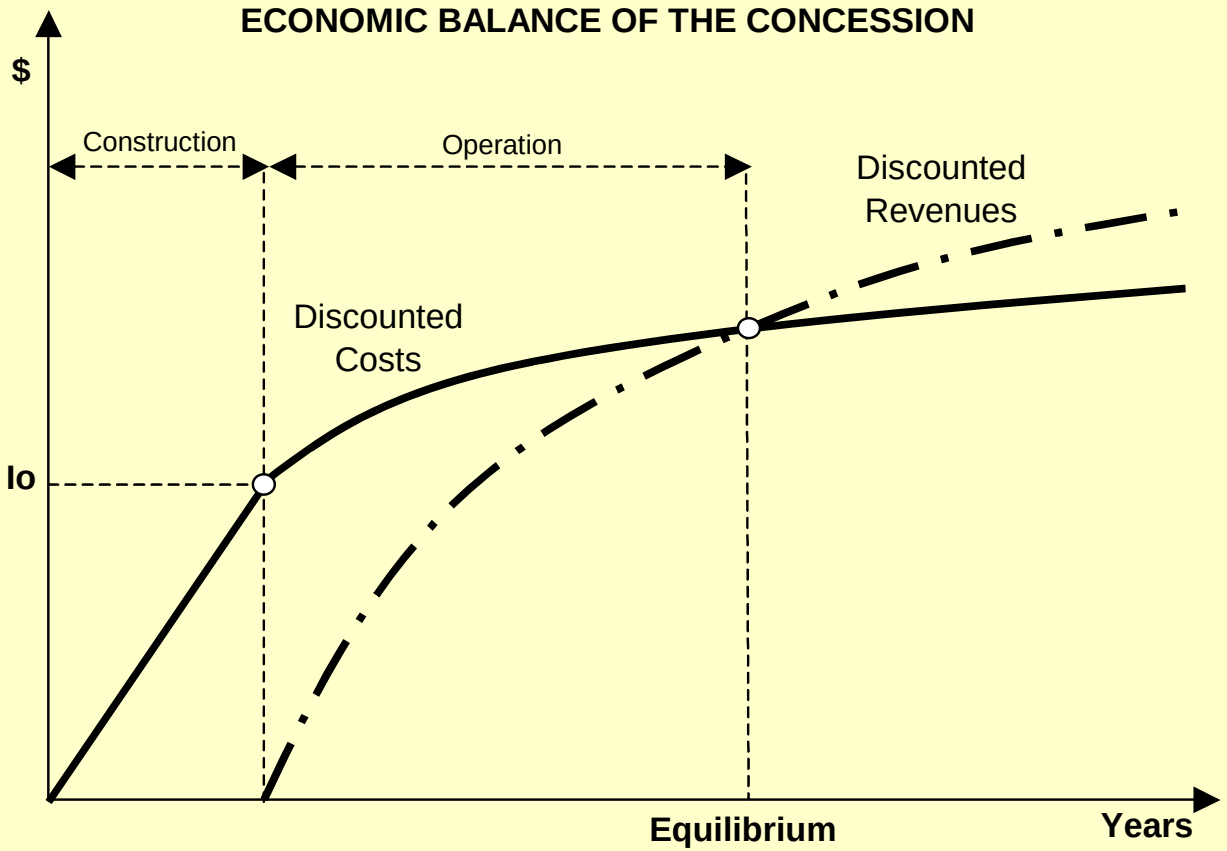
- Foundation:
  - Traffic lower than expected → extension of the contract duration
  - Traffic higher than expected → reduction of the contract duration
- These contracts have been implemented in:
  - United Kingdom: Severn Bridge
  - Portugal: Lusoponte
  - Colombia: several highway concessions
  - Chile: implementation of the “Least Present Value of the Revenues” approach in several highway concessions

Contracts with flexible duration (II)

$$I_o - S = \sum_{i=1}^{i=n} \frac{(p_i \cdot q_i(p_i) - c_i - t_i)}{(1+\alpha)^i}$$

$$I_o + \sum_{i=1}^{n} \frac{c_i + t_i}{(1+\alpha)^i} = \sum_{i=1}^{i=n} \frac{(p_i \cdot q_i(p_i))}{(1+\alpha)^i}$$

PVR



Io: Initial investment

S: Upfront subsidy

α: Cost of capital of the project

n: Concession term

p_i: Price for year i

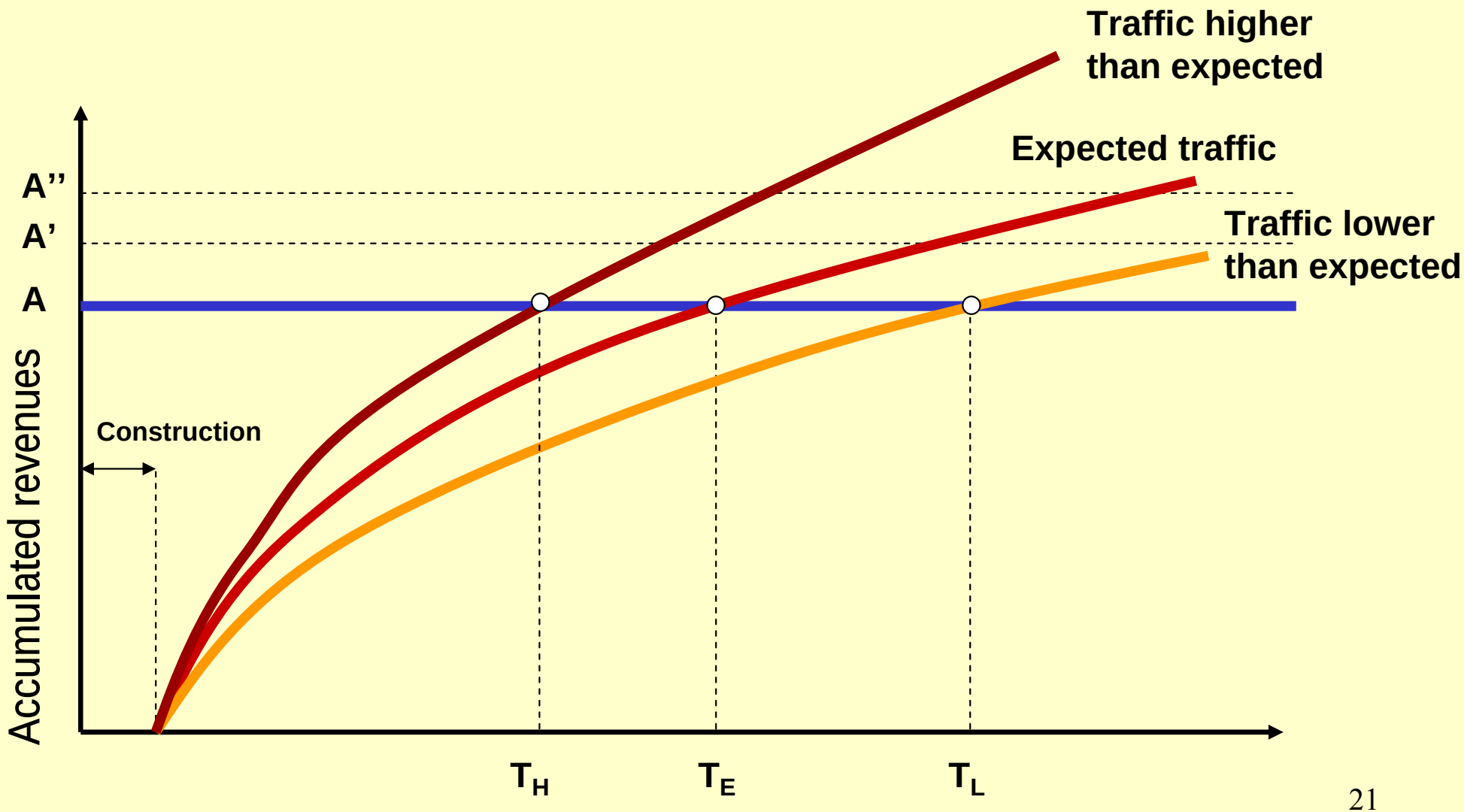
q_i: Annual traffic in year i

c_i: Operation and maintenance cost in year I

t_i: Corporate taxes in year i

Contracts with flexible duration (III)

Variable duration of the contract due to LPVR

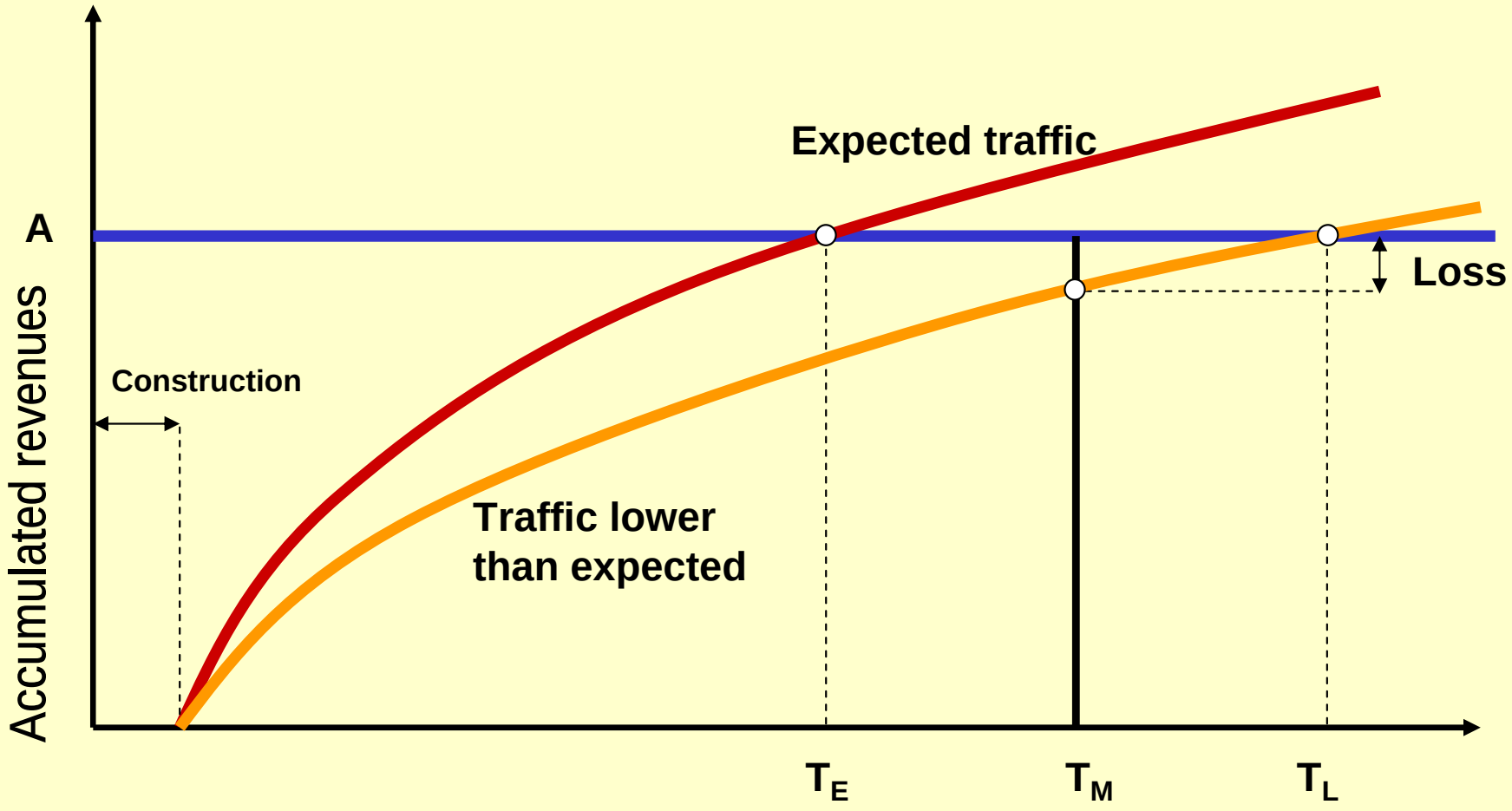


Contracts with flexible duration (IV)

- LPVR has important advantages for the government
  - A compensation based on a variable term does not commit public resources
  - LPVR sets up a clear buy out price
  - LPVR reduces renegotiation expectations so bidders have less incentives to inflate their offers
- However LPVR was applied only few times
  - Strong opposition from private promoters
    - Upside almost inexistent
    - Possible downside if there is a maximum duration established

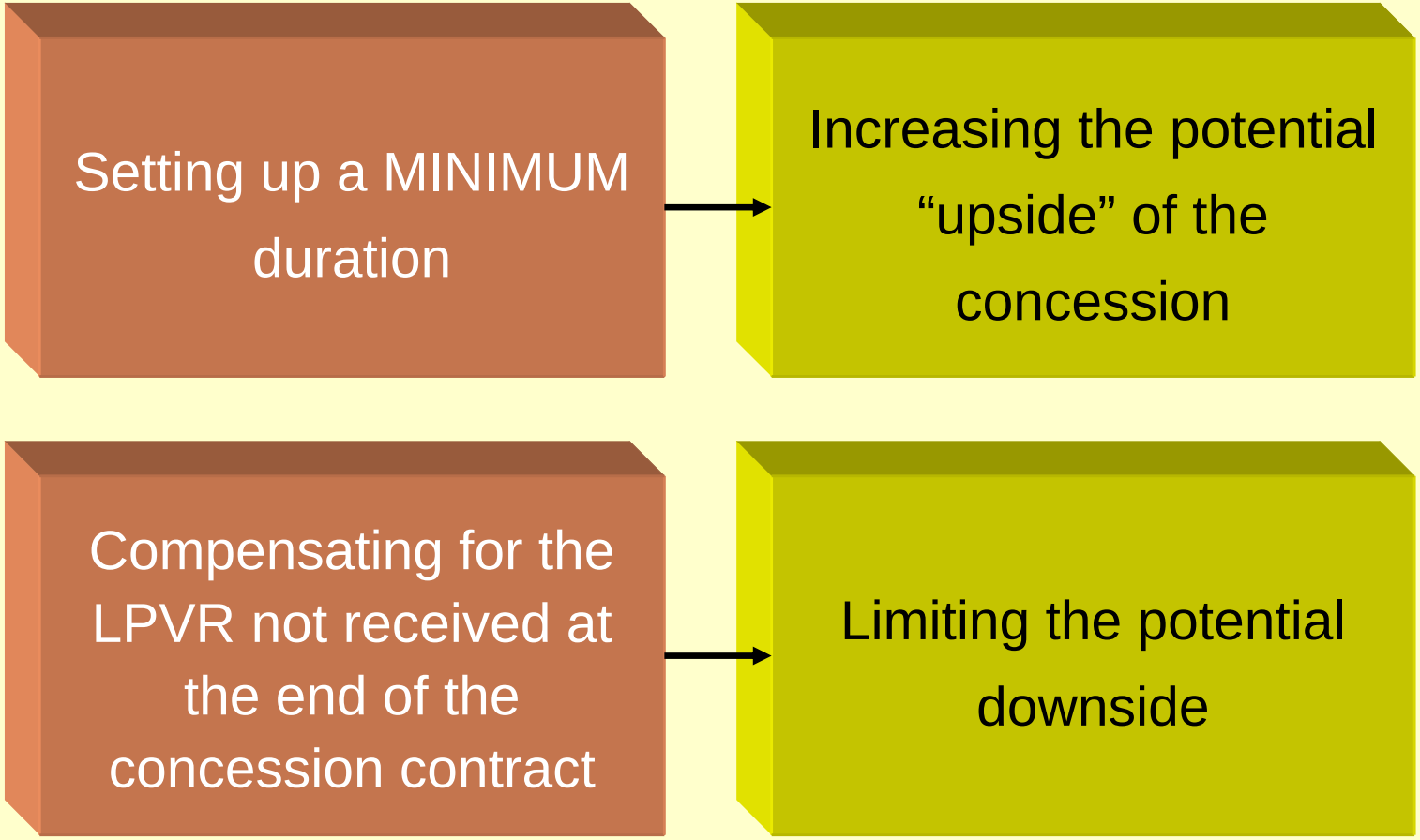
Contracts with flexible duration (V)

Loss endured by the private promoter by a maximum duration agreed in the contract



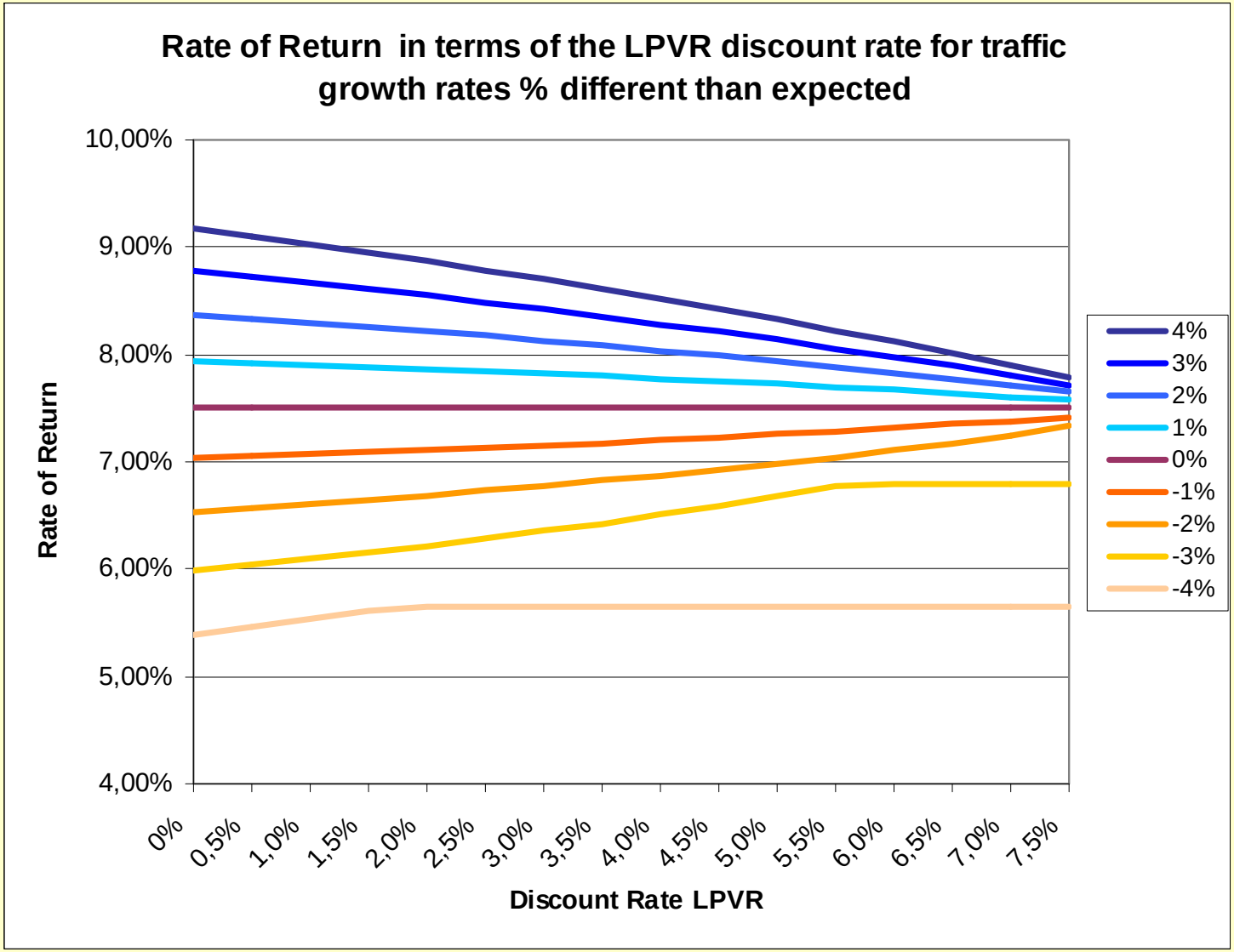
Contracts with flexible duration (VI)

Proposals for improving the acceptability of LPVR among private promoters



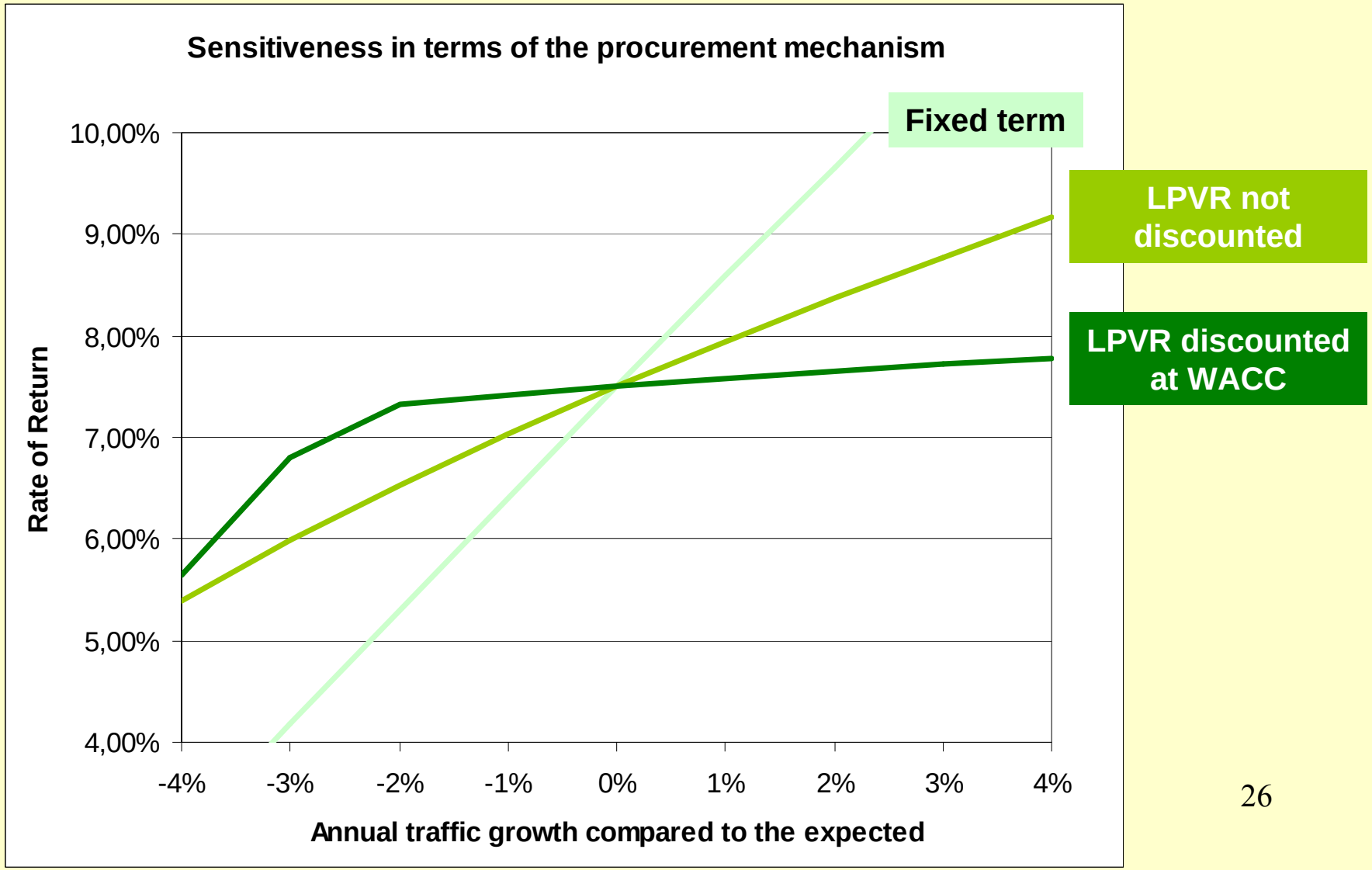
Contracts with flexible duration (VII)

The effect of the discount rate used to discount the revenues



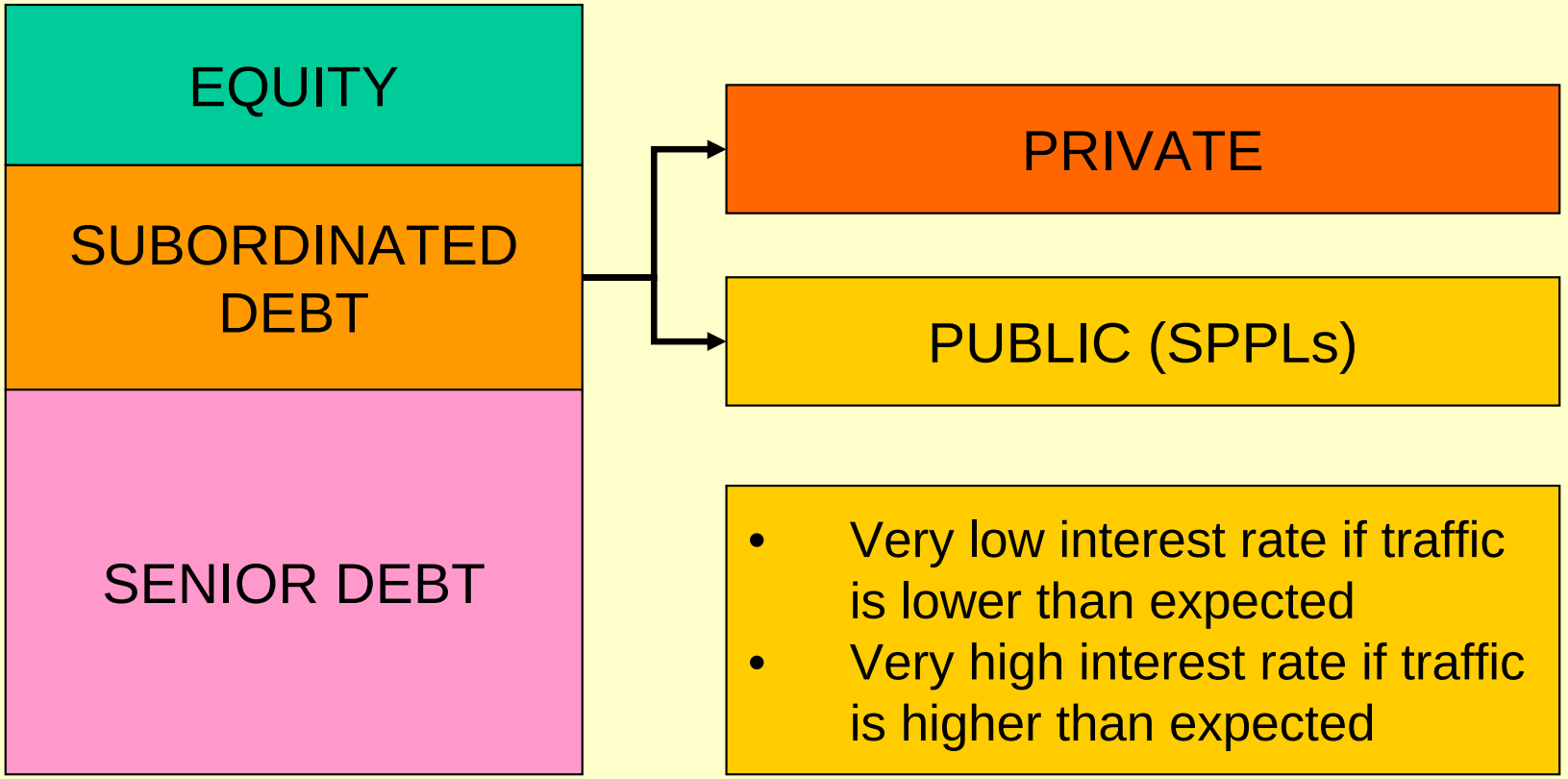
Contracts with flexible duration (VIII)

Rate of return of fixed term vs. LPVR discounted at WACC and not discounted



Subordinated public loans in Spain (I)

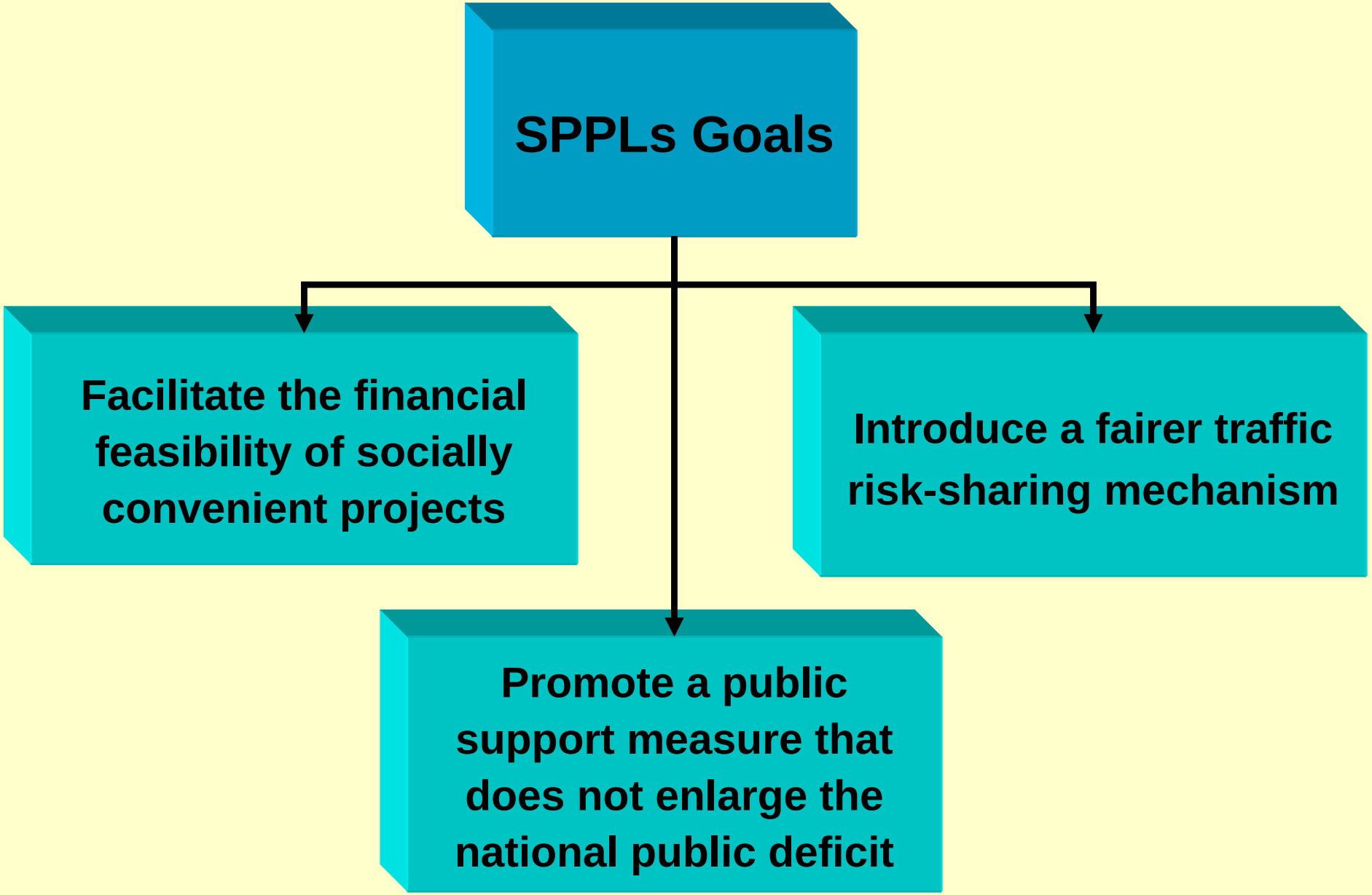
Means of financing a concession project



Subordinated public loans in Spain (II)

- Main characteristics of SPPLs:
  - They are capital contributions by the Government
    - They are public
  - They are raised from the budget, but they do not affect the public deficit
    - Financial investment of the Government
  - They are subordinated to other private senior loans
  - Their interest rate varies according to the level of traffic
  - They are often used as the key economic variable for the concession tender
    - The lower the SPPL requested the greater the possibility of being awarded the concession

Subordinated public loans in Spain (III)



Subordinated public loans in Spain (IV)

- SPPLs have been mostly applied in toll highway concession in Spain
- Specific characteristics:
  - SPPL cannot be > 50% of the investment needs of the project
  - The terms of the loan is the concession term
  - The principal is paid back in the last years of the concession
  - The interest is to be paid every year depending on the level of traffic

Subordinated public loans in Spain (V)

Traffic bands to calculate the interest rate

$$I(i) = \max\left(1.75\% \cdot D; 0.35 \cdot (T_i - T_i^A) \cdot p_i + 0.15 \cdot (T_i - T_i^B) \cdot p_i\right)$$

$$I(i) = \max\left(1.75\% \cdot D; 0.35 \cdot (T_i - T_i^A) \cdot p_i\right)$$