

Broadband Rankings, Broadband Policy



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FEBRUARY 4, 2009

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“It is unacceptable that the United States ranks 15th in the world in broadband adoption. Here, in the country that invented the Internet ...”

Pres. Elect Barack Obama 12/7/08

Salami Consumption



- Only 30% of families consume Salami each years. So, 70% of families don't eat meat.
- In the U.S. (2000), there were 281 million Americans but only 116 million homes. So, 41% of Americans were homeless.
- Internet connections are produced at zero costs everywhere, and everyone values it the same, and each and every connection has the same marginal benefit to the economy.

**All ridiculous, yes.
So why do accept the same logic in OECD
broadband numbers?**

Broadband Subscriptions and ...



- **Salami?**
 - OECD ignores connection modalities (3G)
- **Homelessness?**
 - OECD normalizes by population, when fixed lines are shared among members of a household
- **Cost-Benefit Analysis**
 - Higher subscription rate and/or maximum subscription are not always desirable.

Let's look more
closely at the data,
and the way it is
handled.

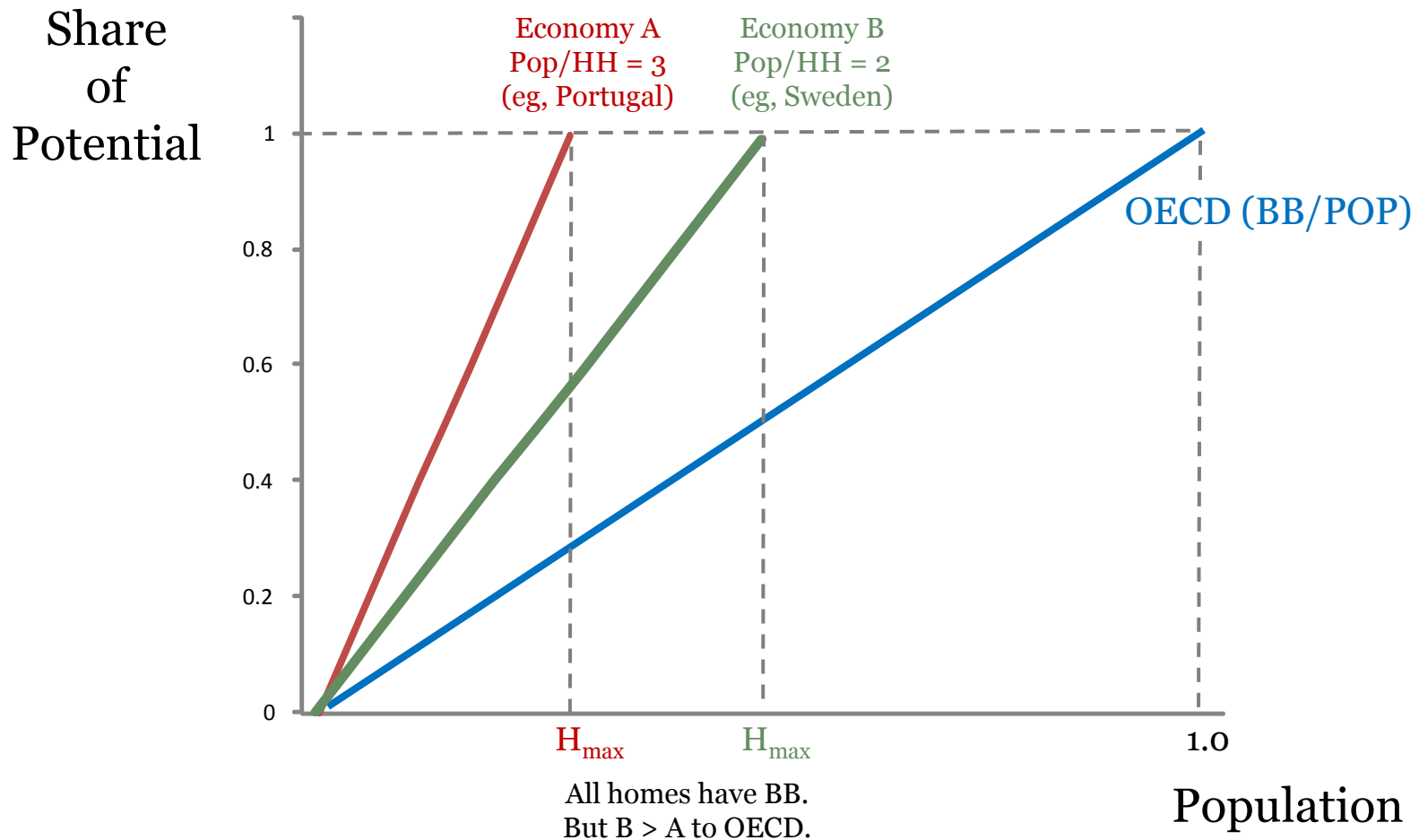
OECD/ITU Normalizing

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$$B = \frac{\text{Broadband Connections Counted}}{\text{Population}/100}$$

- Only particular types of connections are counted
 - Household and small business fixed services
- Conditioned on Population
 - People don't buy fixed connections, homes and businesses do
 - Assumes broadband proportional to population
- Different bean counters
 - Different methodologies?
- Both the numerator and denominator are “counted” by government or business
 - Numbers are estimates

BB/POP tells you NOTHING



Ignores business connections.

Sweden v. U.S.



SWEDEN

- 2.0 People per Home
- If all homes have broadband, per-capita subscription rate is 0.50.

PORTUGAL

- 3.0 People per Home
- If all homes have broadband, per-capita subscription rate is 0.33.

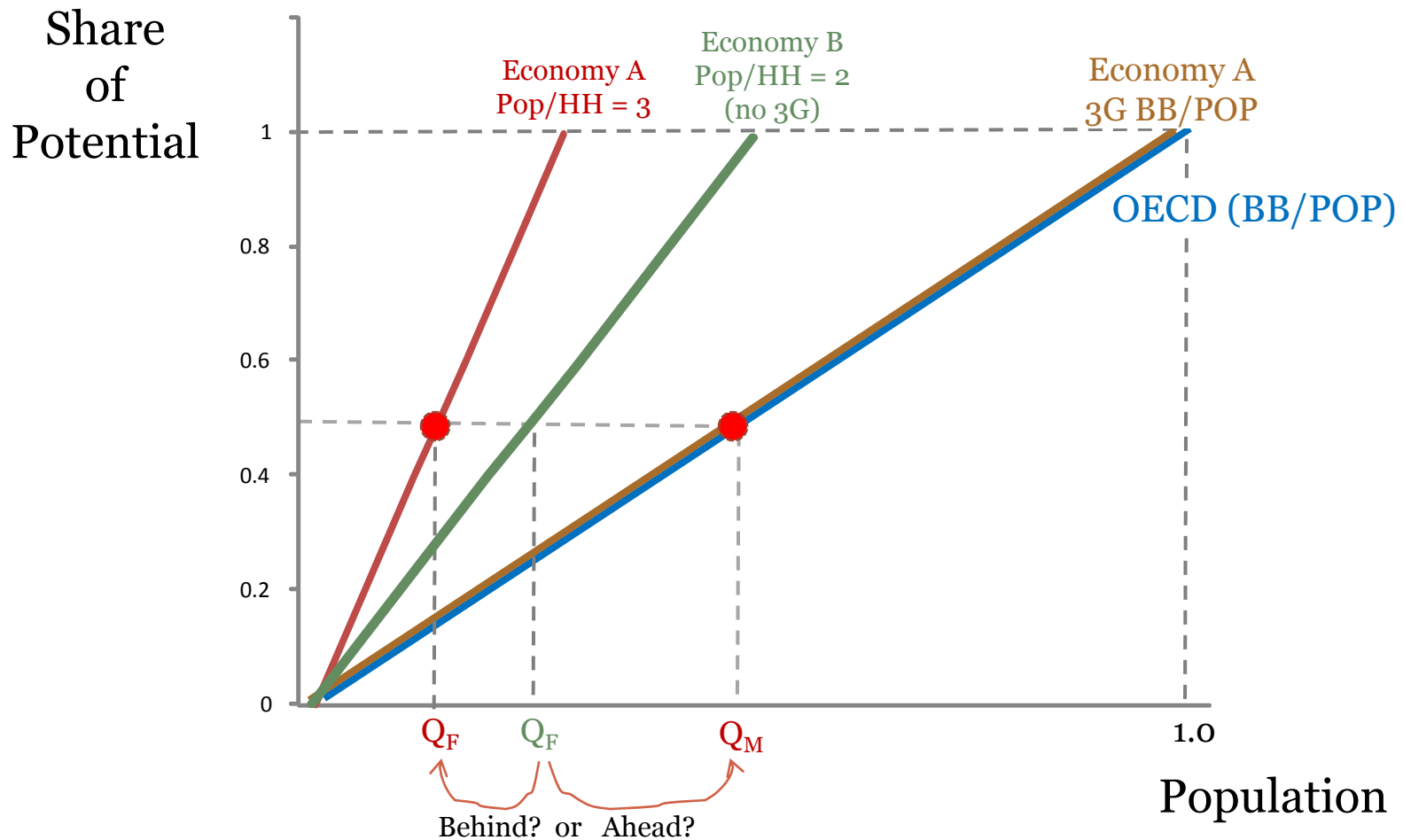
Sweden wins by a long shot, even though the two countries are equivalent.



End of Discussion

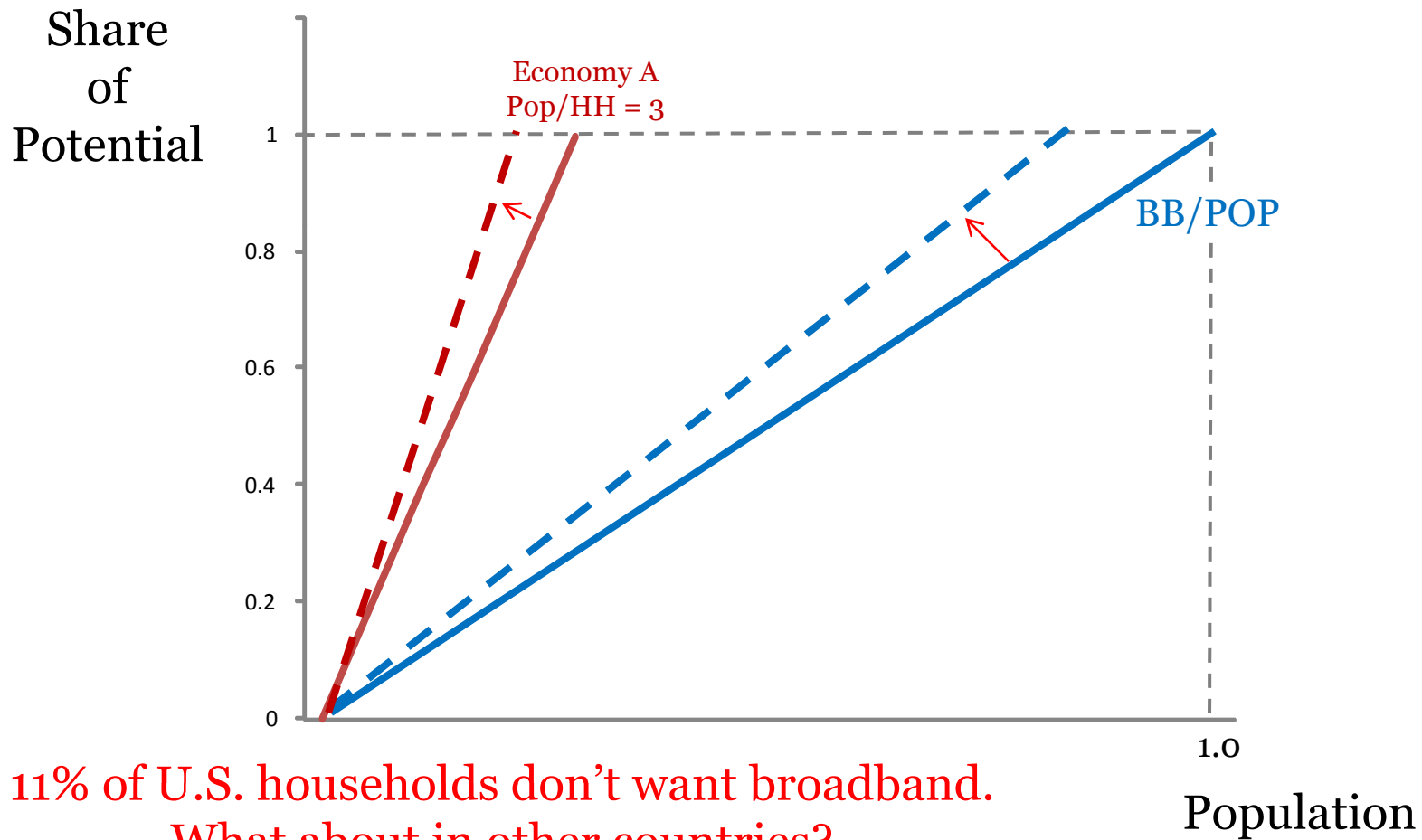
At least, it should be ...

Non-fixed Connections?



Ignores business connections.

BB/POP tells you NOTHING!



Why not use
households to
normalize the data?

Because business lines are 1/3 of total lines.

The “Fixed” Broadband Nirvana

A difference without a difference



Country	Subscription	Rank	Country	Subscription	Rank
Sweden	0.541	1	New Zealand	0.398	16
Iceland	0.489	2	Portugal	0.392	17
Czech Republic	0.478	3	Japan	0.39	18
Denmark	0.478	4	United Kingdom	0.389	19
Finland	0.477	5	United States	0.38	20
Germany	0.449	6	Luxembourg	0.378	21
Netherlands	0.437	7	Greece	0.362	22
Switzerland	0.429	8	Slovak Republic	0.351	23
France	0.424	9	Ireland	0.347	24
Canada	0.419	10	Poland	0.341	25
Hungary	0.411	11	Spain	0.338	26
Belgium	0.41	12	Australia	0.315	27
Austria	0.406	13	Korea	0.254	28
Italy	0.404	14	Mexico	0.247	29
Norway	0.403	15	Turkey	0.212	30

(Homes + Business Establishments)/Population

My Question ...



What do you expect?

4th

OECD Rank 2001



2001
Korea
Canada
Sweden
U.S.

← The U.S. ranked 4th!

Trends in OECD Rank: The Fall

(Connections/Capita)



2001	2002	2003	2004	2005	2006	2007	2008
Korea	Korea	Korea	Korea	Iceland	Denmark	Denmark	Denmark
Canada	Canada	Canada	Denmark	Korea	Netherlands	Netherlands	Netherlands
Sweden	Belgium	Iceland	Netherlands	Netherlands	Iceland	Iceland	Iceland
U.S.	Iceland	Denmark	Iceland	Denmark	Korea	Norway	Norway
	Demark	Netherlands	Canada	Switzerland	Switzerland	Switzerland	Switzerland
	Sweden	Belgium	Switzerland	Finland	Norway	Finland	Finland
	Netherlands	Sweden	Belgium	Norway	Finland	Korea	Korea
	U.S.	Japan	Japan	Canada	Sweden	Sweden	Sweden
		Switzerland	Finland	Sweden	Canada	Luxembourg	Luxembourg
		U.S.	Norway	Belgium	Belgium	Canada	Canada
			Sweden	Japan	UK	UK	UK
			U.S.	UK	Luxembourg	Belgium	Belgium
				U.S.	France	France	France
					Japan	Germany	Germany
					U.S.	U.S.	US



Trends in OECD Rank: The Rise

(Connections/Capita)



2001	2002	2003	2004	2005	2006	2007	2008
Korea	Korea	Korea	Korea	Iceland	Denmark	Denmark	Denmark
Canada	Canada	Canada	Denmark	Korea	Netherlands	Netherlands	Netherlands
Sweden	Belgium	Iceland	Netherlands	Netherlands	Iceland	Iceland	Iceland
U.S.	Iceland	Denmark	Iceland	Denmark	Korea	Norway	Norway
	Demark	Netherlands	Canada	Switzerland	Switzerland	Switzerland	Switzerland
	Sweden	Belgium	Switzerland	Finland	Norway	Finland	Finland
	Netherlands	Sweden	Belgium	Norway	Finland	Korea	Korea
	U.S.	Japan	Japan	Canada	Sweden	Sweden	Sweden
		Switzerland	Finland	Sweden	Canada	Luxembourg	Luxembourg
		U.S.	Norway	Belgium	Belgium	Canada	Canada
			Sweden	Japan	UK	UK	UK
			U.S.	UK	Luxembourg	Belgium	Belgium
				U.S.	France	France	France
					Japan	Germany	Germany
					U.S.	U.S.	US

Trends in OECD Rank: The Rise

(Connections/Capita)

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1996 PSTN Subscription Rank TOP 10

Denmark

Netherlands

Norway

Switzerland

Iceland

Finland

Sweden

Luxembourg

Canada

*Telecom Rank
not in sequence.*

2008

Denmark

Netherlands

Norway

Switzerland

Iceland

Finland

Korea

Sweden

Luxembourg

Canada

Food for Thought

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- Top 10 in broadband rank; 9 are Top 10 in 1996 Wireline Telephone
- Bottom 10 in broadband; 8 are Bottom 10 in Wireline Telephone (7 in 2001)
- Of the 14 above the U.S. in broadband, 12 are also above the U.S. in telephone subscriptions
- Of the 15 below the U.S. broadband, 12 are also below the U.S. in telephone subscriptions

Hypothesis...

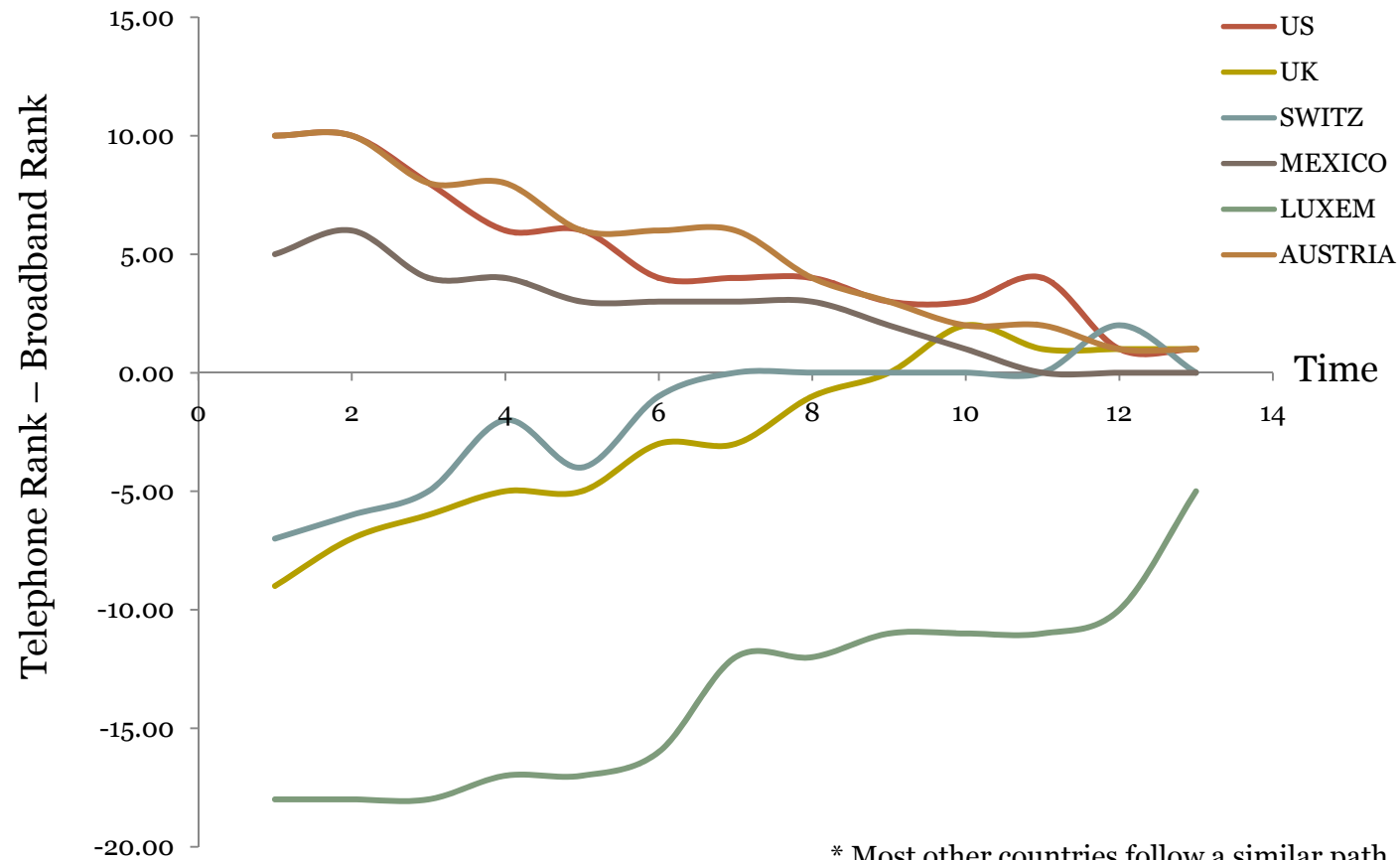


Broadband subscription rank is
converging to fixed telephone
subscription rank at fixed network
maturity (1996^{ish}).

Wireline telephone is similar to fixed in the way it is counted (shared) and included both business and residential connections. “Counted” broadband types (DSL, Cable) are the type often used by businesses counted in the telephone data. For example, in U.S., about one-third of broadband and telephone connections are business.

Convergence to Telephone Rank

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* Most other countries follow a similar path.

Terminal Expectations:

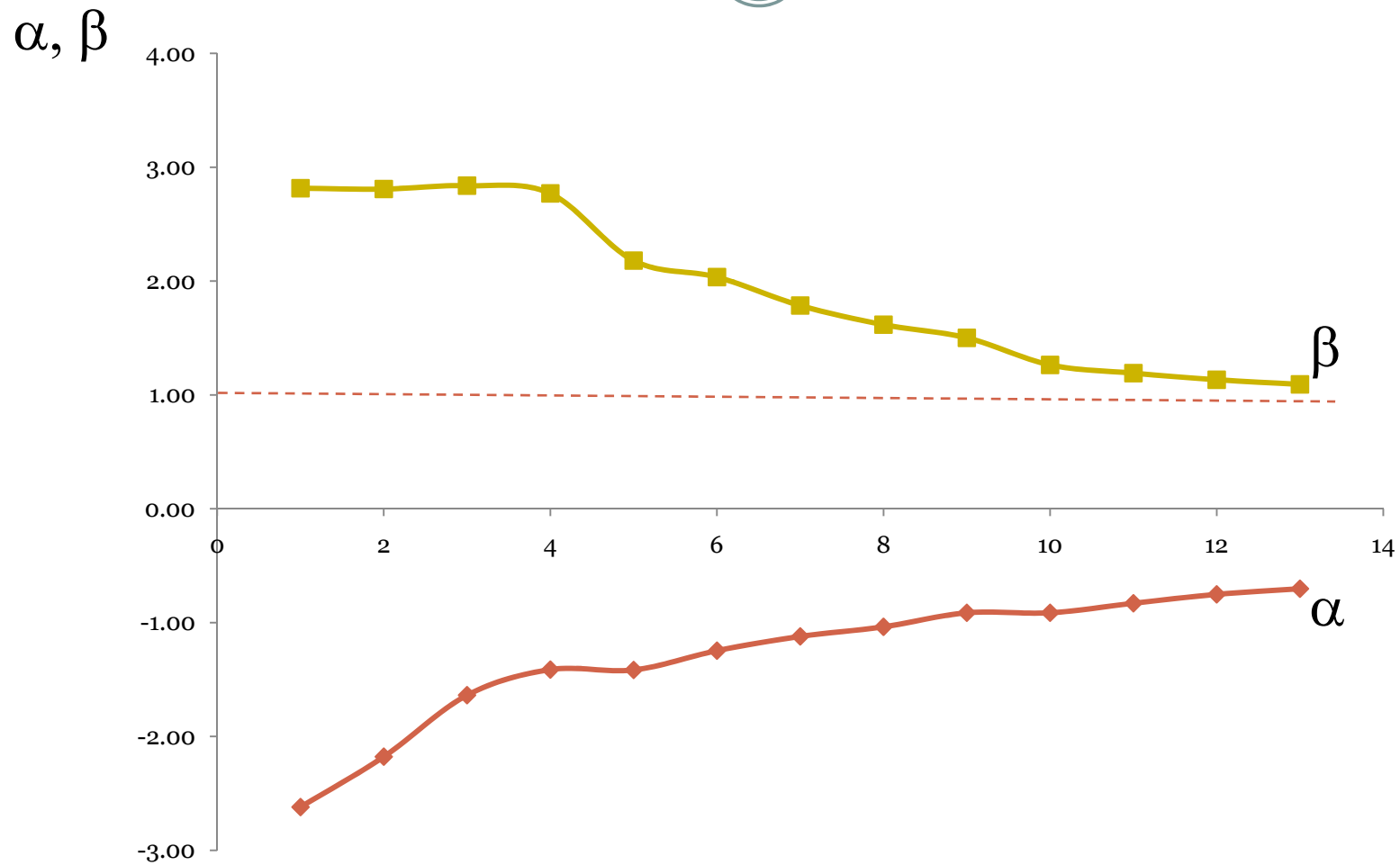
Broadband and Wireline Telephone Ranks

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Year (June Data)	Rank Correlation	Avg. Difference in Ranks
2002	0.600	5.8
2003	0.642	5.5
2004	0.668	5.1
2005	0.728	4.4
2006	0.772	4.1
2007	0.824	3.3
2008	0.861	3.1

Subscription Rate

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Conclusion



We can't reject
convergence.

We are and will be
(about) 15th.

Back to the Match: Sweden v. U.S.

- **SWEDEN**

- Q/POP, Rank 6
- Q/HH, Rank 15
- Q/TEL, Rank 20

- **UNITED STATES**

- Q/POP, Rank 15
- Q/HH, Rank 12
- Q/TEL, Rank 14

Sweden is either way ahead or behind.

General Sentiment

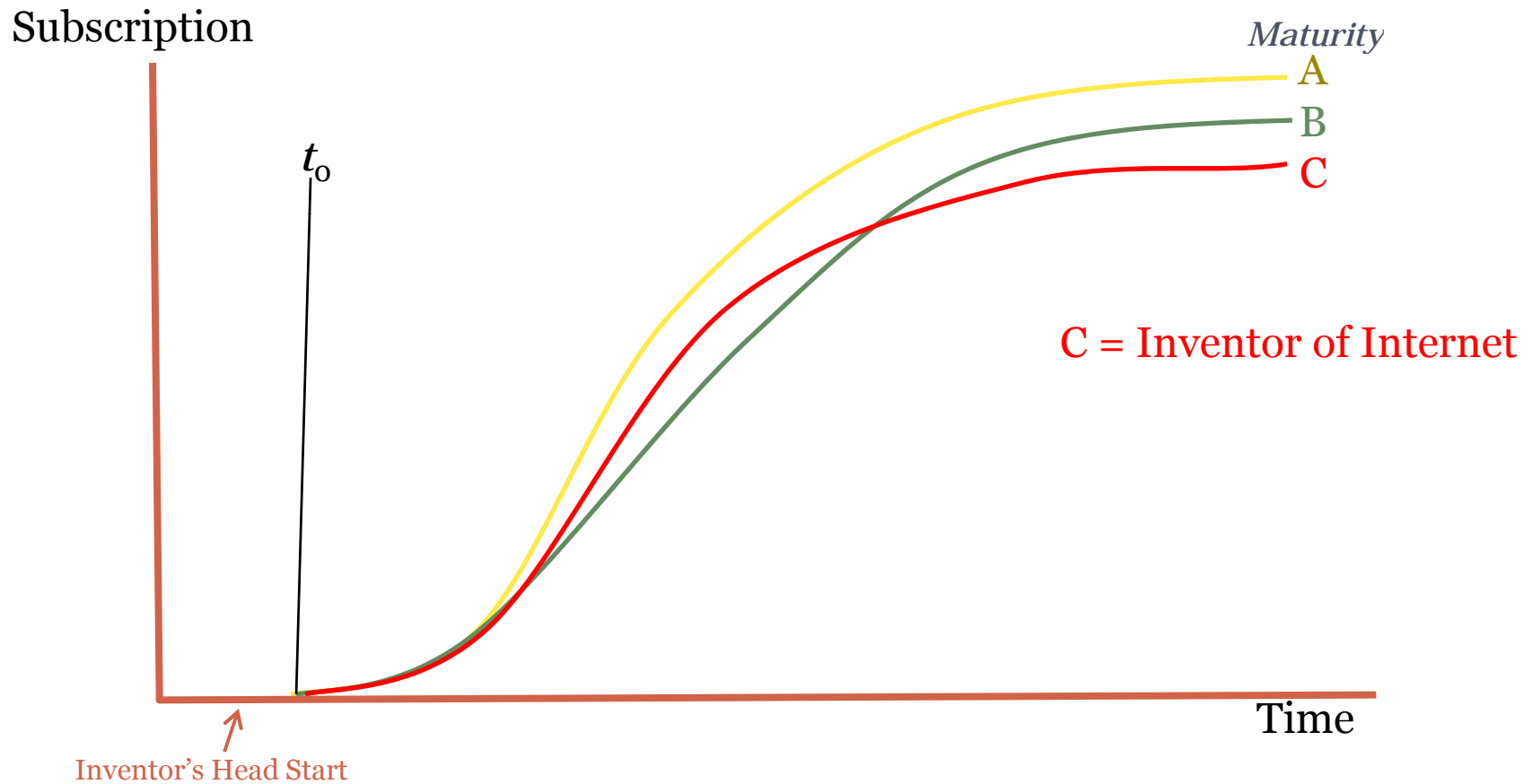


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Broadband Diffusion: When Do We Take a Measurement?

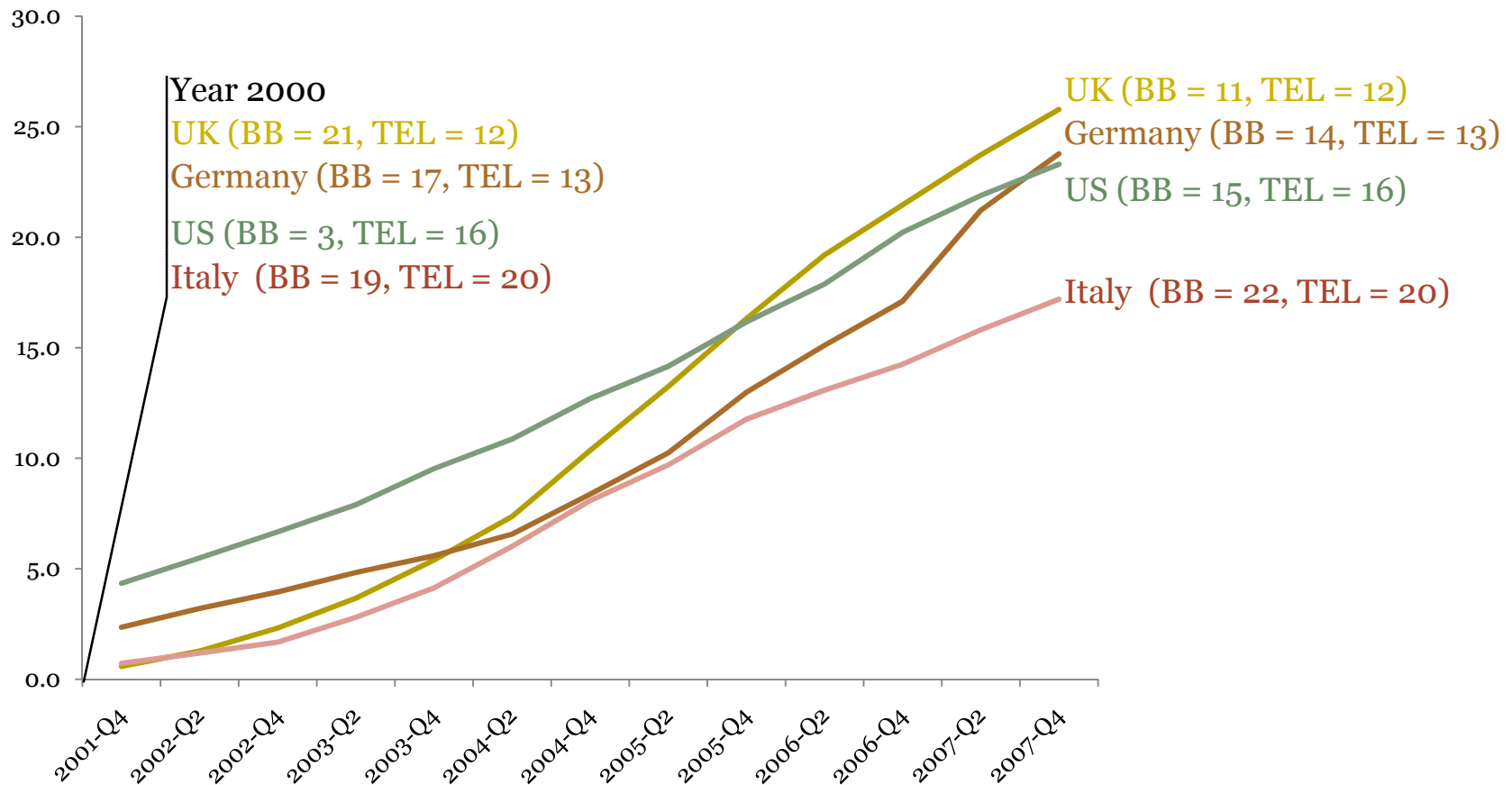
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Convergence to Terminal Position?



BB/Cap



Conclusion ...



Our fall from 4th to 15th is more sensibly viewed as an indicator of our success as a leader, not our failure as a follower.

Does Santa Clause bring
broadband subscriptions?

Broadband is a Service



- Old people subscribe less
 - Japan 27%
 - Korea 13%
 - U.S. 20%
- Density impact costs, so maybe impacts deployment
 - Japan 338 p/km²
 - Korea 483 p/km²
 - U.S. 31 p/km²
- Educated people more likely to buy (tertiary educ)
 - Italy 10%
 - Canada 44%
 - U.S. 38%
- Higher incomes more likely to buy (GDP/capita; GINI)
 - Portugal \$19,000; GINI 35.6
 - Luxembourg \$58,000; GINI 26.1
 - U.S. \$31,000; GINI 32.6

Phoenix Center Policy Papers Nos. 29, 31 and 33

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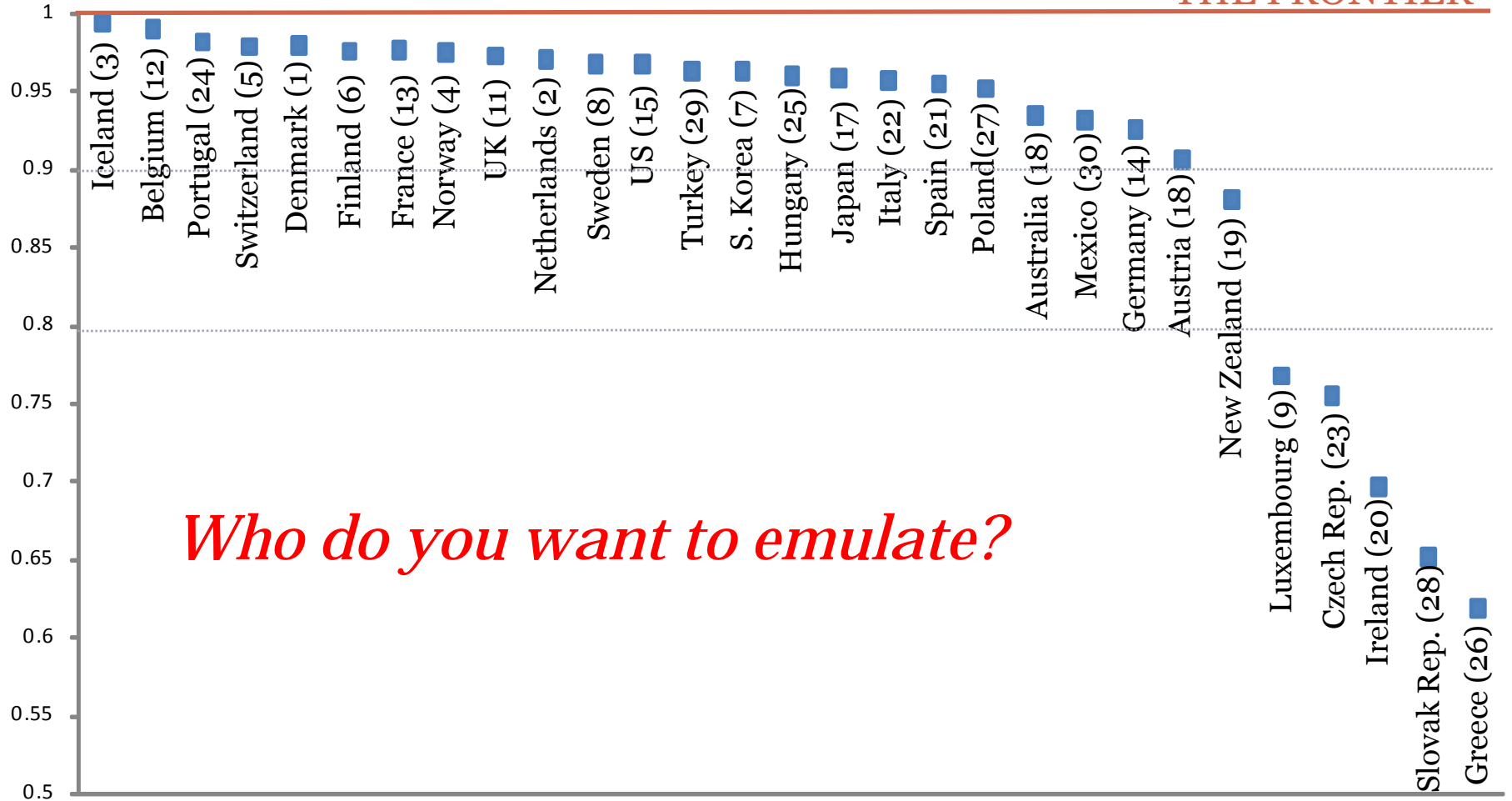
- Statistical Models fit the data very well ($R^2 > 0.90$)
- Most regressors statistically significant
- No Surprises
 - PRICE -
 - GDPCAP +
 - GINI -
 - AGE65 -
 - EDUC +
 - DENSITY +
 - PHONES +

Policy Paper No. 33

Broadband Efficiency Index



THE FRONTIER

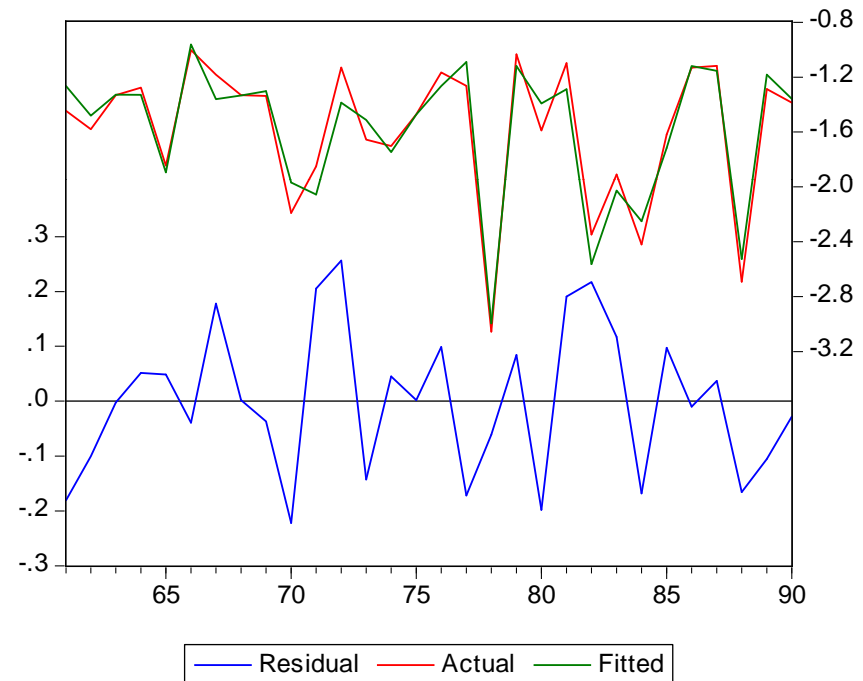


Scaled Down Model



Variable	Coef	t-stat
C	-9.95	-4.81
LN(PRICE)	-0.39	-2.56
LN(GDPCAP)	0.35	2.46
LN(GINI)	-0.73	-3.18
LN(AGE65)	-0.29	-2.60
LN(URBAN)	0.99	3.89
LN(TEL)	2.81	3.50
LN(TEL)^2	-0.36	-2.73

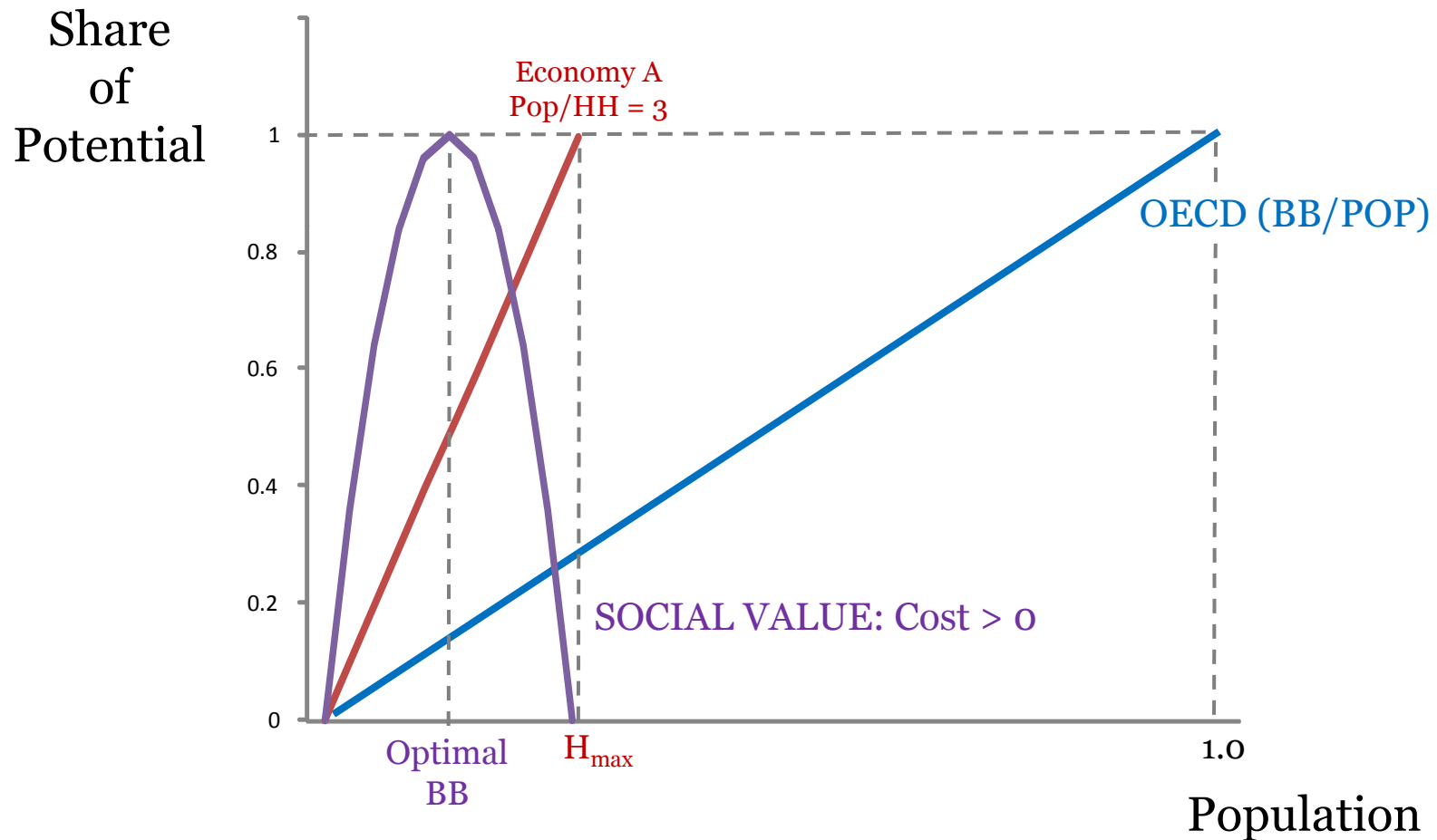
N = 30; June-08 data; $R^2 = 0.93$



Most of the differences across countries are explained by few demographic and economic endowments.

What do we need?

Broadband Ain't Free



Ignores business connections.

Internet Adoption Index



$$\text{Adoption Index} = A_t = \frac{\text{Actual at time } t}{\text{Target}}$$

Goal:

1. Provide for meaningful comparisons across countries
2. Incorporate the underlying economics of adoption and deployment
3. Accommodate different connection modalities

Internet Adoption Index



$$A_t = \frac{\text{Actual}_t}{\text{Target}} = \frac{\sum_{i=1}^N \bar{v}_{i,t} \cdot q_{i,t}}{\sum_{i=1}^N v_i^* \cdot q_i^*}$$

STIMULUS

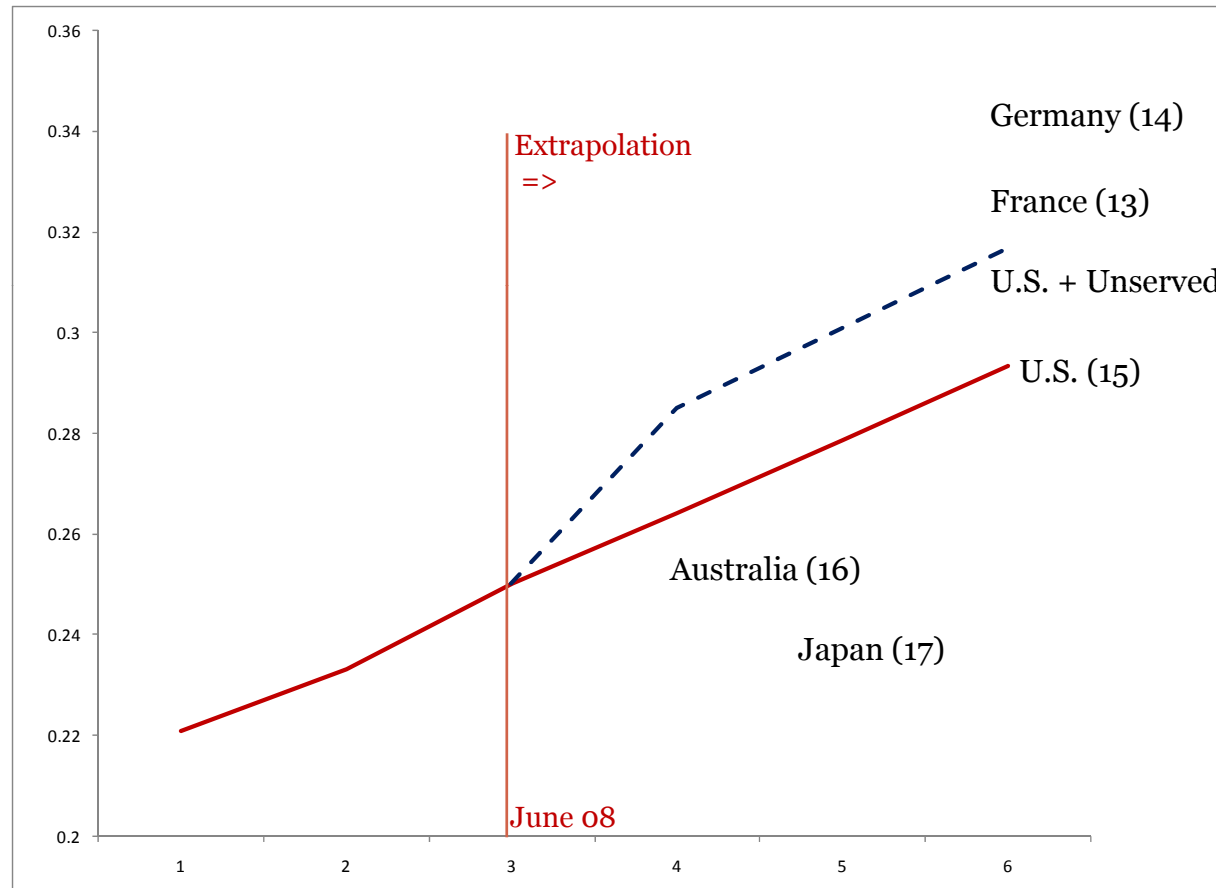
STIMULUS



“It is unacceptable that the United States ranks 15th in the world in broadband adoption. “

So let's spend about \$6-9 billion of the stimulus to get broadband to the 8% of homes and small businesses without it.

Still Rank 15th!



OECD Fixed Connections/Capita, June 07, Dec 07, June 08, extrapolated 3 periods.
“U.S.+Unserved” assumes 8% un-served subscribe at same rate as presently served (probably too high).

Uh ...



Let's build fancy fiber optic
networks.

Still Rank 15th!



- Any effect on subscriptions will, if anything, be small
- Japan is fastest, but ranks 17th
- Upgrade to higher speed by current broadband subscribers does not change connection count.
- There are not many dialup users or non-users giving up 5 Mbps to wait for 50 Mbps.

Spend \$10B, or spend \$40B.

We will still be $\approx 15^{\text{th}}$.

Prediction:

Ranking debate has another 12-18 months.