



European 3G Auctions

- an auction theoretic perspective

Telecommunications Economy and Policy
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Senior Economist, Jonas Holm
Andersen Management International/Ementor

Agenda

- Introduction - 3G in Europe
- Why spectrum auctions?
- Different auction designs
- Characteristics of 3G auctions
- UK, Netherlands, Italy, Switzerland
- Germany, Austria
- Belgium, Greece
- Denmark
- Lessons learned

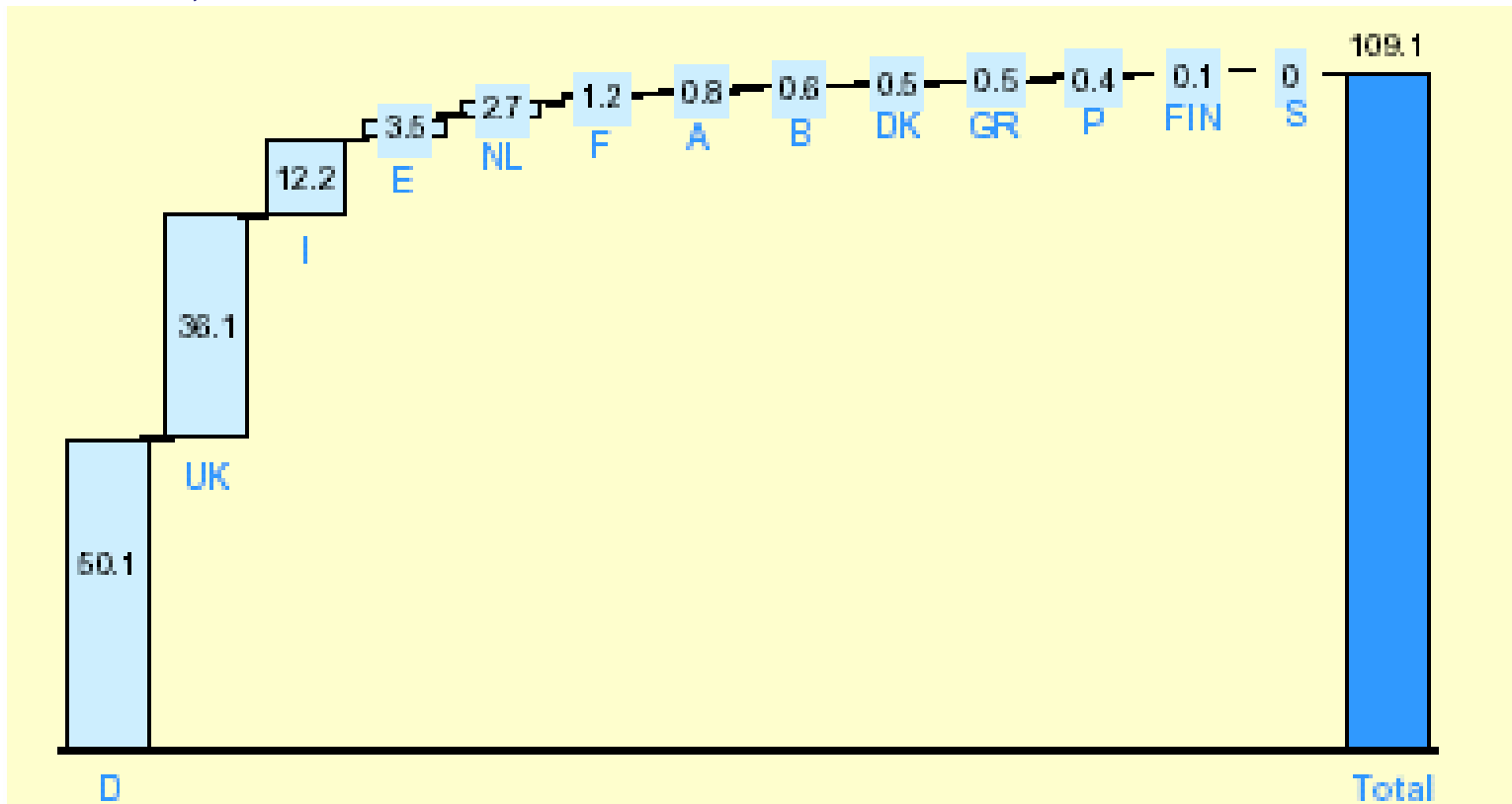
Introduction



- 3G - from GSM to UMTS
- Scarce frequency resources
- Auction versus beauty contest
- 15 tenders from 03/99-02/02
- 7 beauty contests: Finland, Spain, France, Sweden, Portugal, Luxembourg, Ireland
- 8 auctions: UK, Netherlands, Germany, Italy, Austria, Belgium, Greece, Denmark
- Total revenue: EUR 109 billion

Introduction

Revenue, billion EUR



Source: McKinsey&Co for the EU-Commission, June 2002

Introduction

SPECTRUM ASSIGNMENT IN THE EUROPEAN UNION

MHz

	Countries	Repartition of the spectrum available for the different licenses offered						
Same spectrum allocation adopted by half of the Member States	<ul style="list-style-type: none"> • Belgium • Denmark • Finland • France • Ireland • Luxembourg • Portugal • Spain • Sweden 	<table border="1"> <tr> <td>$2 \times 15 + 5$</td> <td>$2 \times 15 + 5$</td> <td>$2 \times 15 + 5$</td> <td>$2 \times 15 + 5$</td> </tr> </table>	$2 \times 15 + 5$	$2 \times 15 + 5$	$2 \times 15 + 5$	$2 \times 15 + 5$		
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Different spectrum allocation for the other half of the Member States	• Austria	<table border="1"> <tr> <td>$2 \times (2 \times 5) + 2 \times 5$</td> <td>$2 \times (2 \times 5) + 2 \times 5$</td> <td>$2 \times (2 \times 5) + 1 \times 5$</td> <td>$2 \times (2 \times 5)$</td> <td>$2 \times (2 \times 5)$</td> <td>$2 \times (2 \times 5)$</td> </tr> </table>	$2 \times (2 \times 5) + 2 \times 5$	$2 \times (2 \times 5) + 2 \times 5$	$2 \times (2 \times 5) + 1 \times 5$	$2 \times (2 \times 5)$	$2 \times (2 \times 5)$	$2 \times (2 \times 5)$
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	• Germany	<table border="1"> <tr> <td>$2 \times 10 + 1 \times 5$</td> <td>$2 \times 10 + 1 \times 5$</td> <td>$2 \times 10 + 1 \times 5$</td> <td>$2 \times 10 + 1 \times 5$</td> <td>$2 \times 10 + 1 \times 5$</td> <td>2×10</td> </tr> </table>	$2 \times 10 + 1 \times 5$	$2 \times 10 + 1 \times 5$	$2 \times 10 + 1 \times 5$	$2 \times 10 + 1 \times 5$	$2 \times 10 + 1 \times 5$	2×10
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	• Greece	<table border="1"> <tr> <td>$2 \times 20 + 1 \times 5$</td> <td>$2 \times 15 + 1 \times 5$</td> <td>$2 \times 15 + 1 \times 5$</td> <td>$2 \times 10 + 1 \times 5$</td> </tr> </table>	$2 \times 20 + 1 \times 5$	$2 \times 15 + 1 \times 5$	$2 \times 15 + 1 \times 5$	$2 \times 10 + 1 \times 5$		
	$2 \times 20 + 1 \times 5$	$2 \times 15 + 1 \times 5$	$2 \times 15 + 1 \times 5$	$2 \times 10 + 1 \times 5$				
• Italy	<table border="1"> <tr> <td>$2 \times 15 + 1 \times 5$</td> <td>$2 \times 15 + 1 \times 5$</td> <td>$2 \times 10 + 1 \times 5$</td> <td>$2 \times 10 + 1 \times 5$</td> <td>$2 \times 10 + 1 \times 5$</td> </tr> </table>	$2 \times 15 + 1 \times 5$	$2 \times 15 + 1 \times 5$	$2 \times 10 + 1 \times 5$	$2 \times 10 + 1 \times 5$	$2 \times 10 + 1 \times 5$		
$2 \times 15 + 1 \times 5$	$2 \times 15 + 1 \times 5$	$2 \times 10 + 1 \times 5$	$2 \times 10 + 1 \times 5$	$2 \times 10 + 1 \times 5$				
• Netherlands	<table border="1"> <tr> <td>$2 \times 15 + 1 \times 5$</td> <td>$2 \times 15 + 1 \times 5$</td> <td>$2 \times 10 + 1 \times 5$</td> <td>$2 \times 10 + 1 \times 5$</td> <td>$2 \times 10 + 1 \times 5$</td> </tr> </table>	$2 \times 15 + 1 \times 5$	$2 \times 15 + 1 \times 5$	$2 \times 10 + 1 \times 5$	$2 \times 10 + 1 \times 5$	$2 \times 10 + 1 \times 5$		
$2 \times 15 + 1 \times 5$	$2 \times 15 + 1 \times 5$	$2 \times 10 + 1 \times 5$	$2 \times 10 + 1 \times 5$	$2 \times 10 + 1 \times 5$				
• UK	<table border="1"> <tr> <td>$2 \times 15 + 1 \times 5$</td> <td>2×15</td> <td>$2 \times 10 + 1 \times 5$</td> <td>$2 \times 10 + 1 \times 5$</td> <td>$2 \times 10 + 1 \times 5$</td> </tr> </table>	$2 \times 15 + 1 \times 5$	2×15	$2 \times 10 + 1 \times 5$	$2 \times 10 + 1 \times 5$	$2 \times 10 + 1 \times 5$		
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Source: McKinsey&Co for the EU-Commission, June 2002

Why spectrum auctions?

- Efficient allocation
- Market is better informed than the regulator
- Objective, fair and transparent allocation
- Valuable resource
- Non-distorting tax - sunk cost
- Information on value (alternative cost)

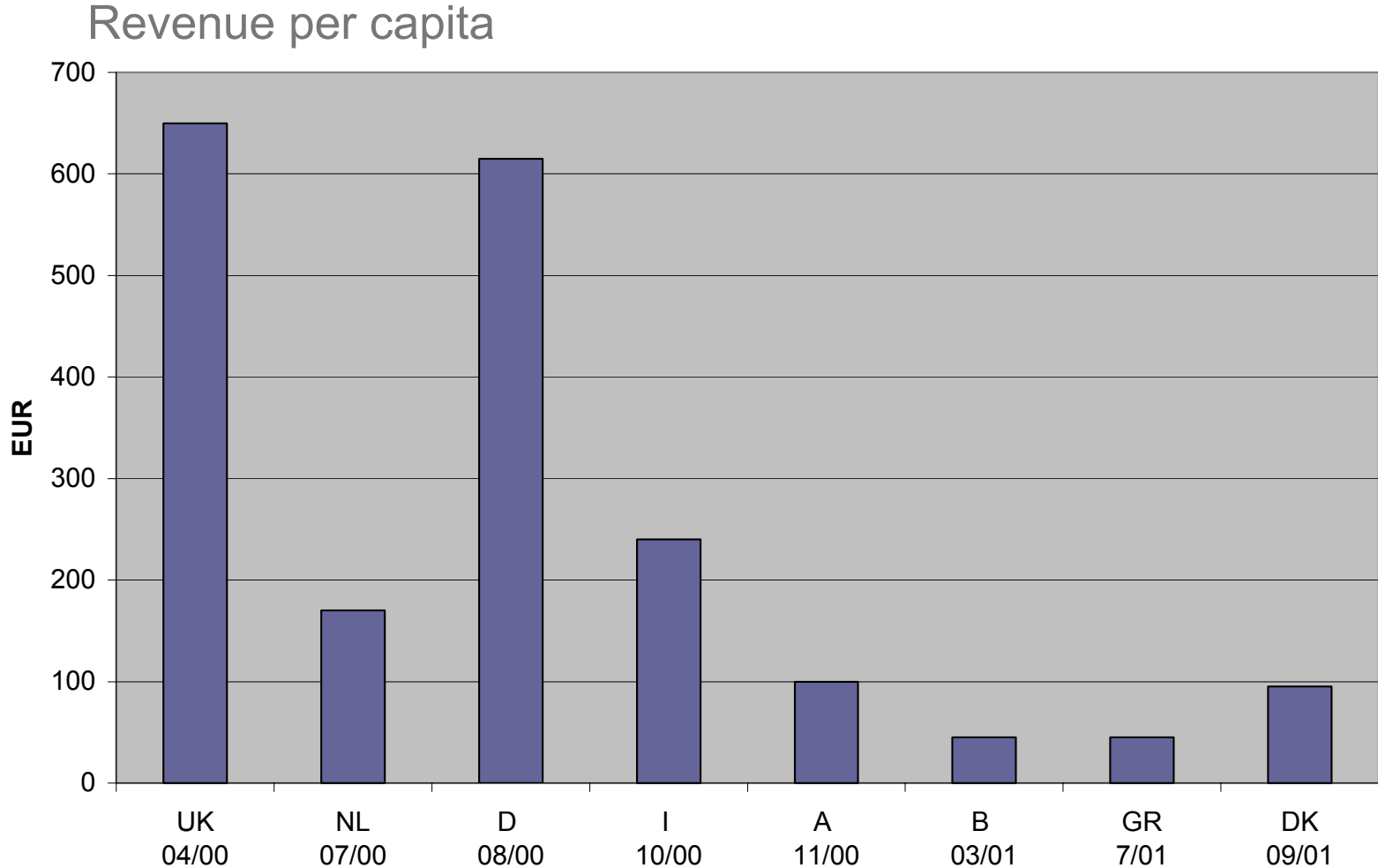
Different auction designs

- Open
 - English auction: UK, NL, D, I, A, B, GR
 - Dutch auction
- Sealed-bid
 - (First price) sealed bid auction: DK
 - Vickrey auctions
- Sequential vs. simultaneous

Characteristics of 3G auctions

- Simultaneous auctions
- Substantial uncertainty about value
- Incumbent 2G-operators with significant advantages
- Private vs. common value
- Comparable frequency blocks
- Large differences in revenue
- Sliding telecom crash
- Prices explained by timing and auction design

Large differences in revenue

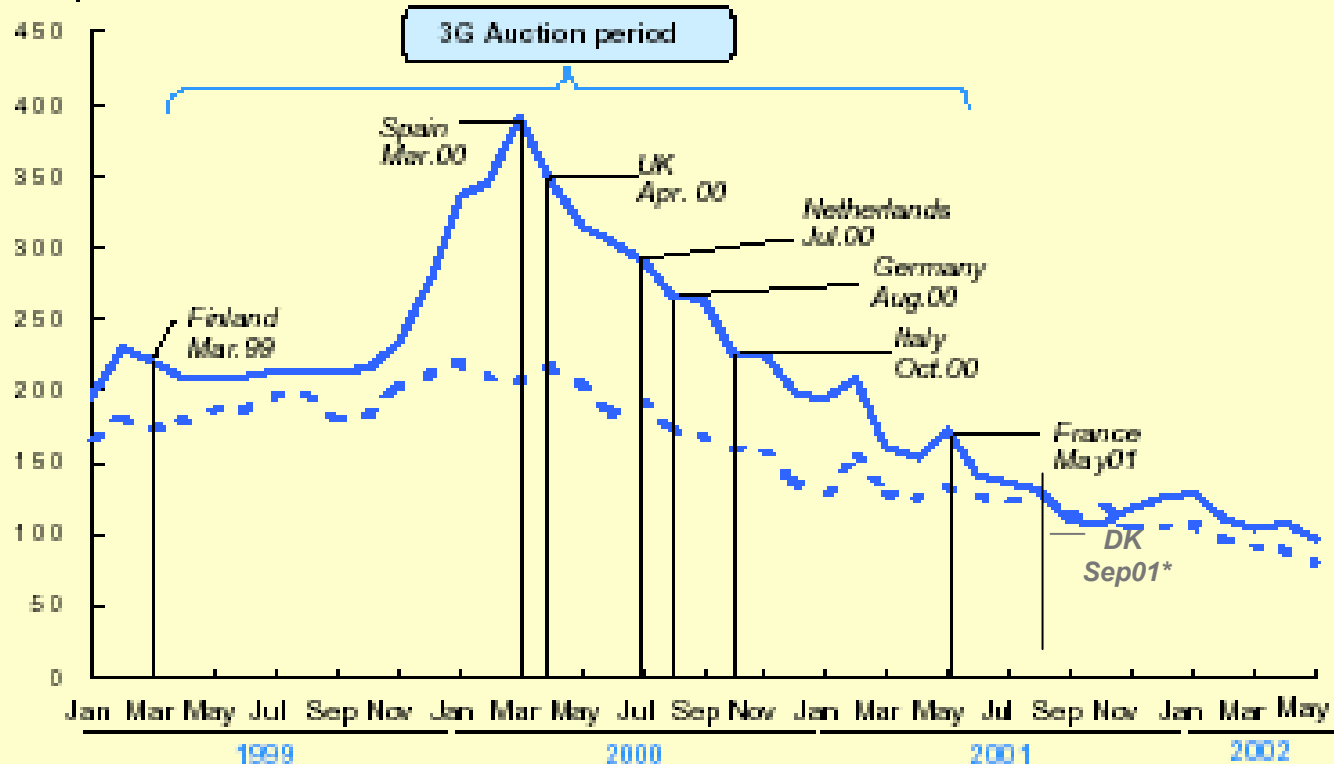


Sliding telecom crash

EUROPE VS USA – DATASTREAM TELECOM SERVICES INDEX*
Stock price index (November 1997 = 100)

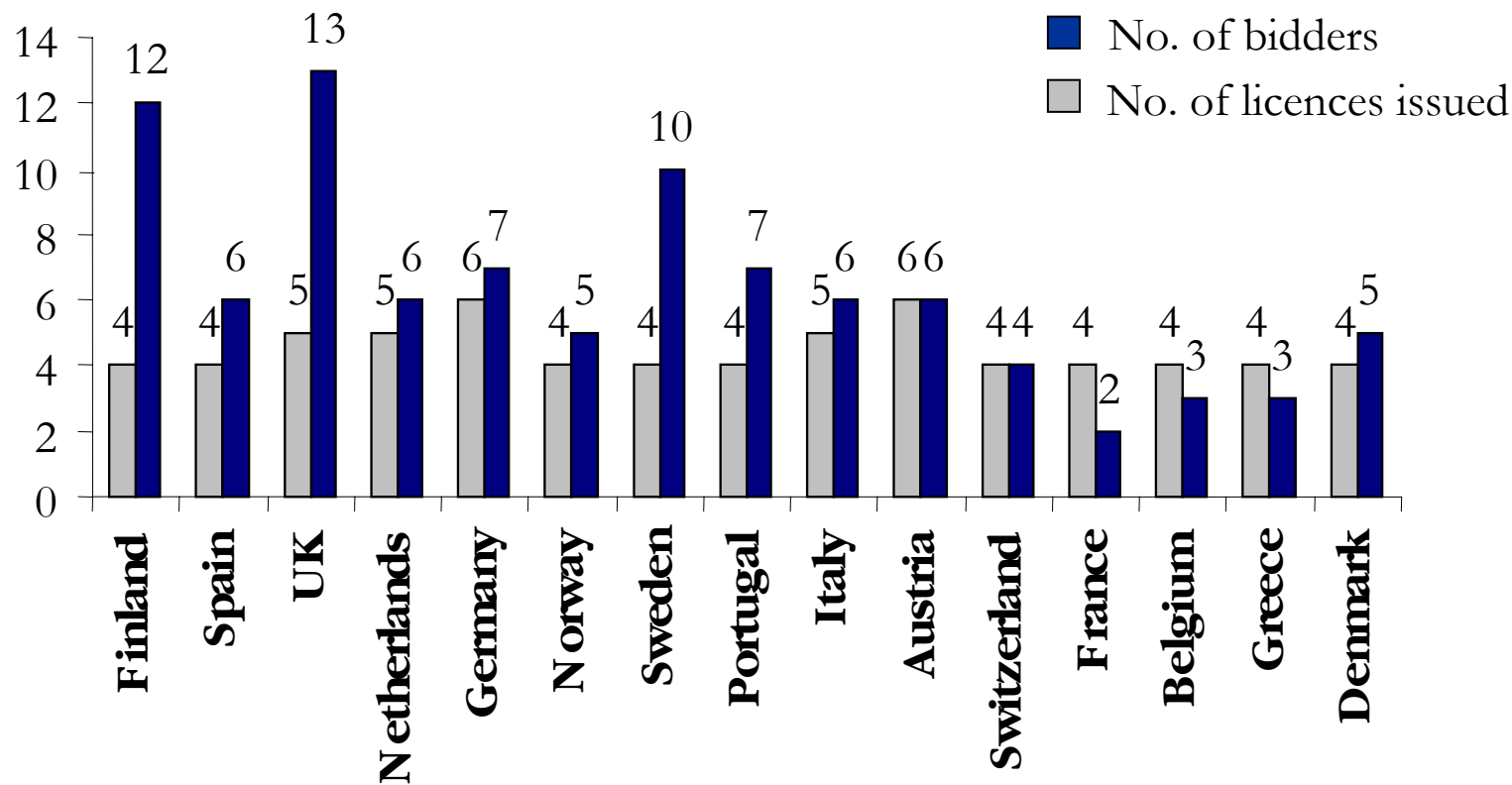
— Europe
- - - U.S.

All operators



Source: McKinsey&Co for the EU Commission, June 2002, *AMI

Diminishing interest for 3G

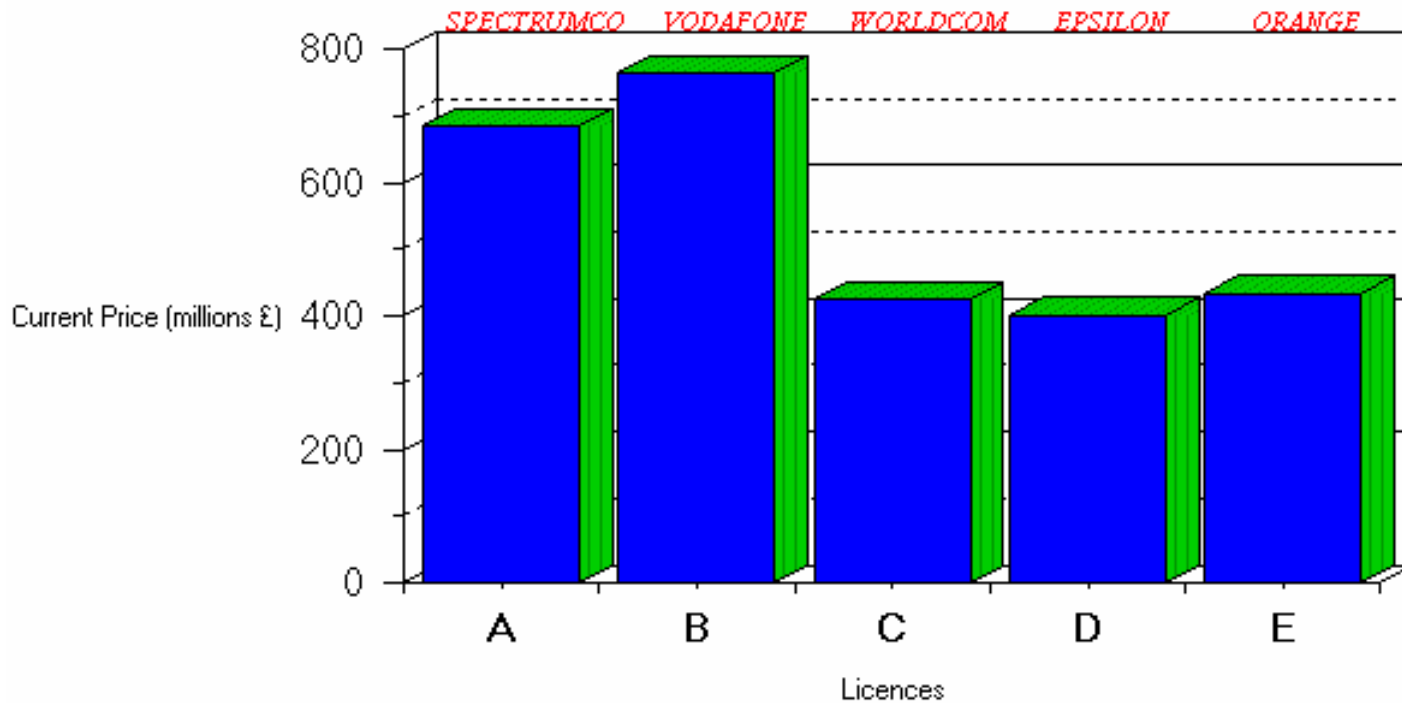


UK

- March/April 2000
- English auction
- 5 licenses: Two large A and B licenses, three small
- A-licence reserved for new entrant
- 13 bidders: 4 incumbents + 9 new entrants
- 150 rounds, 52 days
- EUR 36 billion - EUR 650 per capita!
- Great success - winner's curse?

UK (2)

Current Bidders and Prices- End of Round 50

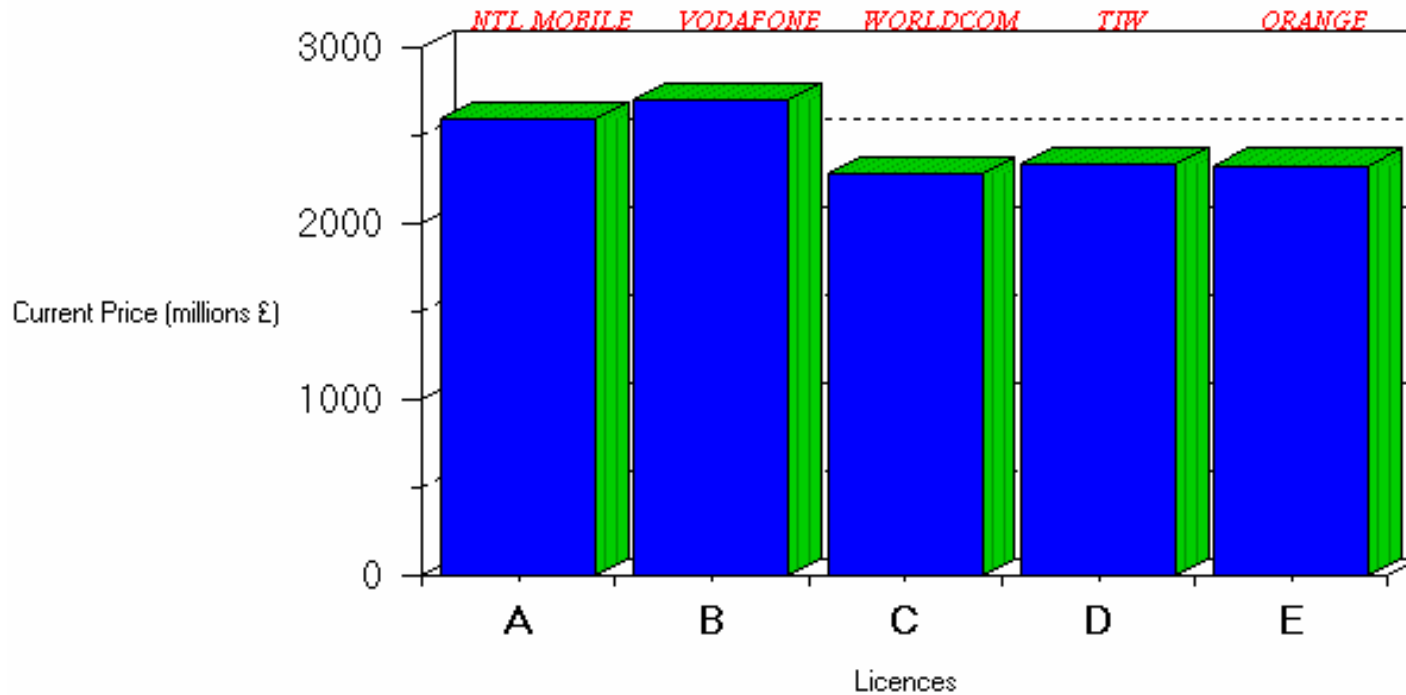


*At the end of round 50 other bidders still active in the auction are-
3GUK, BT3G, CRESCENT
NTL MOBILE, ONE2ONE, ONE.TEL
TELEFONICA, TIW*

http://www.spectrumauctions.gov.uk/auction/auction_index.htm

UK (3)

Current Bidders and Prices- End of Round 100

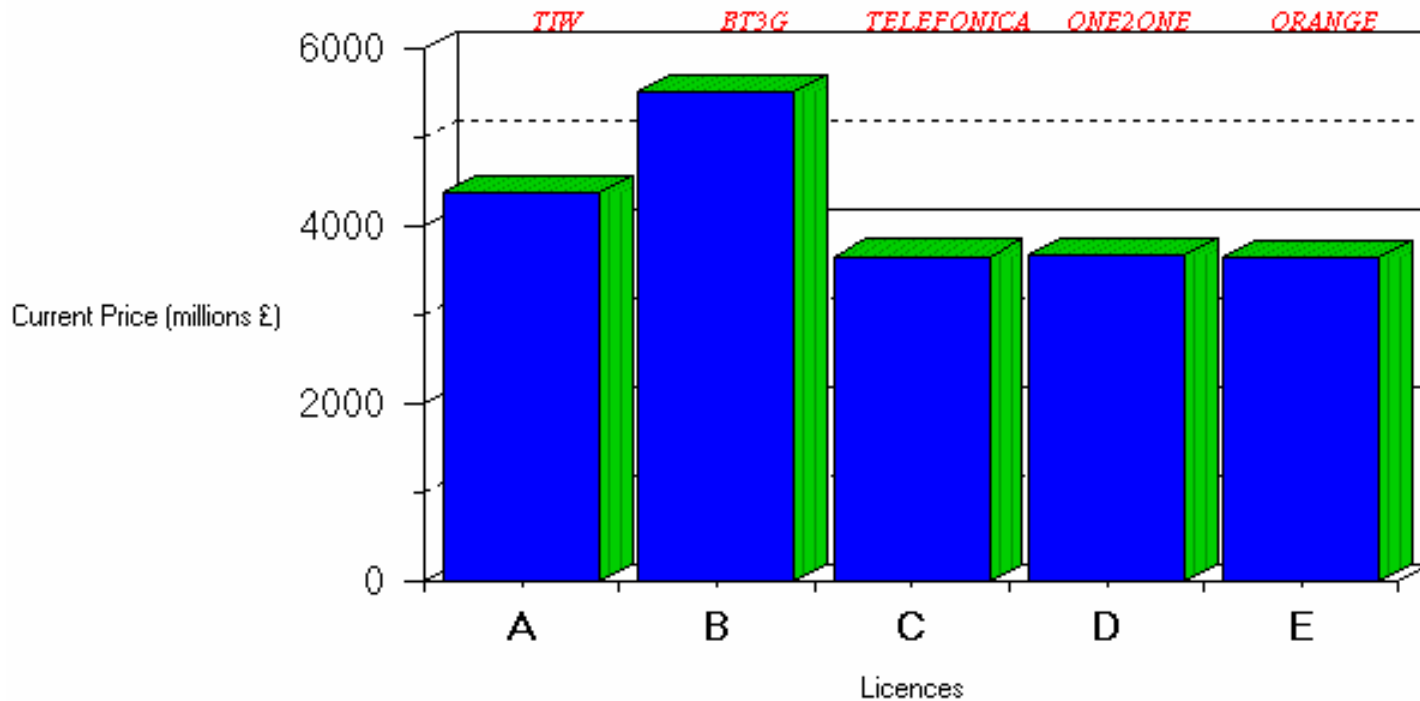


*At the end of round 100 other bidders still active in the auction are -
BT3G, ONE2ONE, ONE.TEL
TELEFONICA*

http://www.spectrumauctions.gov.uk/auction/auction_index.htm

UK (4)

Current Bidders and Prices- End of Round 131

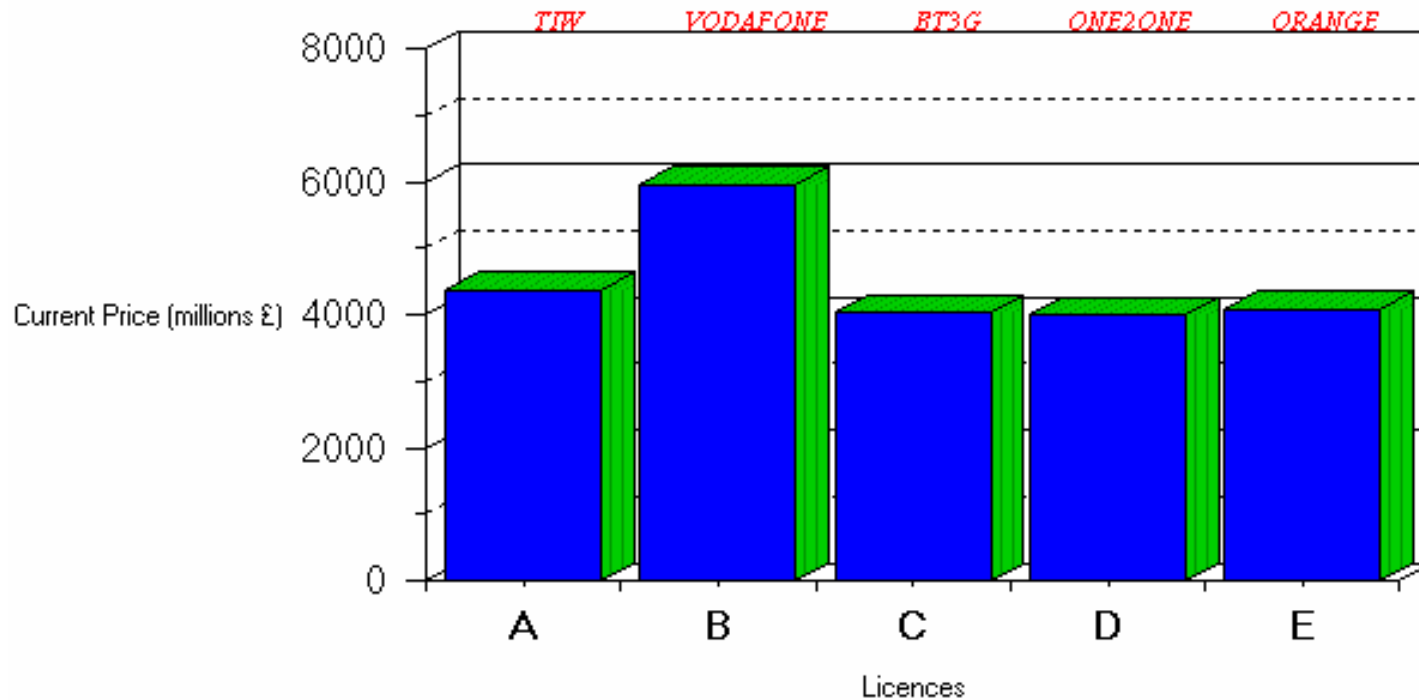


*At the end of round 131 other bidders still active in the auction are-
NTL MOBILE, VODAFONE*

http://www.spectrumauctions.gov.uk/auction/auction_index.htm

UK (5)

Current Bidders and Prices- End of Round 150 - Final Results



http://www.spectrumauctions.gov.uk/auction/auction_index.htm

Netherlands

- July 2000
- English auction
- 5 licenses of equal size
- 6 bidders: 5 incumbents + one weak entrant
- Versatel/Telfort
- EUR 170 per capita
- Moderate fiasco (?)

Italy

- October 2000
- Beauty contest + English auction
- 5 licences
- Option to reduce the number of licences
- 6 bidders
- Blu
- EUR 240 per capita ~ close to reserve price
- Moderate fiasco

Switzerland

- November/December 2000
- English auction
- 4 equal licences
- From 9 to 4 bidders in week prior to auction
- Sunrise/Diax (TDC)
- EUR 20 per capita = reserve price
- Fiasco

Germany and Austria

- July/August 2000 and November 2000
- English “combinatorial” auction
- 4-6 licences (12 frequency blocks)
- Germany: EUR 615 per capita
- Austria: EUR 100 per capita
- Germany: Success, but also lucky
- No. of licenses \leftrightarrow value of licences
- Austria: Fiasco



Germany

Runde 127

Datum 11.08.00

Uhrzeit 17:55:14

Höchstgebote für Frequenzblöcke (mind. 2 Blöcke erforderlich für Lizenz)

Bieter	Anzahl der Frequenzblöcke			Lizenzgebot	
	1	2	3	(TDM)	(€ in Tsd)
E-Plus Hutchison	2 x 5 MHz	2 x 5 MHz		10.246.900	5.239.157
Group 3G	2 x 5 MHz	2 x 5 MHz	2 x 5 MHz	15.919.600	8.139.562
Mannesmann Mobilfunk	2 x 5 MHz				
MobilCom Multimedia	2 x 5 MHz	2 x 5 MHz		10.600.000	5.419.694
T-Mobil	2 x 5 MHz	2 x 5 MHz		10.315.200	5.274.078
VIAG Interkom	2 x 5 MHz	2 x 5 MHz		10.478.200	5.357.419
debitel Multimedia	ausgeschieden				
Lizenzsumme				57.559.900	29.429.910

Runde 173

Datum 17.08.00

Uhrzeit 15:51:26

Höchstgebote für Frequenzblöcke (mind. 2 Blöcke erforderlich für Lizenz)

Bieter	Anzahl der Frequenzblöcke			Lizenzgebot	
	1	2	3	(TDM)	(€ in Tsd)
E-Plus Hutchison	2 x 5 MHz	2 x 5 MHz		16.418.200	8.394.492
Group 3G	2 x 5 MHz	2 x 5 MHz		16.446.000	8.408.706
Mannesmann Mobilfunk	2 x 5 MHz	2 x 5 MHz		16.473.800	8.422.920
MobilCom Multimedia	2 x 5 MHz	2 x 5 MHz		16.370.000	8.369.848
T-Mobil	2 x 5 MHz	2 x 5 MHz		16.582.200	8.478.344
VIAG Interkom	2 x 5 MHz	2 x 5 MHz		16.517.000	8.445.008
debitel Multimedia	ausgeschieden				
Lizenzsumme				98.807.200	50.519.319

Belgium and Greece

- March and July 2001
- English auction
- Unattractive markets for new entrants
- 4 licenses
- Only the three incumbents participated
- 45 EUR per capita in both countries

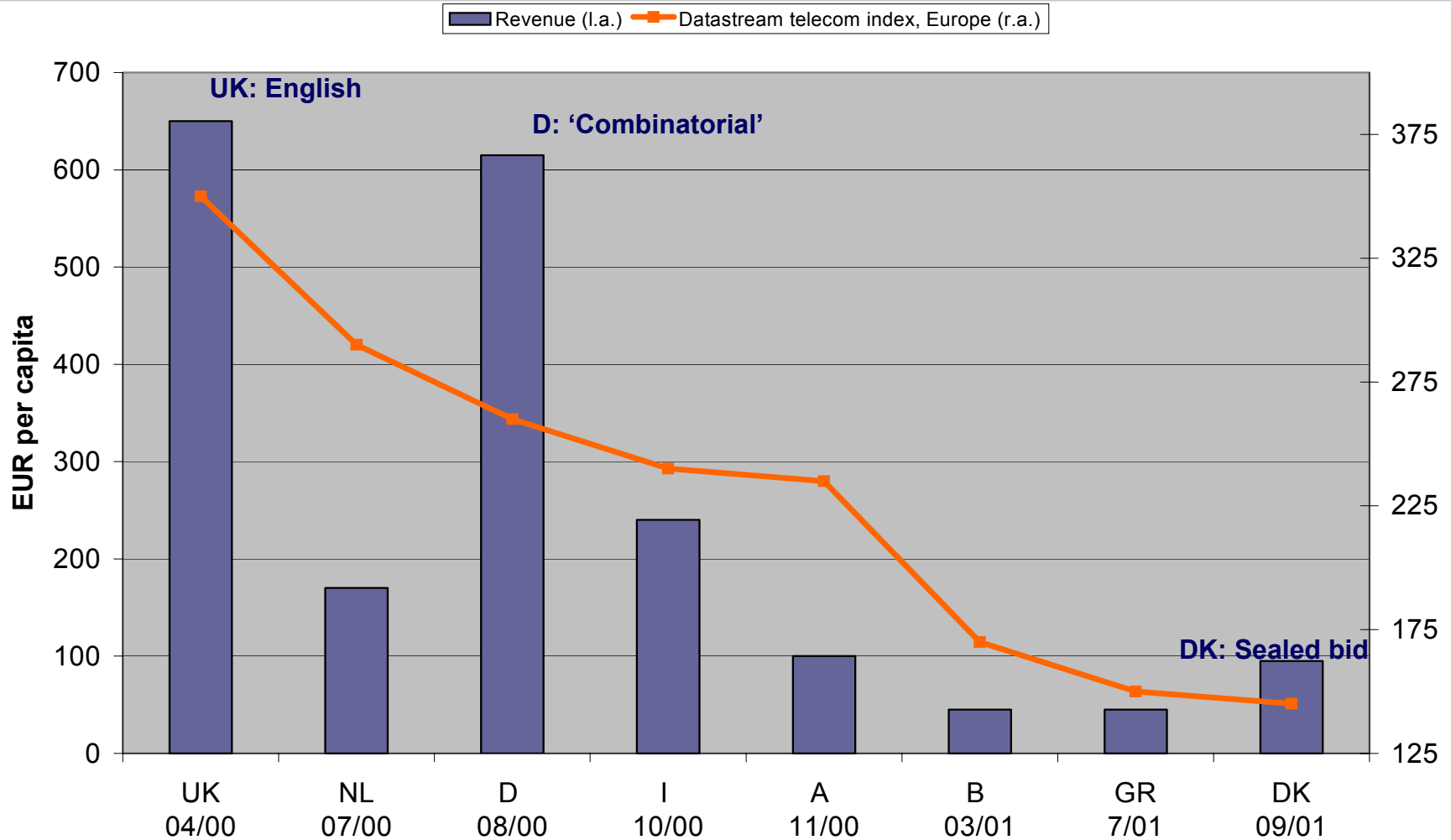
Denmark

- September 2001
- (First price) sealed bid
- 4 licences
- 5 bidders: TDC, Orange, Hi3G, Telia, **Telenor**
- Price = fourth highest bid
- Reserve price: DKK 500 million
- DKK 950 mill. (949.988.000,88), 95 EUR/capita
- Success

Lessons learned

- No size fits all
- Auction design crucial for success
- Attract bidders and avoid collusion
- Key parameters:
 - Design (single round sealed bid, open multiple round)
 - No. of licences compared to no. incumbents
- Few bidders → Sealed auction
- Reserve price important when few bidders
- Bidders learn

Design matters



References

- Why auction the spectrum? John McMillan, 1995 <http://www.market-design.com/files/mcmillan-why-auction-the-spectrum.pdf>
- How (Not) to Run Auctions: the European 3G Telecom Auctions, Paul Klemperer, Nov 2001, <http://www.paulklemperer.org>
- Market design Inc:
<http://www.market-design.com/library-telecommunications.html>
- Comparative Assessment of the Licensing Regimes for 3G Mobile Communications in the European Union and their Impact on the Mobile Communications Sector, McKinsey, Juni 2002
http://europa.eu.int/information_society/topics/telecoms/radiospec/mobile/studies/index_en.htm
- Evalueringsrapport for den danske 3G-auktion
<http://www.itst.dk/wimpblob.asp?objno=95025400>