8th World Telecommunication/ICT Indicators Meeting (WTIM-10)
Geneva, Switzerland, 24 - 26 November 2010

Contribution to WTIM-10 session 2

Document C/17-E
25 November 2010

English

SOURCE: Berkeley Research Group

TITLE: Mobiles, Connectivity and Growth

Mobiles, Connectivity and Growth

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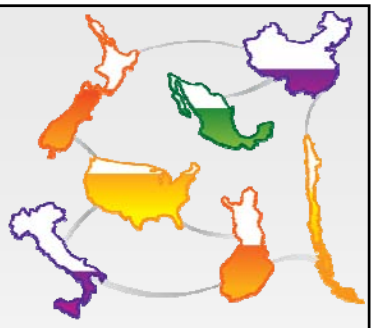
World Telecom Indicators Meeting, November 24th



Mobiles and growth

2010 Connectivity Scorecard

Implications for Policy

Why it ought to matter

- Mobiles are valuable social overhead capital.
- Development of mobile telecom networks has (at least) the following easily theorized benefits:
  - Lower transaction costs (D);
  - Market formation (D);
  - Elimination of physical constraints to information flow (D);
  - Massive consumer surplus from new services;
  - Development of content and applications industries.

(D) Indicates benefits that are particularly prominent in the developing world

Fishermen in Kerala

- Jensen (2007) studied the impact of mobile usage among fishermen in Kerala:
  - Prior to mobiles, suppliers and demanders were mismatched;
  - Suppliers had outdated or inaccurate information about demand at ke delivery points;
  - Mobiles resolved this information asymmetry;
  - Prices fell AND producer profits rose– by 4% and 8% respectively;
  - Wastage– which accounted for the disposition of 5% to 8% of output– eliminated.
- Jensen's study vividly illustrates the "market-making" benefits of ICT in a developing country context.
- It is also a template for the kind of study that has the best hope of producing credible, tangible results
  - Survey-based;
  - Tractable.

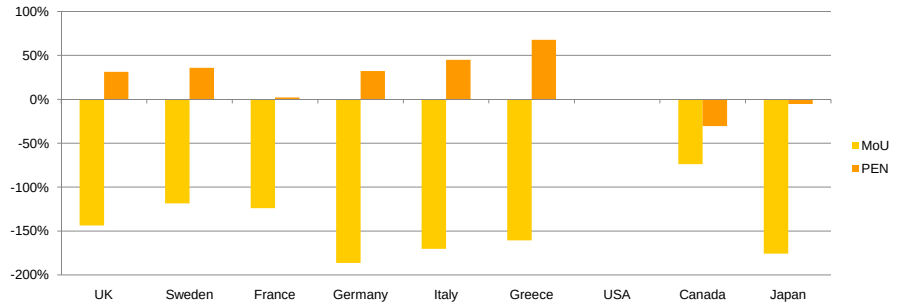
Broader evidence on mobiles

- A “GDP” study: Waverman, Fuss et al (2005):
  - 10 percentage point increase in mobile penetration leads to increase of about 0.6 percentage points in average medium-term growth rate;
  - Behind such a study is the concept of mobile as a “general purpose technology.”
- A “consumer surplus” approach
  - Hausman estimates that welfare gain (compensating variation) from mobiles in India is perhaps between 3% and 10% of annual income;
  - In developed countries, consumer gain is likely equal to annual revenues from mobile services ($ 10s of billions).
- Micro-level studies on market formation
  - Jensen (on fishermen);
  - Aker – impact of mobiles in reducing price dispersion in food grains;
  - Easier to control for omitted variable bias;
  - Possibly the most believable evidence.

The best evidence?

- It’s best seen with one’s own eyes
  - Mobile telephony is ubiquitous;
  - You can SEE that it has an impact on how people do business and how they conduct their lives.
- The survey-based studies capture this best, as they rely on the least number of assumptions
  - E.g., functional forms– utility functions (Hausman), aggregate production functions (Waverman and Fuss).
- On the whole, however, mobile telephony is rightly considered a very good thing.
- But we still have work to do.
- Measuring mobile adoption– in all its evolving forms– is tricky and currently unsatisfactory
  - Oddly, the worst problems might be in comparing developed nations.

Mobile penetration and usage



Source: ML Global Wireless Matrix, Q3 2010

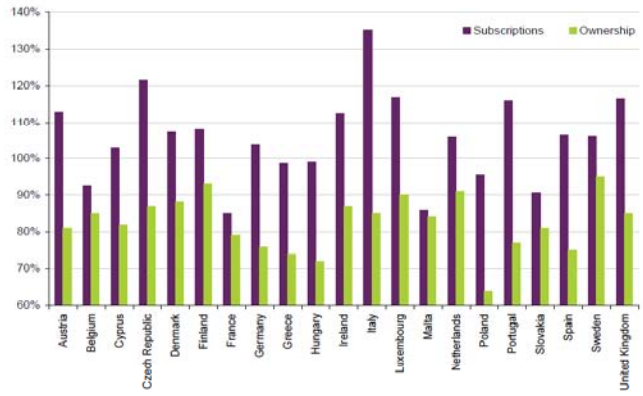
% difference in variable compared to US level

Greek penetration is 1.8 times the level of Japan, France and USA

What accounts for Greek prowess in mobile adoption?

Poor and irrelevant measurement, maybe?

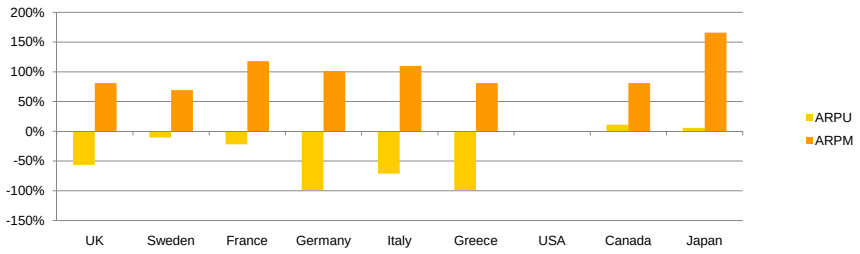
Subscribers per 100 versus unique owners



Source: Ofcom (2009) based on 2006 data

How severe is the mismatch between subscribers and unique users in developing economies? Perhaps the mobile revolution is greatly overstated?

Mobile pricing– who's more expensive?



Source: ML Global Wireless Matrix

Log difference in variable relative to U.S. level

U.S. price per minute is much lower than anywhere else

ARPU is significantly higher than most

Merely points to difference in business models and to role of termination rates in CPP markets.

Mobile Broadband: Another measurement challenge?

- Many people use "3G subscribers per 100 inhabitants"
  - Suffers from the "SIM inflation" problem of all "per 100 inhabitant" measures;
  - Many people have 3G-enabled handsets but DO NOT use these to access the Internet in any serious way.
- Multiple modes of access
  - Some people use USB keys;
  - Others use their handsets.
- Measure of usage are very important:
  - UK has more "3G subscribers per 100 inhabitants" than USA;
  - But U.S. usage of apps, mobile Internet etc seems notably higher (excepting SMS). (See various Nielsen surveys).

Some suggestions

- Surveys of modes of access and of actual usage levels need to be emphasized more than “NRA-level” statistics.
- Good practice in this area:
  - Ofcom’s Communications Markets reports;
  - Pew Foundation reports on Mobile and Broadband usage in the USA;
  - Surveys conducted in conjunction with the NB plan in the USA;
  - European Commission i2010 reports have many merits, although some questionable results raise doubts about cross-country consistency.

➡ Urgently need more survey-based work of this nature for emerging markets and less-developed countries.

But Mobile is just one part of an array of information technologies

- Data and voice can be transmitted over fixed networks too– in fact, more reliably and faster;
- Information is created on computers using software;
- Some content is purely entertainment, some is productivity-enhancing;
- Limits on the economic exploitability of any one technology are imposed by:
  - Workforce skills;
  - The extent to which the business culture values innovation, research and development;
  - The presence of “complementary” investments in people and in other forms of ICT.

“Useful Connectivity”: More than Infrastructure

- **Do countries have the skills and habits to make effective economic use of existing infrastructure?**
  - **Japanese service sector trails many other countries in basic measures of automation and digitalization (e.g., computer use).**
  - **But Japan has some of the fastest broadband networks going;**
  - **Japan has been a major innovator in wireless services.**

- **Connectivity Scorecard is an effort to take into account usage, skills and investments in all types of ICT**
  - **These factors complement broadband deployment.**
  - **Broadband and wireless technologies are key enablers of the digital economy, but they are not sufficient.**

Therefore we focus on ‘useful’ connectivity

i.e. investment in infrastructure, applications, services complementary capital and skills = productivity boost

Account for infrastructure, usage and complementary services and skills

Emphasis
- **on the business sector**
- **on skills**

Different measures for economies at different levels of development

Design based on “economics”

Economic growth and productivity
- **Connectivity as a productivity tool**

Connectivity Scorecard
How we did it – our methodology principles

- **Studied 25 of World Economic Forum's resource and efficiency-driven economies and 25 innovation-driven economies**
- **Indicators grouped into government, business and consumer categories; weighted individually by country**
- **More detail and weighting on business, since it is a key contributor to productivity growth**
- **Relative benchmarked scoring – began in 2008 – now in 3rd year**

Category/Dimension	Sub-categories	Basis for weighting
Consumers	Consumer infrastructure	Contribution to consumer utility
	Consumer usage and skills	
Business	Business infrastructure	Contribution to business productivity
	Business usage and skills	
Government	Government infrastructure	Contribution to government productivity
	Government usage and skills	

Introducing Connectivity Scorecard

2010 results

Implications for Policy

Connectivity Scorecard 2010:

Innovation-driven countries: Sweden is new leader (USA #1 in 2008/09)

Rank	Country [1]	Score	Rank	Country [1]	Score
1	Sweden [2]	7.95	14	Hong Kong SAR [14]	6.10
2	United States [1]	7.77	15	Belgium [17]	6.08
3	Norway [5]	7.74	16	New Zealand [16]	6.07
4	Denmark [3]	7.54	17	Germany [13]	5.77
5	Netherlands [4]	7.52	18	France [15]	5.65
6	Finland [11]	7.26	19	Czech Republic [20]	5.03
7	Australia [8]	7.04	20	Spain [21]	4.79
8	United Kingdom [6]	7.03	21	Portugal [22]	4.45
9	Canada [7]	7.02	22	Italy [19]	4.35
10	Japan [10]	6.73	23	Hungary [23]	4.31
11	Singapore [9]	6.68	24	Poland [25]	4.06
12	Ireland [12]	6.37	25	Greece [24]	3.44
13	Korea [18]	6.33			

- Sweden passed the United States for #1
- US strong performer, but behind the very best in consumer infrastructure
- ICT leadership of Nordic countries: Sweden (1), Norway (3), Denmark (4), Finland (6)
- Korea, Japan excel in consumer infrastructure
- Poor results in southern and eastern European countries (19-25)
- Average Score 6.12

[1] 2009 ranking in parentheses

Connectivity Scorecard 2010:

Resource & efficiency-driven countries: Malaysia top again

Rank	Country [1]	Score	Rank	Country [1]	Score
1	Malaysia [1]	7.14	14	Iran [12]	3.59
2	South Africa [4]	6.18	15	Vietnam [19]	3.42
3	Chile [3]	6.06	16	Sri Lanka [18]	3.18
4	Argentina [7]	5.90	17	China [15]	3.14
5	Russia [6]	5.82	18	Egypt [17]	2.97
6	Brazil [8]	5.32	19	Philippines [16]	2.92
7	Turkey [2]	5.09	20	Indonesia [21]	2.13
8	Mexico [5]	5.00	21	India [20]	1.82
9	Colombia [9]	4.76	22	Kenya [22]	1.80
10	Ukraine [13]	4.67	23	Nigeria [25]	1.78
11	Botswana [10]	4.30	24	Bangladesh [23]	1.69
12	Thailand [11]	4.11	25	Pakistan [24]	1.53
13	Tunisia [14]	3.87			

- Malaysia top scorer for 3rd year in a row, very consistent performance
- Best Latin American performers Chile, Argentina and Brazil retain/improve position
- South Africa's ranks 2nd, helped by strong corporate spending on IT hardware, software and services
- China (17) and India (21) continue to be relatively weak performers
- Average Score 3.89

[1] 2009 ranking in parentheses

Introducing Connectivity Scorecard

2010 results

Implications for Policy

What role for policy?

- **Mobile technology is important, so how best to further its deployment?**
  - **Competition and spectrum availability are key;**
  - **Technological neutrality, don't pick winners and losers ("standards wars");**
  - **Remember that mobile technology has thrived through private investment.**
- **At the same time, don't**
  - **Subsidize inefficient entry;**
  - **Distort investment incentives to favour mobile deployment over other forms of ICT;**
  - **Forget to invest where public investment really matters– education, training;**
  - **Forget to invest in good institutions and rulemaking processes.**

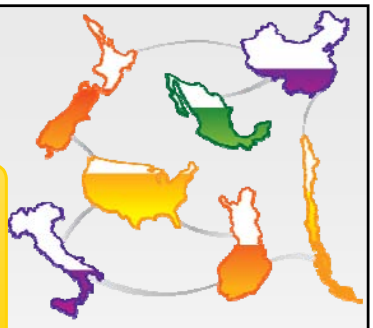
Spectrum policy– avoiding temptation

- The real benefits of making mobile spectrum are in the consumer and business benefits arising from mobile services.
- But governments and too many economists evaluate spectrum allocation policies by looking at revenue-generation.
- This is a serious mistake
  - Auctions are not necessarily efficient if the downstream market is not perfectly competitive;
  - Policies encouraging timely availability of spectrum, avoiding artificial scarcities and encouraging efficient competition and entry in the downstream market will create benefits that dwarf government auction revenue;
- Government control of spectrum is unfortunately one of the last areas in telecoms which gives rise to massive rent-seeking opportunities!

Your questions Please

For further information, link to Connectivity Scorecard online:

www.connectivityscorecard.org

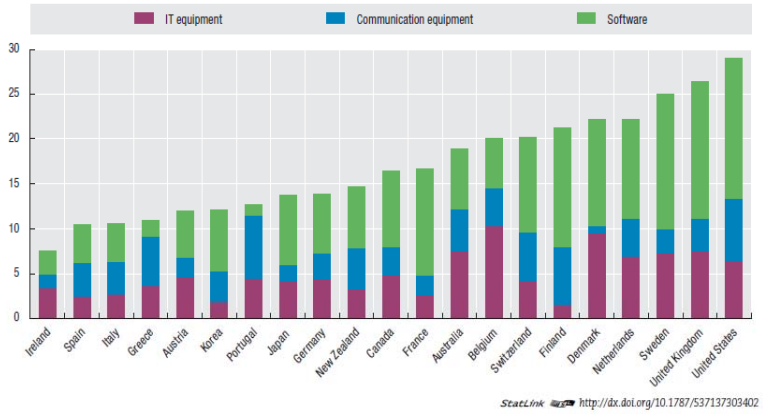


Appendix

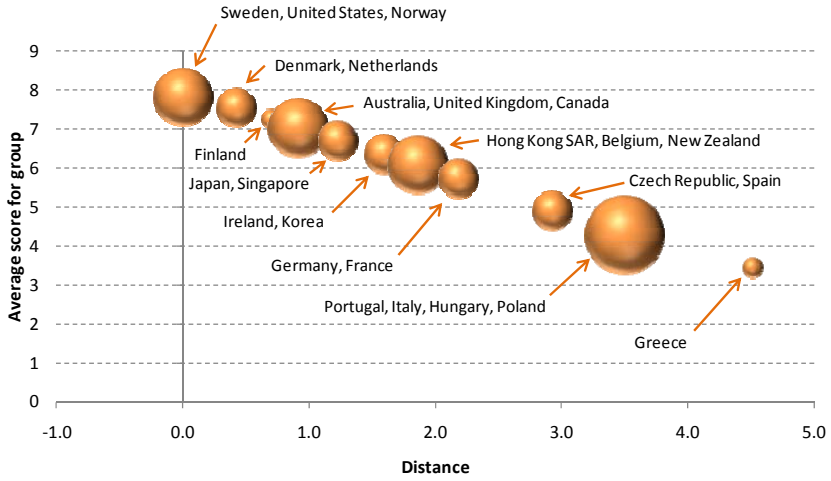
ICT intensity of business investment

Shares of ICT investment in non-residential gross fixed capital formation

As a percentage of total non-residential gross fixed capital formation, total economy, 2007 or latest available year



Source: OECD Factbook 2009



Dissimilarity Index

Rank		Sweden	United States	Norway	Denmark	Netherlands	Finland	Australia	United Kingdom	Canada	Japan	Singapore	Ireland	Korea	Hong Kong SAR	Belgium	New Zealand	Germany	France	Czech Republic	Spain	Portugal	Italy	Hungary	Poland	Greece
1	Sweden	0.00	1.02	0.93	0.96	0.68	0.82	1.02	1.16	0.99	0.97	1.40	1.58	1.36	1.54	1.33	1.34	1.30	1.33	1.83	1.87	2.18	2.12	1.83	2.00	2.53
2	United States	1.02	0.00	1.15	1.03	1.06	1.10	1.04	0.99	0.99	1.48	1.12	1.33	1.69	1.33	1.55	1.17	1.42	1.46	1.91	1.88	2.20	2.14	1.96	2.11	2.50
3	Norway	0.93	1.15	0.00	0.63	0.78	0.73	0.85	0.90	1.07	0.87	1.08	1.38	1.17	1.63	1.45	0.97	1.20	1.28	1.89	1.85	2.07	2.18	1.98	2.11	2.59
4	Denmark	0.96	1.03	0.63	0.00	0.65	0.61	0.83	0.78	1.00	1.12	1.22	1.23	1.46	1.70	1.41	1.05	1.09	1.29	1.76	1.71	1.98	2.08	1.89	2.11	2.51
5	Netherlands	0.68	1.06	0.78	0.65	0.00	0.74	0.90	1.02	0.92	1.06	1.31	1.59	1.29	1.70	1.41	1.18	1.13	1.30	1.84	1.79	2.19	2.09	1.89	2.09	2.52
6	Finland	0.82	1.10	0.73	0.61	0.74	0.00	0.85	0.94	0.95	0.95	0.97	1.32	1.30	1.52	1.18	0.99	1.00	1.05	1.66	1.47	1.90	1.88	1.76	1.94	2.33
7	Australia	1.02	1.04	0.85	0.83	0.90	0.85	0.00	0.75	0.76	1.02	1.10	1.11	1.49	1.41	1.13	0.77	0.94	0.88	1.39	1.38	1.73	1.58	1.41	1.57	1.97
8	United Kingdom	1.16	0.99	0.90	0.78	1.02	0.94	0.75	0.00	1.00	1.19	1.02	0.96	1.74	1.54	1.16	0.80	0.89	1.06	1.43	1.54	1.76	1.78	1.61	1.71	2.13
9	Canada	0.99	0.99	1.07	1.00	0.92	0.95	0.76	1.00	0.00	1.02	1.17	1.31	1.37	1.26	1.22	0.94	0.99	1.01	1.65	1.42	1.96	1.72	1.62	1.84	2.12
10	Japan	0.97	1.48	0.87	1.12	1.06	0.95	1.02	1.19	1.02	0.00	1.41	1.14	1.12	1.45	0.91	1.20	1.03	1.02	1.39	1.41	1.54	1.59	1.30	1.33	1.82
11	Singapore	1.40	1.12	1.08	1.22	1.31	0.97	1.10	1.02	1.17	1.41	0.00	0.92	1.71	0.95	1.12	1.24	1.06	1.00	1.32	1.21	1.28	1.47	1.20	1.44	1.71
12	Ireland	1.58	1.33	1.38	1.23	1.59	1.32	1.11	0.96	1.31	1.14	0.92	0.00	1.56	1.23	0.87	0.74	1.11	1.08	1.12	1.28	1.13	1.34	1.37	1.28	1.67
13	Korea	1.36	1.69	1.17	1.46	1.29	1.30	1.49	1.74	1.37	1.12	1.71	1.56	0.00	1.58	1.53	1.61	1.48	1.52	1.79	1.73	1.85	2.00	1.39	1.66	2.31
14	Hong Kong SAR	1.54	1.33	1.63	1.70	1.70	1.52	1.41	1.54	1.26	1.45	0.95	1.23	1.58	0.00	1.37	1.53	1.42	1.25	1.49	1.41	1.34	1.50	1.19	1.51	1.81
15	Belgium	1.33	1.55	1.45	1.41	1.41	1.18	1.13	1.16	1.22	0.91	1.12	0.87	1.53	1.37	0.00	1.19	0.91	0.78	0.88	0.94	1.12	1.12	0.88	1.07	1.46
16	New Zealand	1.34	1.17	0.97	1.05	1.18	0.99	0.77	0.80	0.94	1.20	1.24	0.74	1.61	1.53	1.19	0.00	0.80	0.91	1.44	1.24	1.52	1.45	1.42	1.48	1.65
17	Germany	1.30	1.42	1.20	1.09	1.13	1.00	0.94	0.89	0.99	1.03	1.06	1.11	1.48	1.42	0.91	0.80	0.00	0.67	1.03	0.96	1.45	1.31	1.15	1.32	1.65
18	France	1.33	1.46	1.28	1.29	1.30	1.05	0.88	1.06	1.01	1.02	1.00	1.08	1.52	1.25	0.78	0.91	0.67	0.00	0.98	0.83	1.33	1.10	0.93	1.18	1.55
19	Czech Republic	1.83	1.91	1.89	1.76	1.84	1.66	1.39	1.43	1.65	1.39	1.32	1.12	1.79	1.49	0.88	1.44	1.03	0.98	0.00	0.88	0.86	0.73	0.67	0.72	1.14
20	Spain	1.87	1.88	1.85	1.71	1.79	1.47	1.38	1.54	1.42	1.41	1.21	1.28	1.73	1.41	0.94	1.24	0.96	0.83	0.88	0.00	1.07	0.81	0.77	1.13	1.25
21	Portugal	2.18	2.20	2.07	1.98	2.19	1.90	1.73	1.76	1.96	1.54	1.28	1.13	1.85	1.34	1.12	1.52	1.45	1.33	0.86	1.07	0.00	0.92	1.12	1.02	1.43
22	Italy	2.12	2.14	2.18	2.08	2.09	1.88	1.58	1.78	1.72	1.59	1.47	1.34	2.00	1.50	1.12	1.45	1.31	1.10	0.73	0.81	0.92	0.00	0.73	0.82	0.89
23	Hungary	1.83	1.96	1.98	1.89	1.89	1.76	1.41	1.61	1.62	1.30	1.20	1.37	1.39	1.19	0.88	1.42	1.15	0.93	0.67	0.77	1.12	0.73	0.00	0.75	1.01
24	Poland	2.00	2.11	2.11	2.11	2.09	1.94	1.57	1.71	1.84	1.33	1.44	1.28	1.66	1.51	1.07	1.48	1.32	1.18	0.72	1.13	1.02	0.82	0.75	0.00	0.79
25	Greece	2.53	2.50	2.59	2.51	2.52	2.33	1.97	2.13	2.12	1.82	1.71	1.67	2.31	1.81	1.46	1.65	1.65	1.55	1.14	1.25	1.43	0.89	1.01	0.79	0.00
	Sum	34.09	35.61	32.74	32.09	33.16	29.97	27.89	29.84	30.29	29.34	29.43	29.66	37.71	34.63	28.00	28.65	27.29	26.79	31.82	31.83	37.00	35.36	31.84	34.97	43.36

Upgrades to US Broadband Networks

Exhibit 3-E: Announced Upgrades to the U.S. Fixed Broadband Network (Millions of households covered)[12]

	Companies	2009	2010	2011
FTTP	• Verizon • Cincinnati Bell • Tier 3 ILECs	• All providers (17.2 million–Sept) • Verizon FiOS (14.5 million–June)	• Verizon FiOS (17 million)	
FTTN	• AT&T • Qwest	• Qwest (3 million)	• Qwest (5 million)	• AT&T U-verse (30 million)
DOCSIS 3.0	• Comcast • Cablevision • Cox • Knology • Time Warner • Charter • Mediacom • RCN	• Comcast (40 million) • Charter (St. Louis) • Mediacom (50% of footprint) • Knology (50% of footprint) • RCN (begin deployment)	• Comcast (50 million) • Cablevision (entire footprint) • Cox (entire footprint) • Time Warner (New York City) • Knology (entire footprint)	

Exhibit 3-H: Announced Upgrades to the U.S. Mobile Broadband Network (Persons covered)[68]

Technology	Companies	2009	2010	2011	By 2013
LTE	• Verizon • AT&T • MetroPCS • Cox		• Verizon (100 million) • AT&T (trials)	• AT&T (start deployment) • Cox (start deployment) • MetroPCS (start deployment)	• Verizon (entire network)
WiMAX	• Clearwire • Open Range • Small wireless Internet service providers (WISPs)	• Clearwire (30 million) • WISPs (2 million)	• Clearwire (120 million)		• Open Range (6 million)

Data, Data, and more Data

- Connectivity Scorecard 2010
  - Began in 2008, now in 3rd year
- Ongoing effort to improve the robustness and representativeness of metrics
  - Looked at ***actual broadband*** speeds (from Akamai) rather than ***advertised speeds*** (OECD)
  - Attempt to address significant inflation in mobile subscriber data eg. use 3G connections as % of total mobile connections, not per 100 inhabitants
- More detailed data on usage
  - e.g. “frequent Internet users” rather than “Internet users”
- Data on business adoption of broadband and websites covers the SME and the large enterprise sectors

Data, Data, and more Data

- Included data on investment in ICT capital assets and in ICT-related R&D as an explicit part of the Scorecard
- Reformed some of the measures on workforce quality previously used
- Capped penetration at 100 % of individuals for countries with reported mobile penetration rates of over 100 %.