Firms and Markets

The ICT Landscape in BRICS Countries
3. China (*)

Jean-Paul SIMON (**)
European Commission, JRC-IPTS, Sevilla (***)

With an area of 9 596 960 square kilometers (3 696 000 square miles) and a population of 1 328 000 inhabitants (2008), the People's Republic of China is the most populated country in the world and the largest country in Asia as well as being the third largest in the world, next to Russia and Canada.

During the past 3 decades, the Chinese government has been fostering a dual economic structure that has evolved from a socialist, centrally planned economy to a socialist market economic system, with a rapidly growing private sector. Since the early eighties China has been through accelerated reforms and economic growth, while opening its doors to global trade, commercial agreements at WTO and outside WTO, and to foreign direct investment (FDI) flows. China is becoming the manufacturing engine of the world and is now a major player in the global economy. China's GDP has achieved a more rapid growth than most countries in the world. [1] In real

(*) This is the third article of a series on ICT in emerging economies based on IPTS research. The IPTS prepared reports on ICT in BRIC countries. A first report focuses on Brazil, India and China, available at: http://is.jrc.ec.europa.eu/pages/ISG/PREDICT/BRIC.html. A second report will deal with Russia and South Africa (forthcoming). All the data unless specified otherwise come from JRC-IPTS China Report.

(**) The views expressed are those of the presenter and may not in any circumstances be regarded as stating an official position of the European Commission.

(***) IPTS (the Institute for Prospective Technological Studies) is one of the seven research institutes of the European Commission's Joint Research Centre.

1 It will overtake Japan by the end of 2010 according to the Unesco Science Report 2010, at 379.

prices, China's average annual growth rate has reached 9% for the period of 1978-2008. China is the second biggest trade partner of the EU (after the USA) whilst the EU itself is China's most important trade partner (2007) accounting for 6% of EU27 exports and 16% of EU27 imports.

The size of the ICT sector

The ICT sector is representative of the massive changes in the Chinese industry and economy. It has developed a strongly growing manufacturing arm, with large inward and outward FDI flows and export-led activities. Since China's economic reform and opening-up in 1978, China's information and communication technology (ICT) manufacturing has been growing rapidly [2]. The ICT sector rose as a pillar of the Chinese economy. The sector has seen a very rapid growth from 2000 to 2004 with a growth rate of 45% per year (in value). From 2005 to 2007 it became a steady 20% growth. However since 2008, it has been through a sharp slowdown with a growth rate reduced to 5%. Manufacturing dominates China's ICT industry. A total of 80% of the ICT industry revenue comes from computer systems, electronic elements & components, communication equipment and home audio and video products. For the period 1978-2006, at current prices, the annual average growth rates of value-added in ICT manufacturing was 25.8%, much higher than the 15.84% and 15.86% annual average growth rate of GDP and industry during the same period (NBSa, 2007). As of 2006, the value added of the total ICT sector has increased to €176.2 billion. [3] China has become the world's largest producer of ICT products (exports of ICT increased fourfold between 2004 and 2008)..

In 2006, the ratio total value added of ICT to GDP was 8.4%. The ICT manufacturing represented 4.48% of the GDP: 1% for wholesale of computers, computer peripheral equipment and software, 2% for telecommunications, and 0.82% for the software industry. In 2009, China produced 49.9% of phone handsets, 60.9% of PCs and 48.3% of colour TVs for the world [4]. China's ICT sector has played an increasingly important role

[2] Data for mainland China only, not including Hong Kong, nor Taiwan.

[3] It does not include the value added of "Wholesale of electronic and telecommunications parts and equipment", "Renting of office machinery and equipment" and "Computer and related activities", but value added by the software industry is included.

[4] Professor Yang Yang, Shanghai Research Center for Wireless Communications (WiCO). Presentation at the IPTS BRICS workshop, Johannesburg, October 5, 2011. In 2007: 65% of monitors, 58% of program-controlled switchboards, and 57% of digital cameras.

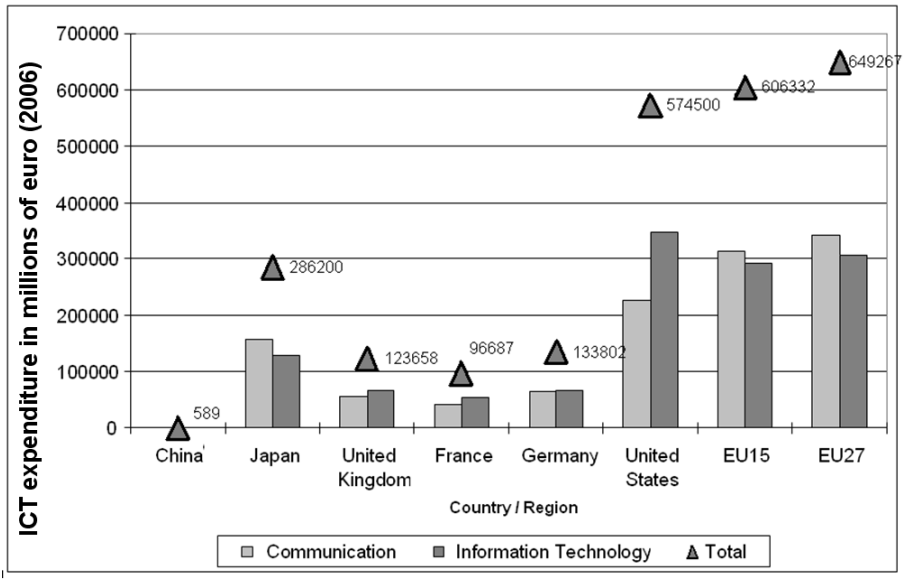
in China's industry, the total economy and international trade. In terms of industry segments, the sub-sector that made the greatest contribution to the whole industry is the manufacture of electronic valves, tubes and other electronic components (NACE Code 3210), followed by the manufacture of office, accounting and computing machinery (NACE Code 3000) and the manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy (NACE Code 3220).

For the period 1979-2006, the annual average growth rates of employed people amounted to 6.87% for ICT manufacturing, above the 3.77% annual average growth rate of industry as well as above the 2.36% growth rate of the total economy during the same period (MIIT, 2008; NBSa, 2007). The number of employed people in the ICT sector reached 7.6 million (1% of total employment and an annual average growth rate of 6.87% in ICT manufacturing for the period 1978-2006). Within the Chinese ICT sector, foreign funded companies made up a large portion of the total number of enterprises (51%), the gross industrial output value (82%) and the value-added of industry (77%). The majority of national enterprises were privately-owned (27%), rather than state-owned and state-holding (22%).

China's ICT manufacturing is characterized by the regional concentration of its production and export. The eastern region contributed the most to China's ICT manufacturing, particularly in Guangzhou. Large-sized enterprises and joint venture enterprises play a most significant role in industry at large. China's software industry continues to grow rapidly, with an increase in revenues from 6.3% as of 2001 to 11.7% as of 2008. There were 14 373 firms in China's software industry (85.84% domestic). Huawei, ZTE and Digital China were the 3 leading software companies in 2008 (with respective revenues of €5.43 billion, €2.52 billion and €1.08 billion) from software. [5] In most Chinese reports and statistics, the ICT industry in China is presented as composed of the Communication Industry and the Electronic Information Industry. However, despite the extensive growth within the Chinese ICT industry in the past three years, the overall market size is small compared to countries such as Japan, Germany and the US. For example, ICT expenditure in China is less than 1/20th of that of Germany (figure 1). By the same token, China has the lowest ICT expenditure in millions of Euros. The ICT expenditure / GDP * 1000 coefficient is 0.3 for China whilst it is 64.7 for EU15. This clearly leaves a lot of room for the potential growth of China's ICT sector.

[5] JRC-IPTS China Report, p. 36, source: MIIT, 2010.

Figure 1 - ICT expenditure / GDP & GDP per capita in $US (2006)



Exchange rate: 1US$ = 7.8087 RMB (from National Bureau of Statistics of China, end of 2006).

Source: S.Pascal, Eurostat
http://www.miit.gov.cn/n11293472/n11293832/n11294132/n11302737/index.html

The major ICT players

Table 1 lists the top 20 ICT firms operating in China according to the revenues from their core business.[6] The total revenue and employment of the top 20 China ICT firms accounts for €139.4 billion and 1.2 million employees in 2006. It shows the major role of foreign funded firms. Asian enterprises are dominant in the number of firms, revenues and trade flows, foreign-funded firms from Europe and United States dominate the technology progress, R&D activities and productivity. Domestic firms contribute much to the total employment in the ICT industry. Most MNCs build their factories in China to benefit from cheap labour and other resources. Many domestic enterprises produce low value-added, low technology, non-brands, and labour-intensified ICT products for foreign companies because of the lack of core technology and competitiveness.

[6] Revenue from core business refers to operating income achieved from major production and business activities for enterprises (group).

However, some Chinese ICT firms, such as Huawei Technology Co., are accumulating and increasing technological advantage over their overseas competitors and ranking among the most important providers for some ICT products for the global market.

Telecommunications services

By 2010 the total number of subscribers (fixed, mobile and Internet [7]) exceeded 1.14 billion: China ranks "top of the world". China is the world's largest mobile market and hit 900 million customers in April 2011. [8] However, telecom revenues are, just like in more mature western markets, suffering from a fast decrease. The compound growth rate from 1998 to 2008 reached 17.2% but plummeted to 3.9% after. The ratio revenue to GDP after reaching an historical peak of 3.5% in 2002 was 2.7% in 2008 because of fast declining tariffs (they fell by 58% between 2003 and 2008). However, mobile operators are still adding over 8 million subscribers each month. China is already achieving another world record for the deployment of mobile 3G networks making 3G service available in one year. The customer's base reached 15 million in 2009 but was expected to rise to 50-60 million over 2010. [9] China aimed to have 150 million 3G mobile users by 2011. [10] China Unicom is now adding more 3G customers than 2G customers. [11] The key success factors are new contents (mostly music) [12] and applications, proper tariff and new devices such as data cards, network laptop and smartphones. China is set to become the world's largest smartphone market in 2012, according to research firm IDC [13].

---

[7] A 29% increase over 2009. Internet users increased 16 times over 8 years reaching 384 million in 2010: 29% penetration. Source: China Internet Network Information Center (CNNIC), 346 million broadband users and 233 mobile internet users.

[8] MIIT, "Operation of China's Telecommunication industry", 24 May, 2011. http://www.miit.gov.cn/n11293472/n11293832/n11293907/n11368223/13767994.html

[9] Source: CHEN JINQIO, MIIT Statistics. GSMA Mobile Briefing 26 November 2010 reported 38.64 3G users by the end of October (China Mobile 16.98, China Unicom 11.66). EITO Special Report (2011) gives almost 84 million for 2011, China pp. 24-29.

[10] According to a Xinhua report quoted by Mobile Business Briefing 26 November 2010.

[11] GSMA Mobile Business Briefing, 20 October 2010.

[12] €3.58 billion for mobile phone content, the largest segment of China's digital publishing industry.

[13] While Brazil and India are forecast to enter the top five markets by 2016. Quoted by Mobile Business Briefing, 16 March 2012.

Table 1 - Top 20 ICT firms in China, 2006 (ranked by revenues from principal business)

Rank	*Company*	*Revenue (Bn Euros)*	*Employment (Heads)*	*Nationality*	*Registr. Status*	*Subsector/main products*
1	China Mobile Communications Corporation	29.42	138,368 a	PRC	State holding	Telecom
2	China Telecom Corporation Ltd.	17.49	243,072	PRC	State holding	Telecom
3	Hongfujin Precision Industry (Shenzhen) Co., Ltd.	15.64	131,864	Taiwan, China	Solely owned	Computer peripheral equipment
4	China Unicom Ltd.	9.62	463,000a	PRC	State holding	Telecom
5	Motorola (China) Electronics Ltd.	8.50a	16,987a	USA	Solely owned	Mobile phones, walkie-talkie, wireless communication equipment
6	Nokia (China) Investment Co., Ltd.	7.79	3,496	Finland	Solely owned	Mobile phones, digital program-controlled switchboards
7	Huawei Technology Co., Ltd.	6.56	35,673	PRC	Private owned	Program-controlled switchboards, software
8	Fu Tai Hong Precision Industry Co., Ltd.	5.24	60,834	Taiwan, China	Solely owned	Mobile handset accessories
9	Inventec Technology Co., Ltd.	4.60	10,221	Taiwan, China	Solely owned	Notebooks, enterprise servers, storage products, wireless communications, network applications, consumer mobile devices, & wireless solutions
10	Hisense Group Co., Ltd.	4.34	12,924	PRC	State holding	Color TV, cell phone
11	Shanghai Dafeng Computer Co., Ltd.	3.81	6,948	Taiwan, China	Solely owned	Notebook computers, servers, mobile phones, LCD monitors, LCD TVs & other IT products.
12	Shanghai Dagong Computer Co., Ltd.	3.79	7,515	Taiwan, China	Solely owned	Computer and notebooks
13	Lenovo Information Products (Shenzhen) Co., Ltd.b	3.50	4,563	USA	Solely owned	Commercial desktop computers, multimedia computers, notebook computers
14	Shanghai Daye Computer Co., Ltd.	2.80	5,084	Taiwan, China	Solely owned	GSM mobile phone & accessories; micro-computer & accessories

15	Lenovo (Beijing) Co., Ltd. b	2.78	4,130	USA	Solely owned	Electronic computer & components, computer peripherals, software, information systems & networking products, electronic information productions.
16	Flextronics Industrial (Zhuhai) Co., Ltd.	2.77	11,040	USA	Solely owned	PCBA(PCBA=Printed Circuit Board +Assembly)
17	Panda Electronics Co., Ltd.	2.74	11,629	PRC	State holding	Wireless base stations, program-controlled switches, colour TV, cell phone
18	Qun Kang Science and Technology (Shenzhen) Co., Ltd.	2.73	16,020	Taiwan, China	Solely owned	Display production, electronic components, semiconductors & components, product-specific materials
19	Beijing Sony Ericsson Putian Mobile Communications Co., Ltd.	2.69	10,444	Sweden/ Japan	Joint venture	Mobile
20	LG Philip LCD (Nanjing) Co., Ltd.	2.60	6,056	Korea	Solely owned	LCD Monitor

(a) Data on revenue and employment of China Mobile Communications Corporation and China Unicom Ltd. for 2008, Data on Motorola (China) Electronics Ltd. for 2007.

(b) Both Lenovo Information Products (Shenzhen) Co., Ltd. and Lenovo (Beijing) Co., Ltd. belong to Lenovo Group. According to the origins of registered capital, Lenovo Group is classified as an American firm.

(c) Firms' nationalities are attributed on the basis of the nationality of the controlling owner of its registered capital.

(d) State-owned enterprises (SOEs) are non-incorporation economic units which are funded completely by the State which owns all assets. State-funded corporations (SFCs) are mainly funded by the State as the controlling owner of all assets. State-owned joint-operation enterprises are funded partly by the State acting as an ordinary owner rather than a controlling one. Enterprises with funds from Hong Kong, Macao and Taiwan refer to all enterprises with funds from Hong Kong, Macao and Taiwan. Foreign Funded Enterprises (FIEs) refer to all industrial enterprises with foreign funds. The latter two subcategories must be registered as the joint-venture, cooperative, sole (exclusive) investment enterprises and limited liability corporations.

Source: LING WANG et al. *(2012)*

The first cable systems in China were the Industrial Community Television or "factory zone TV" within a factory zone (or Dan Wei in Chinese), which was the basic unit of local community during the period of planned economy. [14] In 1991, local governments and the state-owned factories were allowed to invest in the building of cable networks. Those local-government owned networks were regulated by the local Ministry of Broadcasting, Radio and Film branches, which also started to build their own citywide cable network. However, no private companies were allowed to invest in the Chinese cable infrastructure. Since 1999 several attempts have been made to modernize and change the structure of the market but with mixed results.

By the end of 2005, China still had some 1 200 cable operators. The State Administration Radio, Film and Television (SARFT) planned to hook up 30 million digital TV subscribers by 2005 and to complete the coverage by 2010. However, after nearly 10 years, less than 35% of cable subscribers were digital by the end of 2009, [15]. So far, the household cable penetration had reached 44% nationwide (end of 2009).

The Chinese administration is now encouraging more convergence between telecom and cable (so called "three networks convergence") to stimulate the broadband market with new channels. It is regarded as one of China's strategic policies in response to the global financial crisis (State Council, 2010). If cable companies, once authorised, can make inroads into the telecom market, it remains to be seen whether the specificity of TV regulation and control in China may hinder this development of converged services altogether. The regulatory bodies (MIIT, [16] SAFRT) remain separated.

---

14 This section is based on CHUN Liu, "Mapping the future of China's telecommunications regulatory regime: a layered perspective", paper presented at the 38th TPRC 2010, Washington, 3-5 October and at CPR South Fifth, Xi An, 6-8 December, 2010.

15 See SARFT's statistics.
http://gdtj.chinasarft.gov.cn/showtiaomu.aspx?id=8db2a88e-5fd7-447f-8f9f-0f1aedfa6000

16 MIIT was established in March 2008 by merging the previous MII, the Commission of Science Technology and Industry for National Defence of the People's Republic of China (COSTIND), the State Council Office of Developing Information Society, and some offices of PRC National Development and Reform Commission (NDRC). The MIIT became the leading player/ regulator when the market structure was reorganised and the market split between three national wide carriers: China Mobile, China Telecom and China Unicom.

Box 1 - Internet companies: moving to the top

Tencent, Baidu and Alibaba.com are now ranking now 4, 6, 12 among the Top Global 15 Publicly Traded Internet Companies by Market Value in 2010. These companies were not even listed in 2004 as Alibaba, Baidu went public post 2004.

Tencent

Founded in 1998. Momentum continued as revenue rose 55% Y/Y, driven by IVAS (Internet Value Added Services) growth of +57% Y/Y (now ~79% of total sales) and MVAS (Mobile Value Added Services) growth of +56% Y/Y (13% of sales). Market value of US$ 41 billion and revenues of US$ 1 822 million in 2010.

Online game sales supplied the majority of IVAS growth (+67% Y/Y to 49% of total sales) as titles such as CrossFire and QQ Speed reached record usage levels (measured by concurrent users). Tencent blends, in unique fashion, revenues from social networking, virtual goods (it accounts for 29% of the market shares of the top 10 companies by virtual goods revenues [(*)], 2D and 3D worlds/ gaming venues. The firm derived $1.4B of virtual goods revenue (from users customizing their avatars / purchasing game items…) in 2009. As the largest social network in China with 637 million active IM users, it outgrew Facebook (620 million visitors) in 2010.

Online ad revenue maintained healthy growth (+30% Y/Y) and continued to expand its advertiser base following the momentum gained during the World Cup in June and July.

Base of 198 million average monthly unique users.

Baidu

Paid search revenue growth accelerated to 76% Y/Y, as online advertising customers increased 26% Y/Y (to 272K, <1% of total SMEs in China, leaving room for ample upside) and advertiser ARPU rose 41% Y/Y as large corporate customers continued to increase their online marketing spend. Market value of US$ 39 billion and revenues of US$ 641 million in 2010.

Operating margin (56%) improved 2ppts Q/Q and 12ppts Y/Y, owing to pricing power vs. search advertising competitors and fixed-cost leverage over bandwidth and infrastructure costs.

Base of 185 million average monthly unique users.

Alibaba.com

Revenue growth remained strong at 40% Y/Y as international sales (outside China) grew 33% Y/Y (58% of total) and paying member growth continued (30% Y/Y to ~751K). Market value of US$ 10 billion and revenues of US$ 568 million in 2010.

Value-added services (such as keyword bidding, premium placement, and online translations) contributed 25%+ of China Gold Supplier sales and 20%+ of TrustPass revenue, up from mid-teens a year ago, and continue to improve the value proposition for suppliers. [(**)]

Base of 42 million average monthly unique users.

Source: Morgan Stanley, Ten Questions Internet Execs Should Ask & Answer, 16 November, 2010 presentation at the Web 2.0 Summit, San Francisco, CA., USA.

[(*)] Source, In-Stat, Virtual Goods in Social Networking and Online Gaming, November 2010 at 15, 21. The top ten companies accounted for 73% of 2010 virtual goods revenues. According to PricewaterhouseCoopers, (2011), the Chinese entertainment and media was one of the fasted developing markets globally with a 13.9% growth in 2010 and the growth will continue. China is now the second largest video games market in Asia, overtaking South Korea and the third largest behind Japan and the United States.

[(**)] The group is reported to be planning to develop its own mobile operating system, in order to drive mobile use of its various services. Mobile Business Briefing, 4 July 2011.

Conclusion

China's ICT industry is typically characterized as foreign-oriented. Over the past 30 years, China has become the largest country in the world in international trade of ICT products. In 2006, export of the ICT sector [17] has reached €325 billion. For the period 1997-2006, the annual average growth rate of export in the ICT sector was 34.5%, higher than the 20.5% annual average growth rate of total import during the same period (but close to the 31.5% for ICT import). China's ICT sector has been playing an increasingly important role in international trade. The share of the ICT sector in total export and import has reached nearly 42% and 35% in 2006, respectively. [18]

Since 2003, China has become the world's largest recipient of FDI, overtaking the US. Practically all global ICT industry leaders have begun to set up R&D centres in China. By 2004, China became the third most important offshore R&D location after the US and the United Kingdom, followed by India (sixth) and Singapore (ninth). [19] Much of the R&D offshoring to Asia is concentrated in the electronic industry, with China dominating R&D for hardware. As for non-equity forms of R&D internationalization ("offshore outsourcing"), China is now the third most important location behind the United States and the United Kingdom, ahead of Germany and France. Some experts predict that China will become a more attractive location for foreign R&D than even the United States (Dieter, 2008). China's R&D globalization has already reached a level comparable to some smaller but more advanced European countries but it is still at an early stage.

In the last two decades, the national strategy of building national champions has already yielded the creation of several ambitious companies. These companies pursue high value-added strategy, harbour long-term ambitions, and exhibit much higher R&D/sales ratios and higher patenting performance. Several Chinese electronics firms have become global players, including Huawei Technologies, Lenovo, and ZTE. Huawei and ZTE are now major players in the GSM, CDMA, optical and DSLAM equipment markets. Huawei Technologies has become a leading provider of telecommunications networks and increasingly challenges established competitors like Siemens, Cisco, and Alcatel. Lenovo has become a global

17 Including ICT manufacturing, telecommunications and 72 computer and related activities.

18 NBSa, 2007; UNCTAD, 2008.

19 UNCTAD, 2005.

leader in the PC market since it acquired the IBM Personal Computing; it is leading the PC industry in green computing by offering the most PC products that use post-consumer recycled materials.

However, these success stories may be misleading as very few Chinese corporations appear among the main R&D investors (there are scarcely a dozen Chinese corporations among the top 1 000 top R&D investors worldwide). Among these 1 000 top corporations, Chinese and Indian firms account for less than 1% of R&D expenditures (EU firms for 32%, North America for 40%). [20]

Nevertheless, Chinese indigenous innovation capability is increasing. Compared with developed countries, the technical innovation ability of the Chinese ICT industry is still weak. Therefore, truly global R&D in Chinese companies is still a long way ahead. In spite of the growth of R&D expenditure, the level remains modest, much lower than in developed countries. As LING CHEN & LAN XUE sum up:

> "China has a lot to learn from other developing countries in terms of creating an institutional environment favourable to technological innovations and industrial upgrading". (LING & LAN, 2010).

References

CHEN J. (2010): "China Telecom Sector Market and Regulation". http://www.cprsouth.org/wp-content/uploads/2010

CHUN L. (2010): "Mapping the future of China's telecommunications regulatory regime: a layered perspective". http://www.cprsouth.org/wp-content/uploads/2010/12/Layered-Model-CPR_Chun-Liu.pdf

CURIEN N., TOLEDANO J. (2009): "ARCEP Mission in China", French and English version, November. Available at: www.arcep.fr

DIETER E. (2008): "Can Chinese IT Firms Develop Innovative Capabilities within Global Knowledge Networks?", East-West Center Working Papers, Economics Series, n°94, February.

EITO Special Report (2011): *BRIC countries' ICT markets, 2007-2011*, January 3.

[20] Source: Booz Global Innovation 1000. Quoted by Stéphane Grumbach, Senior Researcher, INRIA (China), presentation at the IPTS conference "Asian rise in ICT R&D".

NING H. (2010): "Current and future regulation challenges for the Chinese Telecommunications sector".
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1725129

LING C. & LAN X. (2010): "China's integrated circuit industry", *China & World Economy*, Vol.18, n°6, Nov-Dec.

Ministry of Information Industry - MII (2007): *2007 Yearbook of China Information Industry* (Communication Version), MII.

National Bureau of Statistics of China and China's Ministry of Science and Technology - NBS & MST a (2003-2007): *Statistical Yearbook of China's High-tech Industries*, China's Statistics Press.

National Bureau of Statistics of China - NBS a (1998-2007): *China Statistical Yearbook, 1998-2007*, China's Statistics Press.

NBS Department of Statistical Design & Management (2002): *National Economic Industrial Classifications*, GB/T4754-2002, Department of Statistical Design & Management.

OECD (2008): China'S Outward Foreign Direct Investment.
http://www.oecd.org/dataoecd/28/10/40283257.pdf

PASCALL S. (2010): *EU-China Cooperation of Information and Communication Technologies in RTD, Status and way ahead*, DG INFSO, February.

United Nations (2008): United Nations Commodity Trade Statistics Database.
http://comtrade. un. org/kb/article. aspx?id=10062

Unesco (2010): *Unesco Science Report*, see Mu Rongping, Chapter 18, China, pp. 379-399.

United Nations Conference on Trade and Development - UNCTAD (2005): *World Investment Report 2005*(WIR05). http://www.unctad.org/en/docs/wir2005_en.pdf

WANG L. & LIU S. (forthcoming, 2012): *Trends in Public and Private Investments in ICT R&D in China*, JRC-IPTS.