Introduction to Economic Globalisation and Empirical Studies

Seminar
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Content

• Digital Economy

• ICT

• Regulations

• Innovation strategies of Germany and China

  Industry 4.0 vs. Made in China 2025
## Old Economy vs. New Economy

<table>
<thead>
<tr>
<th>Example</th>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buying and selling text book</td>
<td>Visit the bookstore</td>
<td>Visit web site for publishers and retailers</td>
</tr>
<tr>
<td>Registering for classes</td>
<td>Walk around campus to Departments, Registrar’s office, etc.</td>
<td>Access campus web site</td>
</tr>
<tr>
<td>Photography</td>
<td>Buy film, use camera, take picture, take it for processing</td>
<td>Use digital camera, smart phone</td>
</tr>
<tr>
<td>Order food delivery</td>
<td>Give a call, wait, pay cash</td>
<td>Online order, Know arrive time, online transfer</td>
</tr>
<tr>
<td>Paying the Transportation</td>
<td>Pay cash, coins</td>
<td>Metro cards, electronic cards, online transfer</td>
</tr>
<tr>
<td>Paying for goods</td>
<td>Visit store, take the item, pay, go</td>
<td>Use self, Online shopping</td>
</tr>
</tbody>
</table>
The definition

• The Digital economy: refers to an economy that is based on digital computing technologies.

• The digital Economy:
  ▪ **E-Business**: The use of electronic technologies to transact business
  ▪ **Collaboration**: People and Organizations interact, communicate, collaborate, and search for information
  ▪ **Information Exchange**: Storing, processing and transmission of information
The components (Thomas Mesenbourg, 2001)

- **E-business infrastructure infrastructure** (hardware, software, telecoms, networks, human capital, etc.)

- **E-business** (how business is conducted, any process that an organization conducts over computer-mediated networks)

- **E-commerce** (transfer of goods)
Influence

Economy
- Growth
- Ageing
- Productivity
- Employment
- Labour substitutions

Individual
- Identity, morality & ethics
- Human connection

Business
- Customer expectations
- Data enhanced products
- Collaborative innovation
- New operating models

Society
- Inequality
- Community

National & Global
- Governments
- Countries, regions & cities
- International security

11/10/2017
New Challenges

- **Market:**
  - The Global Economy and Strong Competition
  - The Changing Nature of the Workforce
  - Powerful Customers

- **Technology:**
  - Technological Innovation and Obsolescence
  - Information Overload

- **Societal:**
  - Social Responsibility
  - Government Regulation and Deregulation
  - Protection Against Terrorist Attacks.
  - Ethical Issues
The dimensions for digital economy development

- **Digital infrastructure**
  - International, national, last-mile connectivity
  - Internet exchange points (IXPs)
  - (Mobile) network operators and internet service providers (ISPs)
  - Global digital firms
  - Governments

- **Digital firms**
  - Local platforms (e.g. social networks, e-commerce)
  - Local enterprise development
  - Data centres
  - Training and capacity-building
  - Global digital firms
  - Data centre providers
  - Venture capital, private equity, other funds
  - Local firms (e.g. media firms)
  - Innovation hubs, incubators
  - Enabling environment for innovative forms of financing

- **Wider digital adoption**
  - ICT adoption/devices
  - Training
  - Local businesses
  - Public institutions and governments
  - E-government investment facilitation
  - Business linkages programmes supporting participation in GVCs

Source: UNCAD WIR 17
Information and Communication Technology (ICT)

• The core of the digital economy is the ICT sector.
• The definition of ICT
• The compounds of ICT
• Two main indicators for the future development of the ICT sector:
  ▪ Venture capital investments in ICTs
  ▪ The development of the semiconductor market (the growth rate of the semiconductor industry)
  ▪ ICT-related patents
  ▪ Research and development (R&D) expenditures
ICT components

Source: http://searchcio.techtarget.com/definition/ICT-information-and-communications-technology-or-technologies
Overview of ICT sector

Share of ICT sector in total value added and sub-sectors, 2013
As a percentage of total value added at current prices

Notes: The ICT sector is defined as the sum of industries ISIC rev.4 26, 582, 61 and 62-63. For Germany, Iceland, Ireland, Japan, Mexico, Poland, Spain, Sweden, Switzerland and the UK, data refer to 2012. For Canada and Portugal, data refer to 2011. For Ireland and the UK, data refer to SNA 93 and were extracted in October 2014. For the rest of countries, data refer to SNA 2008. For Canada, Iceland, Ireland, Japan and Mexico, data for Software publishing are not available, and are therefore not included in the definition. The figure for Switzerland shows the ICT sector share as defined by the OECD (2011a). In this particular case, the share is not totally comparable with the rest of the countries.

Source: Based on OECD, National Accounts Database; Eurostat, National Accounts Statistics and national sources, April 2015.
Value added of ICT


Shares of total value added

Note: The ICT sector is defined here as the sum of industries ISIC rev.4 26, 582, 61 and 62-63. For Germany, Iceland, Ireland, Japan, Mexico, Poland, Spain, Sweden, Switzerland and the United Kingdom, data refer to 2012. For Canada and Portugal, data refer to 2011. For Ireland and the United Kingdom, data refer to SNA 93 and were extracted in October 2014. For the rest of countries, data refer to SNA 2008. For Canada, Iceland, Ireland, Japan and Mexico, data for Software publishing are not available, and are therefore not included in the definition. The figure for Switzerland shows the ICT sector share as defined by the OECD (2011a). In this particular case, the share is not totally comparable with the rest of the countries. For Mexico, data refer to 2003 instead of 2001.

Source: Based on OECD, National Accounts Database, ISIC Rev.4; Eurostat, National Accounts Statistics and national sources,
Employment in the ICT sector and sub-sectors, 2013
As a percentage of total employment

Notes: The ICT sector is defined here as the sum of industries ISIC rev.4 26, 582, 61 and 62-63. For France, Germany, Ireland, Japan, Spain and Switzerland, data refer to 2012. For Mexico, Portugal and Sweden, data refer to 2011. For Ireland, Mexico, Portugal and Sweden, data refer to SNA 93 and were extracted in October 2014. For Canada, Ireland, Japan, Mexico, the Netherlands, Portugal and Sweden, data for Software publishing are not available, and are therefore not included in the definition. The figure for Switzerland shows the ICT sector share as defined by the OECD (2011a). In this particular case, the share is not totally comparable with the rest of the countries.

Source: Based on OECD, National Accounts Database; Eurostat, National Accounts Statistics and national sources, April 2015.
Venture capital investment in ICT

Amount of venture capital invested in Internet-specific companies in the USA
USD billions and year-on-year growth, 4Q moving average

Source: PricewaterhouseCoopers based on Thomson Reuters data
International trade in ICT goods and services

World exports by ICT product category, 2013

Billions of USD and as percentage of total ICT goods exports

Source: OECD, UNCTAD, Bilateral Trade Database by Industry and End-use category (BTDIxE)

11/10/2017
International trade in ICT goods and services

Notes: For Denmark, data refer to 2004 instead of 2001. For Chile, Iceland and Israel, data refer to 2012. For Luxembourg, data refer to 2002 instead of 2001. For Mexico and Switzerland, exports of computer and information services are not included.

Source: Based on UNCTAD, UNCTADstat,
Innovation in the ICT sector

ICT-related patents, 2010-12
As percentage of total PCT patent applications

Notes: Data relate to patent applications filed under the Patent Co-operation Treaty (PCT). Patent counts are based on the priority date, the inventor’s residence and fractional counts. ICT-related patents are defined using a selection of International Patent Classification (IPC) classes. Only economies that applied for more than 250 patents in 2010-12 are included. BRIICS refers to Brazil, the Russian Federation, India, Indonesia, China and South Africa.
Source: OECD, Patent Database
Innovation in the ICT sector

Business R&D expenditures in the ICT sector, 2013 As a percentage of GDP and of total business expenditure in R&D
Infrastructures used to enable communication within and across borders need to be of high quality, accessible to all and available at competitive prices.

They provide a foundation for applications and services based on new business models, the development of e-commerce, enhanced production methods, and new collaborative scientific and social networks.

All these positive outcomes are dependent on building trust in the reliability and security of online networks, services and applications. Users must also be assured that their online privacy and consumer rights are protected.

People must be equipped with the appropriate skills to make use of ICTs and digital processes and to manage risks to their online economic and social activities. Ensuring that all these conditions are met requires a whole-of-government approach.
How

• On the supply side, all countries aim to further develop telecommunications infrastructures and to promote the ICT sector.

• On the demand side, they strive for higher uptake of ICTs by government and by businesses and SMEs in particular. Fostering the development of digital local content creation remains an important goal alongside improvements in public administration, healthcare, transportation and education.

• Strengthening digital security and privacy also ranks high, although the resources allocated to improving digital privacy protection are persistently lower than for security. Countries are also increasingly considering the need to promote ICT-related education, training and re-skilling in conjunction with measures to foster entrepreneurship and employment. In so doing, several countries also aim to further e-inclusion, especially for older people and disadvantaged social groups.

• Governments increasingly use ICTs to achieve public sector transformation and to shift from a citizen-centred to a citizen-driven approach. This trend is reflected notably by their use of social media to communicate and engage with citizens.
All these initiatives challenge existing regulation of established markets and call for balanced policy responses that enable innovation while protecting the public interest.

To maximise the potential of the digital economy for productivity, innovation, growth hand jobs, governments need to do more than encourage broadband expansion and up take of ICTs and the Internet. They must also engage in further and renewed efforts to protect competition, lower artificial barriers to entry, strengthen regulatory coherence, improve
• competition in the digital economy is being challenged by several major shifts including:
  ▪ technical convergence towards Internet Protocol (IP) fixed, mobile and broadcasting networks;
  ▪ increasing integration of business models among telecommunication providers and new Internet players providing over-the-top applications; and
  ▪ offers of bundled voice, video and data services.

• Trust is also critical to economic and social interactions, and especially to virtual relationships conducted in a globally interconnected environment.
National digital strategies

- National digital strategies are cross-sectoral by nature and in many instances are designed explicitly to boost countries’ competitiveness, economic growth and social wellbeing.

- Denmark’s ICT Growth Plan, for example, is designed to support “growth in the ICT sector as well as ICT-based growth in the private sector more generally”.

- Italy’s Strategy for the Digital Agenda 2014-2020 aims to “ensure economic and social growth, through the development of skills in business.

- Japan’s ambitious Declaration to be the World’s Most Advanced IT Nation social values, aims to achieve its goal by 2020.

- the Information Economy Strategy of the United Kingdom intends to “help the UK accelerate in the global race, focusing on [its] strengths”.

Key pillars of national digital economy strategies

- Supply side objectives:
  - Further develop telecommunications infrastructure (e.g. access to broadband and telecommunication services) and preserve the open Internet.
  - Promote the ICT sector including its internationalisation, to public sector including enhanced access.
  - Strengthen e-government services information (PSI) and data (i.e. open government data).
  - Strengthen trust (digital identities, privacy and security).
Key pillars of national digital economy strategies

- Demand side objectives:
  - Encourage the adoption of ICTs by businesses and SMEs in particular, with a focus on key sectors such as (i) healthcare, (ii) transportation and (iii) education.
  - Advance e-inclusion with a focus on the aging population and disadvantaged social groups.
  - Promote ICT-related skills and competences including basic ICT skills and ICT specialist skills.
  - Tackle global challenges such as Internet governance, climate change and development co-operation.
Examples

- The Plan France Numérique plans to invest EUR 150 million (USD 162 million) to support R&D through five strategic digital technologies and services: (i) connected objects, (ii) supercomputing, (iii) cloud computing, (iv) big data analytics, and (v) security of information networks.

- Germany’s Digital Agenda 2014-2017 intends to promote investment in: (i) industrial ICT applications, (ii) IT security research, (iii) microelectronics (iv) digital services. Furthermore, two Big Data Solution Centres have been established in Berlin and Dresden to promote innovation related to big data (i.e. data-driven innovation)in industrial applications (Industry 4.0), science (e.g. life sciences) and healthcare.
ICT and global challenges

- Very few national digital strategies have an international dimension. Among those that do, key issues are Internet governance, climate change and development co-operation.
• Germany has called for multi-stakeholder engagement around issues addressed in the Digital Agenda 2014-2017 and active involvement in international policy debates held at the International Telecommunication Union (ITU), the Internet Governance Forum (IGF) and the OECD. Germany’s Agenda also addresses development co-operation issues such as the need for “cyber capacity building” and “cyber security capacity building” in developing countries. It also calls for the government to examine and consider the potential of digital technologies in Germany’s Africa Strategy.

• Sweden also highlights international development co-operation in its strategy, ICT for Everyone – A Digital Agenda for Sweden. Strategic areas include the role of ICT in societal development with a focus on ICT for global development, and related issues such as research and innovation, ICT for the environment, gender equality, freedom on the net and copyright.
Innovation strategy of Germany & China

• **Industrie 4.0**
  An high-tech strategy which promotes the computerization of manufacturing

• **Made in China 2025**
  An initiative to comprehensively upgrade Chinese industry.
Industry 4.0 is a name for the current trend of automation and data exchange in manufacturing technologies. It includes cyber-physical systems, the Internet of things, cloud computing and cognitive computing.
Design principles

- **Interoperability**: the ability of cyber-physical systems (i.e. work piece carriers, assembly stations and products), humans and Smart Factories to connect and communicate with each other via the **Internet of Things** and the **Internet of Services**

- **Virtualization**: a virtual copy of the Smart Factory which is created by linking sensor data (from monitoring physical processes) with virtual plant models and simulation models

- **Decentralization**: the ability of cyber-physical systems within Smart Factories to make decisions on their own

- **Real-Time Capability**: the capability to collect and analyze data and provide the insights immediately

- **Service Orientation**: offering of services (of cyber-physical systems, humans and Smart Factories) via the **Internet of Services**

- **Modularity**: flexible adaptation of Smart Factories for changing requirements of individual modules
Industrie 4.0 framework

Source: PWC
Impacting all aspect of value chain

Source: PWC
Entire value chain is digitized and integrated

Source: PWC
Made in China 2025

- **Goals (three-stage)**
  - By 2025, a member of the world’s most powerful manufacturing nations
  - By 2035, at the mid-ranking position
  - By 2045/49. at the leading position

- **Five Key projects:**
  - Manufacturing Innovation Center
  - Smart Manufacturing
  - Strong Industrial Bases
  - Green Manufacturing
  - High-end Equipment Manufacturing
Design principles

• Innovation-driven
• Emphasise quality over quantity
• Green Development
• Optimise the industrial structure
• Nurture human talent
## Made in China 2025

### Industrial policy for technological progress

The main targets of Made in China 2025

<table>
<thead>
<tr>
<th>Indicators</th>
<th>2013</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Innovation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share of R&amp;D spending of operating revenue (in %)</td>
<td>0.88</td>
<td>0.95</td>
<td>1.26</td>
<td>1.68</td>
</tr>
<tr>
<td>Invention patents per 100 million CNY total revenue</td>
<td>0.36</td>
<td>0.44</td>
<td>0.7</td>
<td>1.1</td>
</tr>
<tr>
<td><strong>Quality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality competitiveness index*</td>
<td>83.1</td>
<td>83.5</td>
<td>84.5</td>
<td>85.5</td>
</tr>
<tr>
<td>Growth of industrial value-added (in %)</td>
<td>9.7</td>
<td>5.9</td>
<td>7.9</td>
<td>9.9</td>
</tr>
<tr>
<td>Productivity growth (in %, annual average)</td>
<td>7.3</td>
<td>6.6</td>
<td>7.5</td>
<td>6.5</td>
</tr>
<tr>
<td><strong>Digitisation of Industry</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broadband internet (penetration in %)</td>
<td>37</td>
<td>50</td>
<td>70</td>
<td>82</td>
</tr>
<tr>
<td>Use of digital design tools in R&amp;D (penetration in %)</td>
<td>52</td>
<td>58</td>
<td>72</td>
<td>84</td>
</tr>
<tr>
<td>Use of numerical control machines in key production processes (penetration in %)</td>
<td>27</td>
<td>33</td>
<td>50</td>
<td>64</td>
</tr>
<tr>
<td><strong>Environmental Protection</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decrease in industrial energy intensity (in % compared to 2015)</td>
<td></td>
<td></td>
<td>-18</td>
<td>-34</td>
</tr>
<tr>
<td>Decrease in CO2 emission intensity (in % compared to 2015)</td>
<td></td>
<td></td>
<td>-22</td>
<td>-40</td>
</tr>
<tr>
<td>Decrease in water usage intensity (in % compared to 2015)</td>
<td></td>
<td></td>
<td>-23</td>
<td>-41</td>
</tr>
<tr>
<td>Reuse of solid industrial waste (in % of total waste)</td>
<td>62</td>
<td>65</td>
<td>73</td>
<td>79</td>
</tr>
</tbody>
</table>

*Source: Merics reports. State Council, National Bureau of Statistics*
Key Strategic Priority Sectors by Made in China 2025

- New advanced information technology
- High-end computerised machines and robots
- Space and aviation
- Maritime equipment and high-tech ships
- Advanced railway transportation equipment
- New energy and energy-saving vehicles
- Energy equipment
- Agricultural machines
- New materials
- Biopharma and high-tech medical devices
Data sources

• Committed to connecting the world ITU:

• OECD
• UNCTAD
• World Bank
• Eurostat
References

Thank You
for
Your Attention!