The Broadband Bonus:
Accounting for Broadband Internet’s Impact on U.S. GDP

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Motivation

- What is the economic value created by a new good?
  - Potentially large economic effects as a new technology replaces old.
    - In 2001: 45m hh use dial up, 10m use broadband.
    - In 2006: 34m hh use dial-up, 47m use broadband.
  - How much economic value was created through the diffusion of broadband?
    - Internet access is a big industry ($39B in GDP in 2006). Merits attention for its own sake.
    - Questions about the extent of economic gains stemming from the deployment of a new technology.
    - Replacing dial-up creates additional complication.
Our Paper’s Objective

• Provide benchmark estimates for policy discussions
  – Relentlessly quantitative. Assembles best public data.
  – Only examine households, not businesses. Only US.
• Two traditional measures in economics.
  – Revenue growth $\Rightarrow$ GDP growth or producer surplus.
  – Buyer willingness to pay (WTP) $\Rightarrow$ consumer surplus.
• Compare revenue & consumer surplus w/ broadband to what would have happened w/o broadband.
  – Robert Fogel: contribution to growth is contribution above what would have occurred in absence of new technology.
  – Compare with a counter-factual world with only dial-up.
Main Results

- When properly accounted for, the use of broadband in households accounted for approx $20 - $22B in new revenue in 2006, but that is not the same as created value.
  - Approx $15B of newly created value.
  - Approx $8.3B to $10.5B is new revenue for firms.
  - Approx $6.7B to $4.8B is consumer surplus, which is not measured as a part of GDP.
  - Equivalent to approx 1.6% to 2.2% price decline, earlier than measured by official price indices.

- These estimates are much lower than others -- by an order of magnitude. Why?
  - Popular forecasts are not grounded in – or calibrated against – historical data, as ours are.
  - We strictly employ traditional economic methods and Fogel’s conceptualization of the issues.
What Our Calculations Miss

• Growth externalities: not considered by parties during the transaction.
  – Suppliers: Benefit to Cisco from selling more Wi-Fi equipment to users. Benefit to Amazon from additional sales b/c broadband users experience more satisfying service. Benefit to Google from more ad sales b/c users stay on line longer.
  – Users: Unanticipated slowness that one neighbor’s use imposes on another, or benefits that one person’s participation in a p2p network confers on another (as long as there is no membership fee).
  – Still important to account for countervailing effects, however.
Summary of Findings: Suppliers

• Summary: 59% to 54% of broadband revenue is replacement of dial-up & second lines.
  – New revenue is $10.6B in 2006 if price = $40. That is 46% of $22B for households.
  – $8.3B when P = $36, which is 41% of $20.3B.
  – Aggressive conversion (too high) $2.3B lower, while unaggressive (too low) $0.9 higher.

• Not an estimate of profitability.
  – Can see cable is big grower, dial-up ISPs biggest loser. Telco gains small b/c also lose second line.
  – Revenue levels consistent w/ cost estimates for upgrade (e.g., $150-$400 per household).
Summary of Findings: Consumers

• CS approx $6.7B to $4.8B in 2006.
  – 44% or 32% of approx $15B total value created.
  – Aggressive conversion (too high) reduces total surplus by $0.8, while unaggressive (too low) increases $0.6, assuming $40 price, so the estimates are much more sensitive to assumption about pricing than conversion.

• Cautionary notes:
  – No adjustment for inelastic demanders or AOL’s pricing.
  – This data is from ’02. Would recent data from users w/ recent experience show greater unwillingness to give up Broadband?
Implications

• Rural broadband expensive relative to likely benefits.
  – “Broadband for Boondocks”
  – A decade of private-led build-out and retrofit of existing infrastructure by cable co. & local telcos have upgraded everywhere that is cost-viable.
  – Leaves high cost retrofits or green field upgrade.
  – *Billion dollars will not go very far in reaching high-cost households.*

• Next generation of upgrade just starting to happen.
  – Next five years: Either 3G/4G or WiMax.
  – Very unclear how to measure benefits.
Future Work

• Broadband diffusion world wide in need of a similar approach to measurement.
  – Potential for extending simple model to world-wide broadband data.

• Next step: estimate more systematic model of the demand for broadband.
  – Give a sense of the world-wide gains.