

China in ICT Goods Production and Exports

Electronics industry, ICT goods** production is one of innovation industries in development of which Asian countries have been successful.

The author's analysis of ICT goods production and exports based on UNCTAD and WTO statistics for 2000–2014 shows that in 2005–2014 China became the leader in ICT goods world exports¹.

Table 1

ICT Goods exports, by regions, 2000–2014 (\$B)

	2000	2005	2010	2013	2014
World					
ICT goods	999.9	1375.3	1722.5	1921.6	1980.0
Computer equipment	367.2	474.1	499.6	515.1	530.0
Telecommunications equipment	154.7	218.7	333.4	461.8	496.0
Consumer electronics	105.7	182.0	229.6	205.7	204.4
Electronic components	321.9	392.3	574.3	657.7	667.5
Developing countries					
ICT goods	429.2	769.3	1160.0	1398.0	1441.5
Computer equipment	166.7	268.2	347.9	359.9	368.1
Telecommunications equipment	38.5	97.6	217.2	338.9	363.7
Consumer electronics	57.6	113.3	138.0	133.9	133.9
Electronic components	146.9	228.8	402.2	512.4	521.9
Developing countries: Asia					
ICT goods	389.2	722.5	1091.3	1328.6	1372.6
Computer equipment	152.8	254.8	330.7	340.0	344.9
Telecommunications equipment	28.6	85.1	196.1	318.8	345.8
Consumer electronics	47.9	99.4	113.0	112.3	111.4
Electronic components	142.6	224.3	397.9	506.0	517.9
Developing countries: East Asia					
ICT goods	216.8	493.5	831.0	1040.9	1076.4
Computer equipment	81.1	175.7	257.0	276.5	281.2
Telecommunications equipment	21.1	66.7	180.3	276.8	303.0
Consumer electronics	29.6	78.3	88.3	89.9	89.6
Electronic components	74.1	122.5	258.7	352.4	356.7

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** According to UNCTAD, ICT goods include such categories as computer equipment, telecommunications equipment, consumer electronics, electronic components and miscellaneous goods.

¹ Tsvetkova N.N. Informacionno-kommunikacionnye tehnologii v stranah Vostoka : proizvodstvo tovarov IKT i IT-uslug. M.: IV RAN, 2016.

	2000	2005	2010	2013	2014
Developing countries: South-East Asia					
ICT goods	170.4	219.2	252.7	279.0	290.0
Computer equipment	71.3	77.6	72.7	62.8	62.9
Telecommunications equipment	7.4	14.9	13.4	37.6	40.8
Consumer electronics	17.4	17.3	22.6	20.1	19.4
Electronic components	68.4	101.1	137.7	152.8	160.6
Developed countries					
ICT goods	569.9	605.2	560.7	520.0	532.9
Computer equipment	200.4	205.8	151.4	154.5	159.6
Telecommunications equipment	115.9	121.0	116.0	122.1	131.5
Consumer electronics	48.0	68.6	90.9	70.5	69.1
Electronic components	174.7	163.4	171.7	144.9	145.1

Source: Bilateral trade flows by ICT goods categories, annual, 2000–2013; 2000–2014. Information Economy. <http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx=15850> (access dates: 12.04.2015; 2.03.2016).

In 1996 world ICT goods exports reached \$701 B. Exports from China amounted to \$19 B and its share in world exports was 2.7 per cent only. Developed countries were leading exporters of ICT goods at that time: in the first place, the USA (\$124 B; 17.7 per cent of world exports) and Japan (14.7 per cent). Asian countries were also important exporters: Singapore (3-d place; \$68 B; 9.7 per cent), Hong Kong (5.4 per cent), Malaysia (5.3 per cent), South Korea (4.9 per cent)².

Table 2

ICT Goods Exports from China and Hong Kong (China), 2000-2014 (\$B)

Goods	Exports (\$B)						
	2000	2005	2010	2011	2012	2013	2014
China							
ICT goods	44.1	234.1	459.5	508.0	554.3	605.8	607.6
Computer equipment	17.9	109.1	196.9	209.0	218.5	214.1	215.9
Telecommunications equipment	5.9	33.1	106.6	134.1	153.9	175.8	196.3
Consumer electronics	11.3	46.8	64.7	66.0	69.3	70.0	71.1
Electronic components	6.6	25.5	74.1	82.2	96.1	130.4	107.3
Hong Kong (China)							
ICT goods	50.3	111.9	177.0	193.5	207.9	222.3	238.5
Computer equipment	14.7	34.5	35.4	40.0	45.2	42.8	43.6

² Information Economy Report 2007–2008. UN. N.Y.; Gen., 2007. P. 136.

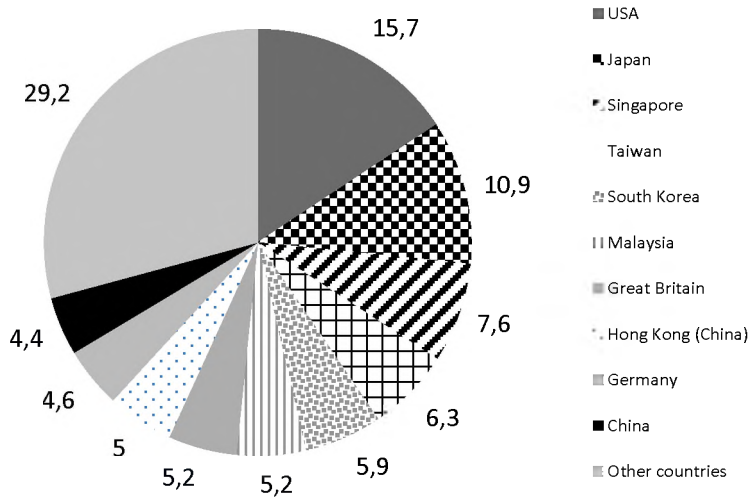
Telecommunications equipment	5.4	7.8	37.7	45.8	53.1	64.9	70.2
Consumer electronics	10.5	21.7	16.9	14.8	14.3	12.1	10.8
Electronic components	15.8	34.4	72.2	77.7	78.7	87.3	100.4

Source: Bilateral trade flows by ICT goods categories, annual, 2000–2013. Information Economy. <http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx=15850> (access date: 12.04.2015; 2.03.2016).

In 2000 world ICT goods exports reached \$999.9 B. China was tenth; its share of world exports amounted to 4.4 per cent (\$44.1 B). Leading exporters were the same as in 1996: the USA (\$156.7 B; 15.7 per cent of world exports), Japan (10.9 per cent), Singapore (7.6 per cent). Top ten exporters included also Taiwan (6.3 per cent), South Korea (5.9 per cent), Malaysia (5.2 per cent), Great Britain (5.2 per cent), Hong Kong (5.0 per cent), Germany (4.6 per cent) (Chart 1).

Chart 1

Leading ICT Goods Exporters: 2000 (per cent)

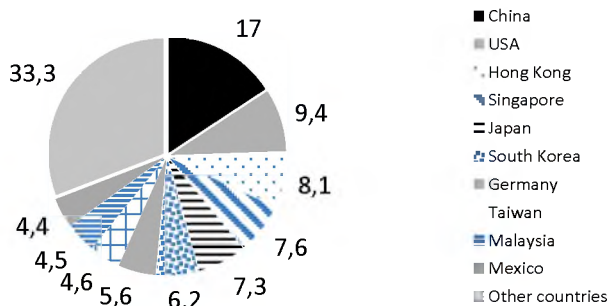


Sources to table 1, 2.

In 2005 China became the first world exporter of ICT goods (17 per cent of world exports). The USA moved to the 2nd place (\$B 128.9; 9.4 per cent), Hong Kong (China) was 3rd (8.1 per cent). Top ten exporters also included Singapore (7.6 per cent), Japan (7.3 per cent), South Korea (6.2 per cent), Germany, Taiwan, Malaysia, Mexico (Chart 2).

Chart. 2

Leading ICT Goods Exporters: 2005 (per cent)



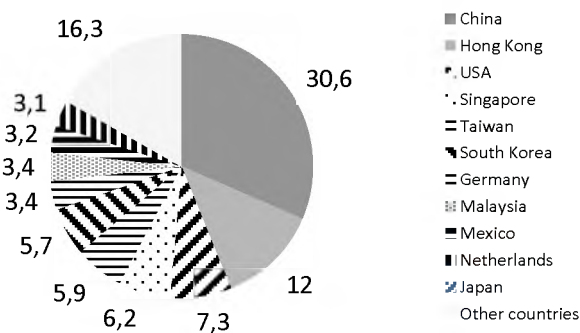
Sources to table 1, 2.

*33,3 per cent – other countries

In 2014 ICT goods world exports amounted to \$1980 B, it exceeded 2013 exports by 3 per cent only. China’s share in the world ICT goods exports reached 30.6 per cent; the share of Hong Kong was 7.3 per cent (Chart 3).

Chart. 3

Leading ICT Goods Exporters: 2014 (per cent)



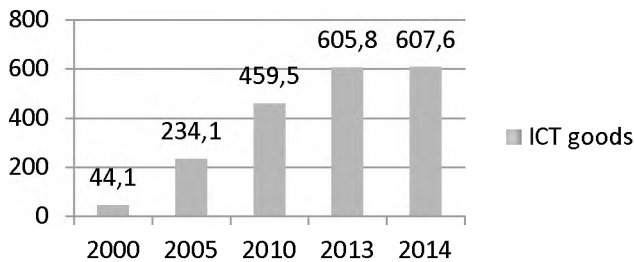
Sources to table 1,2.

In 1996–2000 China ICT goods exports increased from \$19 B to \$44.1 B, by 2.3 times, or by 131 per cent, in average 33 per cent per year. In 2000–2005 it increased from \$44.1 B to \$234.1 B, by 5.3 times, or by 431 per cent, in average by 86 per cent per year. In 2000–2005 ICT exports growth rate was 2.3 times superior to that of 1996-2000. In 2005 was first, but by 2014 China became the top exporter that left all other leading exporters far behind.

In 2005–2014 China ICT goods exports increased from \$234.1 B to \$607.6 B, by 159.5 per cent 1 per cent, but in 2005–2013 it grew by 158.8 per cent, that is, by 19.9 per cent a year, and in 2014, as compared to 013, only by 0.4 per cent. 2000–2005 were the period of most rapid growth of Chinese ICT goods exports (Chart 4).

Chart. 4

ICT Goods Exports from China, 2000–2014 (\$B)

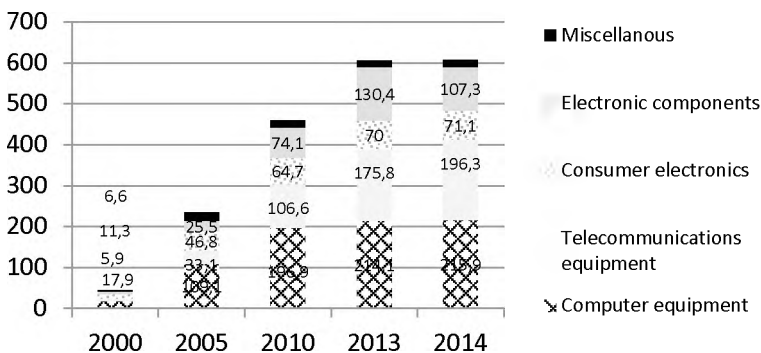


Source: Table 2.

Two categories of ICT goods prevail in China exports: computer equipment and telecommunications equipment. In 2010–2014 the growth of telecommunications equipment exports was most dynamic; its share in China ICT exports grew from 23.2 per cent to 32.3 per cent. The share of computer equipment decreased from 46.6 per cent in 2005 to 42.9 per cent in 2010 and 35.5 per cent in 2014 (Table 2, Chart 5).

Chart. 5

Structure of China ICT Goods Exports (\$B)



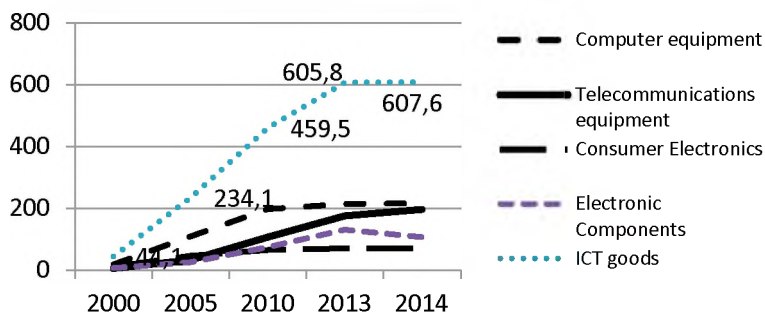
Source: Table 2.

The structure of China ICT exports is shown on Chart 5. Various growth trajectories of different categories of China ICT goods exports can be seen on

Chart 6: while in 2000–2010 most dynamic group was computer equipment, in 2010–2014 there was rapid growth in exports of telecommunications equipment (Chart 6).

Chart 6

Growth of different categories of China ICT goods exports, 2000–2014 (\$B)

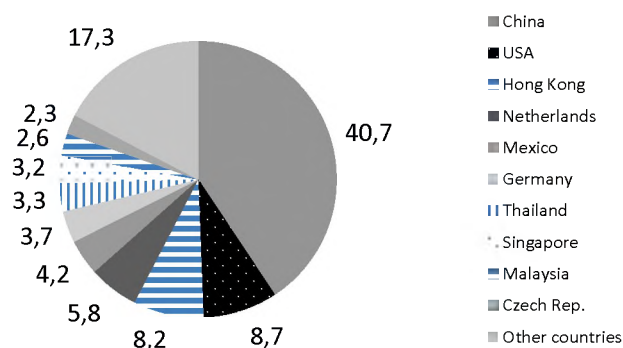


Source: Table 2.

ICT goods are in important part of China total exports: their share was 26 per cent in 2014, while in Hong Kong it was 45.5 per cent, in Taiwan – 35 per cent, Singapore – 30 per cent, Malaysia – 29 per cent, in South Korea – 20 per cent³.

Chart 7

Leading Computer Equipment Exporters: 2014 (per cent)



Sources to Tables 1, 2.

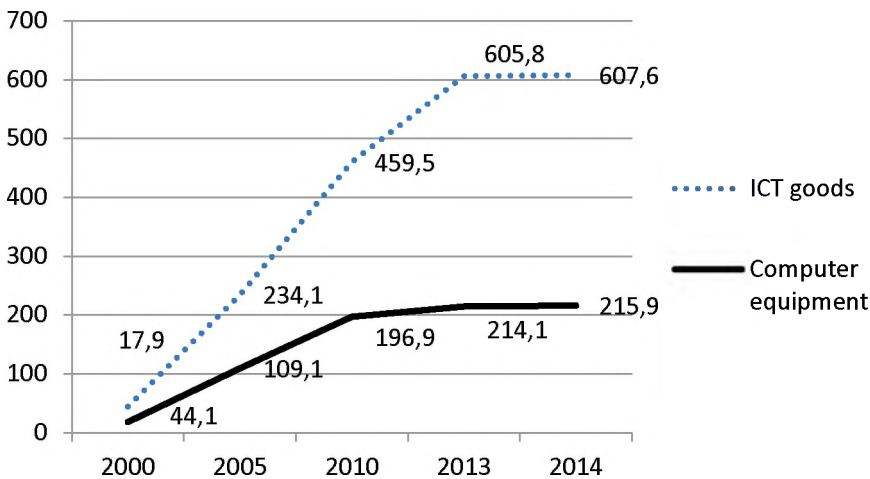
³ Share of ICT goods as percentage of total trade, annual, 2000–2013. <http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=15849> (access date: 1.06.2015).

In 2000–2014 world exports of computer equipment grew from \$367.2 B to \$530.0 B, but its part in world ICT goods exports diminished from 36.7 per cent to 26.8 per cent. In 2014 65.1 per cent of world computer equipment exports originated from developing countries of Asia (as they are defined in UNCTAD statistics, including Singapore, South Korea that have high per capita gross national income, but excluding Japan and Israel that are defined as developed countries). China was the first among exporters (40.7 per cent of world computer equipment exports). Other exporters in the top ten were the USA (8.7 per cent), Hong Kong (China) (8.2 per cent), the Netherlands, Mexico, Germany, Thailand, Singapore, Malaysia, Czech Republic (Chart 7). Two out of five computers on the world market are made in China.

China computer equipment exports increased from \$17.9 B in 2000 to \$214.1 B in 2013. In 2014 it amounted to \$215.9 B, there was practically no growth. It should be pointed out that there was practically no growth of world exports either; world computer market was stagnant due to high market saturation and also due to competition from mobile devices and growing Internet mobile subscriptions in developing countries.

Chart 8

China ICT goods exports, including computer equipment exports, 2000–2014 (\$B)

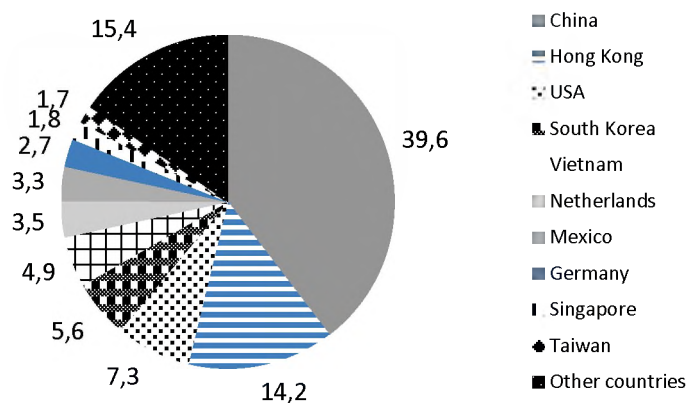


Source: Table 2.

The most dynamic group of world ICT goods exports in 2005–2014 was telecommunications equipment. In 2000–2014 it increased from \$154.7 B to \$461.8 B, and its share in world ICT exports grew from 15.5 per cent to 25.1 per cent. In 2014 69.7 per cent of world exports of telecommunications equipment originated from developing countries of Asia (Table 1).

Chart 9

Leading Exporters of Telecommunications Equipment, 2014 (per cent)

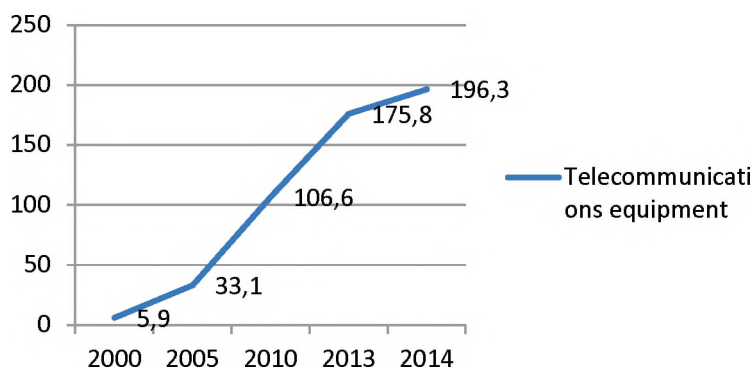


Calculations based on sources to Tables 1, 2.

China was uncontested leader in world telecommunications exports (39.6 per cent of total) that left other exporters far behind. In top ten there were also Hong Kong (China) (14.2 per cent), the USA (7.3 per cent), South Korea (5.6 per cent), Vietnam (4.9 per cent), the Netherlands, Mexico, Germany, Singapore, Taiwan (Chart 9).

Chart 10

China Telecommunications equipment exports, 2000–2014 (\$B)



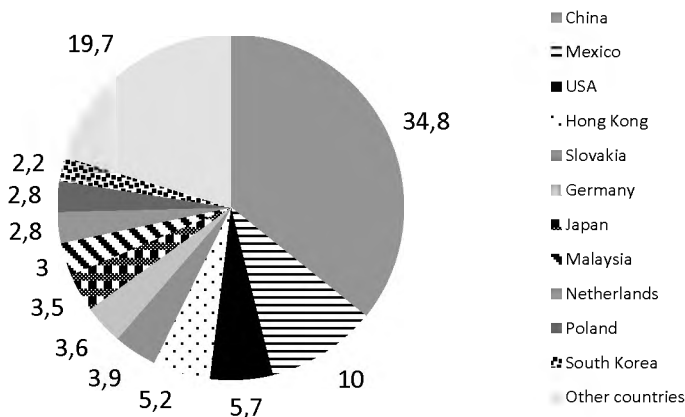
Source: Table 2.

In 2005–2010 China telecommunications equipment exports grew from \$33.1 B to \$106.6 B, almost 3-fold. It is at that period that we can say that

“mobile communications revolution” occurred, and mobile phones became widely spread in all countries of the world, with rare exceptions, such as North Korea. In 2010–2014 telecommunications equipment exports from China grew from \$106.6 B to \$196.3 B, almost twice, it is the period when smartphones became widely spread. Smartphone brand Samsung Galaxy is (or was before well-known accidents in 2016) popular in the world. But on the label and in instructions you can see that Samsung gadgets are “made in China” or in Vietnam (and where are the batteries for the notorious Samsung Note 7 made?). Mobile phones with brands HTC or Acer tablets, Asus netbooks (companies from Taiwan), or Sharp television sets – all of them are “made in China”. Apple iPhones and iPads are also assembled in China.

Chart 11

Consumer electronics world exports, 2014 (per cent)

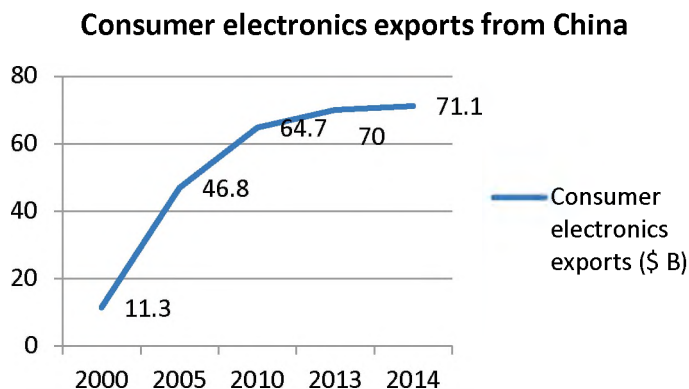


Calc. on sources to Tables 1, 2.

The growth of world consumer electronics exports was rather slow. In 2000–2013 it increased from \$105.7 B to \$205.7 B, and in 2014 it even decreased to \$204.4 B, its share in ICT exports staying almost unchanged: 10.6 per cent in 2000 and 10.3 per cent in 2014. In 2014 54.5 per cent of consumer electronics exports originated from developing countries of Asia. China was the first exporter with 34.8 per cent of world exports. Other leading exporters were Mexico (10.0 per cent), the USA (5.7 per cent), Hong Kong (China) (5.2 per cent), Slovakia (3.9 per cent), Germany (3.6 per cent), Japan (3.5 per cent), Malaysia (3 per cent), the Netherlands and Poland (2.8 per cent each). Most dynamic consumer electronics exports from China were observed in 2000–2005: it increased from \$11.3 B to \$46.8 B, by 4.5 times, it grew to \$64.7 B in 2010, and after that stayed almost at the same level (Chart 12).

Chart 12

China consumer electronics exports, 2000-2014 (\$B)



Source: Table 2.

ICT exports from China grew immensely during past 20 years. But a significant share of ICT goods manufactured in China is sold on internal market. In 2014 400 million smartphones were sold on China market, it is almost 1/3 of smartphones sold in the world (1.3 B units).

By 2014 China became the first industrial economy in the world. In 2014 China gross domestic product (GDP) by PPP (purchasing power parity) exceeded the USA GDP by PPP. Value added produced in China manufacturing industry in 2014 amounted to \$2857.0 B (23.8 per cent of world value added in manufacturing industry, \$11979.0 B), while in the USA it was \$2068.1 B (17.2 per cent of the world total), in Japan \$850.9 B (7.1 per cent) and in Germany \$787.5 B (6.6 per cent). In 2000 China was fourth by value added produced in manufacturing industry (\$384.9 B) in the world after the USA (\$1510.2 B), Japan (\$997.9 B) and Germany (\$400.7 B)⁴.

In 2005 Japan (20.5 per cent of total value added in the industry) was first by value added in radio-, television, telecommunication equipment manufacturing, it was followed by the USA (20.2 per cent), China (13.6 per cent) and Great Britain (9.9 per cent). In 2011 China became first (21.8 per cent of total value added in the industry) by value added in radio-, television, telecommunication equipment manufacturing, the USA were second (16.8 per cent), Japan was third (15.5 per cent), followed by South Korea (12.8 per cent), and Taiwan (11.3 per cent).

⁴ Manufacturing, value added (current US\$).
<http://data.worldbank.org/indicator/NV.IND.MANF.CD/countries?display=Chart>;
<http://data.worldbank.org/indicator/NV.IND.MANF.CD/countries/1W?display=default>
 (access date:10.05.2015); WDI: Structure of manufacturing
<http://wdi.worldbank.org/table/4.3#> (access date: 8.10.2016).

In 2005 the USA were first by value added in computer and office computer and office equipment manufacturing (27 per cent of total value added in the industry), China was second (19.9 per cent), Japan third (14.5 per cent), Taiwan fourth (6.1 per cent). In 2011 China became first, it produced 38.8 per cent of total value added in computer and office equipment manufacturing in the world, USA moved to second rank (23.7 per cent), Japan was third⁵.

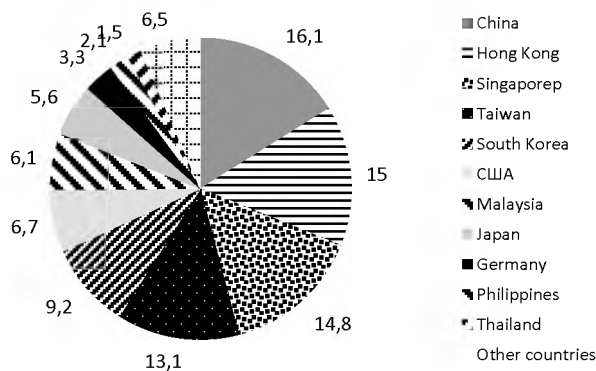
China: exports and imports of ICT goods and electronic components

Growth of international trade in electronic components proves intensification of international division of labor. International division of labor can be at the same time an intra-firm division of labor when different components are produced by affiliates of the same TNC in different countries; they can be also produced by the company subcontractors working under manufacturing contracts.

In 2000 top ten exporters of electronic components for ICT goods (EC) included the USA (\$66.1 B; 20.5 per cent of world exports), Japan (14.2 per cent), Singapore (11.0 per cent), Taiwan (8.1 per cent), South Korea (7.9 per cent), Malaysia (5.7 per cent), Hong Kong, Germany, Thailand (2.2 per cent). China was tenth, with 2.1 per cent of world exports.

Chart 13

Leading exporters of electronic components, 2014 (per cent)



Calculated on data from sources for Tables 1, 2.

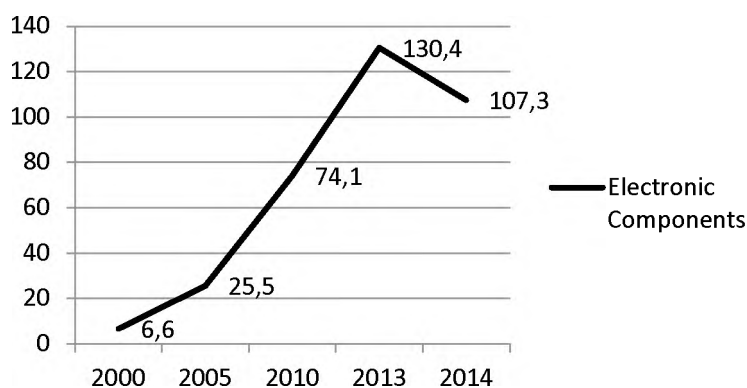
By 2010 situation on electronic components world market changed cardinally: 2/3 of electronic components exports originated from developing countries. In 2014 China was first (16.1 per cent of world exports); in 2013 the share was

⁵ Industrial Development Report 2013. UNIDO, 2013. P. 177.

higher: 19.8 per cent. Top ten exporters also included Hong Kong (China) (15.0 per cent), Singapore (14.8 per cent), Taiwan (13.1 per cent), South Korea (9.2 per cent). The USA (6.7 per cent) moved to sixth rank and Japan, to eighth rank (5.6 per cent). Among leading exporters there were also Malaysia, Germany, Philippines (2.1 per cent), and Thailand (1.5 per cent). The center of electronic components production moved to East and South-East Asia.

Chart 14

China Electronic components exports, 2000-2014 (\$B)



Source: Table 2.

China was the world leading electronic components exporter in 2014, but they constituted only 17.7 per cent of its ICT goods exports. China specializes mainly in exporting finished ICT goods; it has assembly operations and complete cycle electronics manufacturing.

Table 3

ICT goods and electronic components (EC) exports from China and Hong Kong by destination, 2000; 2013 (\$B)

Exports to	China				Hong Kong			
	2000		2013		2000		2013	
	ICT goods	EC	ICT goods	EC	ICT goods	EC	ICT goods	EC
World	44.1	6.6	605.8	130.4	50.3	15.8	222.3	87.3
South-East Asia	4.3	1.1	40.4	11.7	4.8	1.7	11.5	3.3
Singapore	2.1	0.5	12.8	5.2	2.6	0.9	3.2	1.4
Malaysia			7.1	3.0	0.9	0.4	1.6	0.5
Vietnam			7.5	1.3	...		1.6	0.4
Thailand			5.6	0.8	0.5	0.2	2.6	0.7
Philippines			2.1	0.6	0.6	0.2	1.4	0.3

East Asia	12.6	3.3	244.5	96.4	22.4	9.7	157.2	76.6
Taiwan	0.8	0.3	16.0	9.5	2.3	1.5	5.1	2.8
South Korea	1.5	0.6	32.3	6.4	2.0	1.1	4.6	2.3
China	X	X	X	X	17.9	7.1	146.9	71.5
Hong Kong (China)	10.2	2.4	195.7	80.5	X	X	X	X

Source: Bilateral trade flows by ICT goods categories, annual, 2000–2013. Information Economy. <http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx=15850>. (access date: 12.04.2015).

In 2000 China ICT goods exports amounted to \$44 B, the share of countries of East and South-East Asia (ESEA) being 38.3 per cent, with Hong Kong as priority destination. 2/3 of China electronic components exports in 2000 (\$6.6 B) went to ESEA; including 36.4 per cent to Hong Kong. China exported mainly finished ICT goods; the share of EC in its ICT exports in 2013 was 21.5 per cent. Main export markets for EC from China in 2013 were East and South-East Asia countries (82.9 per cent), with 61.7 per cent exported to Hong Kong. Other directions of China EC exports were Taiwan, South Korea and Singapore (Table 3).

EC exports from Hong Kong in 2000 amounted to \$15.8 B, main export markets were East and South-East Asia countries (72.2 per cent), China (44.9 per cent) in the first place, and also Taiwan (9.5 per cent), South Korea, Singapore and Malaysia (7.0 per cent each). In 2013 EC exports from Hong Kong amounted to \$87.3 B and major part of it (\$71.5 B) went to China.

In 2000 7.1 per cent of EC exports from South Korea, 3.1 per cent from Taiwan and Singapore were directed to China, and only in Hong Kong the share of exports to China was high (44.9 per cent). In 2013 China became a priority destination of EC exports not only for Hong Kong (\$71.5 B, 81.9 per cent of EC exports), but also for South Korea (\$23.1 B; 39.7 per cent of EC exports), Taiwan (\$18.9 B; 24.1 per cent), Singapore (\$18.3 B; 20.1 per cent). EC exports to China from the USA in 2013 amounted to \$4.8 B and from Japan to \$10.4 B only. 37.1 per cent of mutual EC exports of six Asian leading exporters of ICT goods: China, Hong Kong (China), South Korea, Taiwan, Singapore and Malaysia went to China and 37.6 per cent to Hong Kong. If re-exports are not taken into consideration (e. g., in WTO statistics), the share of Hong Kong in ICT goods exports is reduced dramatically.

We can state that an intra-regional division of labor in ICT goods production has been formed in East and South-East Asia, in particular between these six countries (and territories): China, Hong Kong, South Korea, Taiwan, Singapore and Malaysia. In 2013 79 per cent of their EC exports were mutual exports⁶. The countries export electronic components mainly to China and

⁶ Bilateral trade flows by ICT goods categories, annual, 2000–2013; 2000–2014. Information Economy. <http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx=15850> (даты обращения: 12.04.2015).

Hong Kong, the latter serves as a re-export center. Taiwan, South Korea, Singapore are mainly exporters of electronic components, but they also receive important flows of EC.

If we deduct exports to Hong Kong (\$195.7 B) in 2013 from China ICT goods exports (\$605.8 B), Chinese exports will amount to \$410.1 B and the exports from Hong Kong (\$223.2 B) minus its exports to China (\$146.9 B) will amount to \$75.3 B only. But in this case, total world ICT goods exports would be equal to \$1579.0 B; developing Asian countries exports to \$986.0 B; their share in world exports to 62.4 per cent, and the share of China to 26.2 per cent; the share of China with Hong Kong in world exports representing 31.0 per cent. Even if Hong Kong factor is taken into account, China, with Hong Kong or without it, remains the world leader (calc. using data from Tables 1, 2, 3).

The division of labor between China, on the one hand, and Taiwan, South Korea, Singapore, on the other hand, is based on comparative advantages, workforce in China being cheaper than in these countries. But there is also the division of labor between Taiwan, South Korea, Singapore, which is based not on comparative advantages, but on economy of scale factors, and in case cost of Chinese labor increases, China can also participate in such kind of division of labor (it exists in European Union countries, to be more precise, between the old EU members – France, Belgium, Germany, not between France and Romania).

Table 4

ICT goods and electronic components exports and imports: China and Hong Kong, 2000; 2005, 2013 (\$B)

	2000			2005			2013		
	exports	imports	balance	exports	imports	balance	exports	imports	balance
China									
ICT goods	44.1	45.5	-1.4	234.1	166.8	+67.3	605.8	400.7	+205.1
EC	6.6	22.5	-15.9	25.5	101.6	-76.1	130.4	275.7	-145.3
Hong Kong (China)									
ICT goods	50.3	59.6	-9.3	111.9	114.7	-2.8	222.3	240.9	-18.6
EC	15.8	21.5	-5.7	34.4	45.6	-11.2	87.3	104.1	-16.8

Source: Table 2, 3.

In 2000 China ICT goods imports (\$45 B) exceeded exports (\$44 B) by 2 per cent. Negative balance of trade in EC was not compensated by finished goods exports. In 2005 ICT goods exports exceeded imports by 40 per cent and in 2014 by 50 per cent. Hong Kong was a net ICT goods importer as it specializes in re-exports trade.

Table 5

Imports of ICT goods, including EC imports, to China and Hong Kong, by origin 2013 (\$B, per cent)

	Imports					
	China			Hong Kong (China)		
	ICT goods	EC		ICT goods	EC	
	\$B	\$B	%	\$B	\$B	%
All countries	400.7	275.7	100	240.9	104.1	100
China	X	X		128.3	32.6	31.3
Taiwan	88.5	80.9	29.3	25.4	20.2	19.4
South Korea	73.9	54.4	19.7	11.8	8.4	8.1
Hong Kong (China)	97.4	38.0	13.8	X	X	X
Malaysia	36.2	32.2	11.7	8.0	6.0	5.8
Singapore	8.8	7.2	2.6	21.2	18.1	17.4
Philippines	11.7	6.5	2.4	4.2	3.0	
Thailand	11.7	3.8		5.8	2.2	
Vietnam	6.6	2.8		3.4	0.1	
Japan	25.5	18.8	6.7	11.9	6.2	6.0
USA	18.2	15.4	5.6	9.2	3.7	
Germany	4.6	3.4				

Source to Table 3.

In 2013 electronic components constituted 68.8 per cent of China ICT goods imports. 29.3 per cent of China EC imports originated from Taiwan, 19.7 per cent from South Korea; 13.8 per cent from Hong Kong, 11.7 per cent from Malaysia; 6.7 per cent from Japan; 5.6 per cent from the USA; 2.4 per cent from the Philippines.

Imports of ICT goods to Hong Kong reached in 2013 \$240.9 B, including EC imports of \$104.1 B (43.2 per cent of total ICT goods imports). 53 per cent of Hong Kong imports originated from China, $\frac{3}{4}$ of exports from China being finished products and $\frac{1}{4}$ electronic components. Hong Kong imported from Taiwan, Singapore, South Korea mainly electronic components. 31.3 per cent of electronic components imports to Hong Kong originated from China, 19.4 per cent from Taiwan, 17.4 per cent from Singapore.

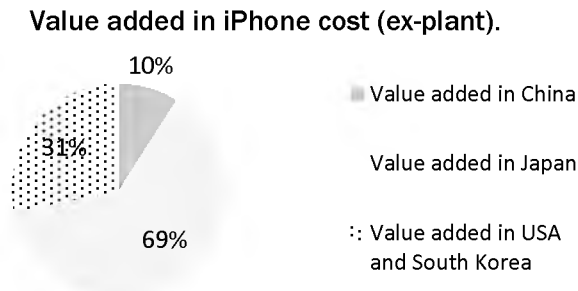
Main destinations of ICT goods and, in particular EC exports, from China and sources of ICT goods imports, in particular of EC imports, to China show the way global value chains are functioning. Main sources of EC imports to China are countries of East and South-East Asia: Taiwan, South Korea, Malaysia and also Hong Kong. EC exports from China are inferior to its EC imports. China EC exports are directed mainly to its special autonomous region Hong Kong. Most part of global value chains are, as a matter of fact, confined to the region of East and South-East Asia, excluding the starting point (R&D, design, patents, copyright) in the country of origin of the technology (the USA,

Japan), and terminal points (marketing, after sale technical support and maintenance,) in different countries-consumers.

A researcher Kate Davies studies how Western cities increasingly depend on vast global networks to survive. Along with fellow ‘speculative architect’ Liam Young, she runs *Unknown Fields*, the infamous nomadic design studio that explores the hidden zones of production and distribution that keep the world running. She’s brought a small group of journalists and researchers to Shenzhen as part of “an expedition to ride the global supply chain backwards to its source”. “We arrived here by container ship, and after two weeks of travelling we’ll end up at rare earth mines and refineries in Inner Mongolia, to see firsthand how all that electronic crap is dug out of the ground”, says journalist Tim Maughan who took part in the group visits⁷. The group visited enterprises of various types in Shenzhen

According to UNCTAD, in 2010 the highest share of imported value added in exports was observed in computer equipment industry (45 per cent), in consumer electronics it amounted to 36 per cent and in oil industry to 5 per cent only⁸.

Chart 15



Source: Global Value Chains in a Changing World. Ed. by D. K. Elms and P. Low. WTO, Fung Global Institute and the Temasek Foundation, 2013. P. 86.

At the end of the 2000-ies, value added in China amounted to 10 per cent of ex-plant cost of an (outdated by now) iPhone model assembled in China (\$144), the share of value added in Japan being 69 per cent, and in USA and South Korea 31 per cent (Chart 15).

But for various other ICT goods the situation is different. According to WTO (2016), in 2011 the share of foreign value added in computer equipment and electronics exports amounted to 55 per cent in China, 40.1 per cent in Singapore, 42.2 per cent in South Korea, 44.6 per cent in Taiwan, 66.8 per cent

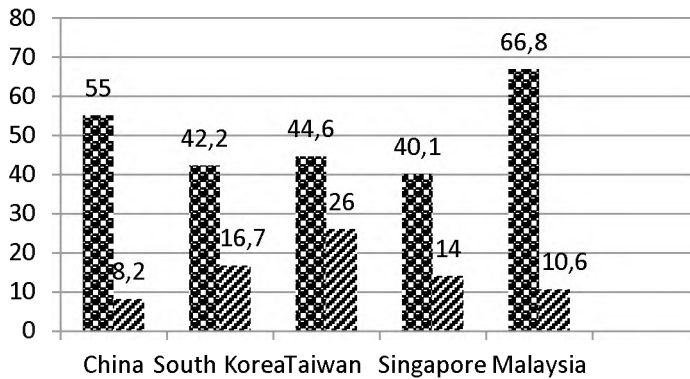
⁷ The Changing Face of Shenzhen, the World’s Gadget Factory. Written by Tim Maughan. August 19, 2015. <http://motherboard.vice.com/read/beyond-foxconn-inside-shenzhen-the-worlds-gadget-factory>

⁸ World Investment Report, 2013, U.N., N.Y.; Gen., 2013. P. 128

in Malaysia. That means that the share of value added produced in the country was 33.2 per cent in Malaysia, 45 per cent in China (it is different from 10 per cent for iPhone), 55.4 per cent in Taiwan, 57.8 per cent in South Korea, 59.9 per cent in Singapore. Another indicator of involvement in global value chains is a part of the industry exports that undergoes further processing in global value chains in other countries: 26 per cent for Taiwan, 16.7 per cent for South Korea, 14 per cent for Singapore, while for China it was 8.2 per cent and for Malaysia 10.6 per cent (Chart 16).

Chart 16

Global value chains in computer equipment and electronics exports in East and South-East Asia, 2011 (per cent).



1) Foreign value added in exports

2) Share of industry exports in GVC in third countries

Source: WTO. Trade in Value Added and Global Value Chains.

https://www.wto.org/english/res_e/statis_e/miwi (access date: 20.03.2016).

Integration into global value chains was one of main factors of success in ICT goods production and exports for China.

ICT goods production: foreign direct investments (FDI) and contract manufacturing

At the end of 1960-ies labor intensive industries, including electronics industry, started migration from developed countries to developing countries of Asia. TNCs began locating their affiliates in South Korea, Hong Kong, Singapore, Taiwan, Malaysia, Thailand, Philippines.

In the 1980-ies electronics industry production and manufacturing in general started migration to China. In 1980–1990 FDI book value in developing countries increased from \$108.1 B to \$529.6 B, by 3.3 times. In China it in-

creased from \$0.06 B to \$20.7 B, by 345 times, in Hong Kong – from \$1.7 B to \$201.7 B, by 119 times⁹.

At that period main investors to China were not TNCs from developed countries, but overseas Chinese and their companies. According to Russian researchers L. Gudoshnikov and K. Kokarev, in total FDI inflow to China in 1985-1990 on average 60.7 per cent, in 1991–1995 58.7 per cent, and in 1996 49.5 per cent originated from Hong Kong. In the province of Guangdong the share of Hong Kong in FDI inflow varied from 93.7 per cent in 1986 to 69.8 per cent in 1990 r. and 78.3 per cent in 1995. The number of employees of affiliates with Hong Kong investors' participation in 1998 was from 4 million to 5 million persons¹⁰.

In 1990-ies investors from developed countries went to China also, and rapid FDI growth continued. In 1990–2000 FDI book value in developing countries increased from \$529.6 B to \$1736.2 B, by 3.3 times. In China it increased from \$20.7 B to \$193.3 B, by 9.3 times, in Hong Kong — from \$201,7 B to \$455,5 B, by 2.3 times.

A significant part of FDI inflow to China was directed into ICT industry. In 2005 in China there were 3000 FDI projects in computer, telecommunications, electronic equipment for the total amount of \$21 B. Dell, Hewlett Packard, Motorola, Nokia and other TNCs created their affiliates in China. In total, there were 3384 foreign companies: they accounted for 21 per cent of assets, 30 per cent of sales, 20 per cent of profits and 16 per cent employed in the industry in 2005¹¹.

In 2014 Hong Kong and China remained main centers of attraction for FDI in South, South-East and East Asia: FDI book value in Hong Kong reached \$1549.8 B; 31.2 per cent of total FDI book value in the region, in mainland China it amounted to \$1085.3 B; (21.8 per cent)¹².

Motivation for locating labor-intensive industries in China still exists. Minimum wages in the USA at the end of 2000-ies amounted to \$5 per hour, average wages – \$15 per hour; it corresponded to about \$900 and \$2600 per month. According to Bloomberg, wages in manufacturing industry in 2014 were \$450 per month in Shanghai, \$400 in Guangzhou, \$340 in Shenzhen. In Ho Chi Minh City and Hanoi they were only \$150 per month; that creates an important competition for China¹³.

⁹ Cvetkova N.N. Informacionno-kommunikacionnye tehnologii v stranah Vostoka : proizvodstvo tovarov IKT i IT-uslug. M.: IV RAN, 2016. p. 20-21

¹⁰ Gudoshnikov L.M., Kokarev K.A. Gonkong — osobaja avtonomija Kitaja. M., 1999. P. 124,170-171.

¹¹ Information Economy Report 2007–2008, U.N., N.Y.; Gen., 2007. P. 125.

¹² World Investment Report, 2016, U.N., N.Y.; Gen., 2016. P. 43.

¹³ Mirovaja jekonomika i mezhdunarodnye jekonomicheskie otnoshenija. Pod red. A.S. Bulatova, N.N. Livenceva. M., 2008. S. 267; China Is Set to Lose Manufacturing Crown.

Besides FDI, non-equity forms of international production (NEMs) also played an important role in migration of electronic industry to Asian countries. In 1970-ies export goods were produced not only by TNC affiliates, but also by local enterprises who worked under subcontracts with TNCs, long-term contracts on goods purchases, under which subcontractors are provided with specifications (technology), materials, equipment; quality of goods that bear the principal's brand is under strict control of the principal. Migration of industrial enterprises from Hong Kong to Guangdong province was made in such a way that the enterprises moved with a network of their relationships with principals: Western and Japanese transnationals. Today Asian countries are involved in global value chains in electronics not only through FDI, but also through contract manufacturing.

In world electronics exports, companies with NEMs accounted for about a half in 2010, according to UNCTAD¹⁴. World Investment Report 2011 gives a list of 10 leading companies working under contract manufacturing in electronics industry: they were 5 companies from Taiwan, 1 from Hong Kong, 1 from Singapore, 2 from the USA, 1 from Canada.

Hon Hai (Foxconn) from Taiwan was first among companies working under manufacturing contracts. It is one of the biggest electronic companies in the world. In 2014 its sales reached \$141 B. In 2012 it had 1.29 million employees and 62.6 per cent of them worked not in Taiwan, but abroad, mostly in China where Hon Hai has about 20 factories. Hon Hai affiliate in Shenzhen was opened in 1988.

Apple products: iPhones and iPads – are expensive and prestigious, but they are assembled by workers receiving low wages and living in employees dormitories that look as military barracks for soldiers with two-level beds. A series of photos of such a dormitory at a factory of Pegatron company from Taiwan in China, which also assembles iPhones for Apple, were posted recently in Internet by Human Rights Watch. The level of wages at the factory is 3264 yuan (CNY); that is equal to about 31600 rubles. But wages may exceed this level in case of working overtime; sometimes it may last 90 hours per month¹⁵.

Flextronics Corp. from Singapore was second among companies working under contract manufacturing system in electronics. It also has factories in China as well as other electronic manufacturing services providers from the list: Quanta, Wistron and Inventec companies from Taiwan. Quanta's clients are Dell, Hewlett Packard, Toshiba, Fujitsu, Siemens, Lenovo, Acer. Wistron performs manufacturing contracts for Dell, Microsoft, Lenovo, Hewlett

<http://www.bloomberg.com/news/articles/2015-04-29/china-is-set-to-lose-manufacturing-crown> (access date: 30.04.2015).

¹⁴ World Investment Report 2011. P. 154–156. Здесь и далее данные о компаниях взяты из: World Investment Report 2011, Annex, Table IV.1;

<http://www.forbes.com/global2000/list/#tab:overall> (access date: 1.06.2016).

¹⁵ <https://hi-tech.mail.ru/news/pegatron-photo/?frommail=1> (access date: 1.09.2016).

Packard, Acer. Inventec works for the same clients and also for Siemens, Fujitsu, Toshiba. All these providers of electronic manufacturing services have their manufacturing facilities in China.

American Jabil Corporation performs manufacturing contracts for Alcatel Lucent, Intel, Philips; it has factories in Shanghai, Chengdu, Yantai in mainland China and in Hong Kong¹⁶. Hong Kong company TPV clients are Dell, HP, IBM, Mitsubishi Electric. 69 per cent of products are manufactured under contracts (ODM, Original Design Manufacturing), and other 31 per cent are OBM (Own Brand Manufacturing): monitors for computers AOC Topview, television sets LDC. TPV manufacturing base is mostly located in mainland China. Canadian company Celestica and American Sanmina SCI (No. 10 in providers list), which works under contracts with IBM, Lenovo, HP, Cisco, Dell, Nokia, Caterpillar, also have factories in China¹⁷. Western TNCs and TNCs from Asian countries, providers of electronic manufacturing services, all of them have their manufacturing base in China¹⁸.

ICT goods production in China: types of manufacturers

There are different types of ICT goods manufacturers in China: affiliates of TNCs from the West and of Asian TNCs, national Chinese companies: enterprises of public and private sectors. There are also a great number of small and medium-scale enterprises. Some startups are rapidly transformed into transnationals: recent example of Xiaomi.

One can get an idea of multi-level structure (“multi-structural economy”) of Chinese electronics industry judging by an example of one of the main centers of electronics in China – Shenzhen. Before it was given SEZ status in 1979, Shenzhen was a fishing port with a population of 300,000. Now it is a city of over 15 million and “it continues to swell, constantly drawing workers from China’s countryside: the children of subsistence farmers hoping to carve out a better life for themselves in the city”. “It’s where all the electrical crap we buy comes from,” Kate Davies, a researcher and architect who studies extreme places, says: “The cheap toys, that box of chargers and adapters that you have, that you’ve no idea what they’re for anymore, the cemetery of old phones in your kitchen drawer...”. “Shenzhen is one of those points on the planet where the world condenses in high density into one place, it’s an artifact of the contemporary global supply network that weaves matter and displaces earth across the planet”¹⁹.

¹⁶ <http://www.jabil.com/> (access date: 1.10.2015).

¹⁷ World Investment Report 2011. P. 219.

¹⁸ Cvetkova N.N. TNK v stranah Vostoka: PII i global'nye proizvodstvennyye seti // Vostochnaja analitika. Ezhegodnik 2012 g. M.: IV RAN, 2012.

¹⁹ The Changing Face of Shenzhen...

In Shenzhen there are affiliates of Western TNCs: Hewlett Packard, TNC from Asian countries: Samsung Electronics and of course Foxconn (Hon Hai) from Taiwan. “Mention Shenzhen to most people, and they’ll probably think of the vast Foxconn manufacturing plant that churns out high-end phones, tablets, laptops, and gaming consoles for the likes of Apple, Microsoft, Dell, and Sony. The size of a small city – with an estimated half a million employees – Foxconn’s Shenzhen plant gets media attention not just because of its vast scale and brand-name clients, but also because of the numerous reports of atrocious working conditions it has engendered, and the stories of employee suicides, protests, and even riots within the campus walls”²⁰.

By 2016 Foxconn has got a newly built manufacturing facility for the iPhones in Zhengzhou, China. And the plant manufactures about 200 000 iPhones per day. 70 per cent of the production of iPhones now comes from Foxconn’s Zhengzhou plant. The iPhones that are manufactured in Foxconn’s Zhengzhou plant are shipped worldwide. In the interview, one of the Foxconn workers in Zhengzhou said “she receives two 15-minute paid rest breaks at noon and afternoon, one 50-minute meal period in each workday in which she work at least eight hours. And she earns 2 000–3 000 yuan (\$316 – \$474) per month. So, Foxconn’s Zhengzhou plant is now the main manufacturing plant for iPhone production line, and Foxconn has been working with the Chinese city of Zhengzhou to make the factory the largest smartphone production facility in the world. Speaking of the workforce at the facility there, there are more than 110,000 workers after large scale recruitment in January 2012. Moreover, some of the newly recruited workers are relocated from Foxconn’s Shenzhen plant. Foxconn’s strategy is to move production from Shenzhen to inland territories where costs are lower and it can pay its peasant workers lower wages, as well as benefiting from tax breaks from city authorities. What’s more, Shenzhen had become notorious for its spate of suicides and accusations of poor working conditions and enforced overtime²¹.

Foxconn is also opening a new “technology tourism factory” in Jiangsu, China, designed to give outsiders a peak into a (carefully managed) version of the Foxconn working experience. The factory will allow visitors to experience IT product manufacturing, Foxconn style. It will consist of two sections, with the front part being an experience center where people can test the latest Foxconn-made gadgets, and the back part featuring a manufacturing demo and retail center. There will also be a home theater, nursery room, and kids’ playground²².

²⁰ The Changing Face of Shenzhen...

²¹ <http://micgadget.com/26325/70-of-iphone-production-now-comes-from-foxconn-zhengzhou-plant/>

²² Get the Foxconn experience with new tourist factory. By [Luke Dormehl](#). January 19, 2016 <http://www.cultofmac.com/407687/get-the-foxconn-experience-with-new-tourist-factory/>

In Shenzhen, besides foreign transnationals, biggest Chinese electronic companies: ZTE, Huawei, TCL also have their affiliates. Kate Davies and her group (“voyage along the supply chain”), including Tim Maughan, whose article is cited here, visited some electronic enterprises in Shenzhen, large and medium, among them TCL and Yuwei. “TCL LCD Industrial Park is one of the world’s biggest television manufacturing plants. It takes about an hour to get here from Shenzhen’s financial center. TCL LCD Industrial Park is a fraction of the size of Foxconn, but it’s still industrial manufacturing on a scale that has become alien in the West. TCL makes 18 million TVs a year, as well as Blu-ray players, all labeled under a number of different brands”. In 2004 TCL acquired RCA, first company that started manufacturing television set in US. There is a museum of television in the Industrial park.

“We get a glimpse of the factory floor as we walk past the windows looking down on one of the production lines”, T. Maughan says. The premises are clean, with a lot of light and high ceilings. “The production line appears semi-automated; there’s a dozen or so young workers wearing t-shirts with QR codes on their backs interacting with various machinery. They work a minimum of one eight hour shift a day, but can do a second if they want (they say, this is optional) for six days a week. In return, they get paid, on average, about 3,000 yuan, or roughly \$484, a month”. “We’re invited to have lunch in one the factory’s three canteens: a huge three-level food court complex. Each canteen serves 3,000 workers a day. Watched over by CCTV cameras, hordes of teenage employees in short sleeved uniforms – color-coded depending on which line they work sit at fast-food restaurant style tables. Everyone is over 16; many appear in their early 20s”. TCL is now also outsourcing manufacturing to other nations, namely to Poland (it has 14 Special Export Zones, SEZ) where workers earn 350 euro a month (comparable to China). Belarus also has a huge SEZ, called the China–Belarus Industrial Park²³.

Shenzhen is also a center where startups are created (sometimes 100 new companies are registered a day) or where startups created in other countries outsource their operations. Some startups have attained success, for example Petcube (distant watching home pets from smartphone and talking to them).

Just as not all factories in Shenzhen are like Foxconn, neither are they all like TCL. For every plant on the scale of TCL Industrial, there are dozens of smaller operations in Shenzhen, grimy little startup factories tucked away in run-down warehouses or suburban trading estates. T. Maughan visited Shenzhen Yuwei Information and Technology Development Co., Ltd, which “is one of these, a small factory with less than 200 workers that specializes in making GPS tracking devices for motor vehicles. Here too workers log one or two eight hour shifts a day, but the pay here is lower; most make just 2,000 yuan (\$323) a month. The work looks monotonous, the atmosphere feels oppressive, the air thick with the

²³ The Changing Face of Shenzhen

smell of sweat and solder”. At 5 PM /?/ there is a dinner break. “The workers form orderly, single-file lines, waiting for managers to tell each team they can leave. As they exit, they each pass through metal detectors, pausing to have their faces scanned by a facial recognition system mounted next to the door. Only when it beeps its approval can they leave. The canteen here is a far cry from TCL’s multi-level facilities. It’s another dingy space filled with wooden tables and benches, paint peeling from the walls”²⁴.

Yuwei is one of those factories – and Shenzhen is full of them – that specializes in components rather than finished consumer products. Just two minutes’ walk from the factory floor is “where the majority of Yuwei’s workers live, in four-story concrete housing blocks reminiscent of brutalist municipal projects in the US or Europe”. Inside, the rooms are largely featureless apart from basic, metal frame bunk beds.

Even Kate Davies, who’s visited multiple factories in Shenzhen, is surprised by the conditions: “For all the things they are manufacturing to be shipped to our homes,” she says, “bulging as they are with the things we all complain we have nowhere to put, the starkness of these dorms is sobering... [there’s] nothing in there but a poster, a pair of shoes, a water bottle, a plastic chair, and a bunk bed with no mattress”²⁵. Living conditions in Foxconn dormitories in Shenzhen were not worse. The problem is that Foxconn workers assembled expensive and prestigious gadgets – iPhones.

Shenzhen is also a center of “shanzhai” industry producing mobile phones and other electronic devices: foreign technology is copied, but some innovations may be introduced into it. They are often “no name” products. “The Economist” calls “shanzhai” Chinese type of innovations. In 2009 in Shenzhen there were about 30000 small enterprises working under “shanzhai” model. About 13 per cent mobile phones sold in the world in 2009 were counterfeit products (not necessarily from China)²⁶. They are highly demanded in countries with low incomes.

Chinese TNCs in ICT goods production

In October 2016 Google introduced on the market a new smartphone, competing with Apple. American journalist Jason Perlow called his article on competition between Apple and Google “Game of Smartphones”, as compared to “Game of Thrones”, popular TV-serial. “While Cupertino /Apple/ and Mountain View /Google/ are enjoying their war of attrition over handset market share, a chilling wind comes blowing from Shenzhen”. Perlow writes, “It is fun to watch the seemingly never-ending Google versus Apple war”. Google created Android and the

²⁴ The Changing Face of Shenzhen...

²⁵ Ibid

²⁶ Information Economy Report 2010. , U.N., N.Y.; Gen., 2010. P. 46

device OEM business that goes along with it. They open sourced it. It's out there. ...the genie is out of the bottle, and Android Open Source Project (AOSP) could be forked as a derivative work. Endless amounts of Android devices can be made by third parties without Google having any say in it.

Apple Google “war” “would be an interesting battle to watch, but it ain't gonna stop the Giant Army of Ice Zombies”, coming from behind the Wall /an allusion to the “Game of Thrones”/. Perlow says, “...when I mean Ice Zombies I mean extremely competent and powerful Chinese manufacturing giants such as Huawei, Xiaomi, and ZTE. And instead of the North they're coming from Shenzhen”. But American companies “know they can't defeat the Ice Zombies /competitors from China/. They know most people can't afford to pay \$600 for a smartphone. If a perfectly viable alternative exists for \$200, most consumers are going to opt for that instead. They know they are a luxury goods manufacturer. They know they have pretty much maxed out market share for what they have, and they are in maintenance mode. Most people can't afford to buy luxury goods”.

“China is going to transform the mobile industry landscape. Apple and Google and its most favored Android OEMs are living on borrowed time. The Ice Zombies are going to lay waste to the current smartphone industry, and nothing is going to stop them – regardless of who ends up in the Iron Throne in Washington in November. The only defense Apple and Google has is *innovation*, and moving on to the next thing, and creating a new market entirely”²⁷.

In the beginning of 2000-ies TNCs from the West and from Taiwan, South Korea dominated China ICT goods exports. In mid-2010-ies we can state that Chinese TNCs are among leaders on the world computer, telecommunications equipment markets.

Among five leaders of world personal computers market Chinese Lenovo was first in 2015 (52.7 million units, 20.7 of the world market). In 2014 it was also first with 59.3 million units sold and the market share of 19.2 per cent. Other companies in top five in 2015 were American Hewlett Packard (market share of 19.4 per cent), Dell (14.1 per cent), Apple (7.5 per cent), and Acer from Taiwan (7.1 per cent of the market)²⁸.

Five leaders on world tablets market in 2015 were Apple (with 24.0 per cent market share), Samsung Electronics (16.2 per cent), Lenovo (5.4 per cent), Asus from Taiwan (3.4 per cent) and Huawei (3.1 per cent). Lenovo and Huawei increased their market shares from 4.9 per cent and 1.3 per cent in 2014²⁹.

²⁷ Game of Smartphones: Why neither Apple nor Google can win this war with China. Jason Perlow for Tech Broiler. June 30, 2016. <http://www.zdnet.com/article/game-of-smartphones-neither-apple-nor-google-can-win-this-war-with-china/> (access date: 1.07.2016).

²⁸ IDC Worldwide Quarterly PC Tracker, January 12, 2016. <http://www.idc.com/getdoc.jsp?containerId=prUS40909316> (access date: 2.09.2016).

²⁹ <http://venturebeat.com/2016/02/01/idc-tablet-shipments-decline-10-1-in-2015-leaders-apple-and-samsung-both-lose-market-share/> (access date: 1.09.2016).

Among 11 leaders of world mobile phones market, including both smartphones and ordinary mobile phones, in 2014 there were 5 Chinese companies – Lenovo (market share, 3.7 per cent, 4th rank after Samsung, Apple, Microsoft /Nokia), Huawei (3.8 per cent), TCL (3.4 per cent), Xiaomi (3 per cent) and ZTE (2.9 per cent) – 6th-9th ranks³⁰. Smartphones constituted 2/3 of mobile phones sold in the world in 2014 and 4/5 in 2015³¹.

In 2015 Samsung remained the leader in the worldwide smartphone market. The Korean giant finished the year with 324.8 million shipments, which is up only 2.1 per cent from the 318.2 million shipments in 2014. “With continuously increasing pressure in the high end from Apple, and at the low end to midrange from Chinese manufacturers Xiaomi, Huawei, ZTE, and others, Samsung faces a multi-front battle”. Continued demand for Apple's iPhones, particularly in China and the USA, elevated Apple in 2015 to 231.5 million units shipped in the year. This represents 20.2 per cent growth from the 192.7 million units shipped in 2014.

Huawei was the biggest winner in 2015, with the strongest year-over-year growth among the top five vendors at 37 per cent. “Huawei also became the fourth mobile phone vendor in history to ship over 100 million smartphones in a year (preceded only by Nokia, Samsung and Apple). Of the key brands originating from China, Huawei has consistently expanded its presence and share on the back of affordable handsets in emerging markets, combined with increasingly competitive flagship models. Lenovo, just over one year after its acquisition of Motorola, was still trying to find its feet amidst organizational changes while facing greater competition in its domestic market from smaller, local competitors at the low end”. The Motorola brand name will be shortened to just “Moto” and be used for high-end devices while the “Vibe” brand from Lenovo will represent the low-end.

Xiaomi leaned heavily on the China market for growth, where volumes were still 90 per cent domestic on average compared to international, despite ramping up in India and launching in Brazil. “Xiaomi spent 2015 trying to encourage a transition away from the low-end range of models into more midrange models, although the bulk of shipments still rest on low-end volumes from the Redmi line. On the basis of this growth, it was able to widen the gap from number 6, LG”³².

But in the first quarter of 2016 Lenovo and Xiaomi left “top 5” on smartphones market. They were replaced by other two Chinese companies – Oppo and Vivo³³.

³⁰ <http://www.dailycomm.ru/m/30481/> (access date: 1.09.2016).

³¹ <https://www.strategyanalytics.com/strategy-analytics/news/strategy-analytics-press-releases/strategy-analytics-press-release/2015/07/30/huawei-becomes-world's-3rd-largest-mobile-phone-vendor-in-q2-2015#.V8Phe2wkrIU> (access date: 2.09.2016).

³² IDC Worldwide Quarterly Mobile Phone Tracker, January 27, 2016.

<https://www.idc.com/getdoc.jsp?containerId=prUS40980416> (access date: 1.09.2016).

³³ <http://phoneradar.com/vivo-oppo-replaces-lenovo-xiaomi-top-5-global-smartphone-brands/> (access date: 3.10.2016)

Chinese Lenovo, Huawei, Xiaomi, ZTE, TCL are among leaders on computer equipment and telecommunications markets. Three American leaders – Apple, Hewlett Packard and Dell rely on contract manufacturing which companies-contractors, mostly from Taiwan perform in China, in their Chinese affiliates.

Table 6

Companies from China and Hong Kong (China), ICT goods production, from “Forbes 2000” lists, 2014, 2016

	Name	Country	Rank in Forbes list		Rank in the sector		Sales (\$B)		Market capitalization (\$B)	
			2014	2016	2014	2016	2013	2015	2013	2015
Computer equipment (hardware)										
1	Legend Holding-	China		611		4		49.3		5.9
2	Lenovo Group	China	566	840	3	6	37.2	47.1	11.9	9.1
	Focus Media- Information Techn.	China		1738		12		1.3		20.9
	Great Wall Computers	China	1740	1922		14		11.6		2.5
Electronics										
7	Hikvision	China	1572	1098	22	15	1.5	4.1	11.4	19.5
8	BOE Technology Group	China	1668	856	25	8	5.4	7.7	4.8	12.9
Consumer electronics										
2	TCL Corp.	China	1335	1015	8	5	13.8	16.4	3.5	6.8
3	Great Wall Technology	China	1740		12		15.1		0.5	8.8
Telecommunications equipment										
2	ZTE	Hong Kong (China)	1220	776	8	5	12.1	15.7	7.2	8.5
Memory storage devices										
	TPV	Hong Kong (China)		1976		6		0.4		11

Source: <http://www.forbes.com/global2000/list> (access dates: 15.09.2014; 1.06.2016)

In Forbes 2016, 2000 Global companies list, there were 10 companies producing ICT goods from China and Hong Kong (China) (1/3 of the total number of companies from Asia and 10 per cent of the total number of companies producing ICT goods). Some of these and some other Chinese ICT goods producing companies are also included in Fortune and UNCTAD ratings.

Lenovo was called “a Chinese face of capitalism”. It was established in 1984 by a dozen of researchers from the Institute of computer technology

of the Chinese Academy of Sciences. The company was called Legend. At first they imported computers, after that began developing Chinese content for software, and finally started computers manufacturing. Lenovo held IPO on the Hong Kong Stock Exchange. Main shareholder of Lenovo is Legend Holdings (41.5 per cent), which is controlled by the Chinese Academy of Sciences, a small percentage of shares are held by American investment funds, more than 1/2 is traded on stock markets³⁴.

In 2005 Lenovo purchased IBM corporation plant which manufactured personal computers in the USA. Lenovo sales centers are located in the USA, China, Singapore and France; its production centers are located in China, the USA, India, Mexico and R&D centers – in China, the USA, Japan³⁵. In 2014 Lenovo acquired Motorola Mobility division from Google and a plant producing servers from IBM.

Chinese Xiaomi is a new “success story” in ICT goods production. It was established in 2010, and in 2015 it was one of “top five” in the world smartphones market³⁶.

There are many public sector enterprises among Chinese TNCs. Particularity of ICT sphere is often an active part the state or state organizations take in establishing such companies or their participation in the company capital. ZTE was established by a group of investors related to the Ministry of Aeronautics industry of China, Lenovo by a group of employees of the Academy of Sciences. China Electronics Corporation (CEC) is a state corporation, it was included in the Fortune 500 Global companies list in 2014 (but not in Forbes list as it is not a public joint stock company). It was established in 1989, and in 2001 it bought from Philips Corp. its share in their joint venture producing mobile phones. CEC manufactures computers, semiconductors, telecommunications equipment.

TCL Communication Technology Holdings Limited (“TCL Communication”), a global mobile terminal manufacturer and Internet service provider, was founded in March 1999. The company headquartered in Shenzhen, China, is a subsidiary company of TCL Corporation. TCL Communication’s portfolio of products is sold in over 170 countries in the world and the company has 13500 employees in China and overseas.

In 2015, TCL Communication’s total sales volume of handsets and other products increased by 9 per cent to 80.0 million units, with the sales volume of smart devices increased by 7 per cent to 44.5 million units. According to the international telecommunications research firm Gartner and to TCL data of year 2015, in terms of shipments volume, TCL Communication ranked no. 5 among global handset manufacturers. The company also ranked no. 8 among global smartphone

³⁴ <http://www.lenovo.com/lenovo/us/en/locations.shtml> (access date: 3.03.2015).

³⁵ <http://www.lenovo.com/lenovo/us/en/locations.shtml> (access date: 3.03.2015).

³⁶ <http://www.mi.com/en/about/> (access date: 10.09.2015).

manufacturers. Its tablet business grew 122 per cent in 2015 and ranked no. 7 among all tablet manufacturers³⁷.

TCL Communication operates with multiple brands: it produces TCL and Alcatel branded products and services. TCL chose its company name by taking the initial letters from *Telephone Communication Limited*. But at the beginning, TCL was also referred to as an acronym for “True China Lion”. TCL’s current corporate slogan is “The Creative Life” (also using the corporate name acronym). The TCL Corp., parent company, began manufacturing consumer electronics for the Chinese market during the 1980-ies. At the beginning TCL was a state-owned enterprise, but after IPO on the Hong Kong Stock Exchange there are also minority private shareholders³⁸.

There is such a trend that was pointed out: having worked for some time in computer companies in the USA, many Chinese and Indians returned to their home countries and used their experience for creating venture companies in technology sphere. In 2015 new Chinese billionaires attracted attention. Xiaomi company is called Chinese Apple and its main shareholder and founder Lei Jun is called Chinese Steve Jobs. Lei Jun had 107th rank in the Forbes Billionaires list in 2016³⁹. Another founder of Xiaomi Lin Bin also was included on the Forbes billionaires list in 2016. Having graduated from Sun Yat Sen University in Guangzhou in 1990, he went to the USA where he got his Master of computer sciences degree. After that he worked as an engineer for Microsoft, for Google, at first in the USA and later in China where he headed Google department for Android platform localization in China⁴⁰. Among other founders of Xiaomi company (there are 8 of them in total) there are Chinese who studied in the USA and worked for Microsoft, Google, Motorola companies.

Representatives of China hi-tech industry occupy an important place among Forbes 2016 billionaires of ICT sphere.

Prospects of ICT goods production in China and new technologies

“Today in ICT goods production we observe competition between cheap workforce and robots. Up-to-date mobile phones and iPads can be produced at automated production lines (Nokia) or by hundreds of thousands workers (Foxconn company)”, points out A.V. Akimov⁴¹.

³⁷ http://www.tclcom.com/?page=company_profile;

<http://www.tclcom.com/?page=milestones> (access date: 1.09.2016).

³⁸ <http://www.tclcom.com/?page=milestones> (access date: 1.09.2016).

³⁹ <http://www.forbes.com/profile/lei-jun/> (access date: 11.11.2015).

⁴⁰ <http://www.forbes.com/profile/lin-bin/> (access date: 11.11.2015).

⁴¹ Akimov A.V. Trudosberegajushhie tehnologii i obshhestvennoe razvitie v XXI veke // Vostok (Oriens). 2015. N 1.

Foxconn (Hon Hai) was for a long period of time using cheap workforce for manufacturing labor intensive electronic products. But after publications in “New York Times” on workers’ suicides, poor working conditions and dormitories looking like military barracks at its factory in Shenzhen, Foxconn president Terry Gou declared in 2011 that the company would use robots at its factories in China. And in 2013 10 000 robots were used at Foxconn factories in China⁴².

Hon Hai, the world’s largest electronics manufacturing services provider, reached an agreement with SoftBank from Japan and Chinese company Alibaba to invest in SoftBank Robotics Holdings Corp. An initial batch of Pepper robots, developed by SoftBank and Aldebaran (that was bought by SoftBank) is manufactured by Hon Hai in its Shandong plant in China.

“Pepper is an emotional robot, 120 cm high, connected with a cloud platform. It can be a nurse for your children and a guardian of your home”. It can also accompany visitors in companies. As it is produced in China, its price is affordable: \$2000, as compared to prices for other robots-companions (\$10000–20000)⁴³.

“Robots are to be the focus of the Hon Hai Group’s strategic development, and the company is to focus on Internet of Everything (IoT) key technologies”, the group’s chairman Terry Gou said. In an interview with Chinese media, Gou said that the introduction of “industrial robots” to the manufacturing sector was an irreversible trend, but would not reduce the number of workers employed in factories.

He said robots are the focus of the company’s strategic development and that Hon Hai, also known as the Foxconn Technology Group, would take robotic services internationally in cooperation with China’s Alibaba Group Holding Ltd and Japan’s SoftBank. Hon Hai also produces industrial robotic arms and 48,000 have been installed in Hon Hai plants, including more than 2,000 self-developed mechanical arms in the company’s Kunshan factory⁴⁴. In May 2016 it was declared that 60000 workers at Foxconn factory in Kunshan would be replaced by robots. They lost their jobs but it was said that professional training would be offered to them⁴⁵.

The situation on China labor market has changed. “Workers born in the 1970s typically had limited education; they grew up when China was still backward and had little exposure to the outside world. Workers born in the 1980s have more technical expertise and depend heavily on working in a particular industry,” says

⁴² <http://www.everything-robotic.com/2011/11/huge-employer-in-china-makes-big-step.html>;
<http://knowledge.cgsb.edu.cn/2013/01/23/china/chinas-manufacturing-metropolises-inside-foxconn> (access date: 20.04.2015).

⁴³ <http://www.zdnet.com/article/softbank-aldebaran-launch-pepper-an-emotional-robot/>
(access date: 1.06.2016).

⁴⁴ Hon Hai to focus on IoT technologies and robots.
<http://www.taipetimes.com/News/biz/archives/2015/12/17/2003634954>
(access date: 1.06.2016).

⁴⁵ <http://www.bbc.com/news/technology-36376966> (access date: 1.07.2016).

John Liu, the 31-year-old founder and owner of Harderson International, a small factory in southern China that applies paint to ceramics and glass. “Those born in the 1990s don’t even want to work. Even many with college degrees don’t know what they want. Single children are pampered, and they often stay home in their parents’ homes. They make very unstable workers.” “You know what makes really stable workers? ...Robots”.

The latest Shenzhen company to make headlines with a new automated line is Evenwin Precision Technology, an electronics processing company which sacked 90 per cent of its employees, replaced them with robots and saw productivity soar. Previously, there were 650 employees at the factory, now there are 60 – mostly engineers and accountants that oversee the production lines – and the number should go down to 20, according to company officials. The robots have produced almost three times as many pieces as were produced before. Quality has also improved. The product defect rate was 25 per cent, now it is below 5 per cent. The International Federation of Robotics (IFR), which represents robot manufacturers and research institutes, said China in 2014 surpassed Japan to become the world’s biggest market for industrial robots. Some 200,000 were operating in China at the end of 2014, the IFR said, with 32,000 installed in 2013 alone, accounting for 20 per cent of worldwide installations that year. The robot-to-worker ratio in the country is still relatively low, the IFR said, with 30 robots working in manufacturing plants per 10,000 employees. Japan’s ratio is 11 times higher⁴⁶.

In case automation and robotics have universal spread, it may result in “compression” of global value chains in electronics industry and in general in radical changes in the international division of labor. But in my opinion, reliance on cheap workforce and automation may co-exist. There may be several responses to these challenges of labor-saving technologies:

First, migration of labor-intensive industries to internal regions of China with lower wages and workforce ready to cooperate with employers (as it is done by Foxconn moving its manufacturing base to internal regions). Chinese ICT companies also create affiliates in countries with cheap labor force (including Eastern Europe).

Second, industry can be reoriented to regional market. There is a division of labor in ICT goods production between Asian countries: one of them (Taiwan, Republic of Korea, Singapore) have become electronic components suppliers, and other countries (China, Viet Nam, Malaysia) assemble finished goods from imported components and export them to many countries, including those of their region. The share of mutual exports of electronic components of six leading exporters of ICT goods: China, Hong Kong (China), Taiwan, Republic of Korea, Singapore, Malaysia in 2013 reached about 4/5 of their total electronic components

⁴⁶ A Chinese factory replaced 90 per cent of its employees with robots – production soared soon after. August 3, 2015 <http://www.zmescience.com/research/technology/chinese-factory-sacks-people-gets-robots-0523534/> (access date: 1.10.2016).

for ICT goods exports. International economic integration processes have been intensified. China does not participate in Trans-Pacific Partnership. But the negotiations on creating Regional Comprehensive Economic Partnership with participation of 16 countries, China among them, continued in 2016. At microeconomics level, the region of East and South-East Asia is characterized by one of the highest levels of integration in the world: there is an interwoven network of global value chains, particularly in electronics industry, with GVCs not always coinciding with framework of international inter-state integration organizations.

Third, ICT goods production can be re-oriented partly to internal market. In China today a growing part of ICT goods is produced for its increasing internal market, e.g. smartphones. Chinese companies produce smartphones mostly for consumers with low and lower middle incomes, but such consumers constitute the majority of population and not only in Asian countries, the demand for such goods is likely to remain high.

Fourth, China in the future will face the problem of ageing population; even now there is a new generation of workforce, “little emperors”, the only children in their families, less obedient to employers and having more demands concerning wages and work conditions. At present China is developing robotics and automation, in particular in electronics industry⁴⁷. Attempts of Chinese companies to raise their competitiveness also benefit from active China government support.

If long or broad global value chains would be replaced by highly automated production units in one country, these production units could be located not only in Western countries or in Japan, but also in China, in proximity of consumers' markets. At any case China attaches great importance to development of automation and robotics in industry.

It is extremely important that China, Chinese companies take an active part in a new stage of scientific and technological revolution – robotics and automation. Other countries (and Russia in the first place) should take into consideration the experience of China. The heart of the matter resides not in creating demo-versions of intelligent robots, but in robotics and automation use in industry and other branches of economy.

⁴⁷ Akimov A.V. Trudoberegajushhie tehnologii i obshhestvennoe razvitie v XXI veke // Vostok (Oriens). 2015. №1.