3. Electric Machine Sector

3.1. Electronic devices

3.1.1 Supply and demand trend

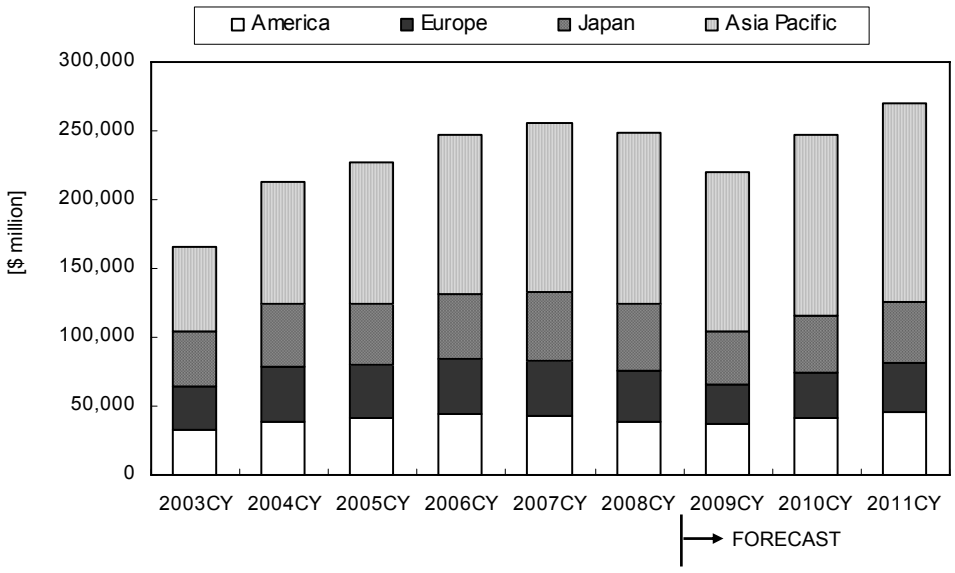
(1) Outline

The production of electronic devices in 2008 suffered a negative growth. Affected by the global recession, demand for personal computers (PCs), cellular phone units, flat-screen televisions (TVs), digital cameras and other digital products declined all over the world, which contributed to the decrease in the domestic production of electronic devices. But solar cells and solar cell modules achieved a solitary good performance in the circumstance where the production of all the other electronic devices slowed down. Partly supported by the government's assistance, demand for photovoltaic generation systems went up and helped increase the output of electronic devices to some extent.

(2) Orders received

According to the "Forecast for the Fall Market in 2009" by the World Semiconductor Trade Statistics (WSTS) (published on November 17, 2009), the estimated amount of semiconductor shipment in 2009 was $220.1 billion or a decrease of 11.5% from the previous year, which was revised upward as compared with the Forecast for the Spring Market in 2009 (down 21.6%) (Fig. 3.1.1). The WSTS expects that in 2010, an upward trend will be resumed because of growing demand for consumer products and the expectations that demand for PCs in businesses will be recovered as a result of the introduction of Windows7 and that this positive note will continue thereafter.

Fig. 3.1.1 Trend of the world semiconductor market by region (actual results for 2002-2008; estimate for 2009-2011)



	2003CY	2004CY	2005CY	2006CY	2007CY	2008CY	2009CY	2010CY	2011CY	CAGR 08-11
Worldwide (M$)	166,426	213,027	227,484	247,716	255,645	248,603	220,123	246,924	269,811	2.8%
America	32,331	39,065	40,736	44,912	42,336	37,881	37,353	41,858	45,936	6.6%
Europe	32,310	39,424	39,275	39,904	40,971	38,249	28,976	32,150	34,890	-3.0%
Japan	38,942	45,757	44,082	46,418	48,845	48,498	38,231	41,995	45,401	-2.2%
Asia Pacific	62,843	88,781	103,391	116,482	123,492	123,975	115,563	130,921	143,584	5.0%
Europe (euro basis; millions of euro)	28,546	31,709	31,575	31,771	29,927	25,968	20,947	22,510	24,428	-2.0%
Japan (yen basis; ¥100 million)	45,032	49,549	48,535	54,024	57,497	50,277	36,161	39,377	42,571	-5.4%

Source: Extracts from the WSTS, “Semiconductor Conference in the Fall of 2009” (November 2009).

(3) Production

Fig. 3.1.2 Trend of the production of electronic devices (value base)

Unit: ¥ million

Production	2006	2007	2008	Growth rate in 2007-2008
Electron tubes, semiconductor devices and integrated circuits	6,995,057	7,136,487	6,823,612	-4.4%
Electron tubes	391,878	376,859	356,936	-5.3%
Microwave tubes	9,397	6,555	6,852	4.5%
PDP modules	326,050	312,211	294,782	-5.6 %
Display tubes	10,926	11,405	9,654	-15.4 %
X-ray tubes	14,945	15,679	15,479	-1.3 %
Semiconductor devices	1,127,415	1,124,980	1,116,522	-0.8 %
Silicon diodes	54,222	46,308	39,896	-13.8 %
Rectifier cells (100mA or more)	83,362	90,123	86,272	-4.3 %
Transistors	322,591	331,029	317,315	-4.1 %
Silicon transistors	132,347	128,560	118,519	-7.8 %
Photoelectric transducers	547,729	539,496	557,758	3.4%
Light-emitting diodes	145,131	154,491	151,982	-1.6%
Laser diodes	100,421	92,423	71,515	-22.6%
Solar cells	-	168,411	221,984	31.8%
Other semiconductor devices	44,597	46,584	45,443	-2.4%
Integrated circuits	3,609,906	3,767,614	3,305,152	-12.3%
Semiconductor ICs	3,370,044	3,516,587	3,068,409	-12.7%
Linear circuits	438,391	445,579	413,854	-7.1%
Standard linear circuits	87,975	89,155	79,833	-10.5%
Non-standard linear circuits	350,416	356,424	334,021	-6.3%
For industrial equipment	169,254	163,274	149,697	-8.3%
For consumer equipment	181,162	193,150	184,324	-4.6%
Counting circuits	2,931,653	3,071,008	2,654,555	-13.6%
Bipolar type	20,796	17,631	13,610	-22.8%
MOS type	2,910,857	3,053,377	2,640,945	-13.5%
Microcomputers	702,598	706,006	623,479	-11.7%
MPU	40,544	25,777	16,515	-35.9%
MCU	662,054	680,229	606,964	-10.8%
Logics	1,234,438	1,340,346	1,224,588	-8.6%
Standard logics	127,576	118,714	170,025	43.2%
Semi-customized logics	483,178	564,616	511,431	-9.4%
Display drivers	219,826	208,888	182,331	-12.7%
Memories	660,994	612,753	438,307	-28.5%
DRAM	26,751	40,204	35,570	-11.5%
SRAM	30,206	30,894	24,623	-20.3%
Flash memories	589,953	518,887	355,721	-31.4%
Other MOS type	312,827	394,272	354,571	-10.1%
CCD	276,106	378,019	347,594	-8.0%
Hybrid integrated circuits	239,862	251,027	236,743	-5.7%
Liquid crystal elements	1,675,062	1,714,254	1,835,724	7.1%
Active type	1,582,875	1,627,600	1,766,185	8.5%
Passive type	92,187	86,654	69,539	-19.8%
Liquid crystal modules	58,834	58,925	43,110	-26.8%
Liquid crystal panels	33,353	27,729	26,429	-4.7%
Solar cell modules	190,796	152,780	209,278	37.0%

Source: Adapted by the authors based on the Research and Statistics Department, Industrial Policy Bureau, Ministry of Economy, Trade and Industry, “Annual Report of Machinery Statistics.”

The production of electronic devices in 2008 was ¥6,823.6 billion or a negative growth of -4.4% from the previous year. By the type of product, the output of electron tubes was ¥356.9 billion (down 5.3% year on year), that of semiconductor devices, ¥1,116.5 billion (down 0.8%), that of integrated circuits, ¥3,305.2 billion (down 12.3%), that of liquid crystal elements, ¥1,835.7 billion (up 7.1%) and that of solar cell modules, ¥209.3 billion (up 37.0%). Due to the worldwide recession triggered by the Lehman shock, demand for electronic equipment using electronic devices dwindled, and as a result the production of these devices had a negative growth.

One of the characteristics of electronic device production in 2008 was the fact that the output of solar cell-related products enjoyed a substantial increase: the performance of solar cells was ¥222.0 billion (up 31.8% year on year) and that of solar cell modules, ¥209.3 billion (up 37.0%). This can be attributed to the policy supports, including the resumption of subsidies for those who have installed a photovoltaic generation system, which stimulated demand for electronic devices. Another feature was an increase in the production of active-type liquid crystal elements (¥1,766.2 billion; up 8.5%). This can be the reflection of the favorable sales of liquid crystal TVs supported by the introduction of the "eco-point" system, a demand generating policy.

According to the "Outlooks for the World Production of the Electronics and Information Technology Industries" published in December 2008 by the Japan Electronics and Information Technology Industries Association (JEITA), the domestic production of electronic devices in 2009 is estimated at ¥4,395.6 billion (down 3%) for semiconductors and at ¥2,479.8 billion (up 3%) for display devices.

(4) Export and import

The export of electronic devices in 2008 was ¥3,976.7 billion, which was a considerable decrease of 13.3% from the previous year. By the type of product, the export of electron tubes was ¥34.0 billion (down 8.5% year on year), that of semiconductor devices, ¥967.3 billion (down 5.5%) and that of integrated circuits, ¥2,975.5 billion (down 15.6%). The export of semiconductor devices suffered a sharp fall in all the product types due to the influence of worldwide decline in demand for electronic equipment with electronic devices, such as cellular phone units, PCs and digital audio-visual appliances.

Fig. 3.1.3 Trend of the export of electronic devices (value base)

Unit: ¥ million

Export	2006	2007	2008	Growth rate in 2007-2008
Electronic devices	1,025,658	4,584,909	3,976,736	-13.3%
Electron tubes	57,307	37,124	33,955	-8.5%
Cathode-ray tubes for TVs	3,763	473	478	1.1%
Microwave tubes	5,050	3,701	3,286	-11.2%
Magnetrons	3,486	2,155	1,828	-15.2%
For microwave ovens	2,053	531	227	-57.2%
Receiving tubes and amplifier tubes	321	129	46	-64.0%
Fluorescent display tubes	17,962	12,674	10,262	-19.0%
Semiconductor devices	968,351	1,023,721	967,262	-5.5%
Diodes	108,658	108,459	90,101	-16.9%
Transistors	229,596	243,690	208,804	-14.3%
Thyristors, diacs and triacs	11,567	11,707	11,359	-3.0%
Photosensitive semiconductor devices	604,874	642,970	641,772	-0.2%
LEDs	213,962	215,432	200,527	-6.9%
Integrated circuits		3,524,064	2,975,519	-15.6%
Processors and controllers		1,037,990	831,780	-19.9%
Unmounted ones		273,548	223,619	-18.3%
Others		764,442	608,160	-20.4%
Hybrid integrated circuits		80,718	116,778	44.7%
Others		683,725	491,383	-28.1%
MPU		144,196	56,710	-60.7%
MCU		255,841	235,385	-8.0%
DSP		25,718	22,335	-13.2%
Memory elements		872,454	755,751	-13.4%
Unmounted ones		438,793	416,221	-5.1%
Others		433,661	339,530	-21.7%
RAM		166,034	139,205	-16.2%
DRAM		142,842	122,654	-14.1%
ROM		155,463	122,291	-21.3%
Flash memories		130,245	103,507	-20.5%
Amplifiers		126,579	113,432	-10.4%

Source: Adapted by the authors based on the Ministry of Finance, “Trade Statistics of Japan.”

The import of electronic devices in 2008 amounted to ¥2,390.3 billion or a drop of 13.1% year on year. By product category, the import of electron tubes was ¥17.8 billion (up 21.5%), that of semiconductor devices, ¥242.7 billion (down 0.1%) and that of integrated circuits, ¥2,129.8 billion (down 14.6%). Light-emitting diodes (LEDs) attracted much attention as low-carbon devices, and the import of LEDs was ¥84.3 billion or an increase of 10.4%. If the use of LEDs is expanded to lighting purposes, import from China, etc. will rise.

Fig. 3.1.4 Trend of import of electronic devices (value base)

Unit: ¥ million

Import	2006	2007	2008	Growth rate in 2007-2008
Electronic devices	269,790	2,750,208	2,390,327	-13.1%
Electron tubes	13,763	14,645	17,794	21.5%
Pickup tubes for TVs	251	261	216	-17.1%
Image-converter tubes, etc.	2,582	3,509	2,668	-24.0%
Other cathode-ray tubes	1,103	1,580	873	-44.7%
Microwave tubes	3,499	3,499	8,866	153.4%
Magnetrons	1,070	1,238	1,296	4.7%
Receiving tubes and amplifier tubes	576	480	491	2.1%
Semiconductor devices	256,027	242,905	242,711	-0.1%
Diodes	36,275	37,829	37,571	-0.7%
Transistors	59,383	57,099	44,717	-21.7%
Thyristors, diacs and triacs	4,026	4,870	4,887	0.3%
Photosensitive semiconductor devices	140,382	132,974	146,238	10.0%
LEDs	85,397	76,335	84,272	10.4%
Photo-electric cells	36,811	33,201	40,706	22.6%
Integrated circuits		2,492,659	2,129,822	-14.6%
Processors and controllers		636,317	522,167	-17.9%
Unmounted ones		78,178	38,640	-50.6%
Others		558,139	483,527	-13.4%
Hybrid integrated circuits		15,094	15,957	5.7%
Others		543,045	467,570	-13.9%
MPU		260,423	232,889	-10.6%
MCU		61,627	71,073	15.3%
DSP		32,070	28,825	-10.1%
Memory elements		858,508	717,511	-16.4%
Others		796,690	661,679	-16.9%
RAM		450,637	355,460	-21.1%
DRAM		416,457	336,047	-19.3%
ROM		279,756	228,803	-18.2%
Flash memories		181,002	148,942	-17.7%
Amplifiers		24,232	24,108	-0.5%
Others		973,602	866,036	-11.0%
Unmounted ones		176,095	170,399	-3.2%
Others		797,508	695,636	-12.8%
Hybrid integrated circuits		30,803	16,733	-45.7%

Source: Adapted by the authors based on the Ministry of Finance, “Trade Statistics of Japan.”

3.1.2. Results of operations and the trend of the electronic device industry

(1) Trend of management

Fig. 3.1.5 shows the business results (sales and operating profits) in 2008 of 11 main semiconductor manufacturers in Japan surveyed by a research firm. The figure indicates that all of the companies suffered a considerable decrease both in earnings and profits. Toshiba, the top in sales, experienced a substantial fall of 26.5% from the previous year with sales amounting to ¥1,023.2 billion, barely keeping the 10 billion-yen level. The company had a fall in profit of ¥368.9 billion compared with the previous year as a result of an operating loss of ¥279.9 billion. The declining prices of NAND-type flash memories, its main products, contributed to Toshiba’s smaller earnings and profits. The sales of second-ranking Renesas Technology greatly dropped by 26.1% to ¥702.7 billion; behind this was a substantial fall of demand for MCUs, its flagship products. Sony and NEC Electronics, which ranked third and fourth, both had a decrease in earnings with sales of ¥580.0 billion (down 31.8%) and ¥521.7 billion (down 20.1%), respectively.

Fig. 3.1.5 Sales and operating profit of 11 major semiconductor manufacturers in Japan (actual results for 2003-2008; estimate for 2009)

Unit: ¥ million

Sales	2003 (actual)	2004 (actual)	2005 (actual)	2006 (actual)	2007 (actual)	2008 (actual)	Year-on-year ratio	2009 (estimates)	Year-on-year ratio
Toshiba	8,988	9,389	10,370	12,981	13,919	10,232	-26.5%	10,500	2.6%
Renesas Technology	9,856	10,024	9,060	9,526	9,505	7,027	-26.1%	Not published	–
Sony	4,000	4,550	4,900	7,800	8,500	5,800	-31.8%	4,900	-15.5%
NEC Electronics*2	6,716	6,798	6,191	6,597	6,533	5,217	-20.1%	4,600	-11.8%
Fujitsu*3	4,039	4,682	4,601	4,735	5,088	3,903	-23.3%	2,900	-25.7%
Panasonic*4	4,800	4,760	4,580	4,382	4,628	3,929	-15.1%	3,285	-16.4%
Elpida Memory	1,004	2,070	2,416	4,900	4,055	3,310	-18.4%	Not published	–
Rohm*5	2,945	3,008	3,207	3,300	3,184	2,742	-13.9%	3,072	12.0%
Sanyo Electric	2,626	2,168	1,936	1,813	1,591	1,171	-26.4%	1,050	-10.3%
Oki Electric Industry*6	1,322	1,507	1,507	1,455	1,382	541	-60.9%	–	–
Seiko Epson*7	1,463	1,394	1,026	911	797	666	-16.4%	550	-17.4%

Operating profit	2003 (actual)	2004 (actual)	2005 (actual)	2006 (actual)	2007 (actual)	2008 (actual)		2009 (estimates)	
Toshiba	1,184	827	1,340	1,283	890	-2,799		-500	
Renesas Technology	448	510	131	235	436	-957		Not published	
Sony	164	-99	-532	Not published	Not published	Not published		Not published	
NEC Electronics*2	546	332	-357	-286	51	-684		0	
Fujitsu*3	275	325	295	190	182	-719		-150	
Panasonic*4	Not published	Not published	Not published	Not published	Not published	Not published		Not published	
Elpida Memory	-264	151	1	684	-249	-1,474		Not published	
Rohm*5	945	761	683	695	674	105		220	
Sanyo Electric	Not published	Not published	Not published	Not published	Not published	Not published		Not published	
Oki Electric Industry*6	23	120	30	7	38	-51		–	
Seiko Epson*7	406	385	-97	-260	-171	-182		-130	

*1. Figures are the sales and operating profit of each company's semiconductor business. For the companies that did semiconductor business only, the whole company's sales and operating profit are shown.

*2. For NEC Electronics, the sales of the production of electronic parts by commissioning are excluded. The operating profit figures are for the whole company.

*3. The operating profit figures for Fujitsu are for all of device solutions, including SAW filters, etc.

*4. The sales figures for Panasonic are the amounts of production for outside users.

*5. The operating profit figures for Rohm are for the whole company.

*6. In October 2008, Oki Electric Industry spun off its semiconductor division into a separate company and transferred 95% of the separate company's shares to Rohm at the same time.

*7. The operating profit figures for Seiko Epson are for the whole of its electronic device division, including quartz devices and displays.

Data: Each company's settlement of accounts published.

Source: Adapted by the authors based on the "Nikkei Market Access," July 6, 2009.

Fig. 3.1.6 Sales rankings of semiconductor suppliers in the world in 2008 (final figures)

Unit: US$ million

Ranking in 2008		2007	2008	
				Share (%)
1st	Intel, U.S.	33,995	33,767	13.1
2nd	Samsung Electronics, South Korea	19,691	16,902	6.5
3rd	Toshiba	12,186	11,081	4.3
4th	Texas Instruments, U.S.	12,275	11,068	4.3
5th	ST Microelectronics, Italy and France	10,000	10,325	4.0
6th	Renesas Technology	8,001	7,017	2.7
7th	Sony	8,055	6,950	2.7
8th	Qualcomm, U.S.	5,619	6,477	2.5
9th	Hynix Semiconductor, South Korea	9,047	6,023	2.3
10th	Infineon Technologies, Germany	6,201	5,954	2.3
11th	NEC Electronics	5,742	5,826	2.3
15th	Panasonic	3,880	4,473	1.7
18th	Sharp Corp.	3,401	3,682	1.4
19th	Elpida Memory	3,838	3,599	1.4
20th	Rohm	2,633	3,348	1.3
24th	Fujitsu Microelectronics	2,529	2,757	1.1
	Total	272,577	258,304	100.0

Source: Adapted by the authors based on iSuppli Japan, news release on March 11, 2009.

Fig. 3.1.6 shows the shares and rankings of the semiconductor market in the world in 2008 (final figures) published by iSuppli Japan, a research firm. Of the top ten, those having a lower growth rate than the average growth rate of the entire semiconductor market are second-ranking Samsung, third-ranking Toshiba, fourth-ranking TI, sixth-ranking Renesas Technology, seventh-ranking Sony and ninth-ranking Hynix Semiconductor. This suggests that the stagnant sales of memories greatly affected the performance of these companies.

(2) Future prospects and problems

In the unfavorable business environment and with the discouraging settlement of accounts results described above, Japanese semiconductor manufacturers have begun to reorganize them by spinning off their divisions, merging and other methods in an effort to survive.

On April 27, 2009, Renesas Technology and NEC Electronics announced that they were studying a plan to merge in April 2010. NEC Electronics belonging to the NEC group and Renesas Technology, a subsidiary of Hitachi and Mitsubishi, are the semiconductor manufacturers that compete with each other mainly in the field of chipsets for cellular phone units. According to the announcement, NEC Electronics is strong in consumer digital solutions, while Renesas is good at solutions for cellular phones and automobiles. Thus, the two companies have different specialized fields and by merging their business, intend to build a third-ranking company in the semiconductor industry in the world and to focus on the development of globally competitive new products. The conclusion of the merger contract was postponed once, but on September 16, 2009, they signed an integrated basic agreement on merger. The two companies will merge on April 1, 2010 with NEC Electronics as a merging company. While it is uncertain to what extent they can display the effects of

merger as declared in their announced policies, the integration of NEC Electronics and Renesas Technology, which have competed in the market, will create a new giant semiconductor manufacturer.

On the other hand, Toshiba announced on January 29, 2009that it planned to spin off its system LSI division as part of the structural reform plan of semiconductor business. But after Renesas Technology and NEC Electronics published their intended merger, Toshiba put off the plan to spin off its LSI division because it had considered a merger with NEC Electronics and seems to continue the LSI business by itself.

Elpida Memory, a DRAM manufacturer, is studying the possibility to cooperate with a Taiwanese manufacturer. The Taiwan government plans to found Taiwan Memory Company (TMC) and assist DRAM manufacturers in Taiwan, and Elpida Memory is searching a way to join the program. On April 1, 2009, TMC announced that it will appoint Elpida Memory as a technical partner, but the negotiations for the foundation of TMC appear to have stalled because DRAM manufacturers in Taiwan are not very willing to take part in TMC. In such a situation, on November 11, 2009, Elpida Memory announced that it signed a memorandum on DRAM production by contract with Winbond in Taiwan.

3.2. Telecommunications equipment and wireless-applied appliances

3.2.1 Supply and demand trend

(1) Outline

The production of wired and wireless communications equipment both suffered a negative growth in 2008. The export of mobile phones may increase if the strategies for overseas markets of Japanese manufacturers of cellular phone units succeed. The import of mobile phones is expected to continue expanding in the future mainly as a result of the introduction of iPhone3G to the Japanese market by Apple in the U.S.

(2) Production

The amount of production of telecommunications equipment and wireless-applied appliances in 2008 was ¥2,537.0 billion, a negative growth of -9.8% from the previous year.

Fig. 3.2.1 Trend of production of telecommunications equipment and wireless-applied appliances (value base)

Unit: ¥ million

Production	2006	2007	2008	Growth rate in 2007-2008
Telecommunications equipment and wireless-applied appliances	3,014,157	2,813,289	2,536,952	-9.8%
Wired communications equipment	606,311	533,162	560,224	5.1%
Telephones	15,773	14,200	12,081	-14.9%
Telephone-applied appliances	110,563	106,781	86,471	-19.0%
Button telephone sets	47,905	46,644	36,344	-22.1%
Intercoms	54,940	53,135	44,137	-16.9%
Telegraph/image appliances	37,247	23,894	21,715	-9.1%
Facsimiles	30,141	17,146	15,874	-7.4%
Switchboards	170,963	142,643	133,067	-6.7%
Electronic switchboards	148,987	122,881	114,140	-7.1%
For exchanges	104,793	81,434	74,698	-8.3%
For PBXs	44,194	41,447	39,442	-4.8%
Carrier devices	271,765	245,644	306,890	24.9%
Digital transmission units	169,518	158,933	195,070	22.7%
Wireless communications equipment (including satellite communications units)	2,365,100	2,241,898	1,937,472	-13.6%
Broadcasting appliances	81,488	71,100	71,915	1.1%
Wireless communications appliances	2,052,046	1,931,716	1,589,900	-17.7%
Fixed communications appliances	128,968	144,981	141,546	-2.4%
Ground communications appliances	109,686	134,535	127,199	-5.5%
Satellite communications appliances	19,282	10,446	14,347	37.3%
Mobile-station communications appliances	1,908,402	1,777,335	1,432,955	-19.4%
Mobile communications appliances	1,818,462	1,695,552	1,348,050	-20.5%
Ground mobile communications appliances	1,805,339	1,681,986	1,334,929	-20.6%
Cellular phones	1,703,752	1,587,678	1,240,390	-21.9%
PHS units for public use	40,203	44,698	37,929	-15.1%
Base-station communications appliances	89,940	81,783	84,905	3.8%
Wireless-applied appliances	231,566	239,082	275,657	15.3%
Network-connecting appliances	42,746	38,229	39,256	2.7%
Routers/hubs	38,920	33,565	35,752	6.5%

Source: Adapted by the authors based on the Research and Statistics Department, Industrial Policy Bureau, Ministry of Economy, Trade and Industry, “Annual Report of Machinery Statistics.”

The production of wired communications equipment in 2008 amounted to ¥560.2 billion, an increase of 5.1% over the previous year. By the type of product, the production of telephones was ¥12.1 billion (down 14.9%), that of telephone-applied appliances, ¥86.5 billion (down 19.0%), that of telecommunications/image appliances, ¥21.7 billion (down 9.1%) and that of electronic switchboards, ¥114.1 billion (down 7.1%). But partly because communications companies made a positive investment stimulated by expanding FTTH (fiber to the home: data communications service for households using optical fibers), the output of digital transmission equipment increased by 22.7% year on year to ¥195.1 billion.

The amount of production of wireless communications equipment in 2008 was ¥1,937.5 billion, suffering a year-on-year decrease of 13.6% and falling below the 2,000-billion yen mark. By the type of product, while the output of broadcasting equipment was firm with ¥71.9 billion or up 1.1%, that of wireless communications appliances experienced a decline with ¥1,589.9 billion (down 17.7%). Of wireless communications appliances, the production of fixed communications appliances was ¥141.5

billion (down 2.4%) and that of mobile communications appliances, ¥1,433.0 billion (down 19.4%).

According to the "Outlooks for the World Production of the Electronics and Information Technology Industries" published in December 2008 by the Japan Electronics and Information Technology Industries Association (JEITA), the estimated output of telecommunications equipment in 2009 is ¥2,584.7 billion or a decline of 1% from 2008.

(3) Export and import

The export of telecommunications equipment in 2008 was ¥426.9 billion or a decrease of 5.3% from the previous year. That of wired communications equipment in 2008 amounted to ¥11.1 billion, which was a fall of 15.0% year on year. The export of wireless communications equipment in 2008 decreased, too, with ¥415.8 billion and -5.0%. By the type of product, the export of mobile phones was ¥23.9 billion and experienced a steep decline of 50.4%. This is probably the reflection of shrinking cellular phone business overseas rather than the result of the transfer of production bases to other countries by Japanese manufacturers. But changes in the stance of Japanese manufacturers of cellular phone units, who used to be oriented to the domestic market, have begun to be seen; for example, Sharp plans to do business in China positively. If the overseas business of cellular phone unit manufacturers succeeds in the future, the export is highly likely to head toward growth.

Fig. 3.2.2 Trend of export of telecommunications equipment and wireless-applied appliances (value base)

Unit: ¥ million

Export	2005	2006	2007	2008	Growth rate in 2007-2008
Telecommunications equipment	110,696	129,049	450,806	426,891	-5.3%
Wired communications equipment	2,219	2,332	13,017	11,060	-15.0%
Telephones	2,219	2,332	13,015	11,059	-15.0%
Wired telephones with cordless handset	2,219	2,332	2,520	1,878	-25.5%
Wireless communications equipment	108,478	126,716	437,789	415,831	-5.0%
Broadcasting appliances			17,081	15,828	-7.3%
Wireless communications appliances			249,693	243,173	-2.6%
Mobile phones			48,254	23,942	-50.4%
Base-station equipment			80,365	64,614	-19.6%
Transmission, receiving, conversing and reproduction appliances (including those for wired communications)			110,121	148,053	34.4%
Wireless-applied appliances	108,478	126,716	171,015	156,830	-8.3%
Radars	17,102	17,413	20,838	23,626	13.4%
Direction finders	5,988	12,375	1,191	371	-68.9%
Other wireless equipment for navigation	71,049	85,523	134,895	122,306	-9.3%
Wireless remote control appliances	14,340	11,405	14,090	10,527	-25.3%

Source: Adapted by the authors based on the Ministry of Finance, "Trade Statistics of Japan."

The import of telecommunications equipment in 2008 was ¥708.0 billion or an increase of 2.8% over the previous year. That of wired communications equipment in 2008 was ¥18.3 billion or a decrease of 23.6% year on year. The import of wireless communications equipment achieved a growth of 3.7% amounting to ¥689.6 billion. In particular, the import of mobile phones, which accounted for about a half of the total import, was ¥223.6 billion or up 16.3%, and mobile phone imports from Asia continued growing. It is supposed that this upward trend was the result of the

introduction of iPhone3G into the Japanese market by Apple in the U.S. (date of introduction: June 10, 2008), and if the sales of this product are good, the import of mobile phones will increase.

Fig. 3.2.3 Trend of import of telecommunications equipment and wireless-applied appliances (value base)

Unit: ¥ million

Import	2005	2006	2007	2008	Growth rate in 2007-2008
Telecommunications equipment	21,264	39,591	688,998	707,969	2.8%
Wired communications equipment	11,834	11,245	24,007	18,344	-23.6%
Telephones	11,834	11,245	23,675	18,344	-22.5%
Wireless communications equipment	9,430	28,346	664,991	689,624	3.7%
Broadcasting appliances			9,235	5,990	-35.1%
Wireless communications appliances			625,545	639,726	2.3%
Mobile phones			192,329	223,630	16.3%
Base-station equipment			56,421	40,776	-27.7%
Transmission, receiving, conversing and reproduction appliances (including those for wired communications)			338,710	349,596	3.2%
Wireless-applied appliances	9,430	28,346	30,212	43,908	45.3%
Radars	2,562	4,413	5,761	5,525	-4.1%
For vessels	440	169	150	360	140.0%
For aircraft	1,846	3,883	5,080	4,811	-5.3%
Wireless appliances for aviation	6,868	13,951	15,281	28,104	83.9%
For aircraft	2,926	5,142	5,287	4,886	-7.6%
Wireless remote control appliances	0	9,981	9,169	10,279	12.1%

Source: Adapted by the authors based on the Ministry of Finance, “Trade Statistics of Japan.”

3.2.2 Results of operations and the trend of the machine tool industry

(1) Trend of management

Figure 3.2.4 shows the sales, operating profit and number of units sold of cellular phones of major telecommunications equipment manufacturers in Japan.

While the manufacturers of cellular phone units suffered a smaller number of units sold in 2008, NEC increased its sales by 6.3% over the previous year. The company started to focus on domestic sales in the first half of 2008 and launched out on the supply of cellular phone units for Softbank’s mobile phones, thereby attaining the sale of 5.10 million units. But this figure was far below the target of 7 million units that NEC had set at the beginning of the year. Thus the company continued its efforts to improve the income structure and announced that it would spin off its cellular phone unit development division and merge the newly founded company with Casio Hitachi Mobile Communications Co., a cellular phone unit developer founded by the joint investment of Hitachi and Casio. NEC is expected to make over 50% investment in the new company. The aim is probably reduction in the burden of development of units for the next-generation cellular phone communications standard (Long Term Evolution (LTE), 3.9G) and reinforcement of the ability to develop by joint development. Sharp gained the top position in Japan for four consecutive years but experienced a marked decrease both in domestic shipment (8.30 million units, down 36%) and in excport (1.60 million units, down 24%). In 2009, the company plans to sell 8.30 million units in Japan, an equal figure to 2008, and 4 million units overseas, more than twice the performance in 2008. In June 2008, Sharp entered the Chinese market with “AQUOS Shouji (Portable)” (price:

approx. 4,000 yuan), a high-grade cellular phone unit having the company's brand for liquid crystal TVs, and expanded the lineup by introducing six high-class to medium-class models. Sharp made it clear that it would take a more positive attitude to overseas markets; in 2009, the company plans to add popular units of 1,000 to 2,000 yuan, too, to its line of products and to sell about 2 million units, a half of its overseas sales, in China.

Fig. 3.2.4 Trend of sales, operating profit and number of units sold of the cellular phone division of major Japanese telecommunications equipment manufacturers (actual results for 2007 and 2008; estimates for 2009)

Unit: ¥ million

Sales		2007 (actual results)	2008 (actual results)	2009 (estimates)
NEC *1		3,403	3,481	2,950
Panasonic *2		3,692	3,304	Unpublished
(For reference: Panasonic Mobile Communications)		4,509	3,897	3,365
Sharp		6,513	4,373	4,900

Unit: ¥ million

Operating profit (loss)		2007 (actual results)	2008 (actual results)	2009 (estimates)
NEC *1		Approx. 110	Approx. 50	Approx. 130
Panasonic *2		Unpublished	Unpublished	Unpublished
(Figures for reference: Panasonic Mobile Communications)		138	237	44
Sharp		Unpublished	Unpublished	Unpublished

(10,000 units)

No. of units sold		2007 (actual results)	2008 (actual results)	2009 (estimates)
NEC		480	510	500
Sharp	Total	1,510	992	1,230
	Japan	1,300	830	830
	Overseas	210	160	400
Fujitsu		590	460	460
(For reference: Sony Ericsson Mobile Communications, U.K.)		10,390	8,880	Unpublished

*1. NEC published estimated figures only for the operating profit.

*2. The sales figures for Panasonic are shown in the upper column. The company did not publish any operating profit figure for its cellular phone business (classified as "mobile communications" in Panasonic), and thus the sales and operating profit of Panasonic Mobile Communications, its subsidiary taking charge of cellular phone business, are shown in the lower column for reference.

Data: Data of the settlement of accounts published by each company, data published at news conferences, etc.

Source: Adapted by the authors based on the "Nikkei Market Access," July 13, 2009.

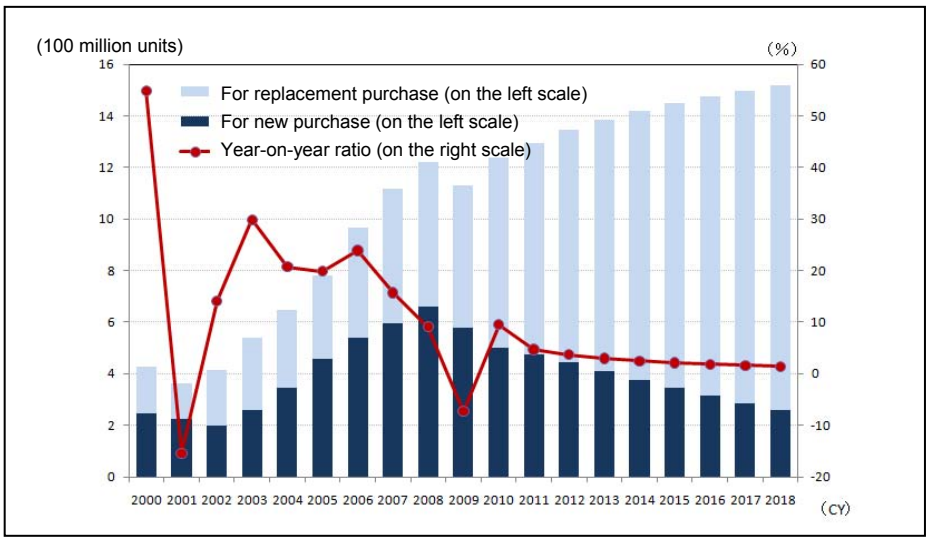
(2) Technological innovation and the environment of the telecommunications appliance industry

According to a private research firm, the production of cellular phone units in the world in 2009 will suffer a negative growth, as a result of the global-scale recession, for the first time in eight years, from the performance in 2008 (approx. 1,219.00 million units) with 1,130.00 million or a fall of 7.3% year on year (Fig. 3.2.5). The research firm says that even if the market recovers in 2010 and after, replacement demand will play a central role in all markets in the world because the market will mature in industrial countries. The markets expected to create new demand in the future will be

found in non-urban parts of BRICs, such as the inland areas of China, and in emerging countries other than BRICs.

A factor likely to affect the global market of cellular phone units in the future is "higher speed" by new-generation products. As BRICs enter the age of spread of 3G, industrial countries will see transition to the next-generation telecommunications standard (3.9G). The increase in telecommunications speed will not only have impact on the market but also urge reorganization of the industry through development activities by the manufacturers of cellular phone units.

Fig. 3.2.5 Trend of production of cellular phone units in the world (actual results for 1998 to 2008; estimates for 2009 to 2018)



Source: Adapted by the authors based on the "Nikkei Market Access," September 30, 2009.

Figure 3.2.6 shows the trend of the market share of cellular phone unit manufacturers in the world. Nokia in Finland ranked top in 2008, getting a good lead on its rivals. The company has a wide product lineup ranging from smartphones and other high-priced, high-performance models to inexpensive ones for emerging markets, and has gradually increased its share since 2005 supported especially by its price competitiveness in low-priced units. Samsung Electronics and LG Electronics, both South Korean manufacturers, continued to take second and third place, respectively, in 2008. By laying stress on the manufacture of low-priced models for emerging countries, these companies have increased their share. Noteworthy is the fact that Zhong Xing Telecommunications Equipment (ZTE) in China won fifth place, taking the place of Motorola. ZTE has achieved a rapid growth in sales in Western Europe and North America. As described above, affected by the changing business environment, that is, a declining demand in 2008 due to the global recession, medium-to-long term market maturing and a rapid expansion in emerging markets, the share of cellular phone unit manufacturers have changed greatly. Some manufacturers have focused on inexpensive models for emerging countries likely to attain a high growth, while others have aimed at raising unit prices with high value-added products; in other words, it can be said that cellular phone companies are dividing

into two groups, one pursuing a larger market share (quantity) and the other, higher earnings (quality).

Cellular phone unit manufacturers in Japan have begun their efforts again to achieve good results in the world market with their original, high value-added products by making use of the technology they accumulated in the area of digital household electric appliances. It is probably no exaggeration to call this an attempt to avoid so-called "Galapagos phenomenon" (the phenomenon of Japanese standards becoming very different from the world standards just as the evolution in the Galapagos Islands came to differ greatly from that in other parts of the world) using the technical ability Japanese manufacturers are good at. In the briefing session of its cellular phone business held in May 2009, Sharp announced that it would export 4 million units of its planned cellular phone output of 12.30 million units. In April 2010, NEC Casio Mobile Communications will be founded by the merger of the cellular phone division of NEC, Casio and Hitachi. This new company plans to do overseas business positively. Its first shipment after the merger is estimated at 8.90 million units, based on the results in 2008, and of these, 1 million to 1.5 million units will be exported. In 2012, three years after the integration, the company plans to increase its total shipment to the 12 million unit level and export 5 million units of these.

Fig. 3.2.6 Trend of market shares of cellular phone manufacturers (numbers of units produced) (actual results for 2001 to 2008; estimates for 2009)

Unit: %

		2001 (actual results)	2002 (actual results)	2003 (actual results)	2004 (actual results)	2005 (actual results)	2006 (actual results)	2007 (actual results)	2008 (actual results)	2009 (estimates)
Nokia Corp.	Finland	37.1	36.1	32.7	30.6	33.0	35.9	39.4	40.3	39.8
Samsung Electronics	South Korea	6.8	9.7	10.0	12.5	12.9	11.7	14.4	17.0	19.4
LG Electronics	South Korea	1.6	3.0	3.8	6.3	6.9	6.4	7.3	8.7	10.4
Sony Ericsson Mobile Communications	U.K	7.2	5.0	4.6	6.0	6.2	7.6	9.2	8.3	6.1
ZTE	China	-	-	-	1.7	2.2	2.2	2.3	3.8	5.0
Motorola	U.S.	13.3	14.1	12.5	13.6	18.2	22.0	13.6	8.6	4.8
Research In Motion	Canada	-	-	-	-	-	-	1.0	2.0	3.1
Apple	U.S.	-	-	-	-	-	-	0.3	1.2	2.5
HTC	Taiwan	-	-	-	-	-	-	0.9	1.0	1.3
Sharp	Japan	0.9	1.4	1.4	1.5	1.4	1.4	1.4	0.9	1.0
Others		33.2	30.7	34.9	27.8	19.2	13.0	10.1	8.2	6.7

Source: Adapted by the authors based on the "Nikkei Market Access," September 30, 2009.

(3) Future prospects and problems

Japanese cellular phone unit manufacturers are ready to resume active business in overseas markets but their main battlefield is still the Japanese market. Here the situation of the domestic market of cellular phone units is discussed referring to the estimates of a private research firm.

According to the research firm (MM Research Institute), the domestic shipment of cellular phone units in 2008 decreased by 29.3% year on year to 35.89 million units, dropping below the 40

million level. This can be the result of a combination of a short-term factor and a medium-to-long term one, that is, the impact of the worldwide recession on the domestic market (specifically inventory cutback) and a longer replacement cycle of the consumer. The extension of the replacement cycle may have resulted from the sales system of compulsory contract term for cellular phone units started in 2007 (the contract term is mostly two years or more) and a shape rise in the price of units due to the introduction of the new sales system, combined with poor demand caused by the recession. Most cellular phone companies have lowered their estimated domestic demand in 2009 to the 30 million range, which means a zero growth. An NEC officer is said to have expected that the domestic demand from 2009 to 2011 would not increase and remain at the 30 million unit mark. MM Research Institute also forecasted a downward demand trend: 33.20 million units in 2009 and 32.60 million units in 2010. Cellular phone units continued to expand the demand mainly by the progress of telecommunications technology and by the addition of new functions. However, it has been considered almost unlikely that any increase in "special procurement demand" will be seen in the cellular phone unit market as a result of the introduction of next-generation models. This is because it is supposed that at the initial stage of LTE introduction, manufacturers will offer dual band models compatible both with the existing telecommunications system and LTE and start with high-grade units rather than changing product generations immediately. But in the domestic market where NTT and other telecommunications companies hold leadership in the sales of units, manufacturers may adopt in 2010 a product strategy aiming at causing demand to be concentrated to some extent in 2012 when the introduction of next-generation models will be made at full swing, taking advantage of the sales method based on the compulsory contract period. Yet it is unlikely that the extension of the replacement cycle will stop; rather, there is probably a high possibility that anticipated demand for next-generation products will promote the elongation of the cycle. MM Research Institute predicted that the replacement cycle would be extended from 2.2 years in 2007 to 3.1 years in 2008, 3.6 years in 2010 and 3.7 years in 2013.

3.3. Medical electronics

3.3.1 Supply and demand trend

(1) Outline

According to the Annual Report on Pharmaceutical Production Statistics 2007[1], the domestic demand for medical appliances[2] was ¥2,131.3 billion or a decrease of 6.0% from the previous year (Fig. 3.3.1). The world market totaled to about ¥20,000 billion, and the Japanese market ranked second after the U.S.'s and was on a similar scale to Germany's. As the aging rate in Japan reached 22.1% in 2008, people's dependence on medical service has become increasing. In addition, national medical care expenditure was as high as about ¥33,000 billion, and this fact has affected demand for

[1] Because the Annual Report on Pharmaceutical Production Statistics 2008 was not published yet, the 2007 edition was used here.

[2] Domestic demand = amount of import + amount of production - amount of export.

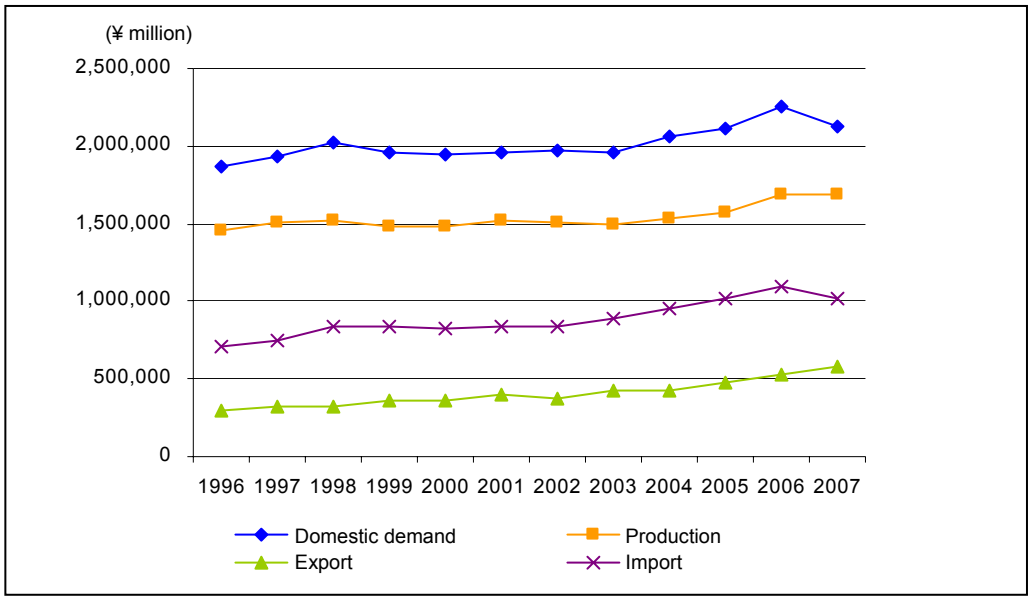
medical appliances directly and indirectly.

(2) Production trend

In the production of medical appliances in 2007 (Fig. 3.3.2), diagnostic imaging systems continued to take first place but decreased by 1.1% year on year to ¥395.8 billion. The production of household medical appliances and clinical equipment and supplies dropped, while that of other medical appliances tended to level off.

For medical electronic appliances[3] (Fig. 3.3.3), the production of medical X-ray devices declined by 16.1% year on year to ¥173.8 billion, that of ultrasonic application medical appliances dwindled by 15.6% to ¥81.6 billion and that of other medical appliances dropped by 7.2% to ¥84.1 billion. As a whole, the amount of output of these appliances suffered a considerable decrease of 13.8% year on year.

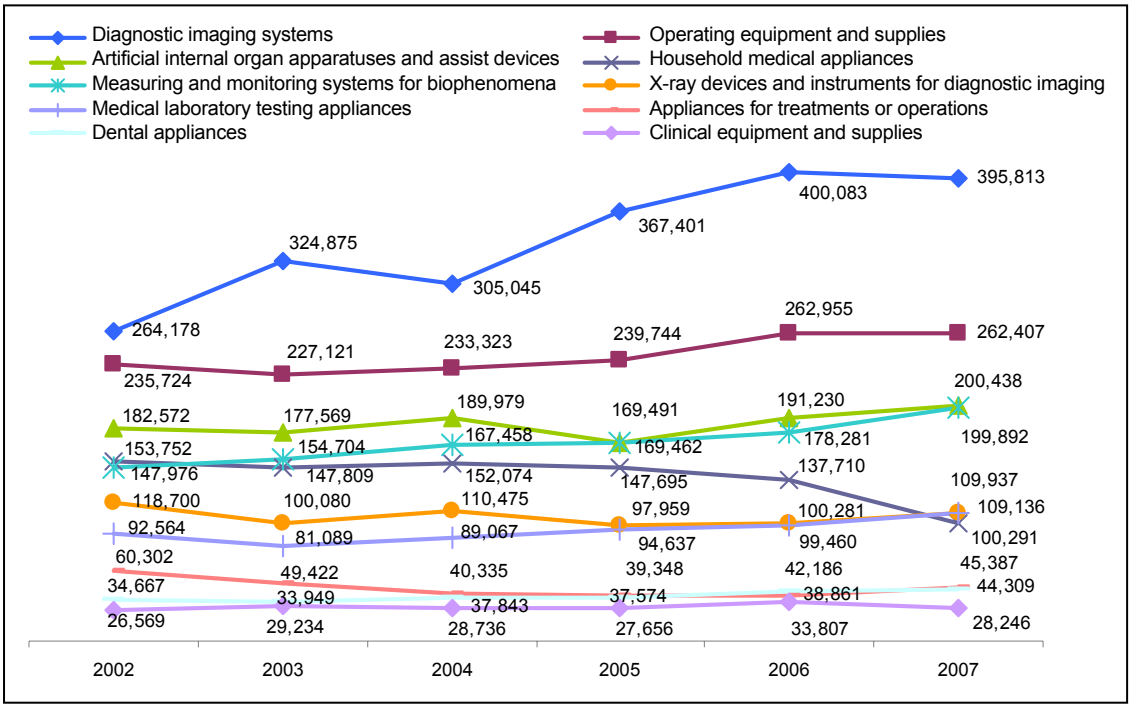
Fig. 3.3.1 Trend of supply of and demand for medical appliances (amount of money)



Source: Based on the Health Policy Bureau, Ministry of Health, Labour and Welfare, ed., "Annual Report on Pharmaceutical Production Statistics." * Including medical materials.

[3] Medical electronics appliances mean the electronic application devices listed in the Ministry of Economy, Trade and Industry, "Annual Report of Machinery Statistics" that are counted as those for medical purposes.

Fig. 3.3.2 Trend of production of medical appliances (calendar years; ¥ million)



Source: Based on the Health Policy Bureau, Ministry of Health, Labour and Welfare, ed., "Annual Report on Pharmaceutical Production Statistics."

Fig. 3.3.3 Trend of production of medical electronics appliances (calendar years)

Unit: ¥ million

	2003	2004	2005	2006	2007	2008	Growth rate (%)
Medical appliances, total	289,922	290,140	367,618	379,122	386,447	339,648	-13.8%
Medical X-ray devices, total	161,193	152,212	191,367	204,308	201,836	173,847	-16.1%
Medical and dental X-ray devices	78,113	75,076	76,454	77,826	78,228	75,083	-4.2%
CT devices	83,080	77,136	114,913	126,482	123,608	98,764	-25.2%
Ultrasonic application medical appliances	72,587	75,846	94,799	88,105	94,356	81,621	-15.6%
Other medical measuring instruments	56,142	62,082	81,452	86,709	90,255	84,180	-7.2%

Source: Based on the Ministry of Economy, Trade and Industry, "Annual and Monthly Report of Machinery Statistics."

(3) Trend of export and import

The total amount of export of medical appliances in 2007 was ¥575.0 billion or a year-on-year increase of 9.0%. This was a continued growth but the growth rate was a little lower than the previous year. The import amounted to ¥1,021.9 billion or a fall of 6.9% year on year.

By the type of product, the export of measuring and monitoring systems for biophenomena grew by 22.3% year on year to ¥58.7 billion, that of artificial internal organ apparatuses and assist devices, by 22.2% to ¥50.6 billion and that of medical laboratory testing appliances, by 26.1% to

¥72.3 billion. While the export amount was not very large, the growth rate was high.

The import of artificial internal organ apparatuses and assist devices decreased by 6.2% year on year but continued to rank first in amount. The growth rate was the highest but the amount was small for the import of clinical equipment and supplies, with ¥8.1 billion or an increase of 8.7% year on year. In the import of medical appliances, many types of product experienced a negative growth.

Fig. 3.3.4 Trend of export and import of medical appliances (calendar years)

Unit: ¥ million

	Export			Import		
	2006	2007	Year-on-year ratio (%)	2006	2007	Year-on-year ratio (%)
Medical appliances, grand total	527,526	575,054	9.0%	1,097,867	1,021,974	-6.9%
Medical appliances, total	511,359	560,310	9.6%	848,172	799,016	-5.8%
Diagnostic imaging systems	208,229	219,535	5.4%	121,449	94,480	-22.2%
Operating equipment and supplies	81,345	80,648	-0.9%	259,199	255,762	-1.3%
Measuring and monitoring systems for biophenomena	48,035	58,727	22.3%	41,983	42,631	1.5%
Artificial internal organ apparatuses and assist devices	41,448	50,644	22.2%	310,798	291,623	-6.2%
Medical laboratory testing appliances	57,422	72,382	26.1%	14,703	15,784	7.4%
X-ray devices and instruments for diagnostic imaging	36,279	38,986	7.5%	9,337	9,700	3.9%
Dental appliances	16,207	17,634	8.8%	10,354	10,210	-1.4%
Household medical appliances	10,102	9,057	-10.3%	21,877	22,926	4.8%
Appliances for treatments or operations	7,729	7,968	3.1%	50,939	47,712	-6.3%
Clinical equipment and supplies	4,563	4,729	3.6%	7,533	8,188	8.7%
Other medical appliances	16,167	14,744	-8.8%	249,695	222,958	-10.7%

Source: Based on the Health Policy Bureau, Ministry of Health, Labour and Welfare, ed., "Annual Report on Pharmaceutical Production Statistics."

(4) Future prospects

Major medical appliance businesses in Japan plan to reinforce their marketing system for China and other Asian markets and for rapidly growing markets as Middle East and Russia. Some of them have already entered these markets by establishing local subsidiaries and offices and will expand their sales functions further in the future.

3.3.2 Results of operations and the trend of the medical appliance industry

(1) Results of operations

Toshiba Medical Systems Corp. enjoyed a relatively good demand at first but later had the consumer's holding down of buying and other problems as a result of the downturn in the economy. As the CT diagnostic imaging device launched in 2007 was highly rated and won the Machine Industry Good Design Award for 2009, the company established the research system for this product.

Hitachi Medical Corp. attained greater sales thanks to a good performance in MR imaging devices. Its X-ray CT scanners had similar sales to the previous year in Japan but suffered a drop overseas as a result of the suspension of production of some products. For X-ray devices, the sales of new products were favorable at home but those of general-purpose X-ray devices, etc. were dull. Ultrasonic diagnostic devices enjoyed bigger sales in China but had a poorer performance in Japan and Europe.

Shimadzu Corp. experienced lower sales because the market conditions for X-ray photography devices, its main products, were dull due to the revision of the medical fee in April 2008 that gave favorable treatment to digital storage of images. Overseas, demand for digital-compatible products was steady and so the company's sales increased mostly in China, Europe and Middle East. Shimadzu also worked, as in the previous year, to increase the assortment of its clinical applications.

In the field of medical endoscopes, Olympus Optical Co. registered steady sales of hi-vision-compatible video scopes both at home and abroad. But due to fluctuations of exchange rates, the company had lower earnings for the whole area of medical endoscopes. In the field of endoscopy instruments for surgery, the sales of Olympus in Japan grew led by the integrated endoscopic video systems that would support surgical operations using an endoscope, and the company's performance of guide wires and other pancreaticobiliary instruments and gastrostomy catheters was better, too. Overseas, the company enjoyed good results in integrated endoscopic operation systems and sampling-based instruments, such as biopsy forceps, mainly in North America.

For ultrasonic diagnostic devices, its flagship, Aloka Co. worked at home on the development of new contrast media for diagnosing cancer in the digestive system and on the method of evaluating blood vessel functions by new technology to detect metabolic syndromes, and these efforts were highly rated by a wide range of users. In addition, Aloka's new high-grade products with good performances and new popular models both showed a steady growth. By contrast, the sales of its medium-class products for the domestic market decreased due to intense price competition. The sales went down abroad, too, affected by the recession and exchange rate fluctuations.

Fig. 3.3.5 Results of operations of main medical appliance manufacturers

	Toshiba Medical Systems [1]	Hitachi Medical [2]	Shimadzu Corp. [3]	Olympus Optical [4]	Aloka Co. [5]
Settlement term	Year ended in March 2009				
Unit	¥ million				
Entire company's sales	268,756	115,088	272,833	980,903	48,986
Year-on-year ratio	-7.5%	4.3%	-5.9%	-13.1%	-12.7%
Operating profit	10,618	3,766	19,613	34,587	3,078
Year-on-year ratio	-40.8%	13.8%	-28.9%	-69.3%	-39.3%
Ratio of operating profit	4.0%	3.3%	7.2%	3.5%	6.3%
Sales of the medical appliance section	-	104,485	51,050	383,828	42,625
Sales ratio of the medical care section	-	90.8%	18.7%	39.1%	87.0%
Year-on-year ratio	-	4.7%	-7.9%	8.7%	-14.0%
Operating profit	-	3,499	1,176	75,043	-
Year-on-year ratio	-	1.1%	-56.1%	-23.8%	-
Ratio of operating profit	-	3.3%	2.3%	19.6%	-

Source: Data of each company (on a consolidated basis)

Notes: The data for the medical appliance division is that for the company's related business segment:

1) In October 2003, Toshiba Medical Systems Corp. integrated its medical system division into Toshiba Medical Corp., which took charge of domestic sales and services. Toshiba Medical Corp. is engaged in the development, manufacture, sale and service of medical devices and systems.
2) The entire company's sales include those of medical information systems.
3) The figures for the medical appliance division are those for the company's medical system field.
4) The figures for the medical appliance division are those for the company's medical system company.
5) The figures for medical appliance division are those for the total sales of medical electronics and analyzing devices except general-purpose analyzing devices.

(2) Future prospects and problems

In Japan, it is expected that population aging will expand further and demand for medical appliances will become greater as a result. On the other hand, the financial situation of national medical care expenditure has been tight, and it has been an urgent issue to prevent the expenditure itself from becoming higher. In addition, while an increasing trend of import ended, global competition will continue to intensify. The Japanese medical appliance industry is required to study a proper supply and demand balance in the circumstance of global competition where there is the need to control national medical care expenditure.

Moreover, medical appliance manufacturers in Japan have one problem: "device lag." Device lag means the time lag between the development of new medical devices and their introduction into the Japanese market. The Japanese government began to review the examination and approval system of these appliances in December 2008 and has since striven to eliminate the device lag. But a drastic deregulation aiming at solving device lag will also invite foreign manufacturers' entry into the Japanese market. Therefore, Japanese manufacturers will need to take some steps to cope with expected greater market competition at home.