

INNOVATIVENESS AND HUMAN CAPITAL AS A MAIN SOURCE OF COMPETITIVENESS OF CHINESE ECONOMY

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Abstract. Since its transformation Chinese economy competitiveness was based on low cost labor, but recently this situation is changing. Research hypothesis of the article is that thanks to development of human capital innovation can become to be the most important competitiveness factor for China. By the method of case studies of the companies operating in one of the most competitive sector in the world, which is office and telecom equipment, the article positively verifies that hypothesis.

Key words: China, education, human capital, innovation, technology.

Introduction

The impact of human capital development on innovativeness and therefore competitiveness of the economy has been proved by many researchers in a large number of publications. More than 100 years ago, Schumpeter (1912: 12-14) underlined the importance of knowledge for innovativeness. Drucker (1969: 264) proved that investment in human capital is crucial for economic development, and leads to country's competitiveness through innovation. He also introduced concept of "knowledge-based economy". Further studies revealed that public and private investment in knowledge leads to spillover effects that have positive effects on the development of a whole economy (Romer 1986: 1003). In more recent research correlation between number of years of education and several measures of innovativeness has been found (Dakhli and de Clercq 2004: 122). It has also been proved that the development of the education system on different levels can support creation of innovative economy (Vandenbussche et al. 2006: 102). According to the recent study (Heckman and Yi 2012: 5) education in China will have major impact on the development and innovativeness of its economy. In depth research and comparison of human capital development in different Chinese provinces revealed that in some regions investment in education can lead to faster economic development than building infrastructure (Fleisher et al. 2010: 229). According to Robert Fogel (who was awarded a Noble Prize in economy) changes in educational system in China will be crucial for the economic development of that country (Fogel 2010: 3). Transformation

of Chinese economy that started in 1978 has opened China for international trade, but did not start creation of knowledge based economy. For many years competitiveness of Chinese products was based on low prices that were possible to maintain thanks to low labor costs. Social pressure and necessity of maintaining high pace of growth of Chinese economy pushed the government to search for new sources of economic development. As the other sources of economic growth (like natural resources) were not sufficient for providing long term effects, creation of the economy based on knowledge became necessary. China has introduced many reforms for building knowledge based economy. Government supports creative industry and high technology companies by providing education and creating human capital of the country. The aim of the article is to verify if China can build competitive economy based on knowledge, and create innovative companies that can compete with global leaders in the most innovative sectors of global economy.

1. Methodology and research hypothesis

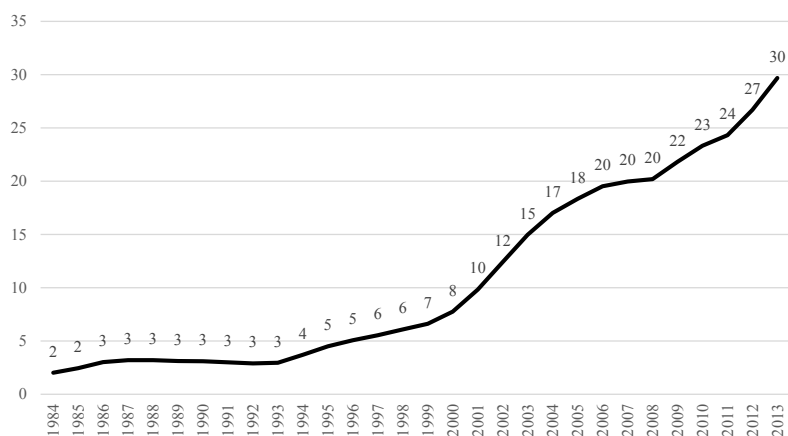
Different methods of economic research were used in the article. First method used was in-depth analysis of the data and statistics on human capital creation in China. Second was comparative, multinational analysis of the data on office and telecom equipment exports. Finally the method of case studies of the chosen companies from high technology sector was used. Research hypothesis of the article is that thanks to development of human capital innovation can become to be the most important competitiveness factor for China.

2. Results

2.1. Human capital creation in China

In 1992 first reforms allowed for the creation of private education that brought fast growth of that specific service sector (Liu 2010: 88). Then the government started large scale reforms of the public sector of education, building thousands of schools and universities all around China. Education became a top priority for Chinese policymakers (Stewart 2012: 65). As a result of that reforms ratio of people attending tertiary education rose from 3% in 1992 to 30% in 2013 (Figure 1). Chinese government is still reforming and investing in education system. From 2008 to 2013 expenses on education in China were rising 21,58% annually and reached 7,79 trillion yuan (which is equal to 1,25 trillion USD and constitutes around 4% of the country's GDP) (Xinhua 2013).

Figure 1. Tertiary school enrollment in China, (total enrollment to the population of the age group that officially corresponds to the tertiary level of education in %)

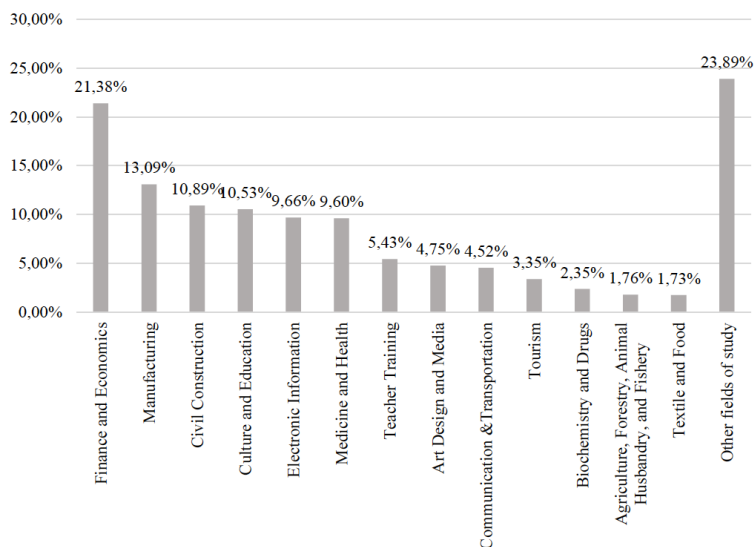


Source: World Development Indicators 2016.

The future also appears very optimistic. By 2020, Peoples Republic of China aims for 20% of its citizens, which is around 195 million people, to have higher education degrees. This assumptions were confirmed by OECD estimations. According to that organization until 2020 around 29% of entire world population of people with higher education aged 25-34 will be Chinese citizens (OECD 2012: 3). There will be more people with higher education in China than in such innovative and competitive countries like United States, Japan, South Korea, United Kingdom, France and Germany combined. What is even more promising for the development of innovative economy is the structure of the fields of study that young Chinese people are enrolled to. Since 1999 to 2010 the number of Chinese graduates in Engineering, Manufacturing and Construction went up from 195 thousands to 2,11 million (Euromonitor 2014). It is the biggest number graduates in that field in the whole world.

Creation of the human capital in fields crucial for development of high technology companies has opened an opportunity for China to become a leader in innovation in several sectors. One of the most competitive industries in which Chinese companies become global leaders is office and telecom equipment. In is an example of the industry which proves that innovation can become a core competency, and the most important competitive factor of Chinese economy. Companies like Huawei, Xiaomi, Lenovo, ZTE, Haier, Coolpad and Oppo benefit from the big number of qualified specialist that finish studies every year. Graduates in manufacturing help with product development and production.

Figure 2. Structure of the total number of student enrolled in 2012 by the field of study



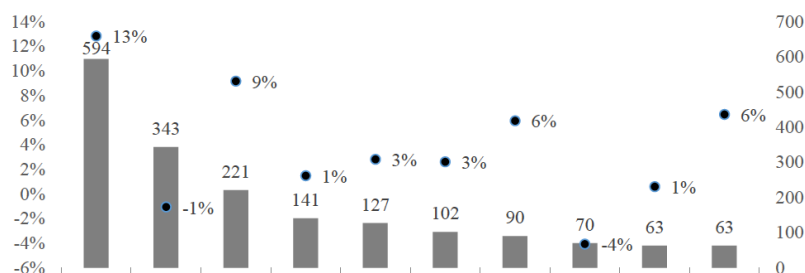
Source: China Statistical Yearbook on Science and Technology 2013: 132.

Electronic information graduates develop software necessary for every product in the office and telecom equipment industry. They also write applications that attract customers to use particular device. Art design and media graduates make products to look attractive for customers. Sometimes their work is more important than engineers, because in highly competitive market like office and telecom equipment most of companies sell devices that are technologically equally advanced. What distinguish one product from another is design and graphics used in the software. All of this fields of study are among the most popular in China (Figure 2).

2.2. China as a leader in the export of office and telecom equipment

Tanks to the development of human capital in the fields that are important for the development of the industry China has become a world leader in the exports of office and telecom equipment (Figure 3). Average growth of exports in that sector in the years 2005-2013 was 13%, much higher than in other competing economies. In 2013 Chinese exports of office and telecom equipment reached 33,92% of total world market. It is a great achievement of Chinese companies taking to the account that this sector constitutes 14,77% of global trade in manufacturers (WTO 2014).

Figure 3. Leading exporters and importers of office and telecom equipment, value (in 2013 in billions of USD) and annual percentage change (2005-2013)



Source: International Trade Statistics 2014: 57.

2.3. Case studies of Huawei and Xiaomi

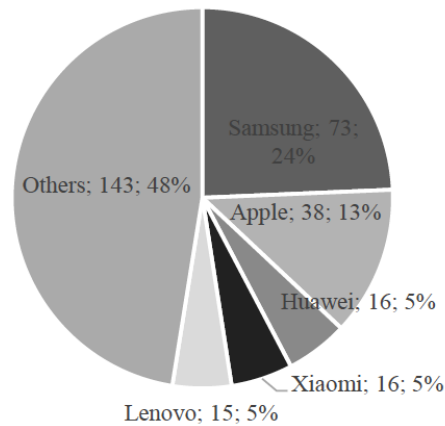
The general view of Chinese enterprises is that their competitiveness comes from cheap labor and intellectual property theft. Case studies of Huawei and Xiaomi prove that it is not only low prices and foreign technology that lead to Chinese preeminence in the office and telecom equipment market, but also and above all innovation.

Huawei is an enterprise that since the very beginnings based its competitiveness on innovation. The company was founded by Ren Zhenfei former engineering officer in People's Liberation Army. Initially he imported telecommunication equipment, but soon realized that competition in this field is too big, and invested in the development of its own products. Huawei broke into the mainstream telecommunication market by developing digital telephone switches with a switching capacity of over 10 thousand circuits. Until that time, Chinese domestic telecom companies were not able to build devices with such capacity. One year later Huawei launched a new line of innovative telecommunication devices and soon became a to be a leader in Chinese market. Good quality, innovative products led the way to international markets (Boutellier 2008: 508). Investment in R&D soon became strategic issue of the company. Slogans like "Continuously innovating for our customers and advancing our technology leadership" show that firm sees innovation as its core competency. In 2013 Huawei's R&D expenditure totaled USD 5,05 billion, accounting for 12.8% of the company's annual revenue. More than any of its global competitors like Ericsson or Alcatel-Lucent (Little 2013: 2). Huawei has cumulatively spent almost USD 25 billion on R&D over the last decade making the company one of the 1000 biggest R&D spenders in the world (Veldhoen 2013: 26). Nowadays Huawei has over 70 thousand R&D employees, comprising more than 45% of their total workforce worldwide. The company have set up 16 R&D centers in countries that include not only China but also United States, Germany, Sweden, France, Italy, Russia, and India. As of December 31, 2013, the

company had filed over 44 thousand patent applications in China, almost 19 thousand outside China, and over 14 thousand under the Patent Cooperation Treaty (PCT). Of these applications, over 36 thousands have been granted with a patent (Huawei 2013: 43). Huawei has become the 5th most innovative company in the world in 2010 according to famous Fast Company List (Kamenetz, 2010). In 2012 Huawei has become the world's largest telecoms-equipment-maker in the world by overtaking Sweden's Ericsson (Economist 2015). In 2013 the company became a leader in DC power systems thanks to its new generation super-efficient rectifier. With a maximum efficiency exceeding 98%, this rectifier reduces power consumption by over 50% when compared to rectifiers with 96% efficiency. With this and other 520 energy-related innovations protected with patents, Huawei leads innovation within this industry. Thanks to the development of new products Huawei gained 24,7% of the market share in 2013 building advantage over its major competitors like Emerson Network Power that held 18,8% of the market share, Eltek (14,1%), and GE Critical Power (11,4%) (Cherian 2014: 65). Huawei has become a leading company also in other telecommunication industry branches like: access networks (GSM, CDMA, WCDMA, WiMAX, LTE, DSL), core/in networks (Edge, Core, IMS, Packed Switched, Circuit Switched) (Little 2013: 8). Huawei was also the 2nd company (after Cisco) in router and switch market in 2013 (Campbell 2014). Another strong branch of the company is mobile handset production. Thanks to the development of series of good quality mobile phones named Ascend, in third quarter of 2014 Huawei has become 3rd biggest producer of smartphones after Samsung and Apple (Rivera 2014). It has also been ranked 5th in total mobile phone production (Statista 2015). As this market is extremely competitive and innovative, it is a very big achievement for Chinese company that was not specialized in mobile phone production before. Recent study reveals that Huawei R&D strategy is successful, because it is aimed to benefit from the windows of opportunity offered by the technology life cycles (Yan 2015: 32). Huawei managed to build strategy of continuous innovation that granted the company success in many international markets. Case study of Huawei proves that Chinese companies can successfully compete globally not only thanks to low labor cost, but also continuous innovation.

Another Chinese company that successfully uses innovation as a key competitive advantage is Xiaomi. The company owes its spectacular success to innovative strategy of business. Xiaomi is one of the newest companies on mobile phone market. It has been established on April 6, 2010, but already became one of the biggest in the World. In 2014 Xiaomi sold 61,12 million smartphones earning 11,97 billion USD in pre-tax revenue. The company experienced 227% year to year growth in handset shipments in 2014 and 135% growth in revenue (Chanthadavong 2015).

Figure 4. Worldwide smartphone sales to end users by vendor in third quarter of 2014 and market share (millions of units in %)

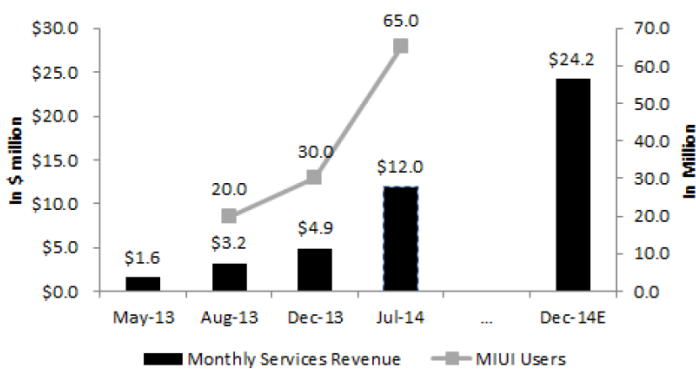


Source: Rivera and van der Meulen 2014.

In third quarter of 2014 Xiaomi has become the 4th global smartphone supplier with almost 16 thousand devices sold which was 5% of the market (see figure 4). The most important market for Xiaomi is still China, but it is expanding quickly in all of east Asian countries, and some major developing economies. Xiaomi is planning to enter new markets in 2015, including Brazil, Turkey, Mexico, Thailand, and Russia (Murphy 2015). As Xiaomi is recently facing supply constraints the company plans to start production in its major markets like India, where its products meet strong demand and import barriers (duties) are high (Arakali 2015). Devices produced by Xiaomi are based on the best available existing technology. The company does not invest too much capital and resources in innovation in hardware. Xiaomi creates very good quality products that are sold on affordable prices, much lower than Apple's or Samsung's. Innovation of Xiaomi, which was new to Asian markets and created a ground for global expansion of the company is building a lifestyle brand. Xiaomi had become one of the Asia's most recognizable brands largely due to the high profile of its leader Lei Jun (Fisk 2014: 270). Xiaomi's CEO is a personification of the young Asians dream. He is smart, good-looking, friendly, successful, extremely rich, happy, powerful, and wordy man. Every young Asian wants to be like him, and products of Xiaomi carry a promise of becoming similar to him. Many accuse Lei Jun of imitating Steve Jobs, and there are some obvious similarities, but his image was perfectly adapted to Asian society. Xiaomi spares no efforts in making its products look good. All of them are very well designed, and shipped to customers in elegant boxes. Well-known brand name gave the company an opportunity to cut of distribution expenses (Xiaomi sales its products only online), so the company has some cost advantage over its

main competitors. Another innovation, which has an impact both on marketing and cost efficiency is that Xiaomi distributes only small amounts of their products at intervals, rather than producing in bulk at one time. It implies no surplus raw material and an increased efficiency of the entire production system (Majumdar 2015). This also results in creation of a specific image of a product that everybody wants so badly that demand exceeds supply. People think that the product is so good that the company cannot keep up with shipments. This image creates additional demand. For example Xiaomi's cellphone Mi Note has sold out in three minutes after it became available to buy on the company's website (Price 2015). One of the key innovations of Xiaomi is the engagement of fans and customers through social media sites in the development of software and devices. Fans help Xiaomi in creation of new products and pre order them on the website before they are released, so the company knows how big is potential demand (Turban 2015: 423). All of the above mentioned innovations are important for the company's success, but truly crucial is the business model that does not assume making profits on mobile handsets sales at all. Instead of chasing its main global competitors in the race for the technological improvements in hardware Xiaomi invested in much cheaper development of software. The most important product of Xiaomi is MIUI which is advanced developed version of Android operating system. Although MIUI is based on Android it does not look like it and it became a base for applications that are developed especially for that system. They are available through Xiaomi's MIUI appstore, not by Google Playstore. Xiaomi has strategy of selling premium hardware roughly at cost. The company receives a margin of 3% from each of their phones (Iftekhhar 2015). Their aim is to create a large base of loyal customers who would buy applications, services, and accessories available through MIUI.

Figure 5. Xiaomi – MIUI Users & Monthly Services Revenue



Source: Singh 2015.

Figure 5 shows that Xiaomi's services revenue, which is the most important because of high-margin, is highly correlated with MIUI user base. Xiaomi sells its devices to increase the size of that customer base and monetize on profitable applications. Xiaomi's R&D is concentrated on development of mobile applications and services. The company is planning to invest up to 1 USD billion in video content for Xiaomi TV (Chanthadavong, 2015). This shows that the company is actively searching for new sources of revenue that can be achieved thanks to its growing number of MIUI users. Innovative strategy has granted Xiaomi huge success making the company one of the leaders of mobile global application market and mobile phone development industry. Case study of Xiaomi proves that Chinese company can become a leader of the market thanks to innovative strategy and services.

Conclusions

In the last several years Chinese government has significantly contributed to creation of human capital that supports creative industry and high technology companies, especially in the sectors like office and telecom equipment. Large number of graduates in fields of engineering, manufacturing electronic information, art and design support innovativeness in Chinese companies. By the method of case studies the article proves that the development of human capital enabled creation of endogenous innovation, that can become to be the most important competitiveness factor for China. Major limitation of the study is the method of the verification of the hypothesis, which is case study. On one hand some might say that it is not enough to prove that whole economy can become innovative by the achievements of just one of its sectors. On the other hand the aim of the article is not to prove that China will become innovative, but that such change is possible, thanks to the development of human capital. Huawei and Xiaomi are Chinese companies that become important global corporations because of innovations created by their workers. Case studies of that companies prove, that Chinese firms can successfully compete with world leaders not just by cheap labor force, but by their endogenous innovation, created by well-educated Chinese people. If the policy of intensive investing in the development of the human capital will continue, most probably other Chinese innovative companies will emerge.

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