

Is there really a spectrum crisis?  
...and a few words on incentives...

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Spectrum shortage / crunch / crisis

What the heck does that mean?

Create price index

# Four factors affect license value

1. Demand for wireless services.
2. Technological change.
3. Physical spectrum characteristics.
4. Institutions (rules & regulations).

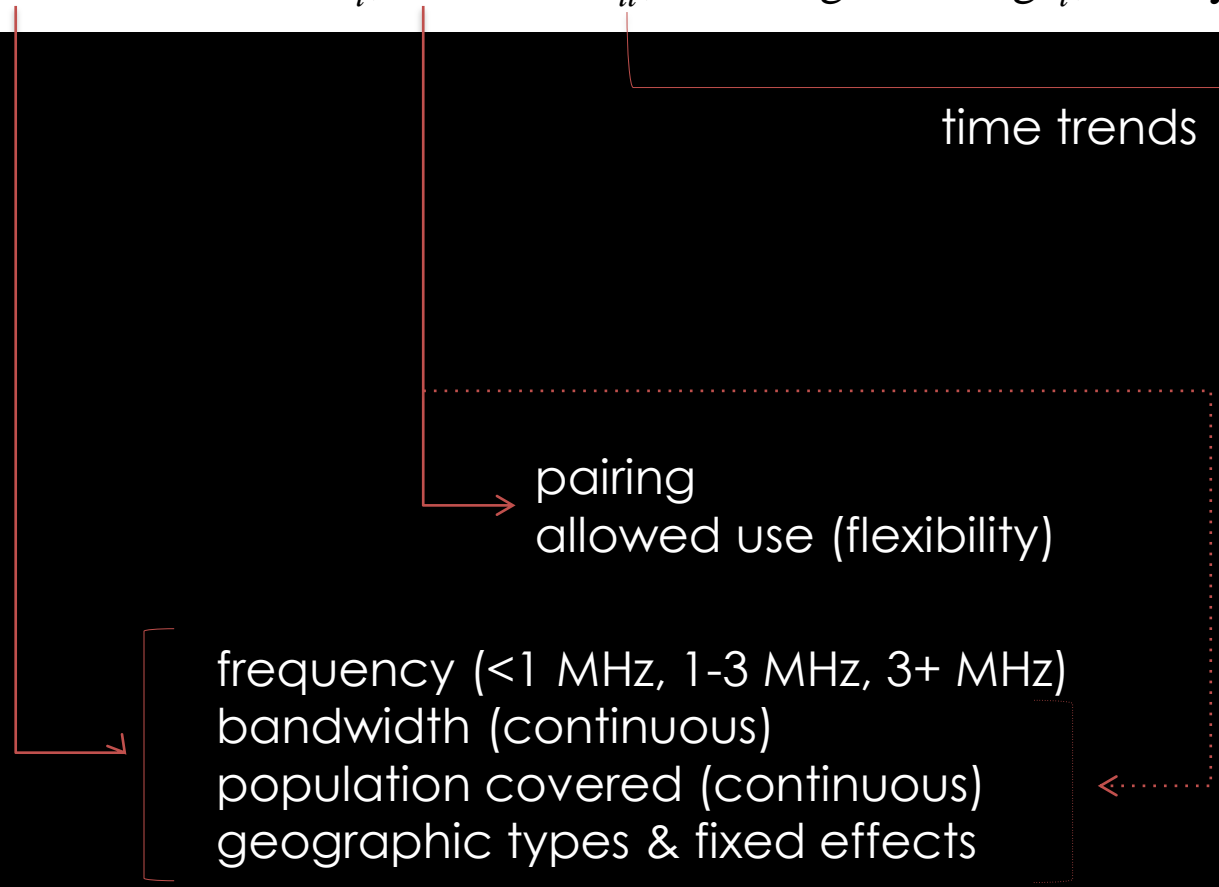
→ winning bid = *private* value (measured in \$/MHz-pops)

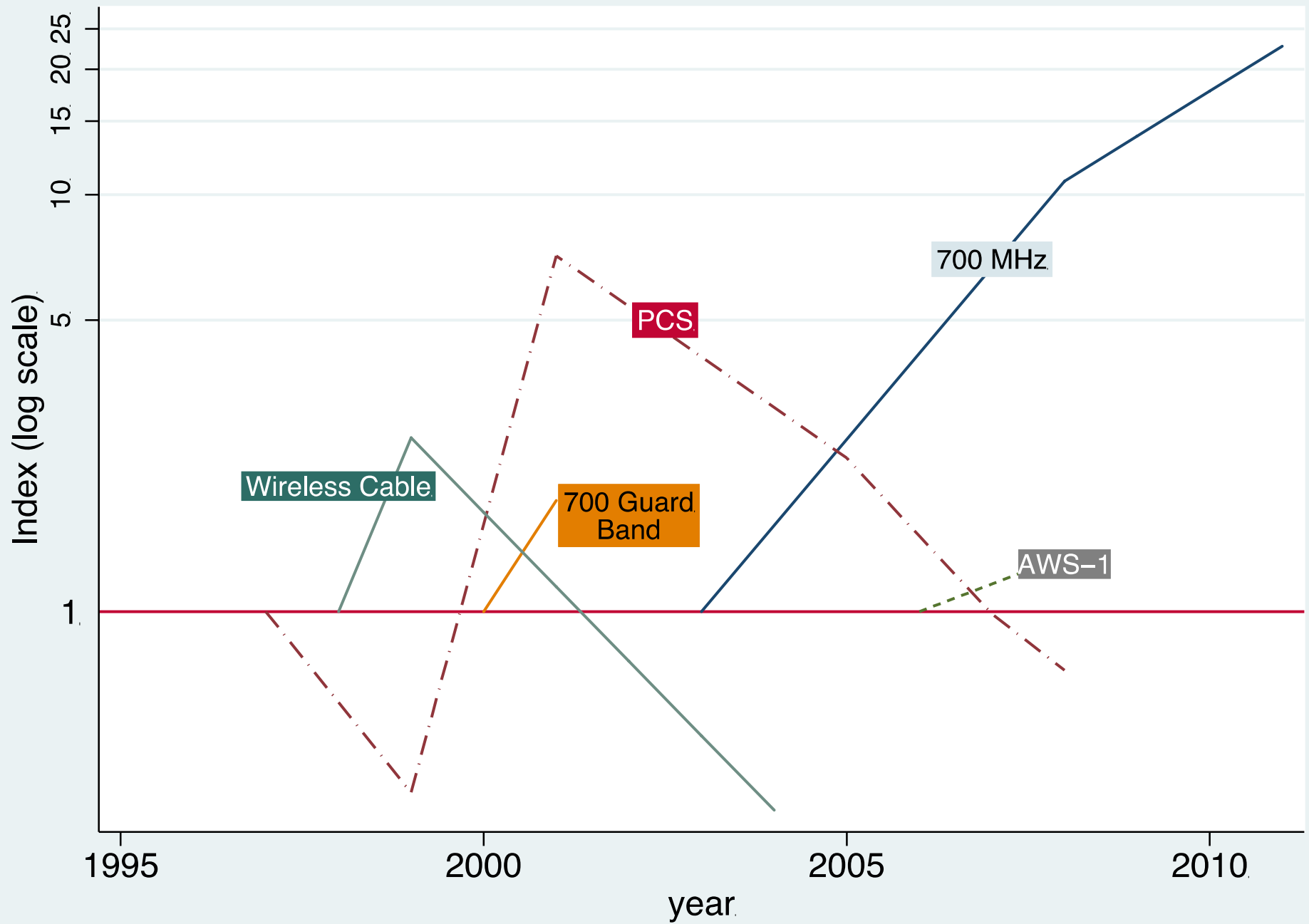
$$\text{value}_{it} = f(\text{physical characteristics}_i, \text{license rules}_{it}, \text{technological change}_t, \text{underlying demand}_t)$$

time trends

pairing  
allowed use (flexibility)

frequency (<1 MHz, 1-3 MHz, 3+ MHz)  
bandwidth (continuous)  
population covered (continuous)  
geographic types & fixed effects





# Secondary Trades

# Selected Major Secondary Trades 2002 - 2013

Buyer	Seller	Year Auctioned	Year Resold	Band Type	\$MHz-POP		Annualized percent increase
					At auction	At resale	
Verizon	<u>NorthCoast</u>	1997	2002	PCS	\$0.26	\$1.69	45%
Verizon	Qwest	1997	2004	PCS	\$0.50	\$1.26	14%
Verizon	<u>NextWave</u>	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	<u>NextWave</u>	2006	2008	AWS-1	\$0.16	\$0.44	69%
AT&T	Qualcomm	2003, 2008	2010	700 MHz	\$0.33	\$1.07	79%
Sprint	<u>Wirefree</u>	2005	2010	PCS	\$0.83	\$0.58	-6.9%
Verizon	<u>SpectrumCo, Cox</u>	2006	2011	AWS-1	\$0.45	\$0.74	10.4%
Sprint	US Cellular	1995	2012	PCS	\$1.00	\$0.96	-0.3%
AT&T	<u>NextWave</u>	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%

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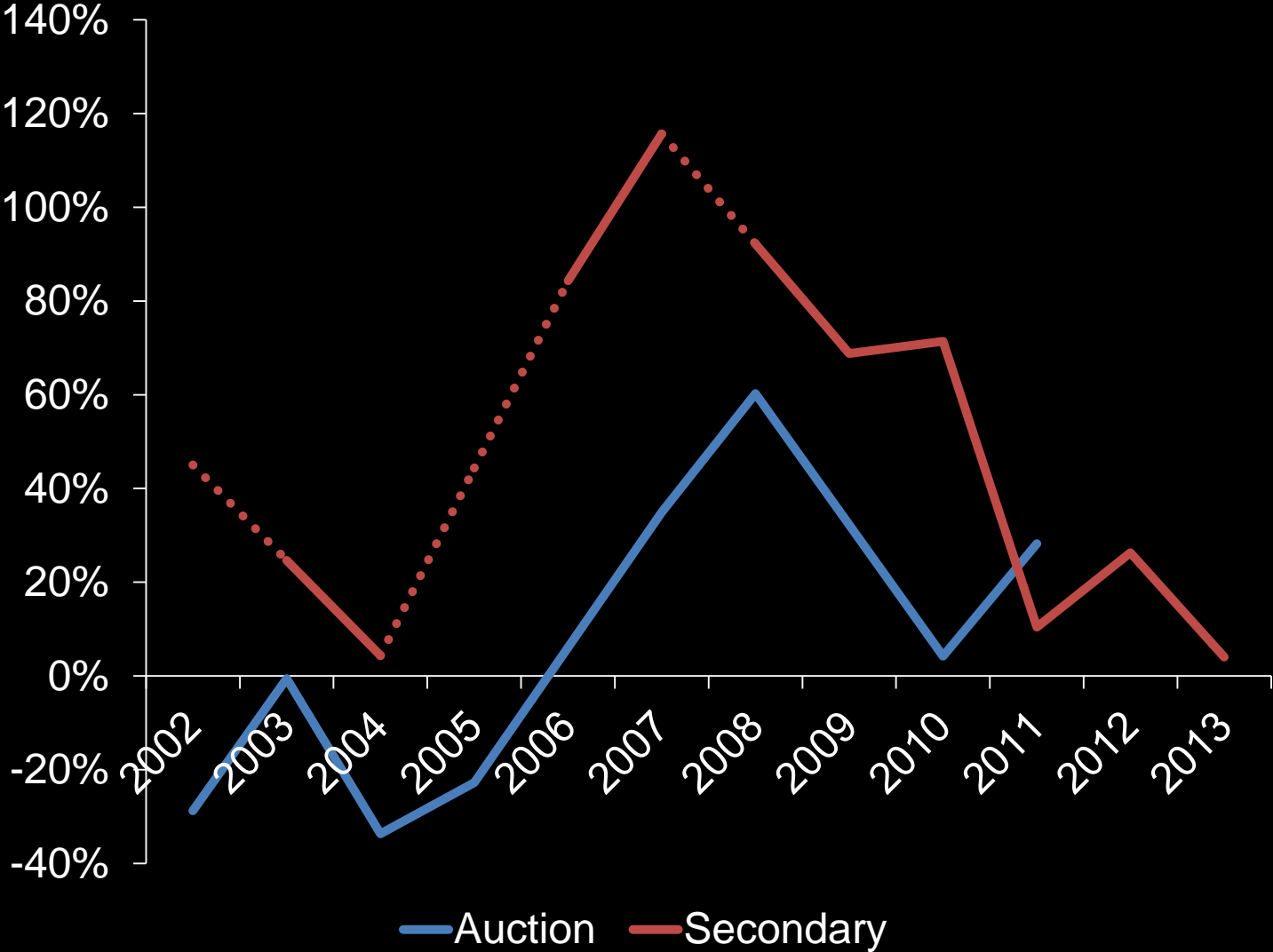


# Consolidating Price Change Estimates

Two indices: (1) auctions, and (2) secondary trades.

For each year, weight annualized change by mhz-pops.

# Consolidated Spectrum Price Indices



# Issues

FCC rules endogenous

Private value | Total (social) value

Incentives

Spectrum sharing is one innovation

By itself doesn't change underlying institutions or incentives.