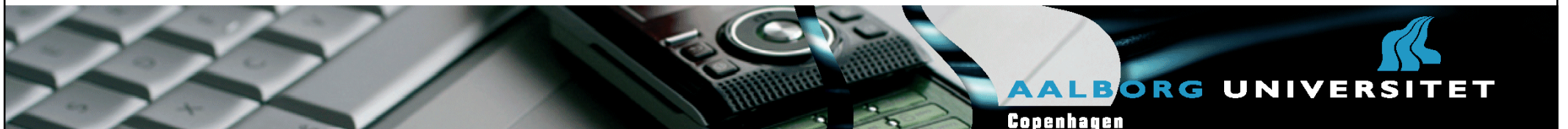


Regulation of International Roaming

COST IS0605 Econ@Tel

Morten Falch

falch@cmi.aau.dk



Agenda:

- Introduction to the EU framework on telecom regulation
- Why has international roaming been regulated?
- How is it regulated
- Techno-economic analysis
- Analysis of market structure
- The need for regulation in the future

European regulatory framework for telecom in EU

- General principles adopted in 2002
- Sector specific regulation on:
 - consumer rights
 - competition
 - Radio Spectrum
 - broadcasting
- An important objective is to ensure fair competition.
- Markets with limited competition may be regulated in order to protect consumers

Competition Remedies applied by (NTA)

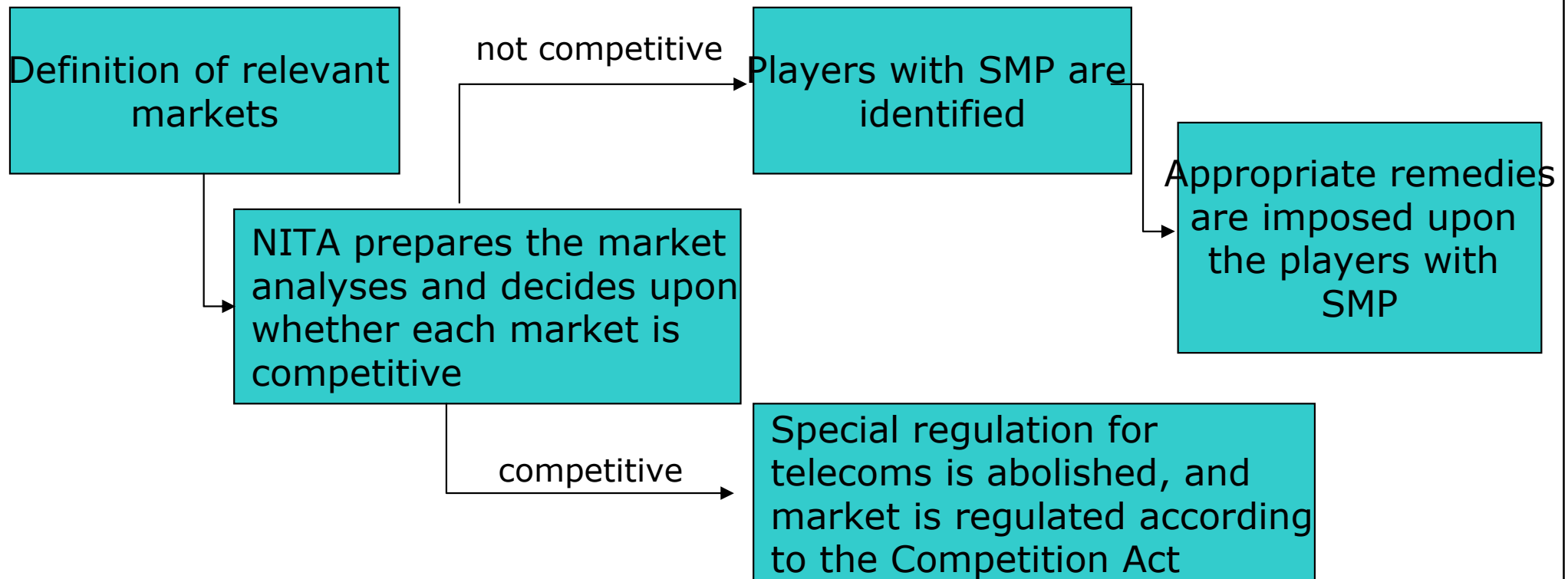
- Transparency
- Non-discrimination
 - Provide equivalent conditions to 3rd party
- Accounting separation
- Access obligation
 - SMP must meet reasonable requests for access to, and use of, specific network elements and associated facilities
- Price control and cost accounting
- Retail obligations - provide good quality services
 - "Regulatory controls on retail services can only be imposed where relevant wholesale or related measures would fail to achieve the objective of ensuring effective competition."

| | Landline | Broadband | Leased lines | Mobile | |
|--|--|----------------------|--------------------------|-------------------------------|------------------|
| Commodity market | 11. Unbundled access | | | | |
| Wholesale market (access network) | 8. Access 9. Termination | 12. Broadband access | 13. Terminating segments | 15. Access 16. Termination | 17. Int. roaming |
| Wholesale market (inter-exchange network) | 10. Transit | | 14. Trunk segments | 10. Transit | |
| Retail market | 1. Res. access 2. Non-residential access 3. Res. national traffic 4. Residential international traffic 5. Non-res. national traffic 6. Non-res. internat. traffic | | 7. The minimum set | | |

Copenhagen

EU market analyses

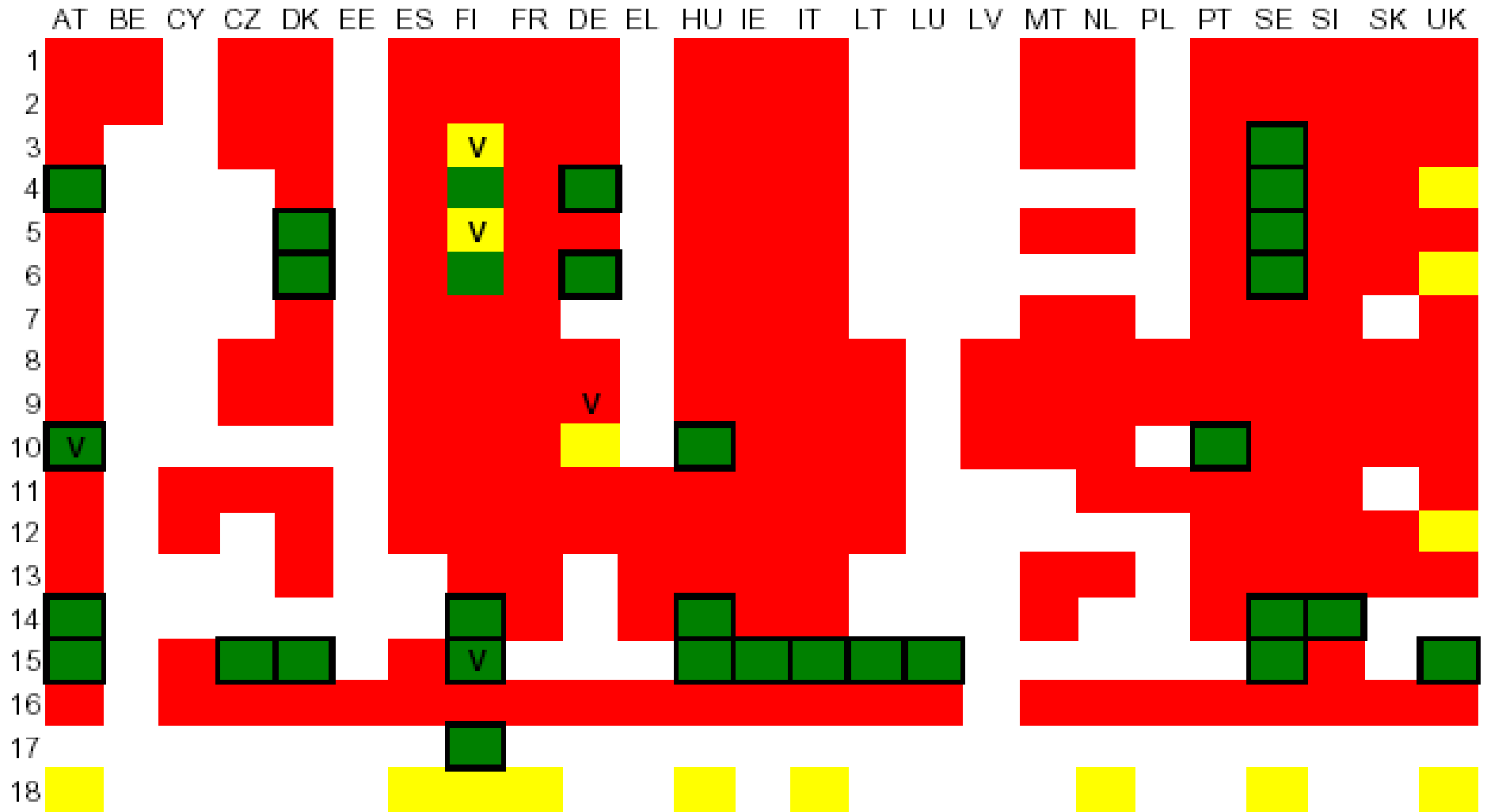
National telecom regulators are obliged to prepare market analyses for 18 designated markets



Indicators for level of competition

| | Indicator type | Indicators |
|-------------|------------------------------|---|
| Supply side | Market structure | <ol style="list-style-type: none"> 1. Market actors, market shares and concentration 2. Barriers of entry 3. Other structural market characteristics |
| | Supplier Behaviour | <ol style="list-style-type: none"> 4. Level of profit 5. Prices and price trends 6. Product differentiation 7. Competitive behaviour |
| Demand side | Barriers for Customer choice | <ol style="list-style-type: none"> 8. Access to information (transparency) 9. Binding periods 10. Barriers for change of operator |
| | Demand Market conditions | <ol style="list-style-type: none"> 11. Price level and price elasticity 12. Change of operator in practice |

Results of market analyses 1 August 2006



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|---|---|----------------------|--------------------------|-------------------------------|------------------|
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What is international roaming?

Voice services:

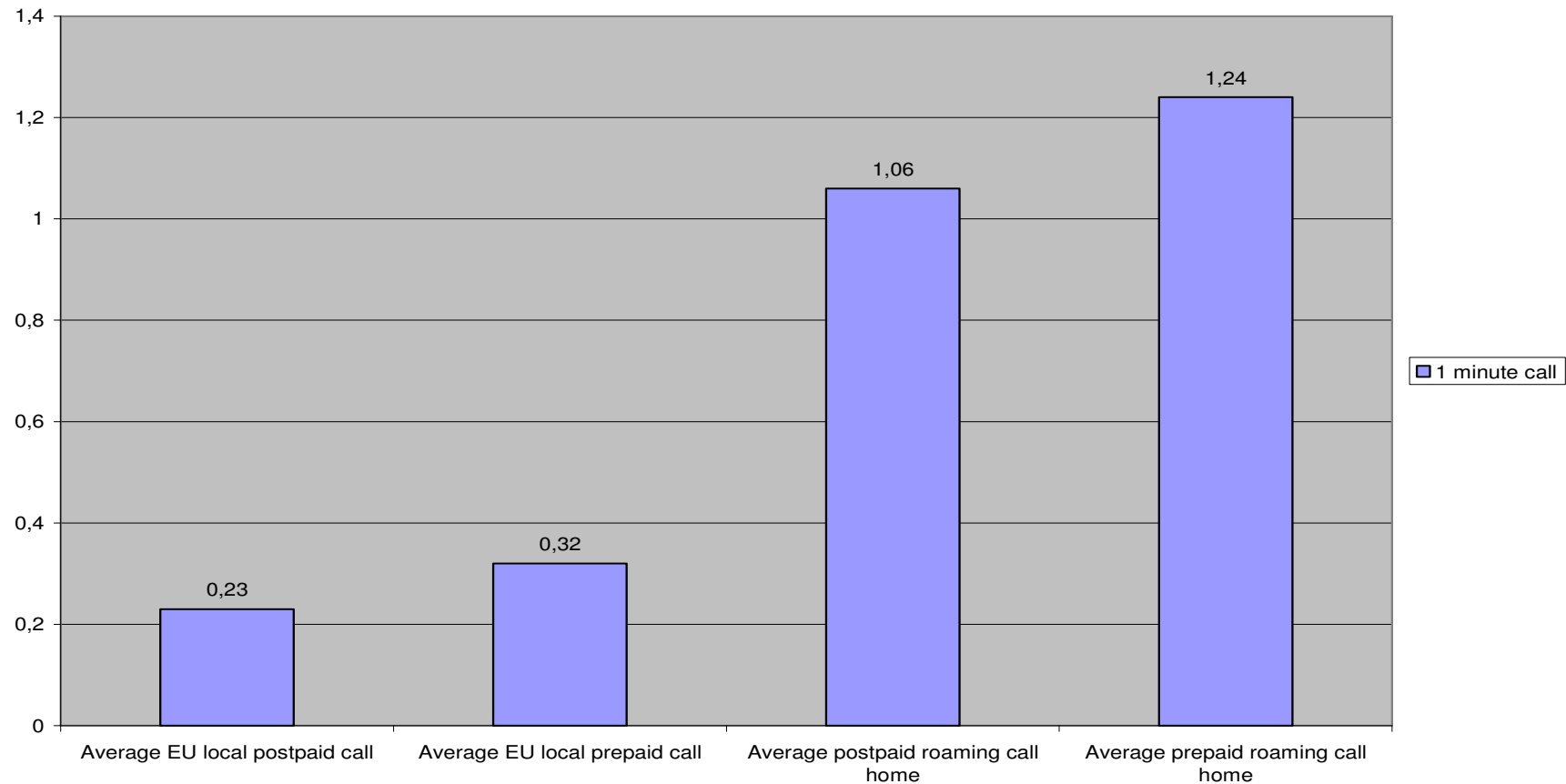
- Calls inside the visited country
- Calls from the visited country to the home country
- Calls from the visited country to a third country
- Receiving calls inside the visited country

Data services

- Sending SMS/Receiving SMS
- Internet access
- Upload/download of data



Why is regulation demanded: Prices of local and roaming calls (CEC 2006)



Situation before the roaming Regulation

- Roaming prices 3-5 times the costs
- Cheaper to buy a local SIM card
- Has been debated for many years
- Business customers have been making complaints for long – INTUG
- A growing number of all users roam
- However, nothing has happened with prices
- Difficult to regulate on a national basis
 - If retail prices are lowered, there will be a price squeeze on local operators
 - If wholesale prices are lowered, it will not be to the advantage of local users
- Commission therefore found the need to intervene with a EU-wide initiative
- This has led to reductions of 57% and 60% in charges for outgoing and incoming roaming calls

Regulation of International Roaming in EU

- In 2008 EU adopted a legislation on International Roaming:
 - Europewide price ceiling on wholesale tariffs
 - Europewide price ceiling on retail tariffs
 - Roaming market to be reviewed after three years

Roaming of data services

- Regulation introduced 1 July 2009
- Limits the price for sending a **text message** while abroad at €0.11. Receiving an SMS in another EU country will remain free of charge.
- Reduces the cost of **surfing the web** and downloading movies or video programs with a mobile phone while abroad by introducing a maximum wholesale cap of €1 per megabyte downloaded. This limit will be decreased each year.
- **Protection of consumers from "bill shocks"** introduction of a cut-off mechanism before March 2010. Once the bill reaches €50, unless they choose another cut-off limit
- Recently, a German downloading a TV programme while roaming in France faced a bill of €46,000). Operators have until March 2010 to put this cut-off limit in place.

Cost analysis: Basic Services in a GSM network

- Origination
- Termination
- Transit

Major Cost drivers

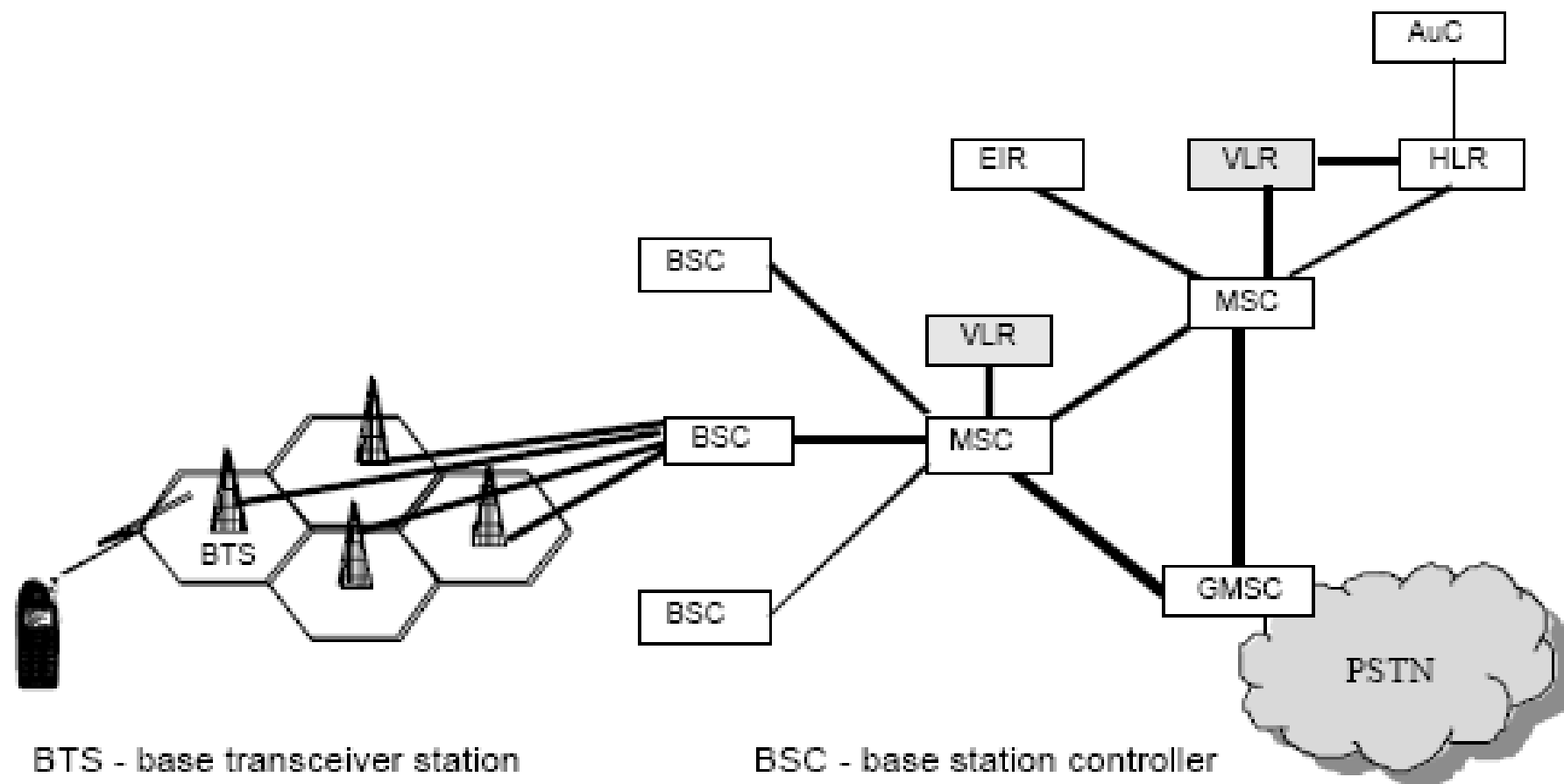
- Coverage
- Capacity
- No. subscribers

- The number of cells is the decisive factor for network cost.
- Non network costs such as customer handling and marketing are also important

Cost drivers 2

- Number of cells depend on:
 - Technology
 - Frequency band used
 - Frequency capacity
- In urban areas the number of cells in 2G networks depend on the need for capacity.
- Small cells are cheaper than large cells
- How should costs of coverage be paid?
 - Subscription, traffic or universal service fund?

Structure of the GSM Mobile System



BTS - base transceiver station
 MSC - mobile switching centre
 VLR - visitor location register
 EIR - equipment identity register

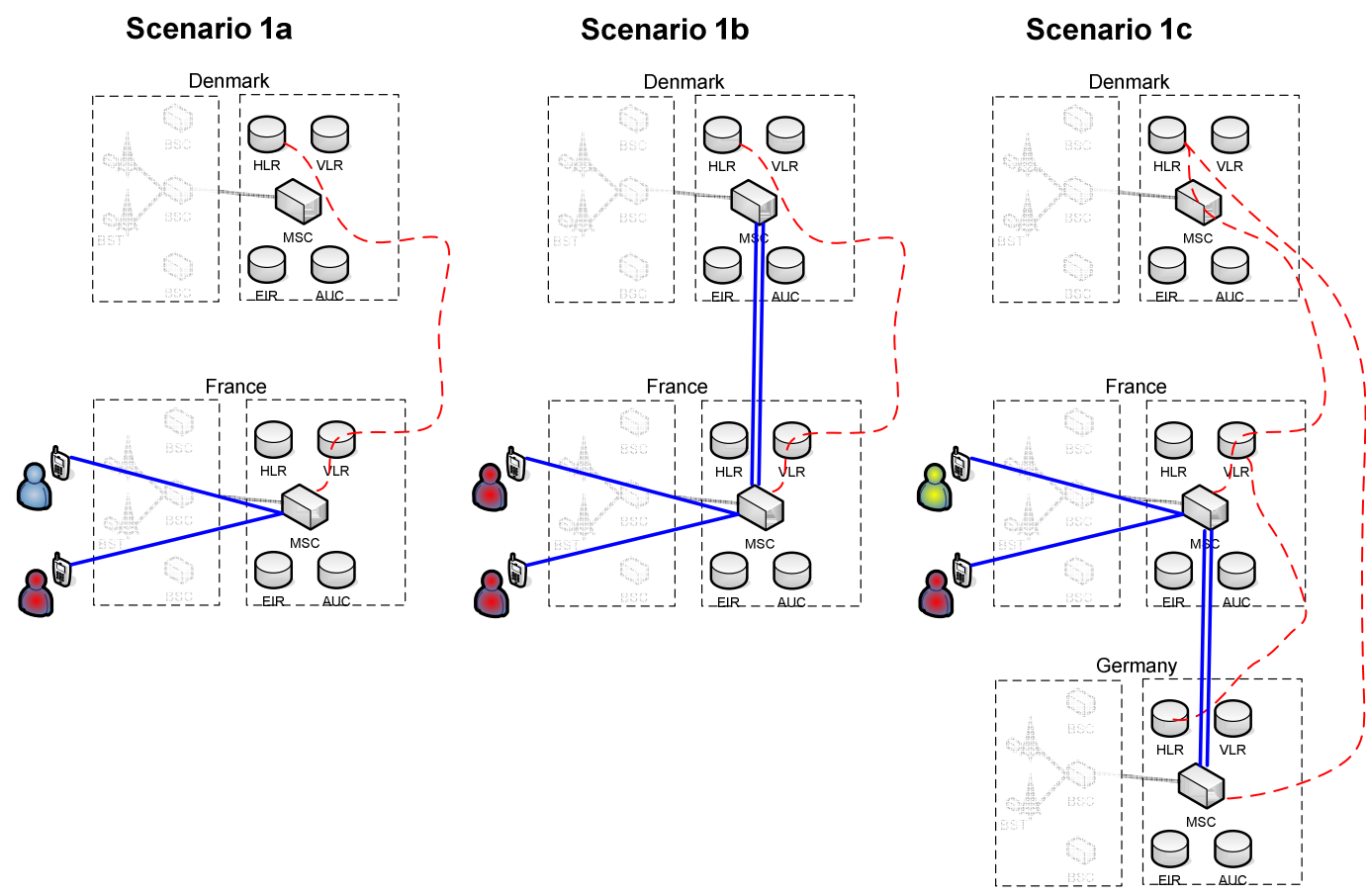
BSC - base station controller
 GMSC - gateway MSC
 HLR - home location register
 AuC - authentication centre

Source: Europe Economics

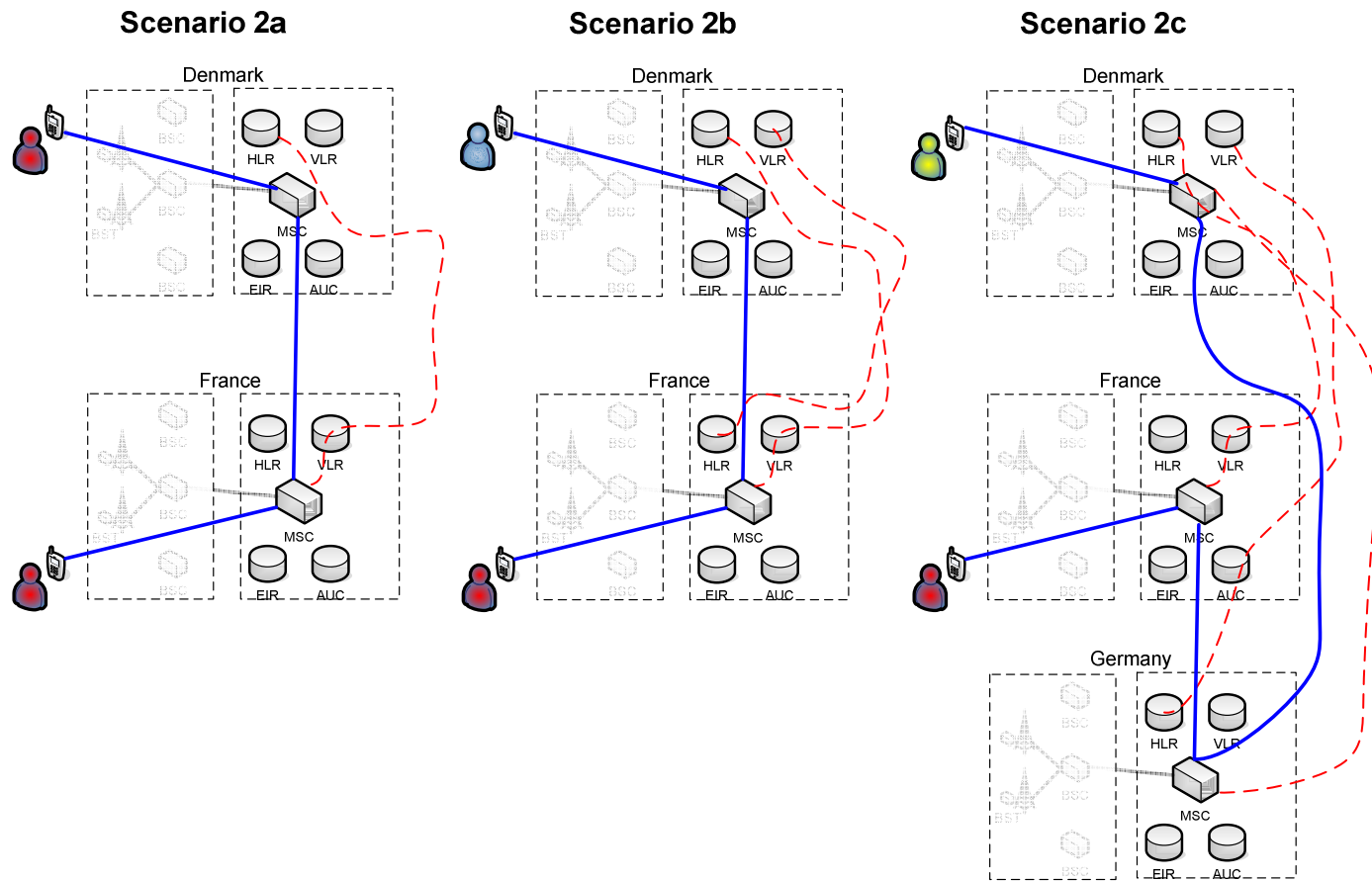
Cost analysis of roaming voice services

- Scenario 1: Calls inside the visited country
- Scenario 2: Calls from the visited country to the home country
- Scenario 3: Calls from the visited country to a third country
- Scenario 4: Receiving calls inside the visited country

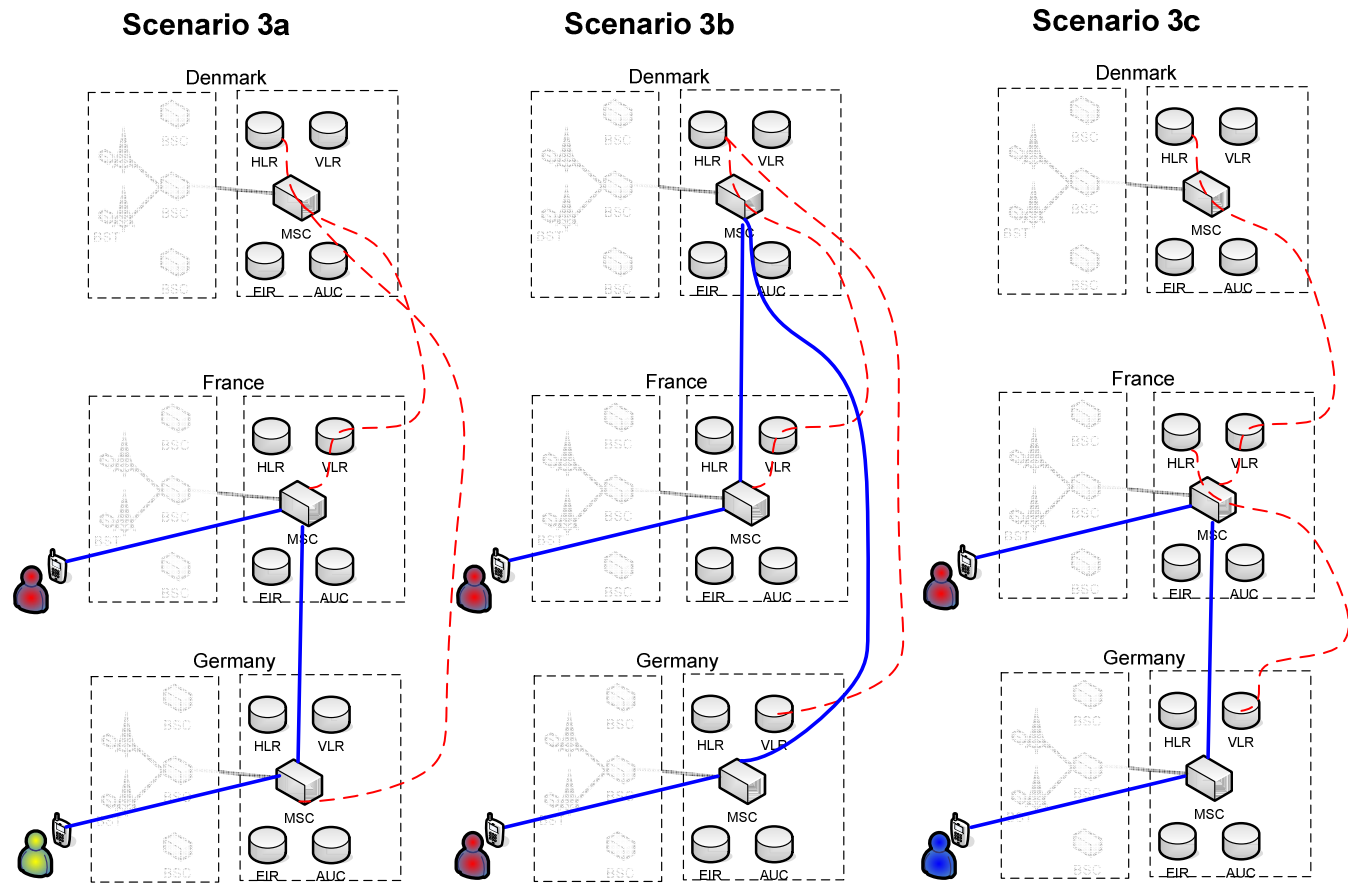
Scenario 1



Scenario 2



Scenario 3



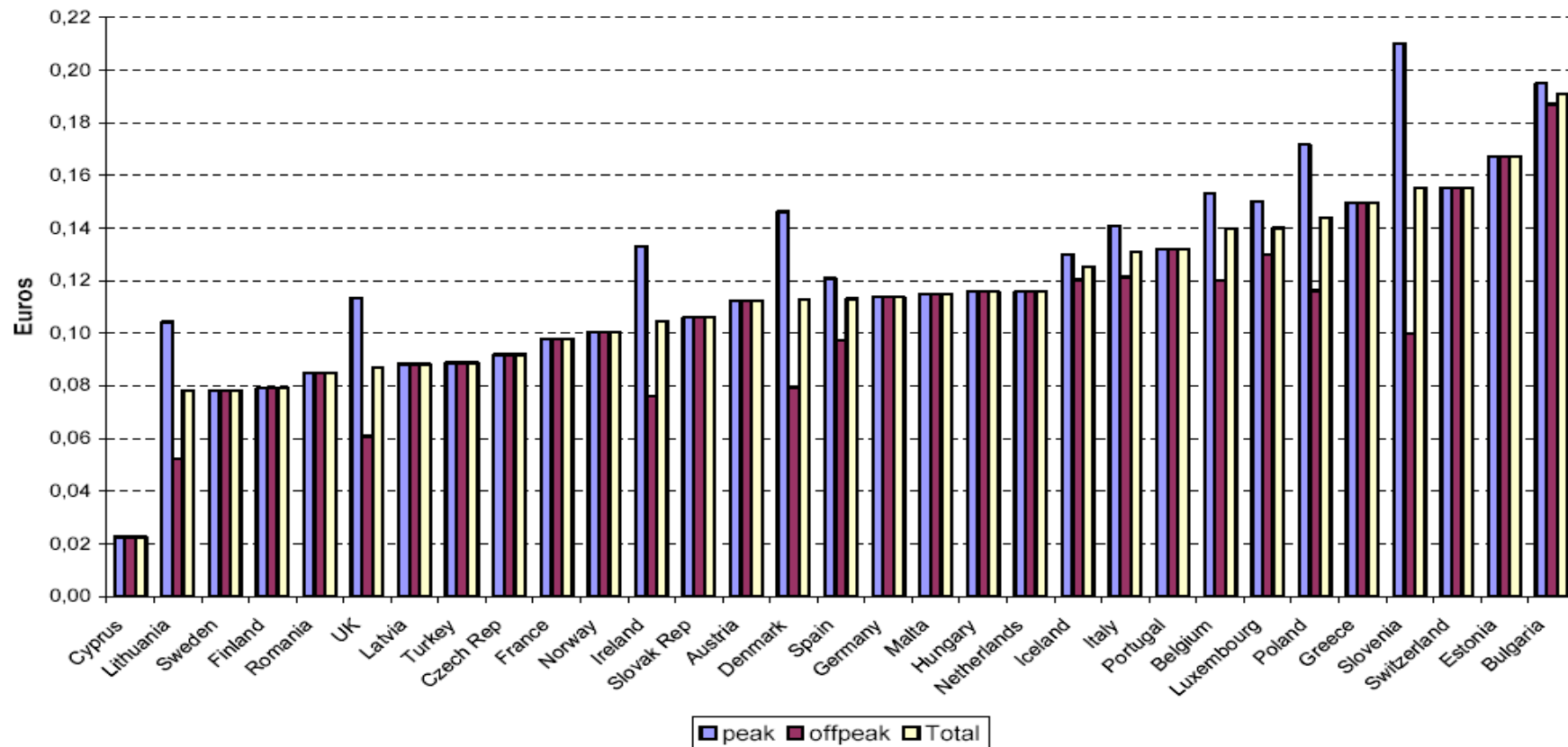
The Cost of International Roaming

- Basically international roaming involves the following functions:
 - Mobile origination
 - Mobile/Fixed termination
 - International transit
 - Roaming specific functions



National MTR- 2006

Average MT Tariff per country January 2006



Cost of roaming functions

| | €-cent per minute |
|---------------------------------------|-------------------|
| Mobile origination / termination (MT) | 11.4 |
| Fixed termination (FT) | 1.25 |
| International transit (IT) | 2 |
| Roaming specific costs (RSC) | 2 |

Roaming costs per scenario (€-cent per minute)

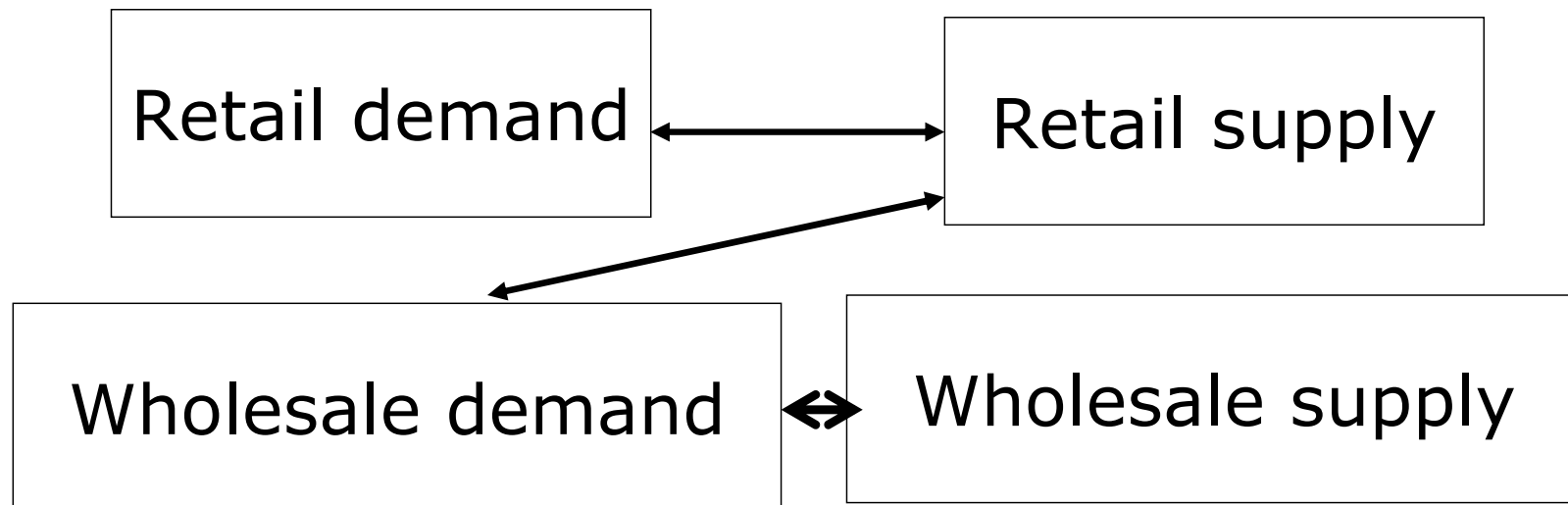
| <i>Scenario</i> | <i>Mobile termination</i> | <i>Fixed termination</i> |
|-----------------|---------------------------|-----------------------------|
| 0 | 2*MT | 22,8 FT+MT 12,65 |
| 1a | 2*MT+RSC | 24,8 FT+MT+RSC 14,65 |
| 1b | 2*MT+RSC+2*IT | 28,8 FT+MT+RSC+2*IT 18,65 |
| 1c | 2*MT+2*RSC+2*IT | 30,8 FT+MT+2*RSC+2*IT 20,65 |
| 2a | 2*MT+RSC | 24,8 FT+MT+RSC 14,65 |
| 2b | 2*MT+RSC+IT | 26,8 FT+MT+RSC+IT 16,65 |
| 2c | 2*MT+2*RSC+2*IT | 30,8 FT+MT+2*RSC+2*IT 20,65 |
| 3a | 2*MT+RSC+IT | 26,8 FT+MT+RSC+IT 16,65 |
| 3b | 2*MT+RSC+2*IT | 28,8 FT+MT+RSC+2*IT 18,65 |
| 3c | 2*MT+RSC+IT | 26,8 FT+MT+RSC+IT 16,65 |
| 4 | IT+RSC | 4 - - |

Conclusions on cost analysis

- High roaming costs can not be justified by network costs.
- No obvious economics of scale in roaming costs, but costs may be higher in rural areas.
- But high mark-ups can be justified by demand conditions and regulatory intervention may not be necessary.



Structure of the market for international roaming



Retail Demand

- Small share of the total communication bill
 - Little focus on roaming when choosing an operator
- Price elasticity between -0.55 and 1.20
- Lack of transparency – lower price sensitivity
- Demand distributed among several different markets
- Bundled with other services
- Uneven distribution of demand – higher in tourist areas

Elasticities

- Price-elasticity

$$(dq/q)/(dp/p)$$

- Income-elasticity

$$(dq/q)/(dy/y)$$

- Cross-elasticity

$$(dq_1/q_1)/(dp_2/p_2)$$

Retail Supply

- The same number of suppliers as for other mobile services
 - Offered by all mobile service providers
- EU national market studies have concluded that roaming markets are competitive
- Costs depends on supply for wholesale services
- Bundled with other services
- Purchase of local SIM-card is an alternative
- Uneven distribution of demand – higher in tourist areas

Wholesale Demand

- Demanded by all mobile operators without a global footprint
- Demand generated by retail demand
- Technical limitations for choosing the cheapest supplier
- Many operators are both demanding and supplying roaming services
- Bilateral agreements

Wholesale Supply

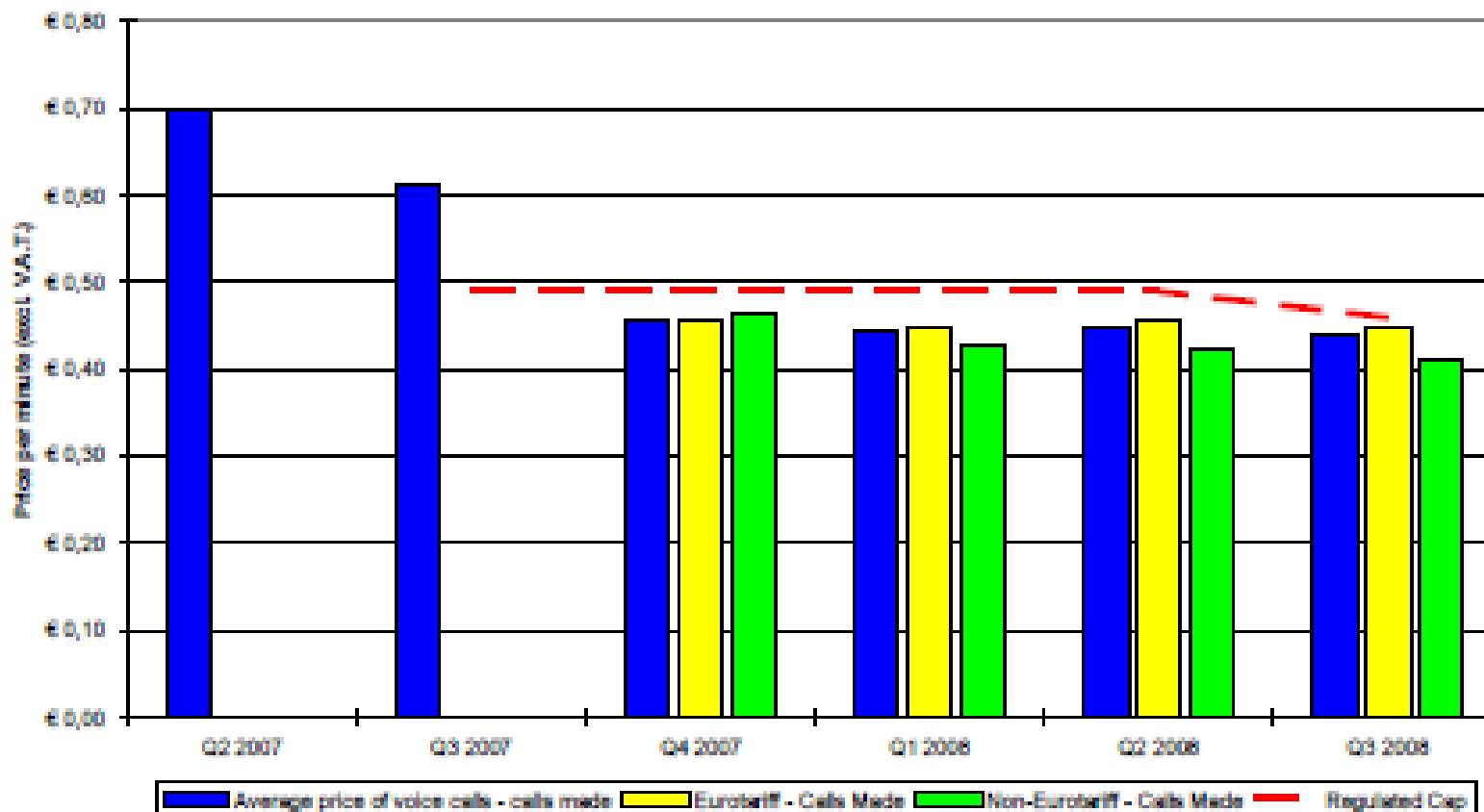
- Based on International Operator Tariffs
- Similar to International Accounting rates
- Tariffs agreed on reciprocal basis
- Costs transferred to retail customers
- Lack of transparency
- Reduction in roaming prices does not benefit the operators' own customers
- Traffic is not always led through the cheapest operator. Lower prices will therefore not attract more traffic.
- Collective agreements within international alliances seem to lead to lower prices, but they harm competition.
- Operators with international presence can offer cheaper roaming rates if they wish.

The Eurotariff

| Eurotariff maximum price while abroad | Making a call | Receiving a call | Sending an SMS | Receiving an SMS |
|---------------------------------------|---------------|------------------|----------------|------------------|
| Summer 2009 | 43 cents | 19 cents | 11 cents | free |
| Summer 2010 | 39 cents | 15 cents | 11 cents | free |
| Summer 2011 | 35 cents | 11 cents | 11 cents | free |



Average prices per minute for retail voice calls received

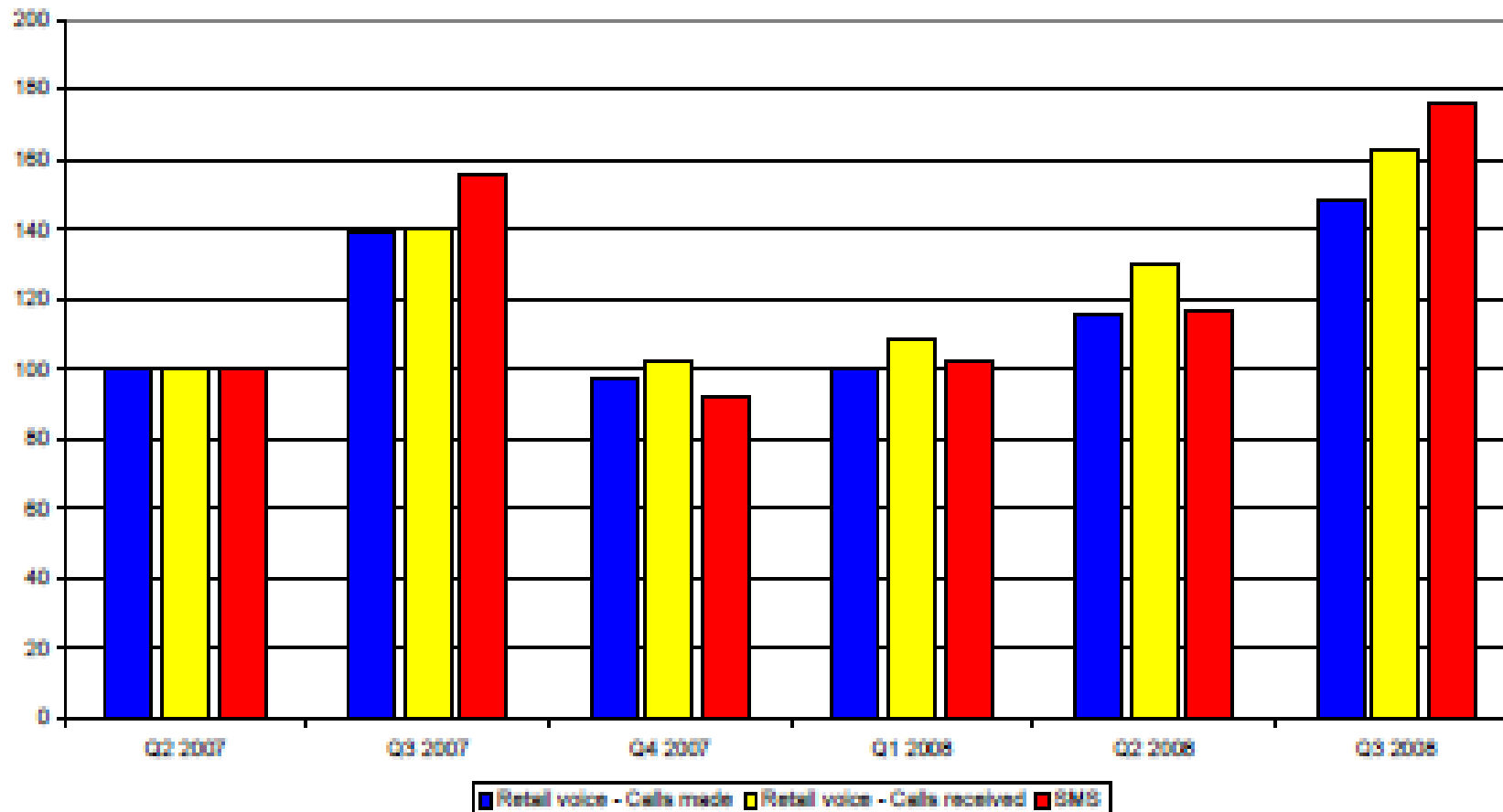


Number of countries with roaming charges below 80, 90, 95 and 100% of maximum (Oct. 2007)

| | Call tariff | | | Receive tariff | | |
|------------|----------------|-------------------|-------------------|----------------|-------------------|-------------------|
| | cheapest offer | 2. cheapest offer | 3. cheapest offer | cheapest offer | 2. cheapest offer | 3. cheapest offer |
| Below 80% | 5 | 0 | 0 | 2 | 0 | 0 |
| Below 90% | 7 | 0 | 0 | 5 | 0 | 0 |
| Below 95% | 12 | 5 | 0 | 10 | 0 | 0 |
| Below 100% | 20 | 15 | 8 | 19 | 14 | 3 |



Trends in vol. for retail voice calls and SMS



Conclusions

- Very intrusive regulation at the EU level
- Little room for regulation at the national level
- Drastic reductions in prices
- Little variation in roaming prices indicate limited competition
- No visible increase in volume