

China-US Trade in Advanced Technology Products

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Abstract __ This paper explores the performance of China in exporting advanced technology products to the United States during the 2002-2015 period. Advanced technology products include about 500 products representing lead- edge technology and cover 10 broad groups. Findings reveal that China's exports of high-tech products to the United States are heavily dominated by information & communications products and opto-electronics. Notable product groups for which China has a comparative disadvantage are aerospace and life science products.

Keywords __ Advanced technology products, market share, revealed comparative advantage

I. INTRODUCTION

High technology products are characterized by external economies and high R &D intensity. Several studies (among others, Ferrantino, Koopman, Yinug, and Wang [1], Rodrik [2], Schott [3], and UNCTAD [4]) have explored the performance of China in exporting high-technology products.

This paper contributes to the literature by exploring the performance of China in exporting advanced technology products to the United States during the 2002-2015 period at a disaggregated level. Advanced technology products include about 500 products representing lead -edge technology and cover 10 broad groups: biotechnology, life science, opto-electronics, information and communications, electronics, flexible manufacturing, advanced materials, aerospace, weapons, and nuclear technology.

II. DATA AND METHODOLOGY

The advanced technology products (ATP) are defined and selected by the US Department of Commerce. Ten broad groups including their definitions are presented in Table 1. Data for China-US trade in ATP are available from the US Department of Commerce.

The methodology of the paper includes several quantitative indicators such as: the trade balance, the Revealed Comparative Advantage (RCA) and market shares.

Table 1. BROAD GROUPS OF ADVANCED TECHNOLOGY PRODUCTS

Groups	Definition
Biotechnology	Medical and industrial applications of advanced scientific discoveries in genetics to the creation of new drugs and therapeutic items
Life Science	The application of scientific advances to medical science such as nuclear resonance imaging, echocardiography, and novel chemistry.
Opto-Electronics	Electronic products that involve the emitting and detection of light such as optical scanners, optical disk players, solar cells, photo sensitive semiconductors and laser printers
Information & Communications	Includes central processing units, computers and peripheral units, fax machines, and telecommunication equipments
Electronics	Recent design advances in electronic components such as integrated circuits circuit boards, capacitors, and resistors
Flexible Manufacturing	Advances in robotics, numerically-controlled machine tools, and similar products.
Advanced Materials	Recent advances in the development of materials that allow for further development of advanced technologies such as semi-conductor materials, optical fibre cable, and video discs.
Aerospace	New military and civil helicopters, airplanes and spacecraft.
Weapons	Military goods such as guided missiles, bombs , mines and rocket launchers.
Nuclear Technology	Nuclear reactors and parts

III. BASIC STATISTICS

Table 2 reports some basic statistics on trade between China and the United States in ATP during 2002-2015. It is clearly evident from table 2 that US imports of ATP from China increased substantially, from about \$20 billion in 2002 to about \$154.9 billion in 2015. The US trade deficit in ATP jumped from \$11.8

billion in 2002 to about \$120.7 billion in 2015. Furthermore, China's share in total US imports involving ATP rose from 10.3% in 2002 to 35.7% in 2015. Growing sophistication of China's exports to the USA is evident from the upward trend in the share of US imports of ATP products in total US imports of all goods from China (SCAMC).

Table 2. US TRADE WITH CHINA IN ATP PRODUCTS (\$MILLIONS)

Year	XAC	MAC	TBA	MAW	TMC	SCA	SCAMC
2002	8,289	20,097	-11,808	195,150	125,192	10.3	16.1
2003	8,290	29,345	-21,055	207,031	152,436	14.2	19.3
2004	9,423	45,694	-36,271	238,276	196,682	19.2	23.2
2005	12,320	59,253	-46,933	259,742	243,470	22.8	24.3
2006	17,633	72,727	-55,094	290,760	287,774	25	25.3
2007	20,349	88,006	-67,657	326,809	321,443	26.9	27.4
2008	17,363	91,392	-74,029	331,152	337,773	27.6	27.1
2009	17,205	89,699	-72,494	300,892	296,374	29.8	30.3
2010	21,444	115,631	-94,187	354,253	364,953	32.6	31.7
2011	20,133	129,448	-109,315	386,439	399,371	33.5	32.4
2012	22,157	141,207	-119,050	396,228	425,626	35.6	33.2
2013	29,051	145,932	-116,881	401,076	440,448	36.4	33.1
2014	30,827	154,571	-123,744	421,529	466,656	36.7	33.1
2015	34,228	154,946	-120,718	434,474	481,881	35.7	32.2

Notes:

1. XAC= Exports of ATP from USA to China
2. MAC = Imports of ATP from China to USA
3. TBA= Trade balance in ATP for the USA with China
4. MAW= Imports of ATP from the world to the USA
5. TMC= Total imports of all commodities from China to USA
6. SCA= Share of China in total imports of ATP from the world to USA (%)
7. SCAMC= Share of imports of ATP from China in total imports from China to USA (%)

IV. CHINA-US TRADE IN ATP: A DISAGGREGATED ANALYSIS

Table 3 shows China-US trade in ATP for ten broad groups for 2002 and 2015. Several points can be highlighted: first, information & communications (IC) is the dominant group of imports from China to the United States, followed by opto-electronics, amounting to about \$16.6 billion and \$1.9 billion in 2002. Second, in the same year, the United States had large deficits in information & communications, and opto-electronics, but a substantial surplus in aerospace. Third, the market share of

China in US (SCUS) was highest in opto-electronics (34.1%) followed by information & communications (16.5%). Fourth, the value of US imports of information & communications from China increased to over \$139 billion in 2015. The market share of China in this product group rose sharply from 16.5% in 2002 to 59.1% in 2015. Finally, in 2015, the United States had substantial trade deficits in information & communications and opto-electronics. In contrast, the United States had significant trade surpluses in aerospace, biotechnology, life science, electronics, and flexible manufacturing.

Table 3. US-CHINATRADE IN TEN ATP GROUPS: 2002 and 2015 (\$ MILLIONS)

Group (2002)	XC	MC	Balance	TM	SCUS
Biotechnology	11.1	13.3	-2.2	1869	0.7
Life science	461.3	433	28.3	25416	1.7
Opto-Electronics	107.5	1,857	-1749.5	5447	34.1
IC	1,856.7	16,582	-14725.3	100660	16.5
Electronics	1,663.5	810	853.5	26592	3.0
Flexible Manufacturing	618	130.8	487.2	6550	2.0
Advanced Materials	27	39.7	-12.7	1468	2.7
Aerospace	3,499.2	99.4	3399.8	25005	0.4
Weapons	35.6	36.5	-0.9	406	9.0
Nuclear technology	7.7	94.8	-87.1	1737	5.5
Group (2015)	XC	MC	Balance	TM	SCUS
Biotechnology	796	124	672	17,213	0.7
Life science	3,316	2,446	870	48,541	5.0
Opto-Electronics	465	7,058	-6,593	26,858	26.3
IC	5,178	139,325	-134,147	235,812	59.1
Electronics	6,023	3,552	2,471	35,624	10.0
Flexible Manufacturing	2,541	952	1589	12,250	7.8
Advanced materials	211	407	-196	2,521	16.1
Aerospace	15,481	881	14,600	52,528	1.7
Weapons	2	156	-154	839	18.6
Nuclear technology	215	45	170	2,288	2.0

Notes: XC= Exports to China, MC = Imports from China, TM = Total US imports, SCUS = Market share of China in US (%), IC = Information & Communication.

Table 4 reports the values, the market share of China (Schina in %), and the Revealed comparative Advantage (RCA) of top 15 ATP products of China at the ten digit level.

The RCA is defined as follows:

$$RCA_i = (M_{Ci}/M_{Wi}) / (M_C/M_W)$$

Where M_{Ci} = Imports of ith ATP from China to the US

M_{Wi} = Imports of ith ATP from all countries to the US

M_C = Value of all ATP imports from China to the US

M_W = Value of all ATP imports from all countries to the US.

If the value of RCA for an ATP is greater than one then China is likely to have a comparative advantage in that ATP. On the other hand, if the RCA has a value less than one, then China is likely to have a comparative disadvantage in that ATP.

It can be observed from Table 4 that three items dominate the top 20 ATP products from China: HS Code 8517120050, HS Code 8471300100, and HS Code 8517620050 with market shares of 79.29%, 91.9%, and 38.43%, respectively. It is also evident from Table 4 that most of the items have RCA values greater than one.

Table 4. REVEALED COMPARATIVE ADVANTAGE (RCA) OF CHINA'S TOP ATP PRODUCTS, 2014

Commodity	MC	Schina	RCA
8517120050 Cellular	41,585.3	79.29	2.16
8471300100 Port Dgtl	38,574.0	91.90	2.50
8517620050 Mach For Recp	12,488.8	38.43	1.05
8473301180 Pts Adp Mch	3,847.9	70.36	1.92
8528726400 Tv Recp,	3,836.9	30.80	0.84
8473301140 Pts Adp Mch	3,460.8	52.06	1.42
8443310000 Mach Prfm Gt	3,179.7	68.75	1.87
8473305100 Pts & Accessories	3,028.1	68.45	1.87
8471500150 Proc Unt	2,879.9	19.72	0.54
8528510000 Monitors	2,720.4	89.95	2.45
8471490000 Dgtl Adp	2,268.5	58.48	1.59
8523510000 Solid-state	2,086.0	49.92	1.36
8517700000 Parts	2,050.7	38.03	1.04
8528712000 Tv Set Top Boxes	1,772.0	50.93	1.39
8541406020 Solar Cells	1,606.7	39.02	1.06

Note: MC= Imports from China in \$Millions.

V. CONCLUSIONS

The empirical findings reveal that China's exports of high-tech products to the United States are heavily dominated by information & communications products and opto-electronics. China's exports of these products are undertaken by foreign enterprises, especially, from East Asian Countries, located in China. Furthermore, the share of foreign value-added in these Chinese exports is quite high; for instance, the share of foreign value-added in China's exports of computer and electronic products in 2011 was 55%. [5]

Notable ATP product groups for which China has a comparative disadvantage are aerospace and life science products. The data of the US Department of Commerce show that in these R & D intensive products, European countries outperform China in the US market. The notable countries which are competitors of China in ATP products are Ireland, Germany, Switzerland, South Korea, Taiwan, and Mexico.

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