A CAICT Approach to Measuring Digital Economy: Definition, Methodology and Key Findings

Dr. Sun Ke

Senior Engineer , China Academy of Information and Communication Technology
sunke@caict.ac.cn

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Definition

The Concept and Components of Digital Economy

Digital Economy：It is a new economic form, which takes the information and digital coding of knowledge as the basis, takes the digital resources as the core factors of production, takes the Internet as the main carrier, be integrated closely with other areas by using digital technology . Digital economy includes the information industry and the improvements on traditional industry by using information and communication technology (ICT) as main content.

Features：

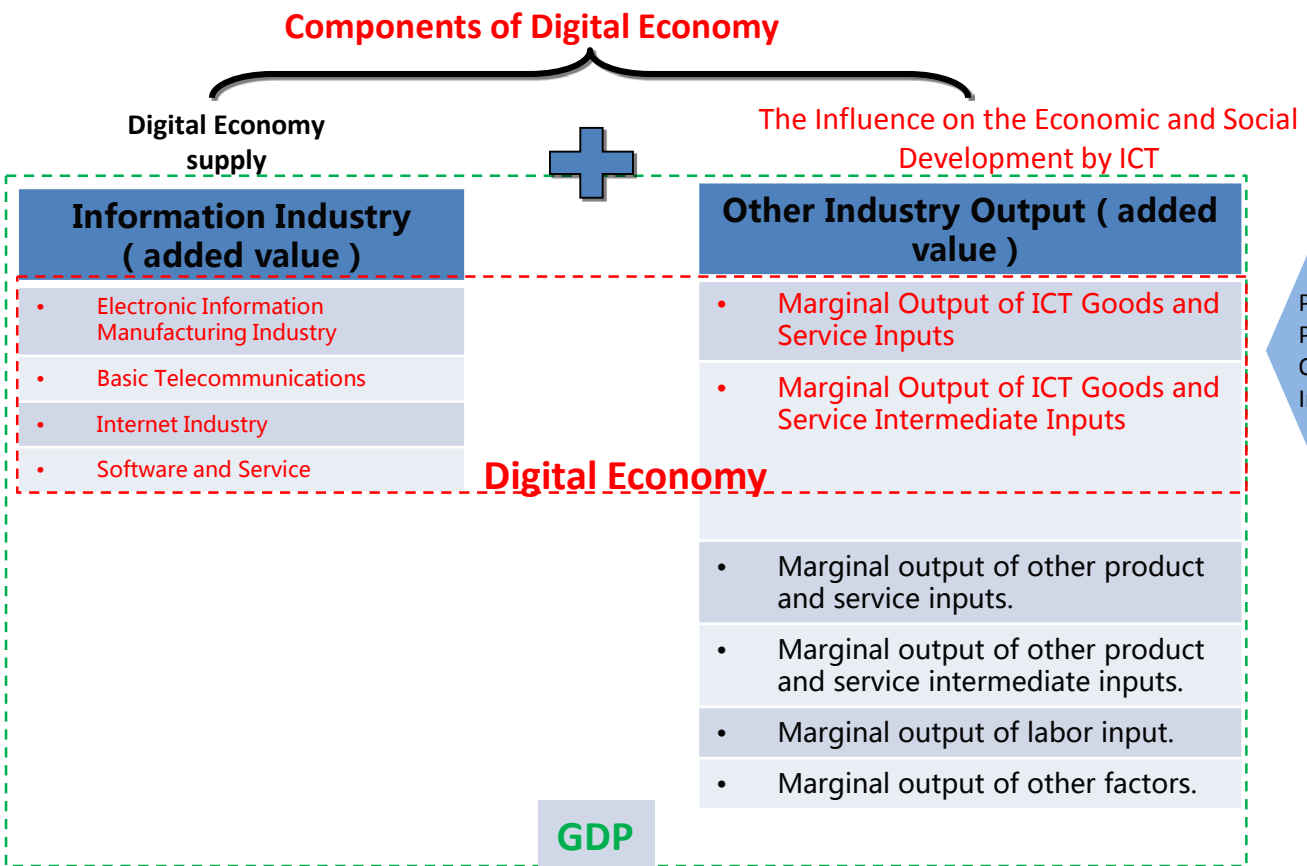
（1）The information and digital coding of knowledge is the basis，all kinds of information must be saved, processed and transmitted in digital form；

（2）Digital resources become important factors of production, the same important as capital and labor;

（3）Internet is the main carrier of digital economy development. And the orientation of the integration of other areas and the development of digital economy is the same；

（4）Digital economy can be divided into two portions--- ICT industry supply and the influence on the economic and social development by ICT.

The Concept and Components of Digital Economy



Methodology

Methodology

1. The supply apart of digital economy

The added value of the supply apart of digital economy =

- the added value of electronic information manufacturing industry + — The added value of electronic information manufacturing industry equals the output value of electronic information manufacturing industry multiply by the Value added rate
- the added value of basic telecommunication industry + — the added value of basic telecommunication industry equals the income of basic telecommunication industry multiply by the Value added rate
- added value of internet industry + — the added value of internet industry equals the income or output value of internet industry multiply by the Value added rate
- the added value of soft service industry — the added value of soft service industry equals the income of soft service industry multiply by the Value added rate

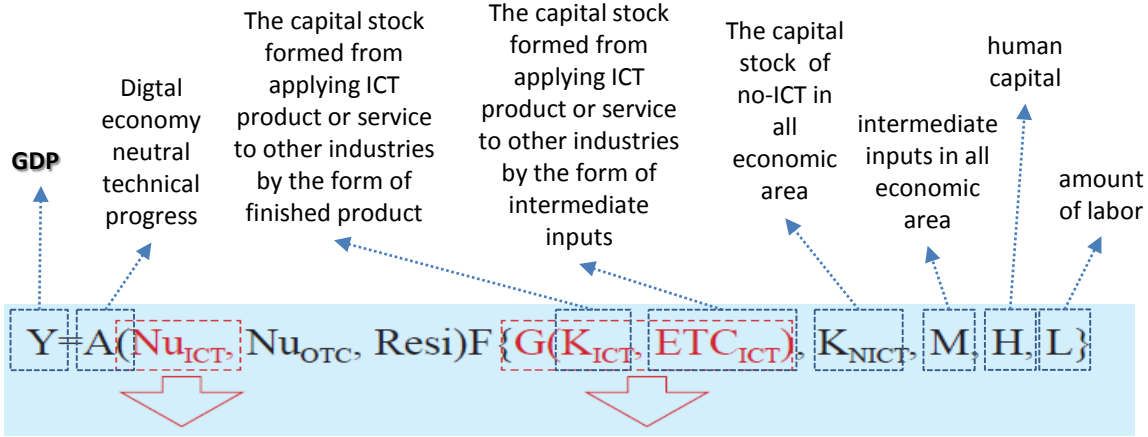
Data source:(1) output value of industries comes from National Bureau of Statistics of China and Ministry of Industry and Information Technology; (2) Value added rate calculated by the input-output table

Methodology

2 The Influence on the Economic and Social Development by ICT

The added value of impact of ICT technology on economy and society **=** the added value of output increased and efficiency improved by applying the products and service of ICT to other area

The framework of growth accounting



Where:

- Resi stands for residual term ;
- F stands for a functional form , it could be a C-D function、D-S function or CES function

Methodology

（2）Calculation of key indicators

（a）GDP

The GDP in calculation is Real GDP, and it follows that

Real GDP = Nominal GDP / GDP Deflator

where Nominal GDP and GDP Deflator comes from each country's official statistics

（b）K_{ICT}

There are six steps to calculate K_{ICT}（ICT capital stock）:

①Define the ICT Investment（I_{ICT}）

Category	Computer	Communication Device	Software
Items	Computer Manufacturing	Radar and Ancillary Equipment Manufacturing	Public Software
	Computer Network Equipment Manufacturing	Communications Transmission Equipment Manufacturing	Others
	Computer Peripherals Manufacturing	Communication Switching Equipment Manufacturing	
		Communication Terminal Equipment Manufacturing	
		Mobile Communications and Terminal Equipment Manufacturing	
		Other Communications Equipment Manufacturing	
		Television Program Production and Transmission Equipment Manufacturing	
		Television Reception Apparatus and Equipment Manufacturing	

The data of ICT Investment sources from each country's official statistics.

Methodology

(b) K_{ICT}

②Determine Methodology and Data Source of ICT Investment (I_{ICT})

$$IO_{t1} \times (1 + INF_{t1t2} + \gamma) = IO_{t2}$$

$$\dot{\gamma} = \dot{IO} - \dot{INF}$$

Where,

IO_{t1} is the benchmark value of the initial Input-Output Table

IO_{t2} is the benchmark value of the final Input-Output Table

INF_{t1t2} is the growth rate of domestic demand from initial to final year (Domestic demand=production-export+import)

IO is the average annual growth rate of actual investment between interval years

INF is the average annual growth rate of domestic demand between interval years

r is the conversion coefficient

Source: Input-Output Table comes from each country's official statistics department

③Determine ICT Investment Years and Depreciation rate (r_{ICT})

Country	Depreciation rate	Sources
China	Computer 0.3119；Communication Device 0.2644；Software 0.315	National Bureau of Statistics of China、CAICT
US	Computer 0.3119； Communication Device ：Business 0.1500，Others 0.1100；Software：Business 0.5500，Commissioned 0.3300	BEA
UK	Computer 0.315；Communication Device 0.115; Software 0.315	KLEMS database of EU
Japan	Computer 0.4377；Communication Device 0.3187；Software 0.3690	"ICT Economic Analysis Report" of Japan's Communications Ministry

Methodology

(b) K_{ICT}

④ Calculate ICT Investment Price Indices ($\lambda_{i,t}$)

Set US as the benchmark county; ICT Price Indices of Investment (constant 2000) :

$$\lambda_{i,t} = f\left(\Delta lnP_{i,t}^{U} - \Delta lnP_{K,t}^{U}\right)$$

Here the data of US sources from BEA, $\lambda_{i,t}$ is predicted difference value of US ICT capital input and non-ICT capital input. $\Delta lnP_{i,t}^{U}$ is the difference value of US non-ICT price index of fixed investment. $\Delta lnP_{K,t}^{U}$ is the difference value of US ICT price index.

⑤ Calculate actual ICT investment (Real I_{ICT})

$$\text{Real } I_{ICT} = I_{ICT} / \lambda_{i,t}$$

⑥ Calculate K_{ICT}

Use Gold—Smith Perpetual inventory Stock Method to calculate :

$$K_{ICT\{t+1\}} = I_{ICT\{t\}} + (1 - \lambda_{i,t}) * K_{ICT\{t\}}$$

Methodology

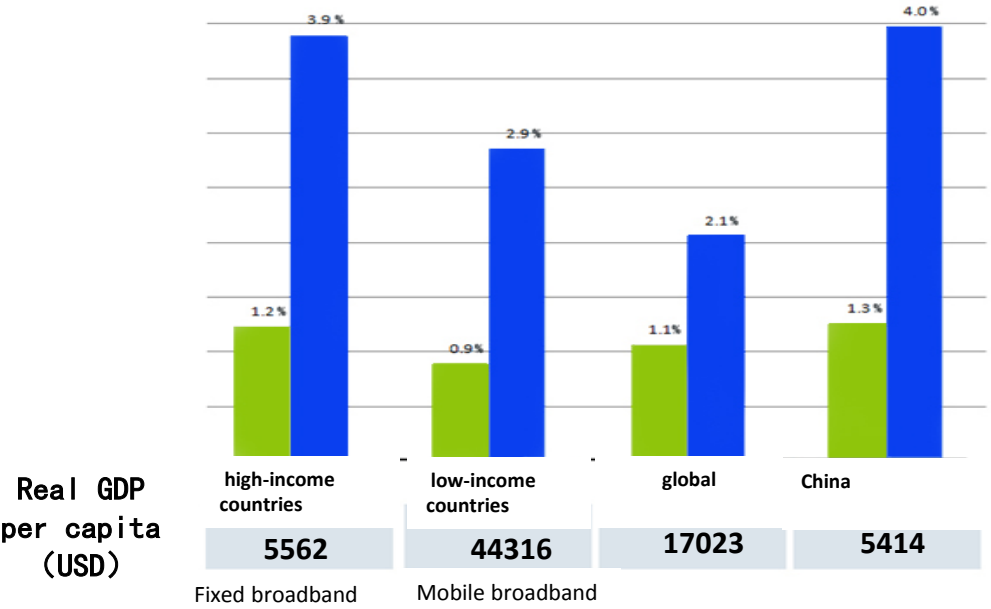
(3) Other Indicators

- M (Intermediate input) is calculated with total output and Input-Output Table, which data sources from each country’ s official statistics .
- H stands for human capital stock, which is divided into primary school, junior middle school, high school, graduate degree. The data of China, Japan and UK comes from their National Bureau of Statistics, and data of US comes from BLS.
- L is labor quantity which comes from each country’ s National Bureau of Statistics.

Key Findings

The Contribution of ICT to Total Factor Productivity (TFP)

Figure: The Contribution of ICT to TFP



Note: The Chinese influence coefficient is calculated by the low-income countries and high-income countries with income levels coefficient regression trend. Real GDP per capita contains 97 countries,including 68 low-income countries and 27 high-income countries. Veritical axis in the figure represents TFP growth raised when the penetration rate increased by 10%.

China ICT technology and TFP

Fixed broadband :

Each 10% increase makes TFP increase of 1.3%

Mobile Broadband :

Each 10% increase in Penetration rate makes TFP increase of 4.0%

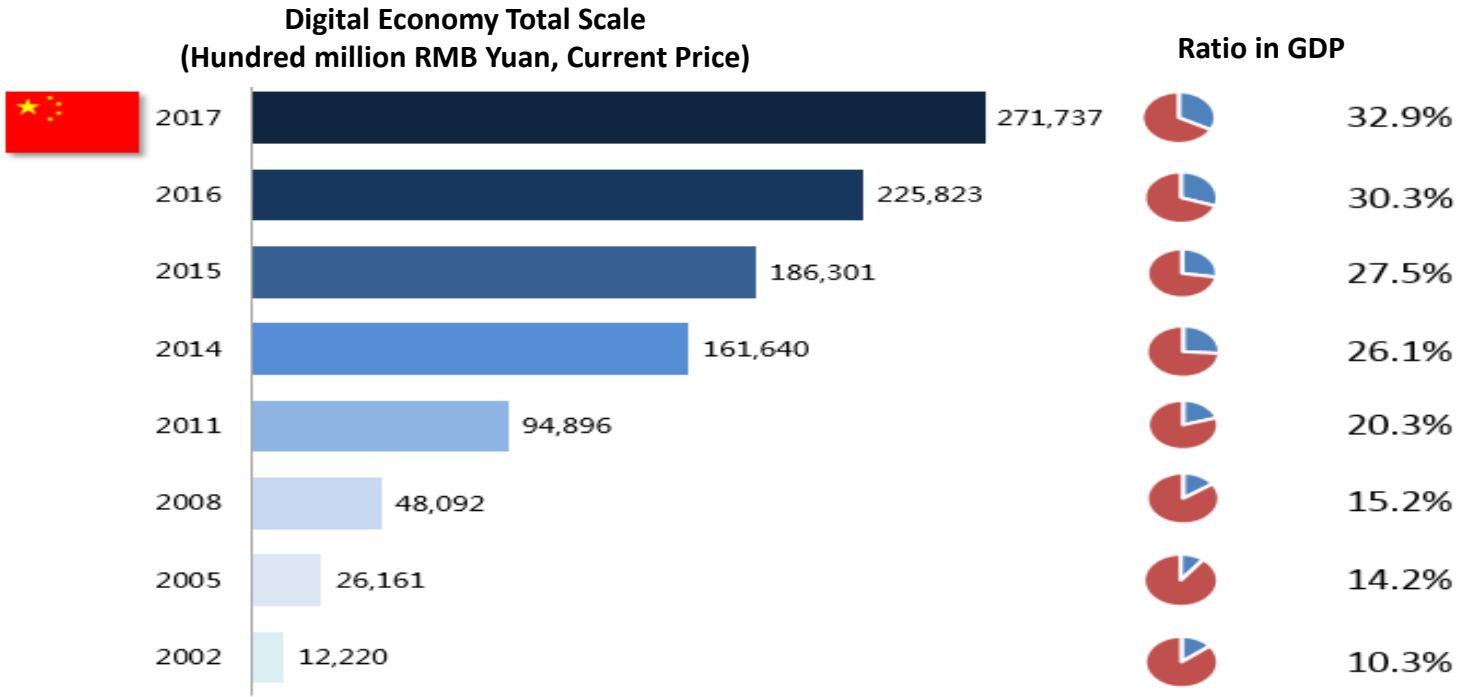
China VS Global

The promotion to TFP is negatively correlated to the economic level.

The promotion to TFP by ICT technology in China is significantly higher than the global average.

Amount of Digital Economy (China)

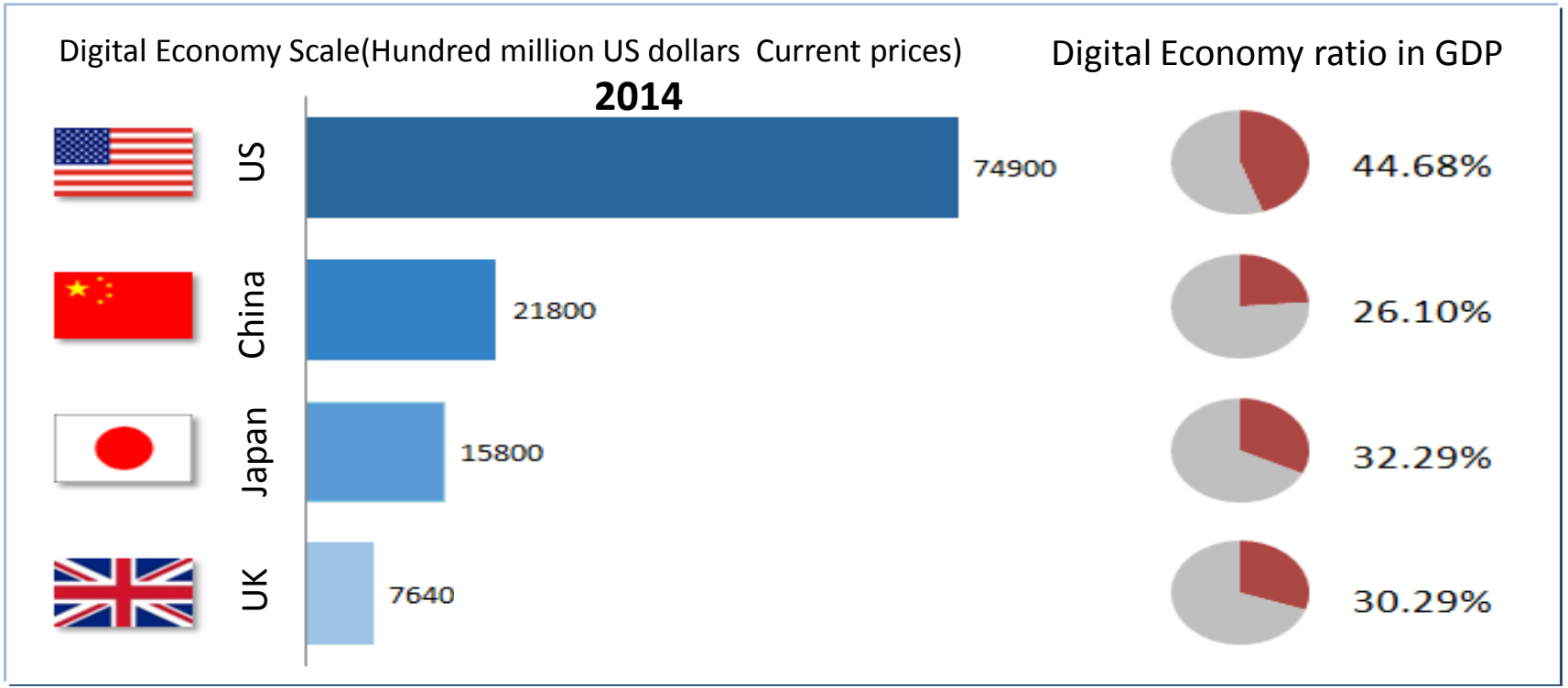
In 2017, China's digital economy has reached 27.2 trillion Yuan .



Digital Economy proportion of GDP continuously improving. From 2002 to 2017, the proportion increased by 22.6 percentage points.

Amount of Digital Economy (Typical Countries)

US leading global digital economy , accounting for up to 44.7% of GDP . Chinese digital economy scale has surpassed Japan and the United Kingdom , but the proportion of GDP has a large gap compare with the other three countries .



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中国信息通信研究院

THANK YOU!