



Impact of excessive spectrum prices

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Conference

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NERA study for the GSMA



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This presentation is based on the findings of a NERA report for the GSMA on effective spectrum pricing, available at:

<http://www.gsma.com/spectrum/wp-content/uploads/2017/02/Effective-Spectrum-Pricing-Full-Web.pdf>



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NERA Publishes Report on Effective Spectrum Pricing for GSMA

Managing Director Richard Marsden,
Associate Director Dr. Bruno Soria, and
Senior Consultant Hans-Martin Ihle authored
the report.





What is the right price for spectrum?

The price of spectrum



- The price of spectrum consists of up to three elements:



- This is distinct from the value that a mobile operator could realise from acquiring any particular spectrum licence, which is influenced by:

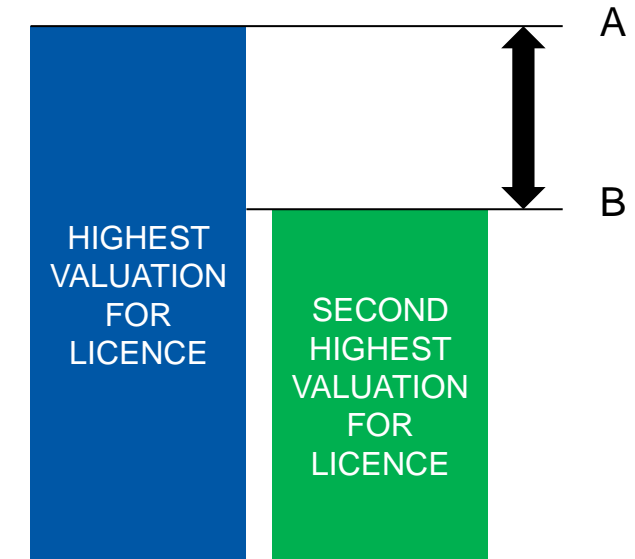



- In a properly functioning market, companies bid to acquire spectrum when its expected value exceeds the price



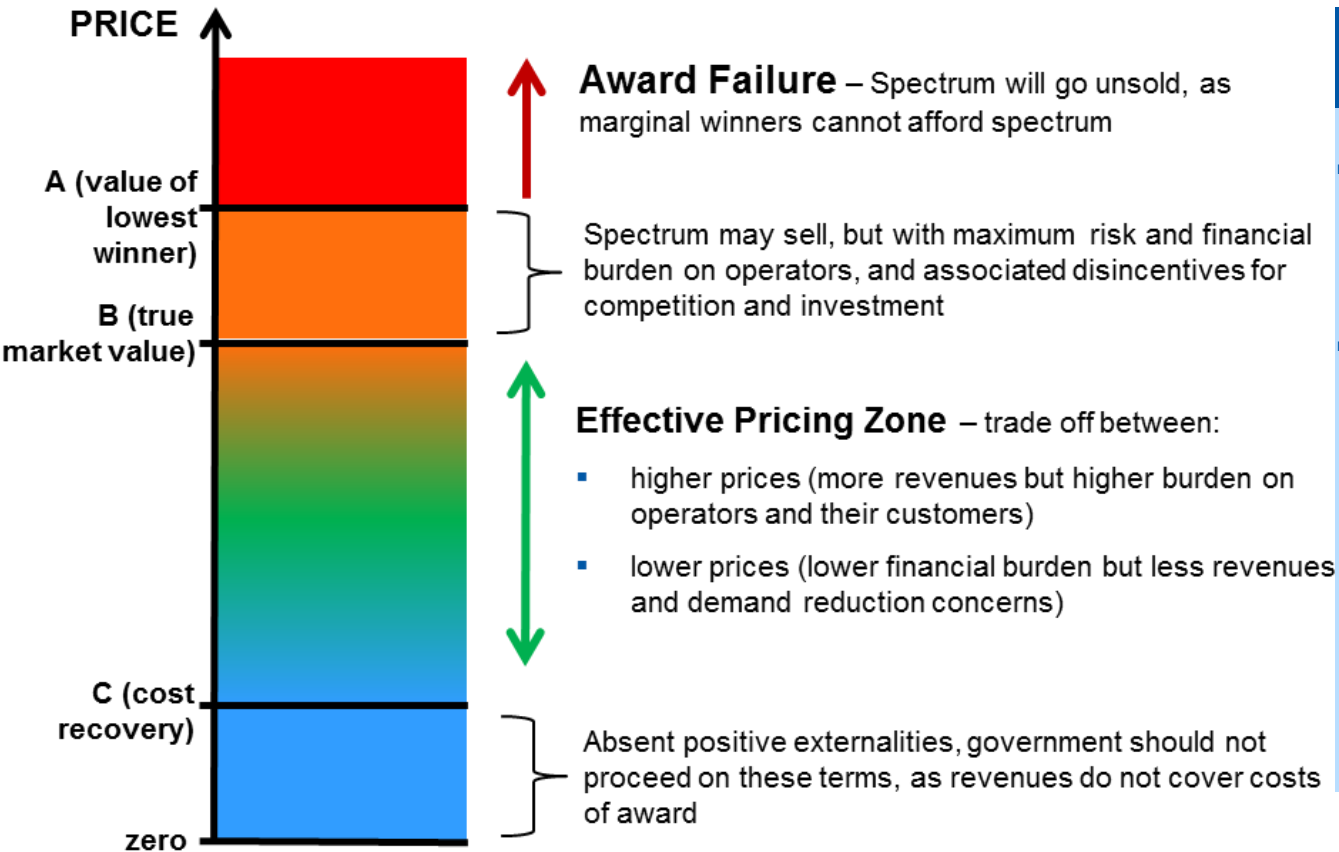
- Economic literature emphasises the importance of “efficiency” in allocating scarce public resources
- This is reflected in the mandate of most regulators to allocate spectrum to those who can use it best
- In a spectrum auction setting, the purpose of pricing is to identify the efficient user(s)
- Revenues should always be a secondary objective, as:
 - Benefits to consumers flow from efficient outcomes
 - At high prices, efficient outcomes may not be realised

AUCTION FOR A SINGLE LICENCE



- 
- **To avoid unsold spectrum, regulators should prioritise ensuring price is below A**
 - **As it is inherently difficult for regulators to estimate prices, best way to achieve efficiency is to use auction to identify true market value, B**
 - **This requires reserve price (including annual fees) is set below conservative estimate of B**

What is the right price for spectrum?



IMPLICATIONS FOR REGULATORS

- Best practice: Set reserve price in the green zone and rely on auction to determine market price
- Bad practice: Attempting to price in the orange or red zones
 - High risk that award will fail with spectrum going unsold, at expense of consumer benefits from spectrum use
 - Even if spectrum sells, consumer benefits may be destroyed owing to disincentives for investment and competition

Sunk cost theory does not provide a rationale for high spectrum prices



- Prevailing school of thought amongst many policymakers that upfront spectrum prices are sunk:
 - No impact on investment and pricing
 - Higher fees always preferable to lower ones provided outcome is efficient
 - Auction revenues are a distortion free tax and preferable to direct taxation
- Such arguments are flawed:
 - High prices are inherently risky, as they are more likely to be associated with inefficient allocations & award failure
 - They ignore more sophisticated evidence from economic and financial theory regarding impact of repeat events and access to capital
 - They ignore empirical observation that firms with high sunk costs do adjust pricing decisions

1. Hold-up problem (Economic theory)

- Spectrum awards are recurring transactions, not one off events
- If firms perceive that their expected returns will be extracted in successive auctions, they will moderate their investment behaviour accordingly (and may even exit)

2. Internal financial constraints (Financial theory)

- High auction prices may exhaust access to scarce, lower cost internal funds, displacing other investment activity
- Access to capital from multinational parents or external sources may be rationed in response to low profitability

3. Observed pricing decisions (Behavioural economics)

- Empirical evidence suggests that in sectors with imperfect competition, firms with high sunk costs are more reluctant to engage in price competition
- High upfront licence fees may act as a signal for market participants to set higher prices



What is happening in practice?

Frequently asked questions...



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#1 Are spectrum prices increasing?

Yes – both reserve prices and final prices for spectrum have been trending upwards since 2008
Average final prices are up 250% from 2008 to 2016

#2 Do high spectrum costs affect the level of investment in 4G networks?

Yes – high spectrum costs are correlated with lower levels of investment in 4G (contrary to simple sunk cost theory)

#3 Do high spectrum costs affect downstream pricing decisions?

Yes – high spectrum costs are correlated with higher prices for mobile data (again, contrary to simple sunk cost theory)

- Results are based on an analysis of 325 spectrum band releases across 60 countries from 2000-2016

#1 Prices in the 4G era are trending upwards ...



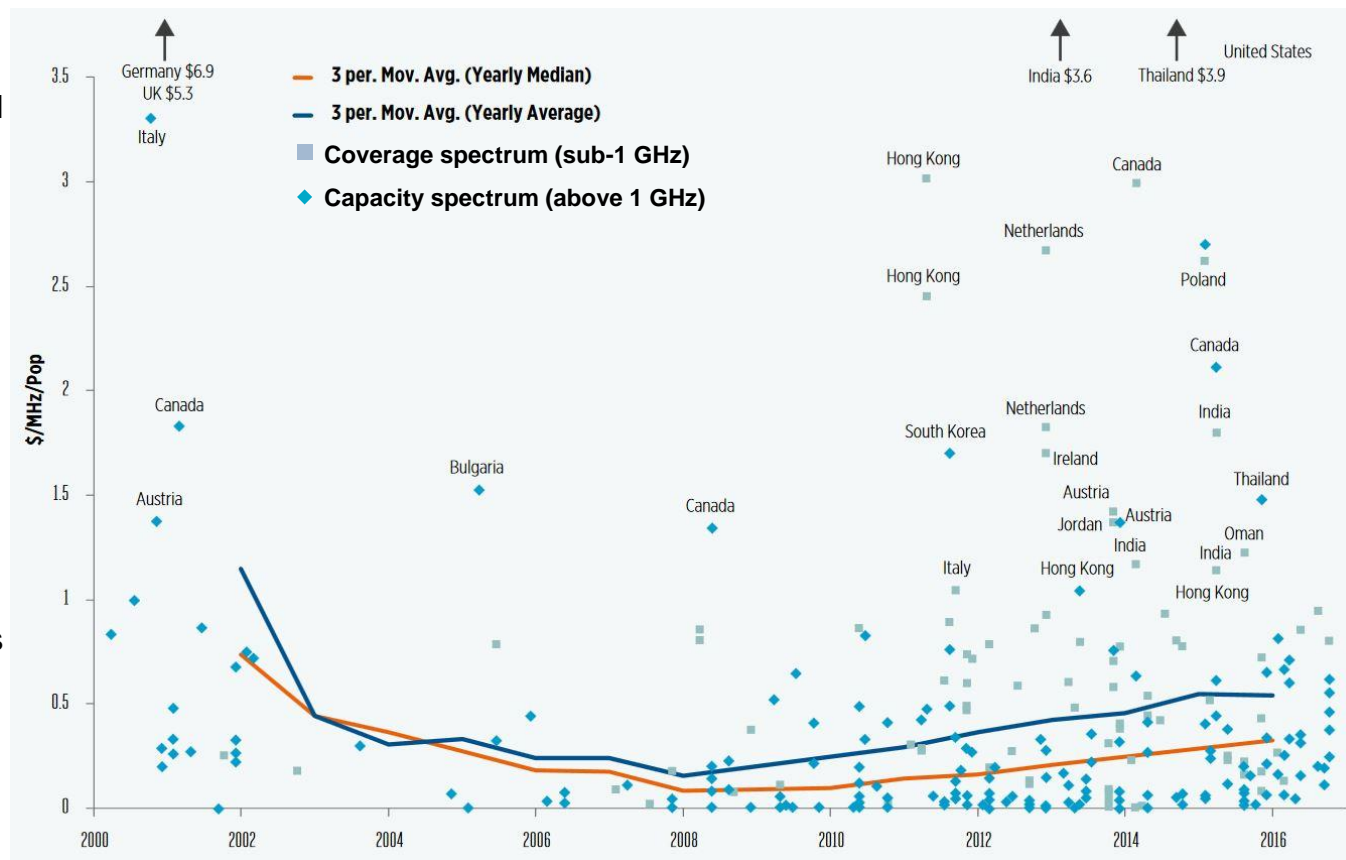
Since 2007, large increase in number of spectrum awards:

- Driven by the need to find new bands and repurpose old ones for 4G mobile broadband
- This period coincides with a take-off in consumer demand for mobile data services

Average prices have climbed steadily since 2008:

- Upward trend in level of reserve prices (see next slide)
- Increase in number of awards of sub-1GHz (coverage spectrum)
- **Growth in number of high price outliers for both coverage and capacity spectrum**

GLOBAL TRENDS IN SPECTRUM PRICES, BY BAND AND AUCTION, 2000-2016



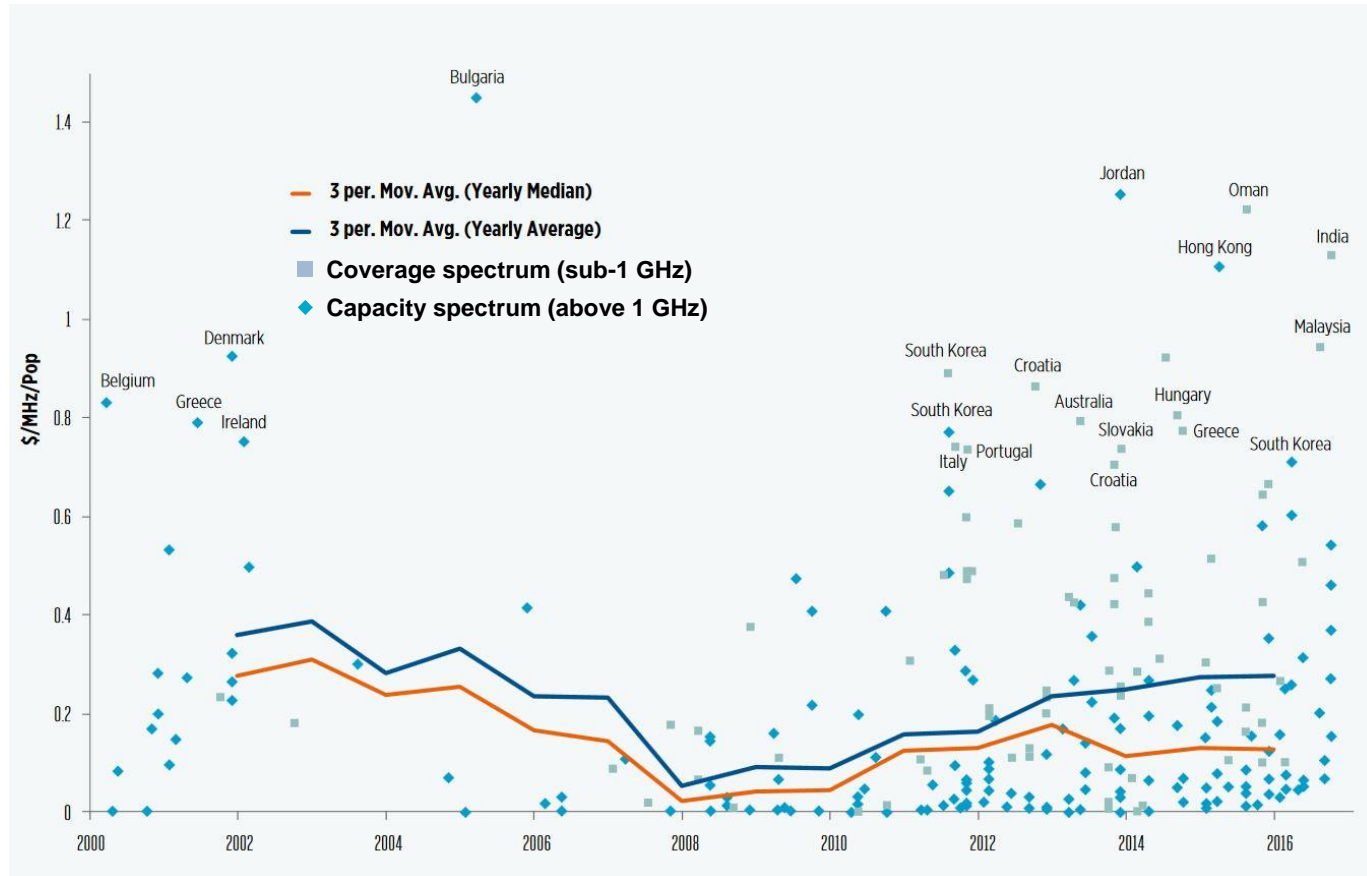
NOTES: Prices per MHz pop are adjusted for inflation and were converted to USD using IMF purchasing power parity (PPP) rates. Prices are also adjusted for licence duration, based on a standard 15 years, using a 5% discount rate.

#1 ... as are reserve prices



GLOBAL TRENDS IN SPECTRUM RESERVE PRICES, BY BAND AND AUCTION, 2000-2016

- Reserve prices have increased at a faster rate than spectrum prices
 - Since 2012, there have been a large number of very high reserve prices
 - Coincides with growing confidence regarding the need for operators to acquire more spectrum to deliver data services
 - High reserves may be linked to use of benchmarks incorporating high price outcomes



NOTES: Prices per MHz pop are adjusted for inflation and were converted to USD using IMF purchasing power parity (PPP) rates. Prices are also adjusted for licence duration, based on a standard 15 years, using a 5% discount rate.

#2 We developed a 'wireless score' to rank each country's investment in 4G networks



- As a proxy for 4G network investment, we developed a 'wireless score'
- It has three components that collectively measure the quality and uptake of next-generation data services

3G/4G COVERAGE (%)

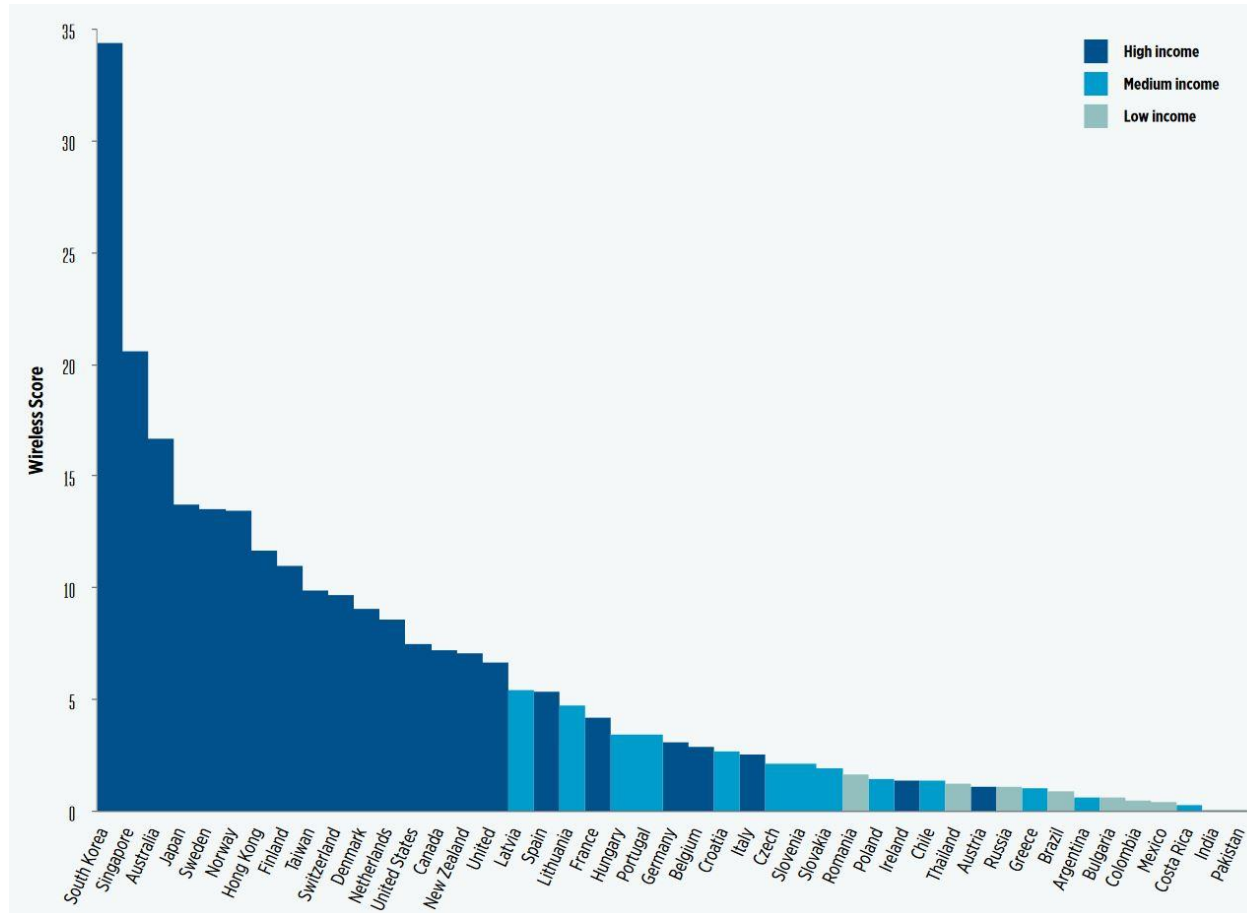


4G SUBSCRIBERS (%)



AVERAGE SPEED (Mbps)

Wireless score by country

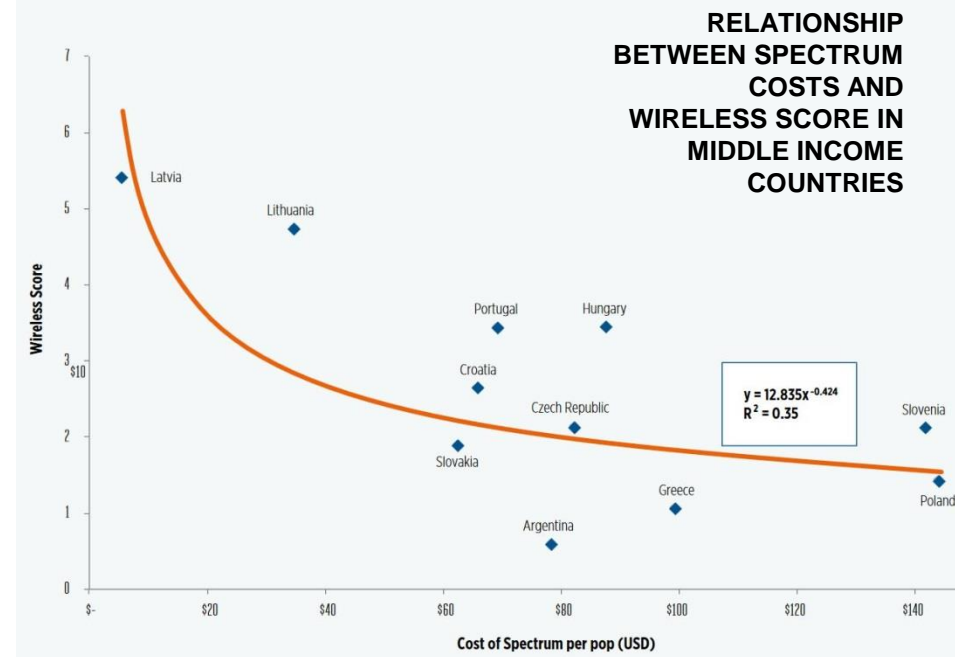
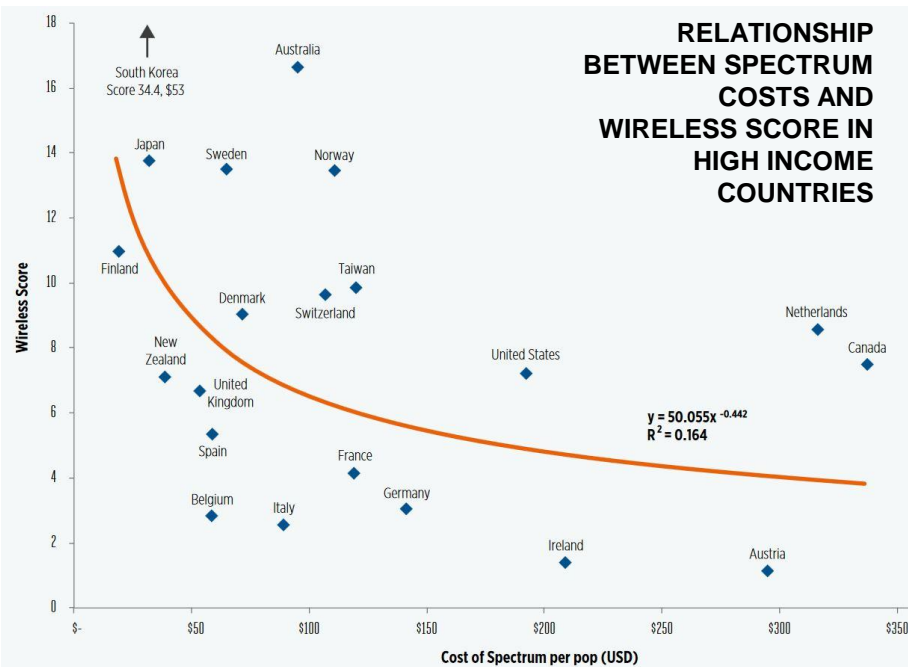


Source: NERA Economic Consulting, using data from OpenSignal.com and Telegeography GlobalComms database

#2 High spectrum costs are correlated with low wireless scores



- We observed that, for groups of higher income and middle income countries:
 - There is a statistically significant, **negative relationship between total spectrum spend and the wireless score**
- This evidence supports both broader theoretical and empirical work linking high input costs for scarce resources to lower rates of investment

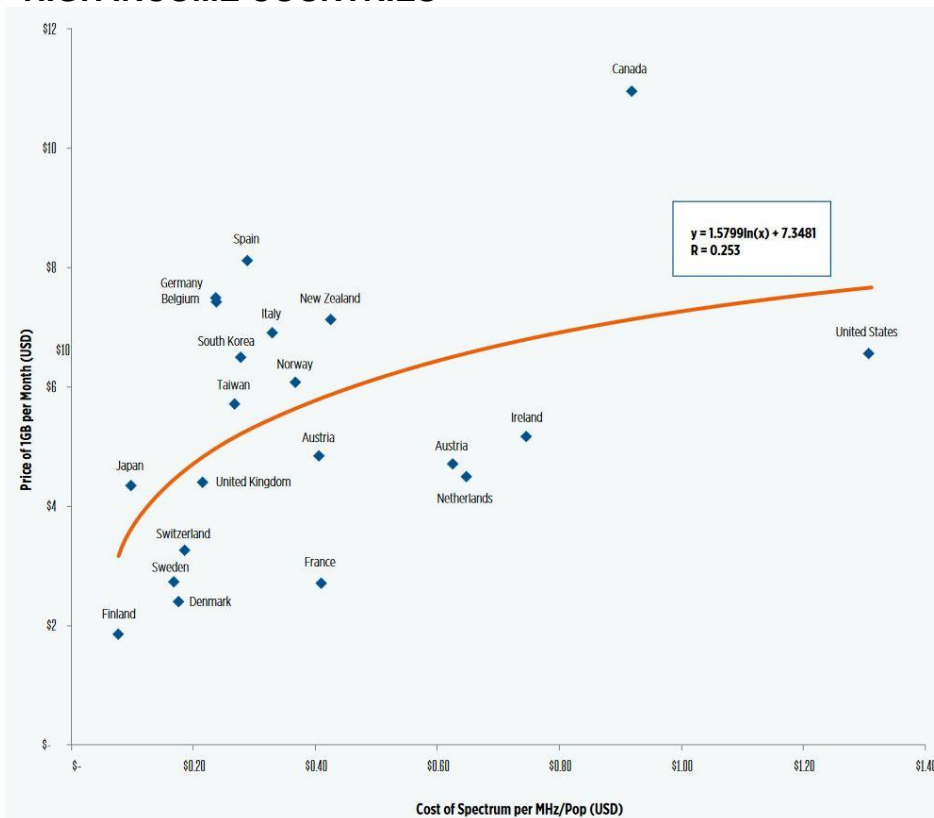


#3 We also identified a relationship between high spectrum costs and higher downstream data prices

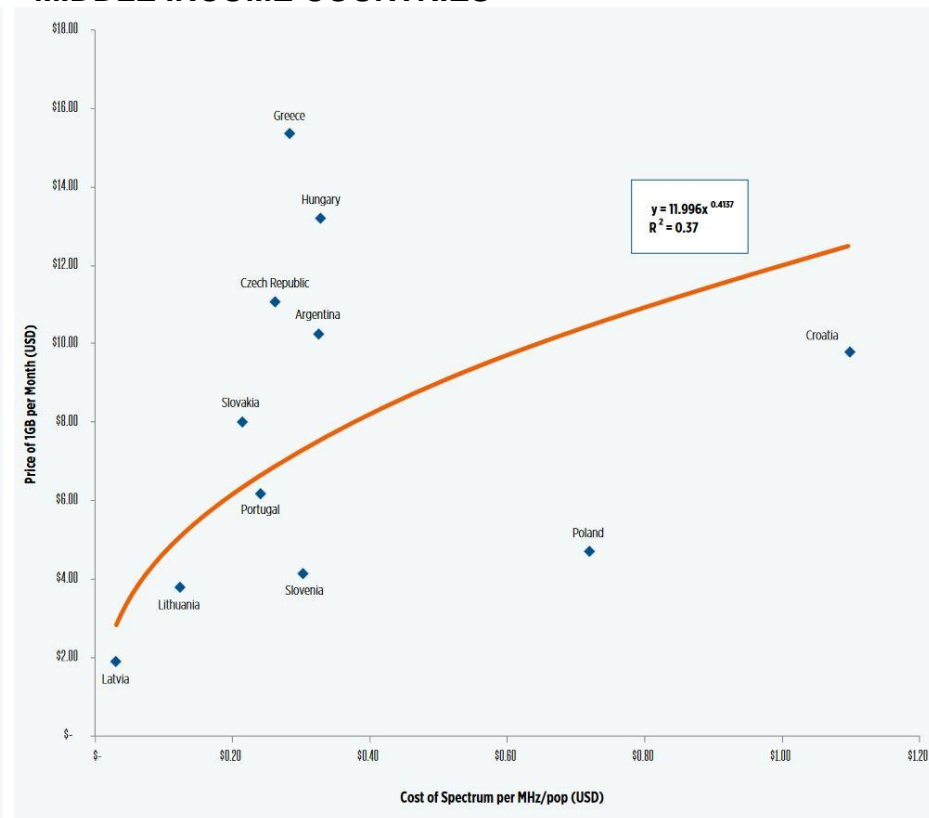


- We built a price index based on the average cost of 1 GB in each country
- We observed that, for groups of higher income and middle income countries, there is a statistically significant, **positive correlation between the cost of spectrum and the prices that consumers pay for data**
- This evidence supports both broader theoretical and empirical work linking high input costs to disincentives for price competition

PRICE AND SPECTRUM COST RELATIONSHIP IN HIGH INCOME COUNTRIES



PRICE AND SPECTRUM COST RELATIONSHIP IN MIDDLE INCOME COUNTRIES



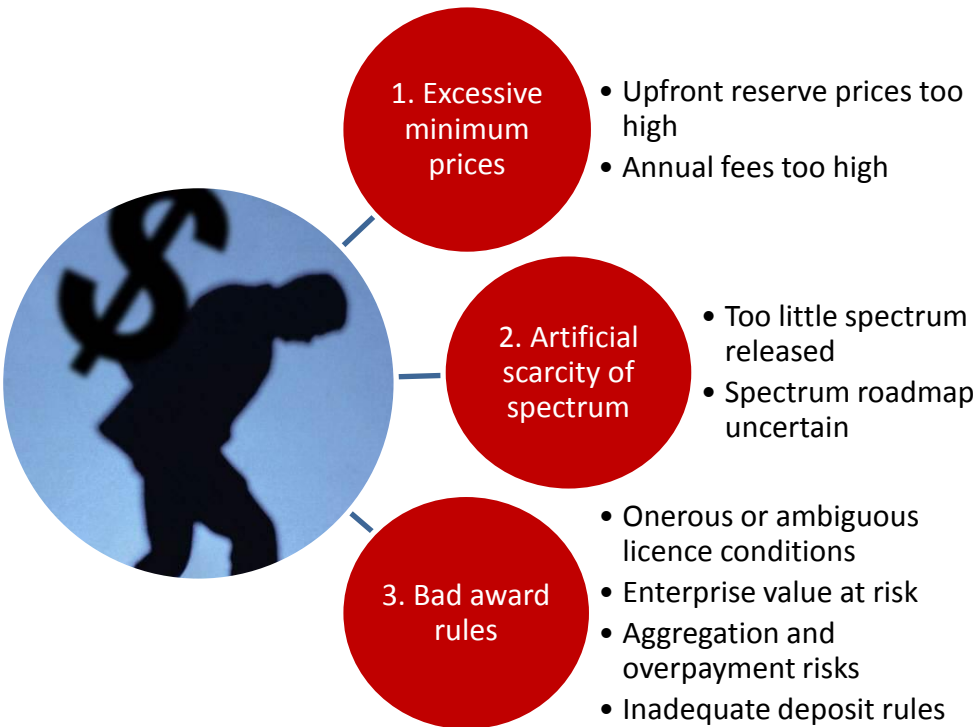


Common mistakes in spectrum pricing

Common mistakes in spectrum pricing



Regional case studies



India 3G & 4G

- Drip feeding spectrum to market created artificial scarcity
- This led to high prices, and encouraged government to set successively higher reserve prices
- Culmination: failure to sell lower frequency bands in recent auctions, even though these offer the greatest welfare benefits

Thailand 900 & 1800 MHz

- Uncertainty over spectrum availability
- Minimal upfront deposits for bidders (in particular new entrant)
- Raising deposit requirements during the auction could have prevented auction failure

Myanmar 2.6GHz auction

- First spectrum auction in Myanmar
- Untested auction format and regional structure exposed bidders to significant aggregation and overpayment risk as well as uncertainty over final outcome
- Very low initial deposits with no further top-ups
- Following best practice for auction design may have let to a better outcome

Korea multiband auction

- High reserve prices for 700 MHz, 1800 MHz and 2.1 GHz bands
- Even though operators complained, auction went ahead
- Most spectrum sold at reserve price (likely above fair market price)
- Reserve price set too high and 700 MHz spectrum went unsold

A decorative horizontal bar at the top of the slide. It consists of a solid dark blue bar on the left, followed by a square area containing several 3D cubes in various shades of blue and yellow, and another solid dark blue bar on the right.

Best practice for spectrum pricing recommendations

Recommendations for best practice



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#1

Set modest reserve prices

- Release usable spectrum in anticipation of need
- Provide a roadmap for future spectrum availability, so operators understand their options

#2

Prioritise spectrum allocation

- Do not set reserve prices above a conservative estimate of true market value
- Treat annual fees as an integral part of the reserve price

#3

Help operators manage risk

- Reduce overpayment risk by having adequate deposit rules in place
- Be mindful of threats to enterprise value
- Adopt an integrated approach to spectrum pricing and licence conditions, such as coverage obligations

#4

Adopt a long-term perspective

- Prioritise consumer welfare benefits from investment and competition over short-term revenue benefits
- Adopt longer licence durations (20 years +)
- If possible, de-politicise decisions on spectrum pricing by delegating to independent regulator with mandate to protect consumers



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