Spectrum Value

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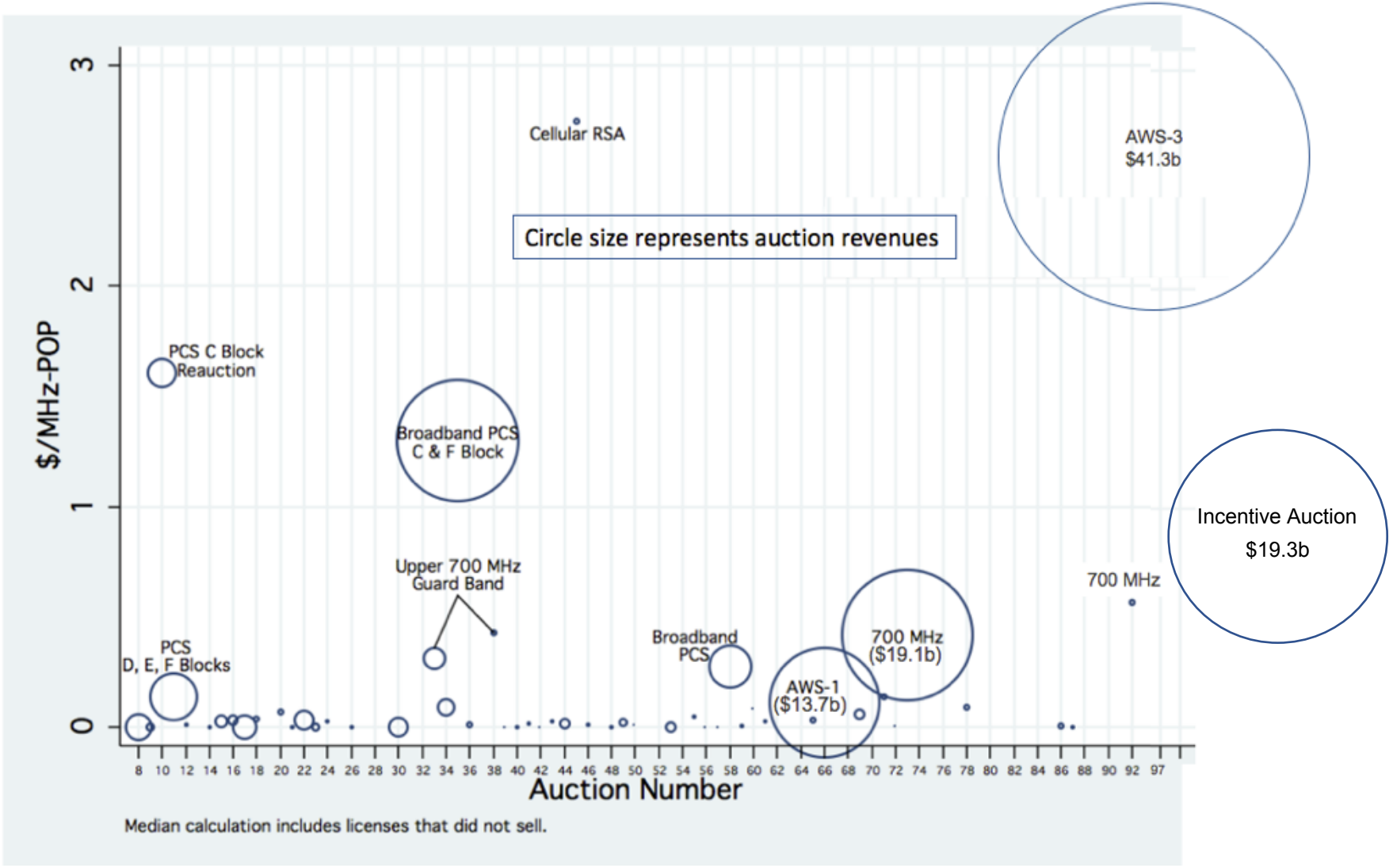
Four Factors Determine Spectrum Value

- Demand for wireless services
- Technology
- Physical characteristics of the spectrum
- License rules and definitions

Spectrum Value
- Does Not -
Always Increase

Data on Spectrum Value from Auctions and Secondary Trades

FCC Auction Results



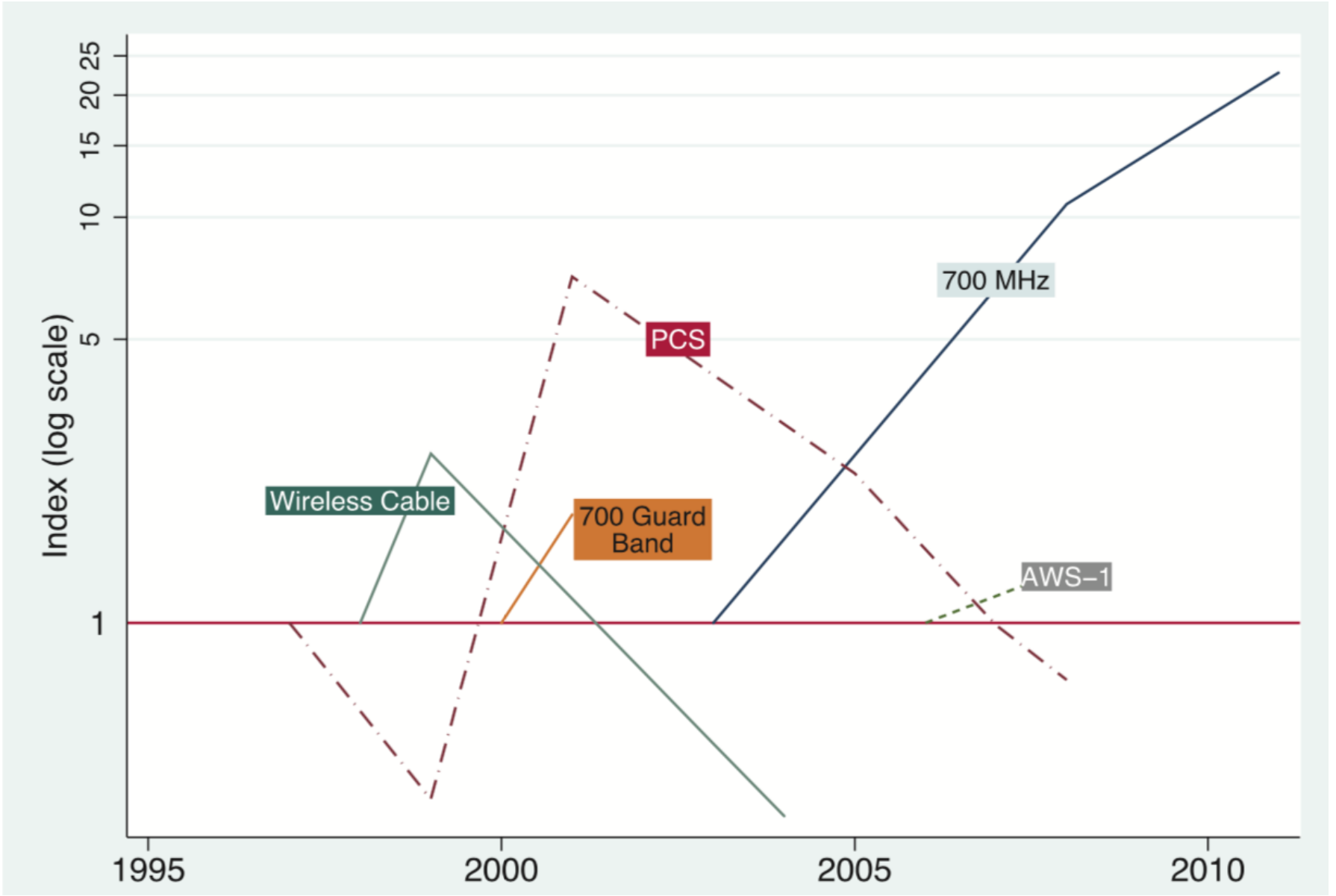
Major Secondary Spectrum Trades

Selected major secondary spectrum transactions.

Buyer	Seller	Year auctioned	Year resold	Band type	$MHz-POP		Annualized percent increase
					At auction	At resale	
Verizon	NorthCoast	1997	2002	PCS	$0.26	$1.69	45%
Verizon	Qwest	1997	2004	PCS	$0.50	$1.26	14%
Verizon	NextWave	1996, 1997	2004	PCS	$1.59	$1.90	2.3%
Aloha Partners	LIN TV	2002, 2003	2007	700 MHz	$0.05	$0.25	39%
AT&T	Aloha Partners	2002, 2003	2007	700 MHz	$0.03	$1.34	121%
T-Mobile, Metro PCS, others	NextWave	2006	2008	AWS-1	$0.16	$0.44	69%
AT&T	Qualcomm	2003, 2008	2010	700 MHz	$0.33	$1.07	79%
Sprint	Wirefree	2005	2010	PCS	$0.83	$0.58	−6.9%
Verizon	SpectrumCo, Cox	2006	2011	AWS-1	$0.45	$0.74	10.4%
Sprint	US Cellular	1995	2012	PCS	$1.00	$0.96	−0.3%
AT&T	NextWave	1997, 2006	2012	AWS-1, WCS	$0.00	$0.26	32%
AT&T	Verizon	2008	2013	700 MHz	$4.07	$4.98	4.1%
Grain Management	Verizon	2008	2013	700 MHz	$4.31	$5.15	3.6%
T-Mobile	US Cellular	2008	2013	AWS-1	$0.25	$0.96	16.4%
VerizonT-Mobile	Verizon	2008	2014	700 MHz	$1.58	$2.17	5.5%
T-Mobile	Verizon	2008	2014	700 MHz	$1.27	$1.75	5.5%

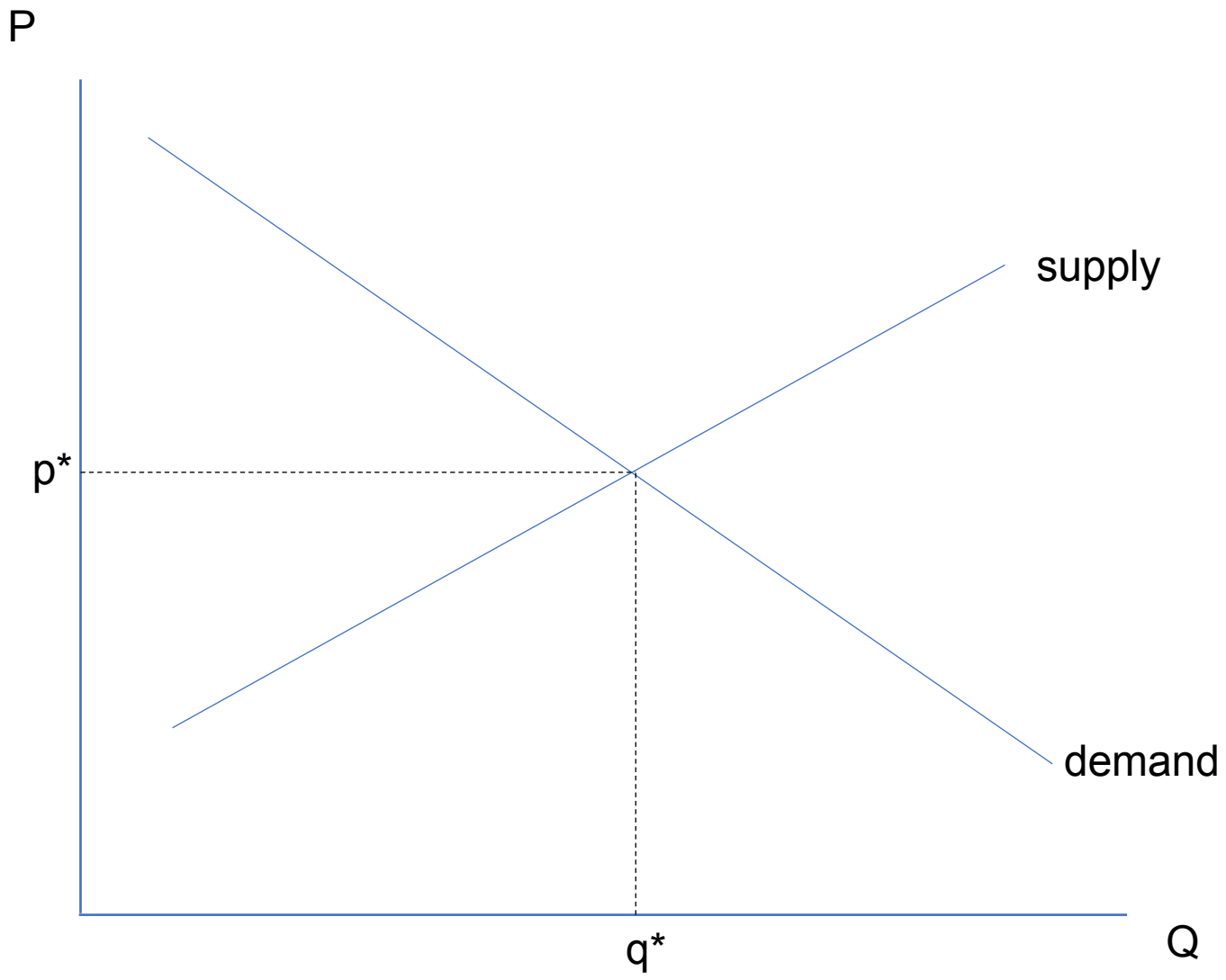
Sources: Company press releases, FCC Universal Licensing System Database, FCC auction data, and Moffett (2013).

Spectrum Price Indices



Source: Wallsten, 2016

Price & Quantity of Spectrum as Function of Wireless Services



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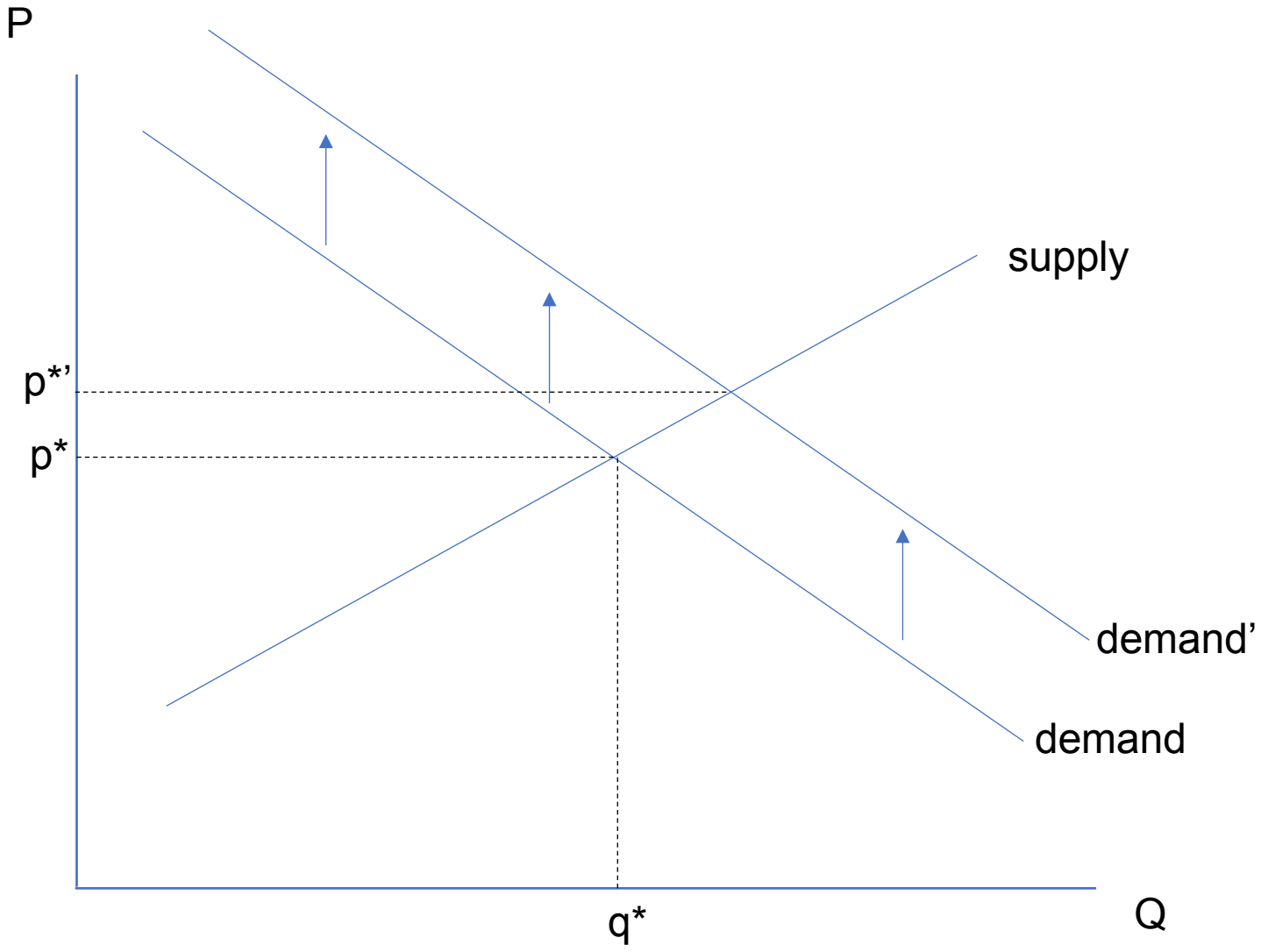
Increase in Demand for Wireless Services Increases Spectrum Value, All Else Equal



Increase in Demand for Wireless Services Increases Spectrum Value, All Else Equal

But All Else is NOT Equal!

Spectrum Value
- May Not -
Always Increase Even When
Demand for Wireless Services Does

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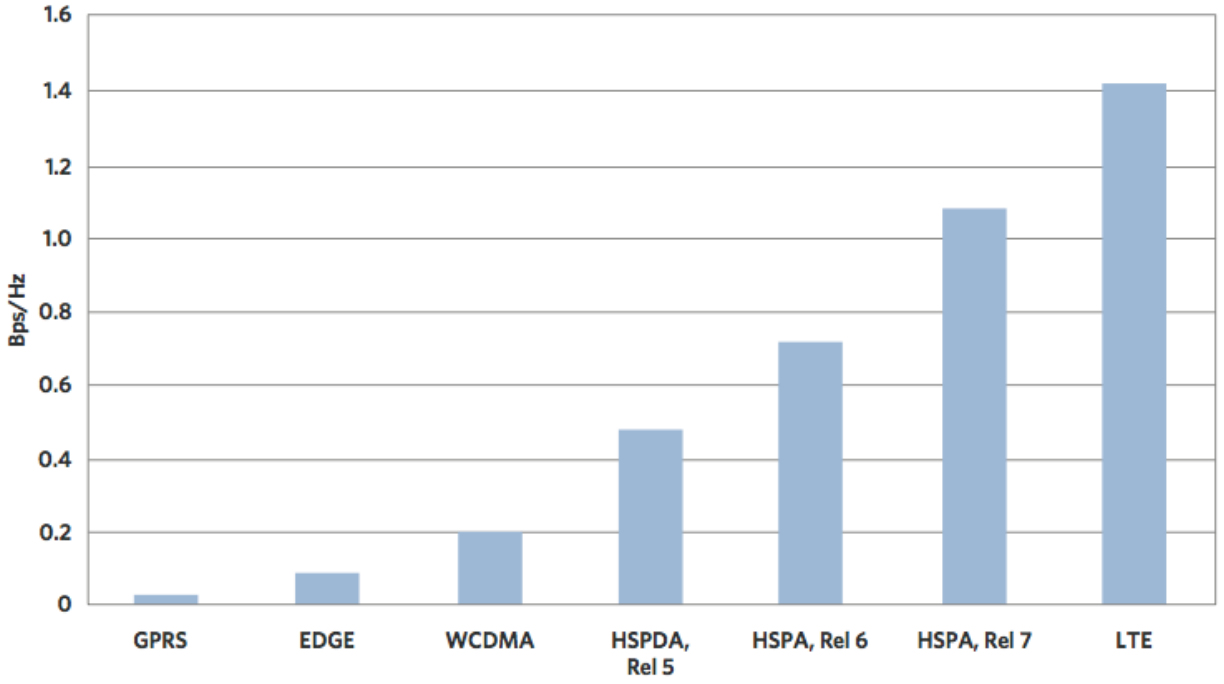
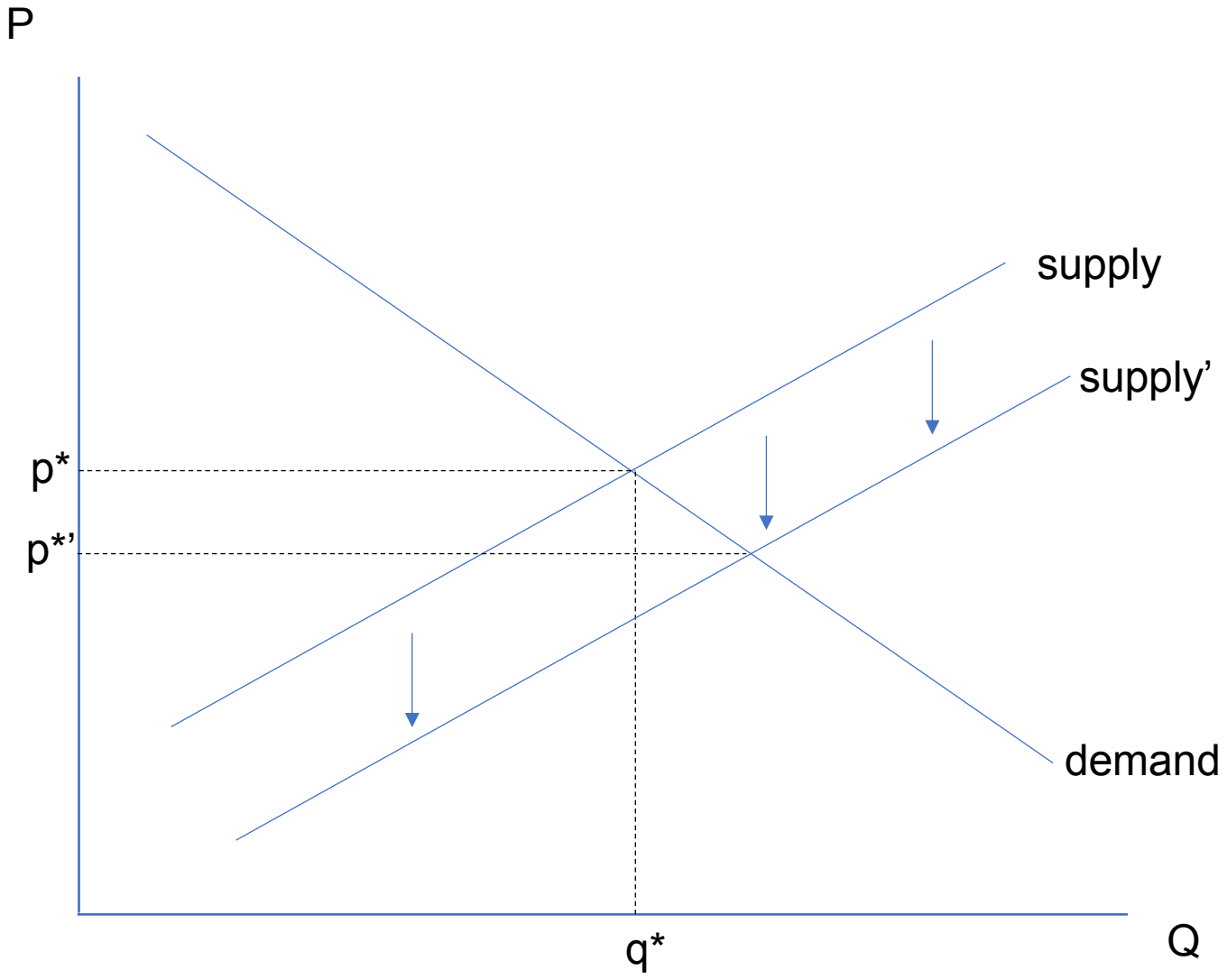
Innovation Improves Spectral Efficiency



technological improvements reduce the cost of transmitting any given amount of data (normalize however you please)

Technological Improvements Reduce Spectrum Value, All Else Equal



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Physical Characteristics of the Spectrum

Higher Frequencies ≙ Lower Price/MHz-pop

Due to propagation characteristics—higher frequencies need more investment to provide given level of service over any given area.

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License Rules and Definitions

Allowed Uses

- More Flexible ↑

Geographic Area Covered

- Topography: Flat, boring ↑ Mountainous, Urban ↓
- More economic activity ↑
- Size of Area Covered ↑↓
  (very large worth less than small, but among smaller sizes unclear)

Bandwidth ↓ (in a linear regression; I suspect true relationship is nonlinear)

Paired ↑

Any Restrictions / Obligations ↓

License Rules and Definitions

Private and public values may differ.
Some obligations may benefits society but reduce the private value of the spectrum.

(Then the debate is whether those are net benefits)

Any Restrictions / Obligations ↓

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- Technology

Change quickly

- Physical characteristics of the spectrum → Never changes
- License rules and definitions → Slow change

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