



Getting more out of spectrum – applying the dismal science

Brian Williamson

LS telcom Summit, Lichtenau

4th July 2012

Plum Consulting, London, brian.williamson@plumconsulting.co.uk, T +44 (0)20 7047 1919, www.plumconsulting.co.uk

Overview

- Economic value
- Spectrum value
- Spectrum demand and supply
- Spectrum allocation
- Conclusion



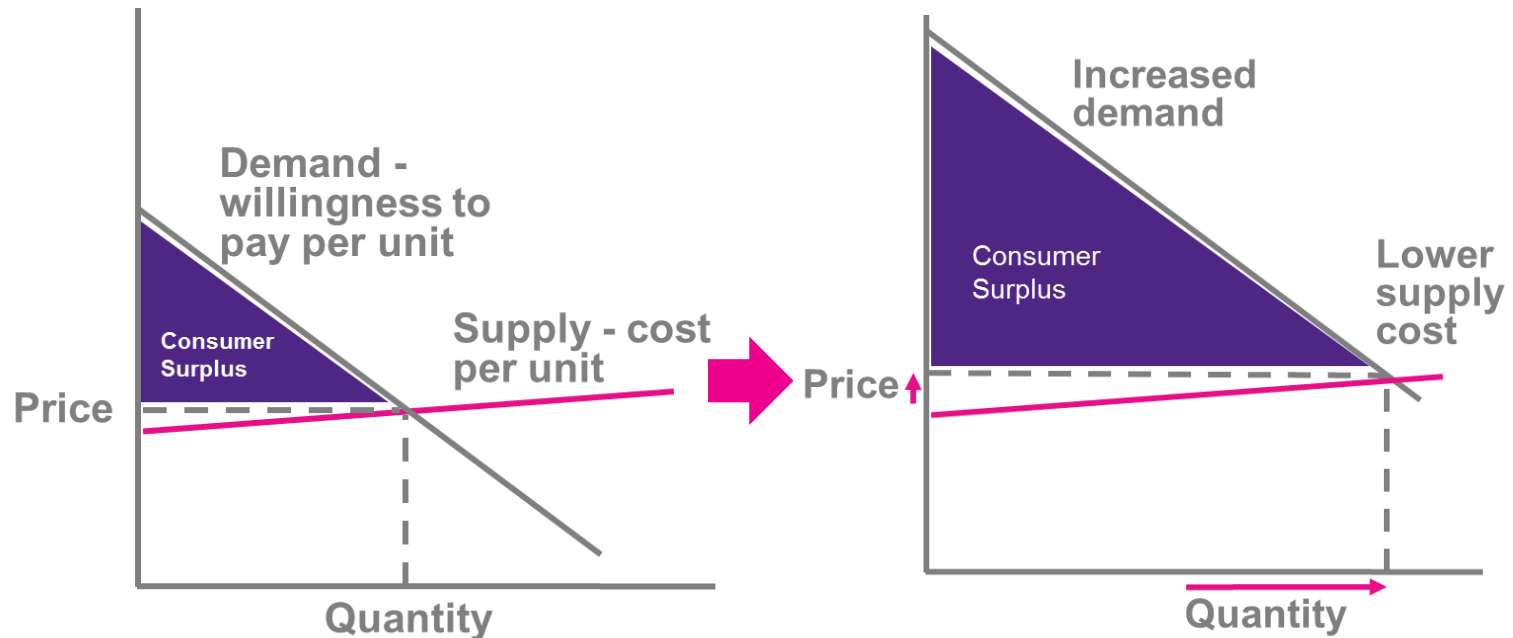
Economic value $\neq$ money

Expansion of opportunity



Economic & social value flows from expansion of what we can and want to do

Economic surplus (concept due to Dupuit, civil engineer & economist)



Consumer surplus usually dominates (small producer surplus – not shaded above)

Avoiding double counting and errors of inclusion/omission

- **Potential double counting**

- Productivity or GDP gains, since they involve double counting of economic surplus (alternatively count productivity or GDP gains alone)
- Second round impacts, since these typically involve a redistribution of primary impacts
- Normal profit, as this represents the opportunity cost of capital

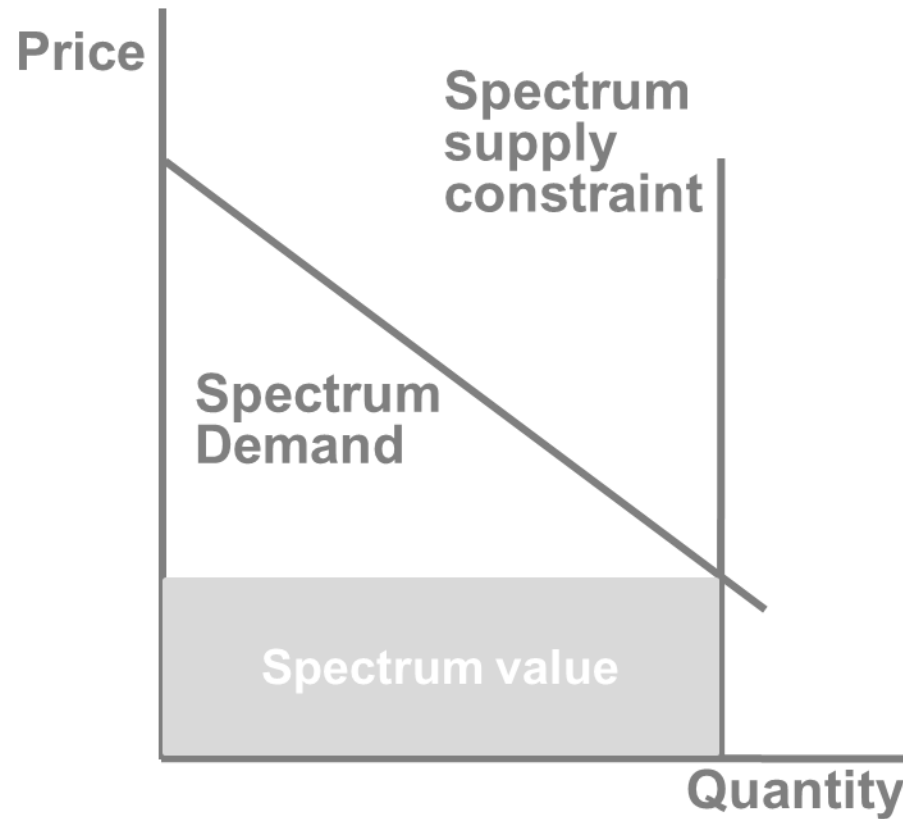
- **Errors of inclusion/omission**

- Errors of inclusion
 - Jobs associated with an activity, since unlikely to represent net jobs created in whole economy
 - A transfer of value i.e. payments and taxes
 - Expenditure *as a benefit*, since it is a cost & is netted off in surplus calculation
- Errors of omission
 - Non-market values such as the value of leisure time

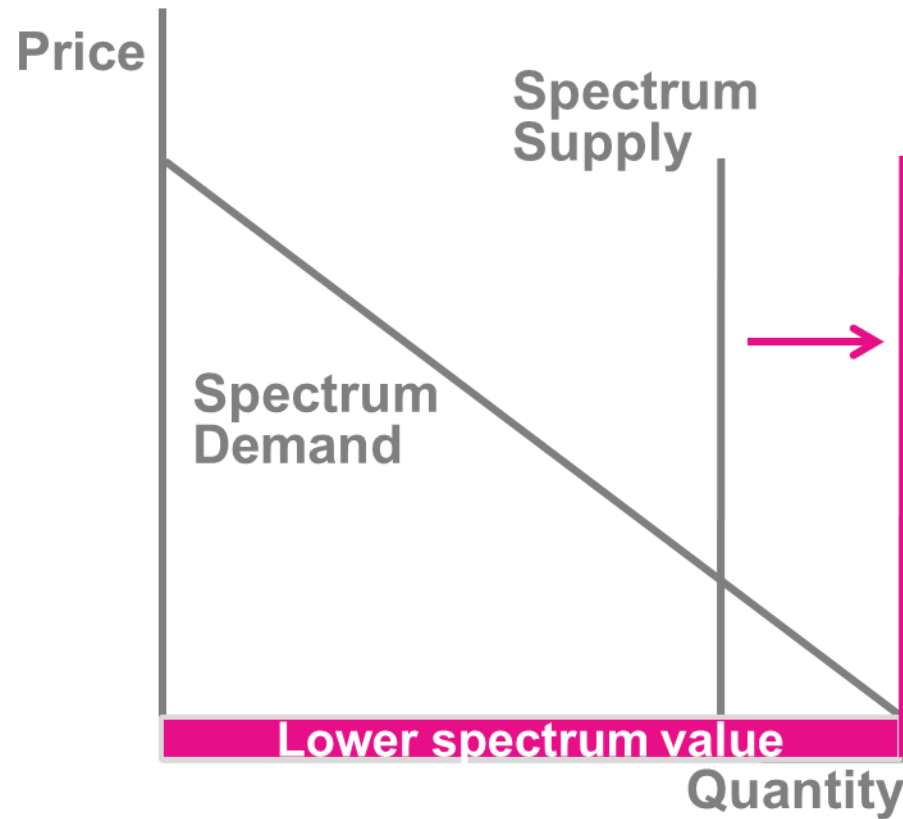


Spectrum value $\neq$ economic value

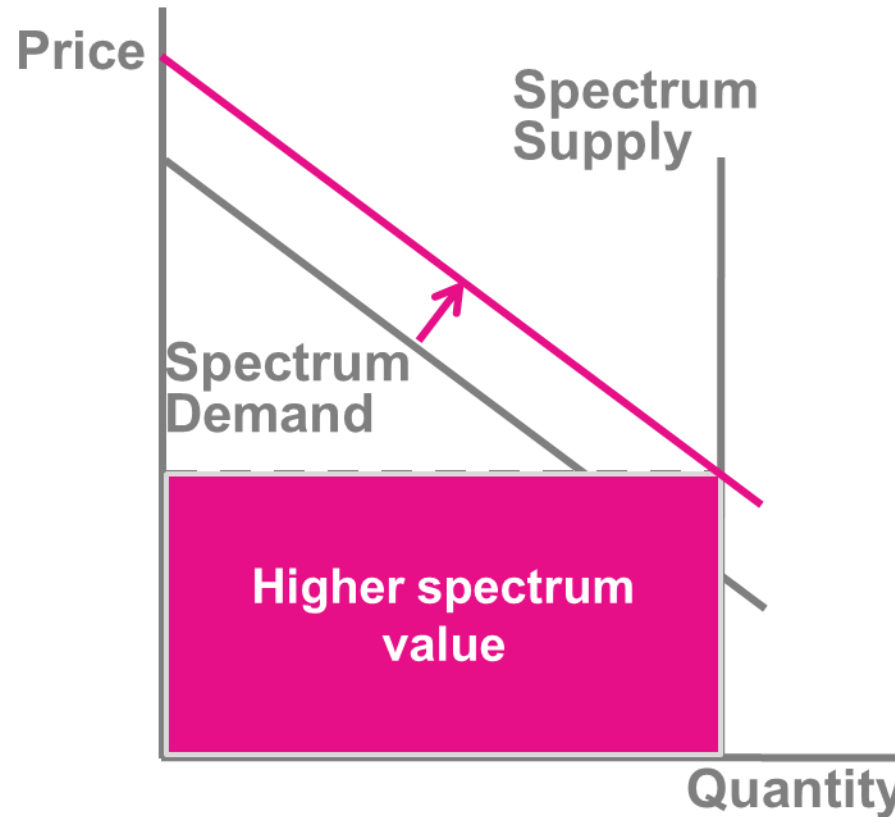
Constraint => spectrum value



Spectrum $\uparrow$ spectrum value $\downarrow$
economic value $\uparrow$



Demand ↑ spectrum value ↑
economic value ↑



We should not be alarmed if more is paid for spectrum in Europe than elsewhere

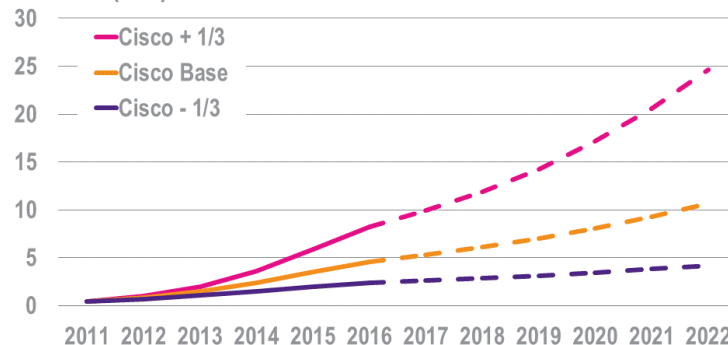


Spectrum demand & availability (with mobile broadband focus)

Demand & demand uncertainty



Traffic scenarios per mobile connection per month (GB)



Source: Plum Consulting, Cisco

- **Economic way to think: willingness to pay vs. cost**

- Willingness to pay will rise
 - Subscriber growth 2 to 3-fold
 - Applications growth & network effects – how much?
 - Fixed substitution ($\approx$ €30 per household towards mobile)
- Unit costs will fall
 - Higher efficiency $\approx$ 5-fold
 - More spectrum $\approx$ 2-fold
 - Increased network utilisation

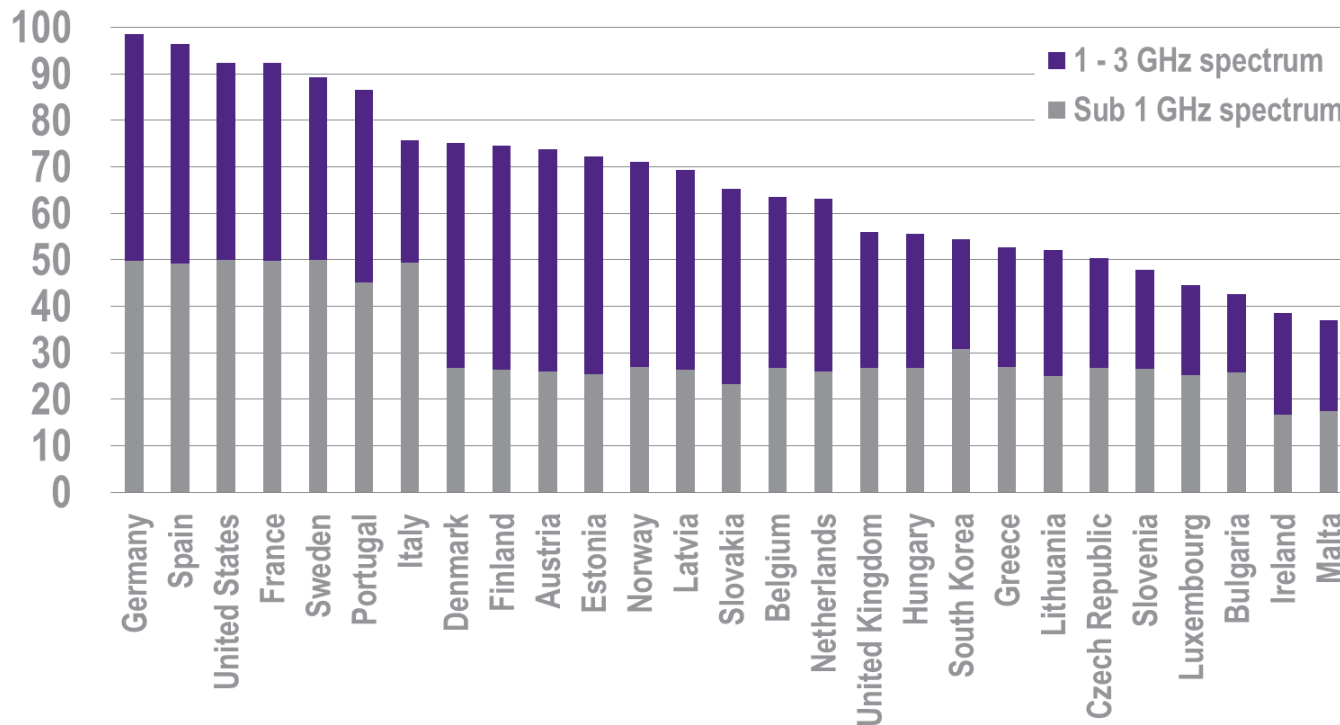
- **Cisco growth extrapolated (+/-) to 2022 appears plausible**

- 25 GB per user per month (+1/3)

Availability now out of 625 MHz (plus 380 MHz for Wi-Fi)

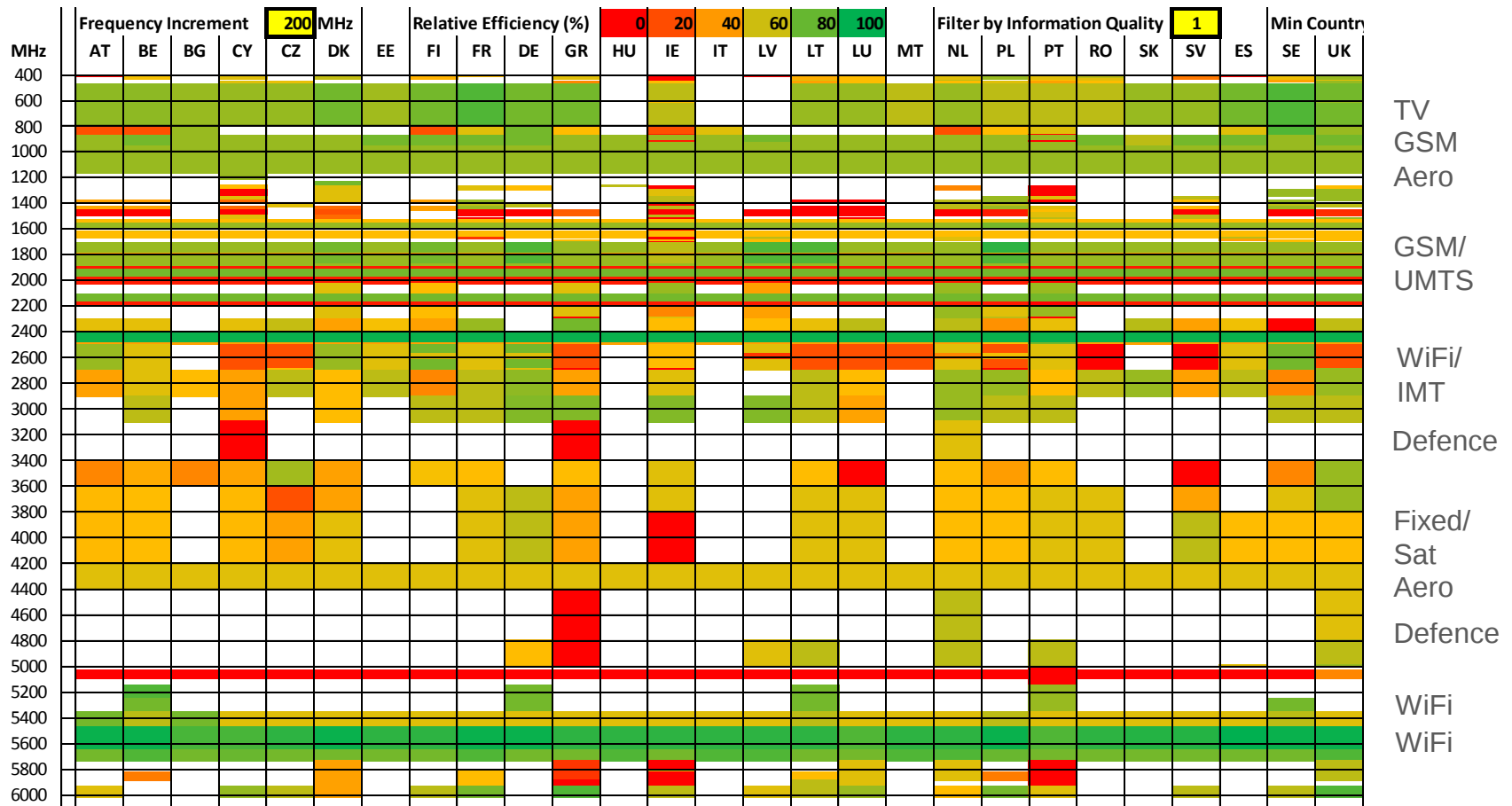


Spectrum availability index



Source: Plum Consulting, ECO

Potential availability





Spectrum allocation, re-allocation & shared use

Allocation, re-allocation and sharing

- **Availability, opportunity and transition costs**

- Costs of relocation of 95 MHz from 1750-1855 MHz band estimated at US\$18 billion (NTIA, March 2012). US President's Council of Advisors on Science and Technology propose sharing.
- Transition costs may be a particular problem in less developed countries.

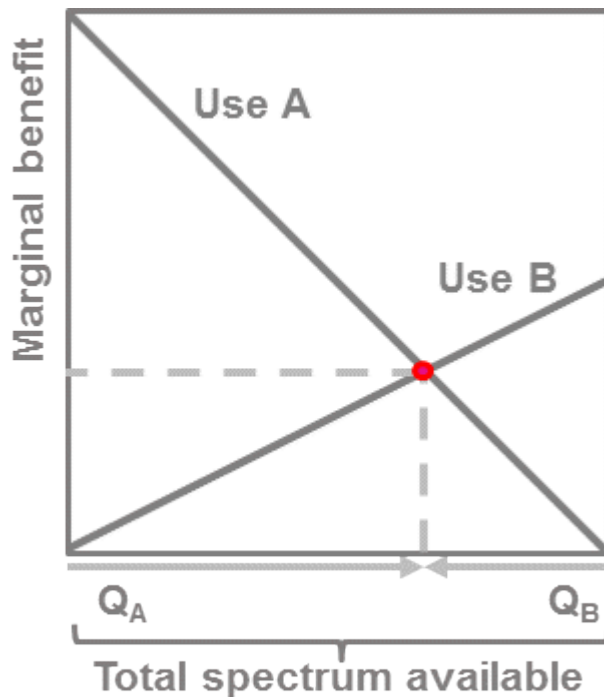
- **Re-allocation mechanisms**

- Administrative cost-benefit based decision
- Administrative incentive pricing (requires incremental value estimate)
- Trading, leasing – efficient outcome without need for cost benefit estimation (market is informationally efficient)

- **Sharing**

- Where feasible, may maximise overall value and be faster than re-allocation

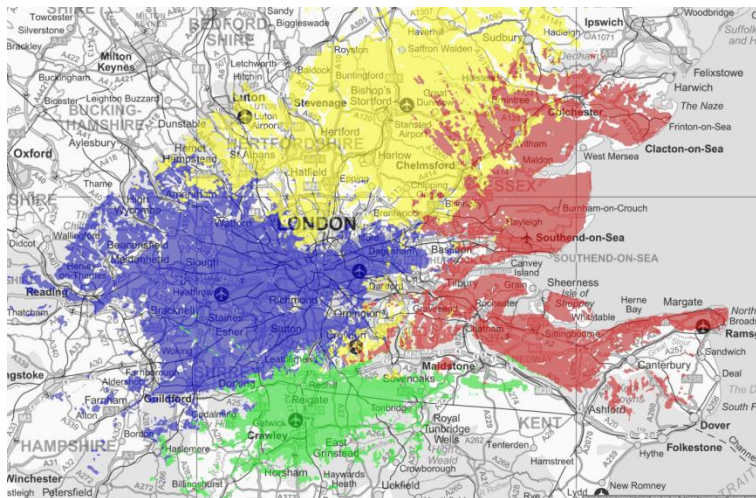
Balancing competing spectrum uses



- Potential uses A & B
- Maximise total value with equal spectrum values at margin via
 - Good decision
 - Auction/trade
 - Price = marginal value *at efficient outcome*
- In this case quantity $Q_A > Q_B$

Give more spectrum to an activity until value of a little more spectrum just equals value in next best use

But it isn't easy



- **Interference & change of use**

- 2.6 GHz mobile broadband sterilised due to London radars receiver interference (Aegis Systems modelling for 67 dB)
- Radar filters proposed

- **Harmonisation & band plans to achieve scale & interoperability**

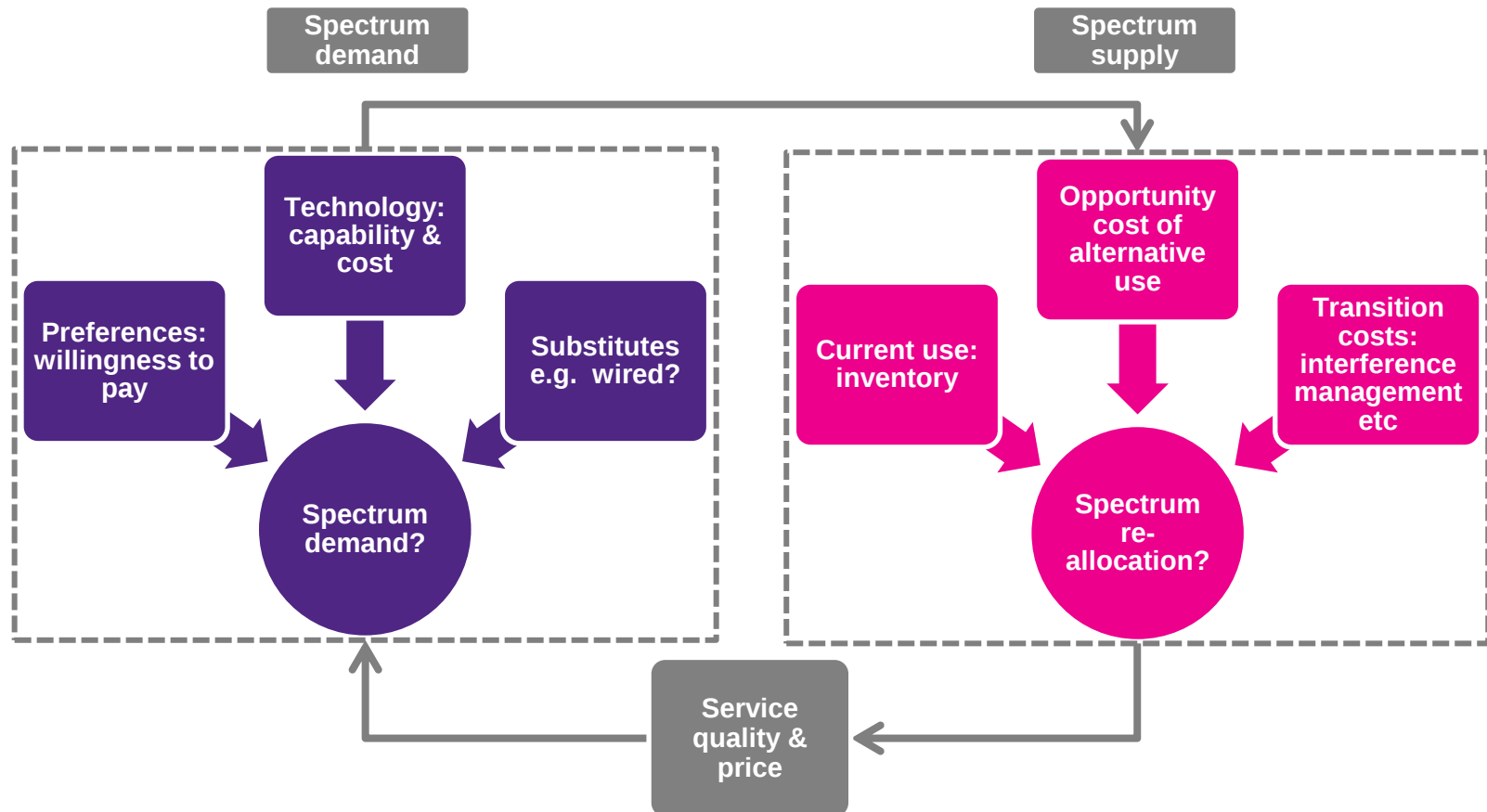
- **Managed shared use may help**

- New applications
- New bands for mobile faster



Conclusion

Value via dynamic re-allocation



Sound economics + engineering + dynamic considerations => substantial gains

Bibliography



- 2012. “Inventory and review of spectrum use”. Workshops:
http://ec.europa.eu/information_society/policy/ecomm/radio_spectrum/get_involved/activities/index_en.htm#past_workshops
- PlumInsight. January 2012. “Mobile data growth – too much of a good thing?”
http://www.plumconsulting.co.uk/pdfs/Plum_Insight_Jan2012_Mobile_data_growth_-_too_much_of_a_good_thing.pdf
- August 2009. “Impact assessment framework.” A report for the European Communications Office.
http://www.plumconsulting.co.uk/pdfs/Plum_Aug09_Impact_assessment_framework.pdf
- June 2008. “A framework for evaluating the value of next generation broadband.” A report for the Broadband Stakeholder Group.
http://www.plumconsulting.co.uk/pdfs/Plum_June08_Evaluating_the_value_of_next_generation_broadband.pdf