Policy Challenges of Cross-Border Cloud Computing

Renee Berry and Matthew Reisman
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Takeaways

• As cloud computing grows, so do the flows of data across borders.

• These flows raise policy concerns…
  – Many of which fall outside “conventional” trade policy.

• Countries are pursuing novel approaches to cooperation…
  – But the policy environment is in flux.
Agenda

- Definitions and market characteristics
  - Export estimates
  - Trade agreements
  - Policy issues
  - Developing country case studies
Definitions

The Cloud: You’re already there.

- Gmail and Yahoo! mail
- Snapfish and Shutterfly
- Google Docs
- iCloud
- Mint.com and TurboTax (online version)
- Spotify (streaming)
- Netflix Instant (streaming)
NIST definition: 5 essential characteristics of the Cloud

- On-demand self-service
- Broad network access
- Resource pooling
- Rapid elasticity
- Measured service
Variations on the Cloud

• 3 types of cloud services: Software as a Service (Saas), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS).
• Public cloud, private cloud, and options in between.
Why Cloud?

• Accessibility
• Customization

• Separates data from device
• Potential cost savings
Who provides cloud services?

- Cloud-only/cloud-based companies
- Traditional software companies
- Hardware + service companies
- Internet service companies
- Largely U.S.-based
So how big is the Cloud, anyway?

<table>
<thead>
<tr>
<th>Table 1 Cloud market estimates and forecasts, 2010 and 2015 ($ billions)¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Gartner</td>
</tr>
<tr>
<td>Forrester</td>
</tr>
</tbody>
</table>


¹ Totals do not include Gartner’s estimates of public cloud revenues from “business process services” and Forrester’s estimates for “business process as a service.”
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Export Estimates: Three Steps

1. Find categories in U.S. export data most likely to contain cloud computing.
2. Estimate cloud computing’s share of transactions in those categories.
3. Do the arithmetic.

Source: Wikimedia Commons
1. Find the categories

<table>
<thead>
<tr>
<th>Category</th>
<th>$ millions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U.S. cross-border exports (2010)</strong></td>
<td></td>
</tr>
<tr>
<td>Computer and data processing services</td>
<td>8,771</td>
</tr>
<tr>
<td>General use computer software</td>
<td>35,040</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>43,811</strong></td>
</tr>
<tr>
<td><strong>Sales of services by U.S. majority-owned foreign affiliates (2009)</strong></td>
<td></td>
</tr>
<tr>
<td>Computer systems design and related services</td>
<td>66,250</td>
</tr>
<tr>
<td>Software publishers</td>
<td>24,982</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>91,232</strong></td>
</tr>
</tbody>
</table>

Source: USDOC, BEA
2. Estimate the cloud shares

<table>
<thead>
<tr>
<th>Category</th>
<th>Global Revenues, 2010 ($ billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PaaS</td>
<td>1.3</td>
</tr>
<tr>
<td>IaaS</td>
<td>2.8</td>
</tr>
<tr>
<td>IT services</td>
<td>793.0</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>(\frac{\text{PaaS} + \text{IaaS}}{\text{IT services}})%</td>
<td>0.5</td>
</tr>
<tr>
<td>SaaS</td>
<td>10.0</td>
</tr>
<tr>
<td>Enterprise software</td>
<td>244.0</td>
</tr>
<tr>
<td>(\frac{\text{SaaS}}{\text{Enterprise software}})%</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Source: Gartner
### 3. Do the arithmetic

<table>
<thead>
<tr>
<th>Category</th>
<th>Cloud + Non-cloud ($ millions)</th>
<th>Cloud share (%)</th>
<th>Cloud ($ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U.S. cross-border exports (2010)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer and data processing</td>
<td>8,771</td>
<td>0.5</td>
<td>45</td>
</tr>
<tr>
<td>General use computer software</td>
<td>35,040</td>
<td>4.1</td>
<td>1,436</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>43,811</td>
<td></td>
<td><strong>1,481</strong></td>
</tr>
</tbody>
</table>

| **Sales by U.S. majority-owned foreign affiliates (2009)** | | | |
| Computer systems design and related services   | 66,250                         | 0.5             | 343                |
| Software publishers                            | 24,982                         | 4.1             | 1,024              |
| **Total**                                      | 257,824                        |                 | **1,366**          |
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WTO

• No GATS commitments on cloud computing *per se*.

• 83 on “computer and related services.”

• 60 on “on-line information and/or data processing.”

Source: Wikimedia Commons
Free Trade Agreements

• Korea—United States
  • Hortatory language: “Parties shall endeavor to refrain from… unnecessary barriers to electronic information flows across borders.”

• Digital products

• TPP: ?

Source: Wikimedia Commons
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Data privacy

- Major area of difference internationally
- U.S. and EU have very different approaches, developing countries in flux
- U.S. approach: self-regulatory overall, sector-specific restrictions
EU Data Privacy Directive

• Standards that all member states must follow in their domestic laws

• Applies to all personal data collected on any individual EU citizen

• Seven core standards for data storage and processing related to: fairness, specific purpose, limiting to what’s relevant, accuracy, destruction once obsolete, security measures, and restrictions on the use of automated processing
U.S. firms and the EU Directive

- Safe Harbor provision
- Variation in member states’ application
- Additional challenges to doing business
OECD Guidelines

- Adopted in 1980
- Attempt to keep governments out of the way and thereby encourage self-regulation
- Basic core principles for governments
- Currently under review
APEC Privacy Framework

- Core principles for providers, not governments
- Data collector accountable for following principles as data move across borders
Security-related policy

- Special sectors
- Contractual obligations
- Security and government access to data
  - PATRIOT Act
  - EU Data Retention Directive
  - Uncertainty in developing countries
- OECD, ISO guidance
Localization requirements

• At odds with the cloud model
• Provider willingness/ability to accommodate varies
• Concrete examples for financial and government data. Concern about proposed/potential broader measures.
• U.S. not immune: recent controversy involving government cloud procurement.
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Cloud Enabling Environment

• Infrastructure
  – Telecommunications
    • Broadband quality, availability, and cost
  – Electricity

• Laws and regulations
  – Data privacy and security
  – Internet filtering (censorship)
  – Intellectual property
Case study: China

- Potential market, not an existing one
- Cloud and the latest 5-Year Plan – indigenous development of the Cloud
- City and company-level investments
- Uncertain policy environment
- Infrastructure challenges
Case study: India

- World’s leading exporter of computer and information services…

- …but is the cloud a threat to the Indian success story?

Source: Wikimedia Commons
Indian cloud suppliers

• Small fries
  • Specialists in specific cloud services
    • Cnergyis, Orangescape, Netmagic

• Big guys
  • Wide range of services
    • Wipro, Infosys, TCS
Challenges

• Infrastructure
  • Unreliable and expensive electricity

• Legal uncertainties
  • Information Technology (Amendment) Act
    • “Reasonable security practices”

Source: Wikimedia Commons
Conclusions

• Cross-border cloud computing is substantial and growing…
• … but the policy environment is still in flux.
• International cooperation across multiple channels is valuable.
• Cloud development is particularly challenging for developing countries…
  – But those countries are not standing still.