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Rethinking the Digital Boom
— the key to survival —

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(In 2002, the research division of IBJ was merged with the Dai–Ichi Kangyo Research Institute and the think tank division of the Fuji Research Institute Corporation to form MHRI.)

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Summary

1. The digital boom exhibited a more complex boom–bust pattern of different goods in contrast to the information technology (IT) boom, which generated a synchronized surge and collapse of various goods.
2. In terms of consumer goods, the digital boom is characterized by (1) an explosive rise of demand for digital consumer electronics, and (2) the slump of personal computers (PCs) and cellular telephones, which were the drivers of the IT boom.
3. IT capital investment is characterized by (1) a high level of investment in production facilities, (2) the limited rise of stock levels in spite of such a high level of investment in production facilities, and (3) sluggish IT investment mainly with respect to telecommunications.
4. Profitability in the IT and digital industry follows a U–shaped "smiling curve". Thus, the struggle for survival in producer goods – namely electronics parts – will serve as the key to competitiveness. In the digital boom, the sharp rise of production of high value–added producer goods served as a major boost to the economy.
5. On the surface, 80% of the upward pressure upon the composite *Indices of Industrial Production (IIP)* stemming from the IT sector is attributed to producer goods. However, in the backdrop to the rise of output of producer goods is the rise of demand for consumer goods such as digital consumer electronic appliances.
6. The qualitative characteristics of the digital boom may be summed as (1) the pioneering position of the Japanese market, and (2) the accumulation of technologies in Japan, enabling the "integration" of technologies crossing over a broad spectrum of industrial sectors.
7. The three most highly desired household appliances today, dubbed the "New Three Sacred Treasures" [(the original "three sacred treasures" of household appliances in the mid–1950s were

black & white TVs, refrigerators and washing machines)] shed light upon the following characteristics of the IT and digital sector: (1) their large potential demand, (2) the disproportionate contribution to corporate earnings in relation to the scale of demand for such products, and (3) large scale capital investment necessary for survival.

8. In the field of IT and digital electronic appliances, Japanese companies possess a competitive edge in terms of product development backed by "the pioneering position of Japan's domestic market" and "the accumulation of technologies crossing over a broad spectrum of industries". Japanese companies must develop unique key technologies by maximizing their advantages mentioned above in terms of product development and to reap the profits through prior investment. However, most important for survival is the development of new key technologies while it can enjoy the benefits of existing technologies. Complacency is a taboo. To survive as the "winners", companies must create a cycle of new technologies and new product development.
9. The digital boom is nearing its end, in the sense that the digital industry is maturing. The "digital boom" is starting to be assimilated into the Japanese economy and is no longer a special phenomenon.

1. Introduction

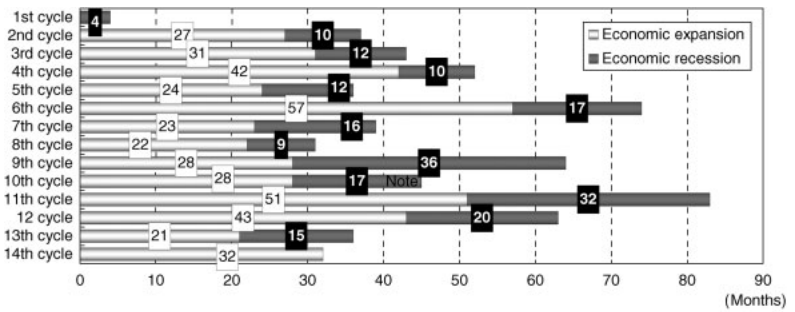
Japan's current economic recovery starting in January 2002 has lasted 32 months as of September 2004, catching up with 33 months which is the average span of past recovery cycles (**Chart 1**). Inasmuch as the Japanese economy has emerged out of a prolonged recession and has entered a period of transition toward renewed expansion, a simple comparison of the length of the recovery has little significance by itself. Even so, we can still confirm from the

foregoing that the current economic recovery is not subordinate in length in comparison to past recoveries.

The three following factors are cited as the source of momentum propelling the current recovery: (1) the improvement of financial stability among private corporations, (2) the strong recovery of overseas economies including China, and (3) the expansion of demand for IT and digital equipment. It is not within the purpose of this report to discuss the first two factors since the Mizuho Research Institute Ltd. (MHRI) has been commenting on "the improvement of financial stability among private corporations" and "the strong recovery of overseas economies including China" on various occasions.

The Mizuho Report dated February 17, 2004, *Will the Digital Boom Save the Japanese Economy?*, sets forth and analyzes the characteristics of the digital boom. This report is a further analysis of the IT and digital sector in the Japanese economy, taking into consideration the developments during the interim period (Note 1).

Chart 1: Japan's Economic Cycles Since the End of World War II



Note: The 13th cycle is provisional. The 14th cycle is based upon MHRI's estimate as of September 2004.
Source: Cabinet Office.

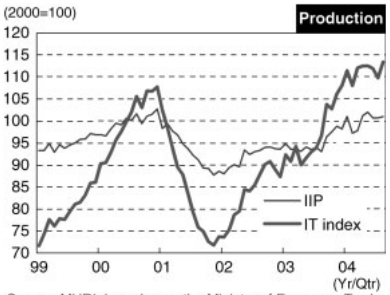
2. The characteristics of the digital boom

(1) The quantitative characteristics

As a means to supplement the industrial production activity of manufacturers in the IT and digital equipment industries, MHRI compiles is own IT Index (**Chart 2**) on the basis of the *Indices of Industrial Production (IIP)* released by the Ministry of Economy, Trade and Industry (METI). The IT Index is comprised of information–related producer goods, capital goods and consumer goods in addition to household electronic machinery (which includes a wide array of digital consumer electronic appliances), semiconductors and liquid crystal manufacturing equipment (**Chart 3**). Its weight to the *IIP* is slightly less than 20% in terms of both the production index (1851.5/10000) and the shipments index (1987.7/10000) (Note 2).

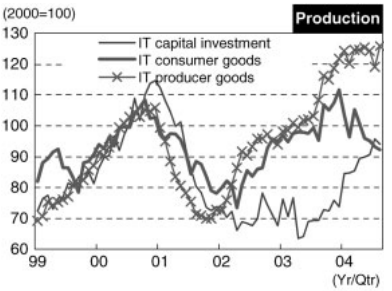
The IT–related goods are classified according to the standard industrial classification of normal goods, thus broadly classified into final demand goods and producer goods. Final demand goods are classified further into consumer goods and capital goods (≒ investment goods (Note 3)). This report provides an analysis of "IT capital investment", with IT–related capital goods referring to the following: (1) user–side IT investment (informatization–related investment) comprised mainly of PCs and servers, and (2) producer–side investment in production facilities for IT products such as semiconductor manufacturing devices.

Chart 2: The IT Production Index



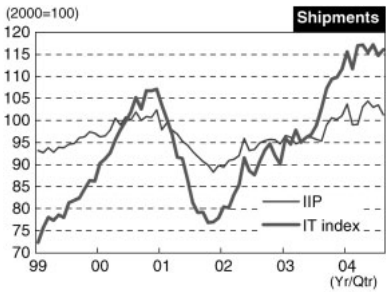
Source: MHRI, based upon the Ministry of Economy, Trade and Industry, *Indices of Industrial Production.*

Chart 3: Breakdown of the IT Production Index



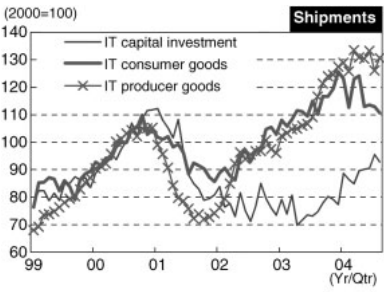
Source: MHRI, based upon the Ministry of Economy, Trade and Industry, *Indices of Industrial Production.*

Chart 4: The IT Shipments Index



Source: MHRI, based upon the Ministry of Economy, Trade and Industry, *Indices of Industrial Production.*

Chart 5: A Breakdown of the IT Shipments Index



Source: MHRI, based upon the Ministry of Economy, Trade and Industry, *Indices of Industrial Production.*

Chart 6: Percentage Change of the IT Index
(a comparison with the previous economic peak and trough)

	(2000=100, %)	Index level			(Rate of change) Apr-Jun 2000	
		2000 Oct-Dec	2002 Jan-Mar	2004 Apr-Jun	2000 Oct-Dec	2002 Jan-Mar
Production	Indices of industrial production (composite)	101.8	89.2	101.3	-0.5	13.6
	IT index	107.1	75.8	112.3	4.8	48.1
	IT consumer goods	104.5	80.9	97.3	-6.9	20.3
	Informatization-related consumer goods	109.7	79.7	78.8	-28.2	-1.1
	Household electronic machinery	98.5	82.2	118.9	20.7	44.6
	※Digital consumer electronics	108.2	87.0	122.7	13.4	41.0
	IT capital investment	112.7	72.1	90.0	-20.2	24.9
	IT investment	107.3	86.8	71.5	-33.4	-17.6
	Production facilities for IT products	121.8	47.6	120.7	-0.9	153.5
	IT producer goods	105.3	76.4	124.8	18.5	63.4
Shipments	Indices of industrial production (composite)	101.3	90.5	103.5	2.2	14.4
	IT index	106.9	81.2	116.5	9.1	43.5
	IT consumer goods	105.7	89.1	116.8	10.6	31.1
	Informatization-related consumer goods	109.6	81.7	78.2	-28.6	-4.3
	Household electronic machinery	101.6	96.7	156.5	54.0	61.8
	※Digital consumer electronics	110.7	97.4	162.1	46.3	66.5
	IT capital investment	110.5	79.4	90.1	-18.5	13.5
	IT investment	106.3	90.8	79.2	-25.5	-12.8
	Production facilties for IT products	122.1	48.4	119.6	-2.0	147.0
	IT producer goods	105.1	80.2	131.4	25.0	63.8

Note: * Digital consumer electronics" are special entries. "IT producer goods" are equivalent to informatization-related producer goods.
Source: MHRI, based upon data released by the Ministry of Economy, Trade and Industry.

a. A discrepancy between production and shipments

In the *IIP*, the shipments index in the Apr–Jun quarter of 2004 surpasses the level at the peak of the IT boom in the Oct–Dec quarter of 2000. The production index, however, remained virtually flat. While both the production and shipments indices of the IT Index in the Apr–Jun quarter of 2004 surpass the levels in the Oct–Dec quarter of 2000, the percentage rise is larger with respect to the shipments index (**Charts 2~6**). This discrepancy suggests that companies are taking a more cautious stance with respect to stockpiling inventories in the current economic recovery in contrast to the IT boom when companies boosted output in a bid to build inventories. The phenomenon also indicates that the "quantitative level" of production did not reach as high as the previous IT boom because Japanese companies shifted their production activity toward more high value–added products.

As indicated in **Chart 5**, there was a simultaneous boom and bust of IT producer goods, IT consumer goods and IT capital investment

during the previous IT boom. Thus, the inventory adjustment of IT producer goods and IT consumer goods coincided with the stock adjustment of capital investment, culminating in a serious adjustment. In the digital boom, IT production goods, IT consumer goods and IT capital investment are all following very different patterns, making it necessary to follow the trends of each type of goods.

b. Consumer goods

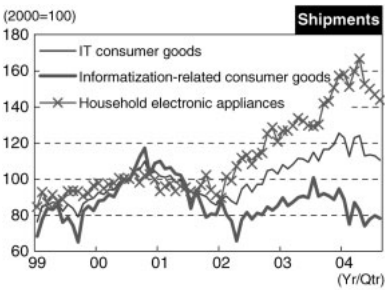
Let us first look at consumer goods. A striking characteristic of consumer goods is the dramatic rise of digital consumer electronics and, in terms of a broader categorization, household consumer electronic appliances. The shipments index in the Apr–Jun quarter of 2004 reveals a 46.3% rise of digital consumer electronics and a 54.0% rise of household consumer electronic appliances from the peak of the previous IT boom in Oct–Dec quarter of 2000. There is no doubt that one of the characteristics of the digital boom is the significant increase of consumer demand for digital consumer electronics including the New Three Sacred Treasures (**Charts 7 and 8**).

The ongoing slump of informatization–related consumer goods such as PCs and cellular telephones provides a sharp contrast. Not only is the shipments index in the Apr~Jun quarter of 2004 28.6% lower than the Oct–Dec quarter of 2000, but also 4.3% lower in comparison to the most recent trough of the economic cycle in the Jan–Mar quarter of 2002. Despite corporate demand to renew models installed at the time of the so–called millennium bug, demand for PCs for personal usage remains weak given their competition with digital consumer electronics. Demand for cellular telephones still lacks momentum. Although the shipments index jumped at one point in 2003 because of the rapid spread of camera–equipped cellular telephones, the demand for third generation (3G) cellular telephones is still too weak to trigger a switch–over from 2.5G models. Furthermore, the increased division of labor with Asia such as Taiwan and China is another factor contributing to the lackluster rise of the production index for

informatization–related consumer goods in comparison with the previous IT boom. While a relatively large part of the assembly process of digital consumer electronics still takes place within Japan, the low value–added assembly process of cellular telephones and PCs has been shifted to Asia such as Taiwan and China. As a result, the rise of the production index of informatization–related consumer goods is limited in comparison with the rise of demand.

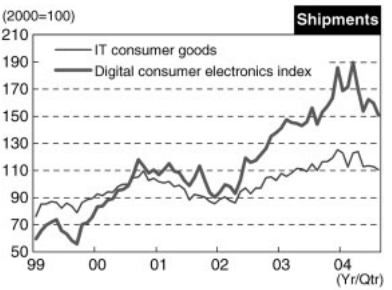
In terms of consumer goods, the digital boom is characterized by (1) an explosive rise of demand for digital consumer electronics, and (2) the slump of PCs and cellular telephones, which were the drivers of the IT boom.

Chart 7: The Shipments Index of IT Consumer Goods



Source: MHRI, based upon the Ministry of Economy, Trade and Industry, *Indices of Industrial Production.*

Chart 8: The Digital Consumer Electronics Index



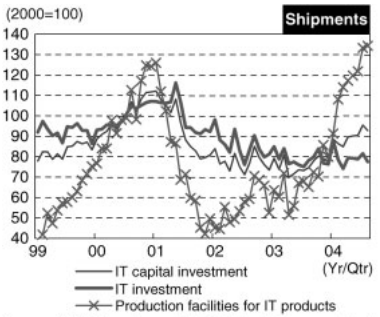
Source: MHRI, based upon the Ministry of Economy, Trade and Industry, *Indices of Industrial Production.*

c. IT capital investment (capital goods)

Moving next to the trends in IT capital investment, **Chart 9** shows a sharp rise of investment in production facilities. Although the shipments index in the Apr–Jun quarter of 2004 is virtually unchanged from the Oct–Dec quarter of 2000, the index has soared a staggering 147% (or 2.5 times) from the trough of the economic cycle in Jan–Mar quarter 2002. Of course, the rise of shipments bound for domestic markets would be slightly lower since shipments bound for overseas markets are included in the shipments data. Furthermore, it should also be noted that shipments on a nominal value basis (the

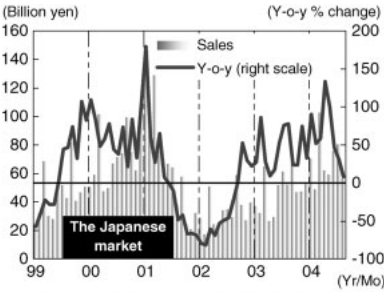
corporate equivalent of sales) is not rising as much as the quantity index due to sharp price falls of equipment such as semiconductor manufacturing devices. According to statistics released by industry organizations (liquid crystal display (LCD) manufacturing equipment is not included), total sales of semiconductor manufacturing equipment in the Japanese market doubled from the Jan–Mar quarter of 2002 and reached 197.1 billion yen in the Apr–Jun quarter of 2004. This, however, still falls far short of 240.9 billion yen in the Oct–Dec quarter of 2000 (**Chart 10**).

Chart 9: The IT Capital Investment and Shipments Indices



Source: MHRI, based upon the Ministry of Economy, Trade and Industry, *Indices of Industrial Production*.

Chart 10: Sales of Semiconductor Manufacturing Devices in the Japanese Market

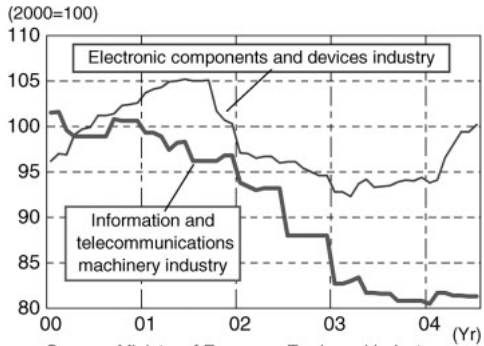


Source: Semiconductor Equipment Association of Japan.

Note that the level of capital stock is not rising in spite of the heavy investment in production facilities. Although the production capacity index of the electronics parts and devices industry is rising rapidly (indicating the expansion of production capacity) since early 2004, it still falls below the annual average of 100 in the year 2000 (**Chart 11**). Looking at the current state of capital investment and removal of equipment in the electrical machinery sector in the *Financial Statements Statistics of Corporations*, the level of capital stock is continuing to decline in spite of aggressive capital spending because large volumes of capital stock are being removed at the

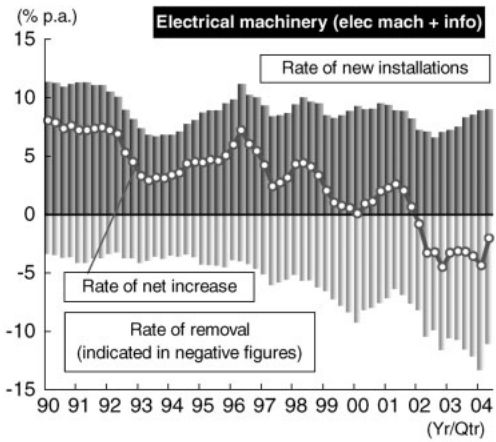
same time (**Chart 12**).

Chart 11: The IT–Related Production Capacity Index



Source: Ministry of Economy, Trade and Industry, *Indices of Industrial Production*.

Chart 12: Capital Stock in the Electrical Machinery Sector



Note: Due to changes in in classification in the *Financial Statements Statistics by Industry* from the Apr-Jun Qtr of 2004, the electrical machinery industry has been subdivided into the (new) electrical machinery industry and the information communication electronics industry. The two have been combined in the graph above.

Source: MHRI, based upon Ministry of Finance, *Financial Statements Statistics by Industry*.

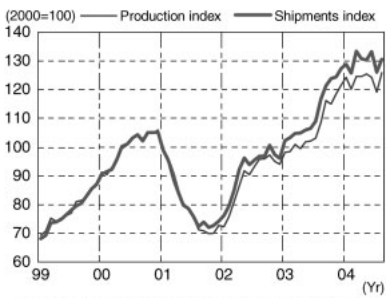
IT capital spending is also characterized by the ongoing sluggishness of IT investment. IT investment, or more precisely, user–side investment in PCs and servers remains weak. Investment in IT equipment is continuing to crawl at rock–bottom levels, in the absence of a temporary upswing in Japan's current economic recovery.

The characteristics of IT capital investment in the digital boom may be summarized in three points as follows: (1) the high level of investment in production facilities, (2) the limited rise of capital stock in spite of the foregoing, and (3) the weakness of IT investment, mainly with respect to telecommunications–related equipment.

d. Producer goods

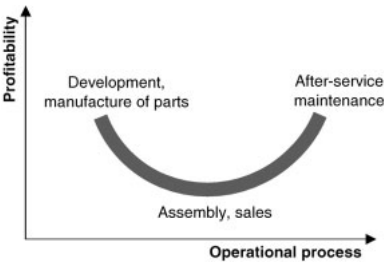
Lastly, let us look at the trends in producer goods (**Chart 13**). Since profitability in the IT and digital industry follows a U–shaped "smiling curve" (Note 6), the race for supremacy in producer goods – electronic components and devices – is a decisive factor for the industry's competitive edge (**Chart 14**). Thus, the production of key devices crucial to competitiveness must be kept within Japan despite a deepening horizontal division of labor with Taiwanese and Chinese companies. As a result, the growth of producer goods would be higher than consumer goods.

Chart 13: The Production and Shipments Indices of IT Producer Goods



Source: MHRI, based upon the Ministry of Economy, Trade and Industry, *Indices of Industrial Production*.

Chart 14: The Smiling Curve



The production and shipments indices of producer goods for the Apr–Jun quarter of 2004 are approximately 20% higher than the Oct–Dec quarter of 2000. Furthermore, the levels at Apr–Jun quarter of 2004 are 60% higher when compared with the Jan–Mar quarter of 2002. The strong growth of producer goods is the most prominent feature of the digital boom. The improvement of competitiveness among Japanese companies in the electronic components sector led to the sharp rise of production and shipments of producer goods, serving as the driving force for the Japanese economy in the form of the digital boom.

The enhanced competitiveness of Japanese companies in the electronics parts sector is also spurring the competitiveness of Japanese companies with respect to final products in which such electronic components are the integral devices.

e. The positive contribution to the *IIP*

On the basis of the trends in production and shipments above, we shall examine how the IT Index is pushing up the *IIP* (**Chart 15**). Looking at the contribution of the IT Index as a whole, approximately half of the rise of both the production and shipments indices since the trough of Japan's current recovery cycle (Jan–Mar quarter of 2002) is attributed to the IT Index (production index: 7.6% pt/13.6% pt; shipments index: 7.8% pt/14.4 % pt). A breakdown of the components reveals that approximately 80% of the positive contribution is attributed to IT producer goods such as electronic components and devices (production index: 6.2% pt/7.6% pt; shipments index 6.2% pt/7.8% pt). The next largest segment of *IIP* growth is investment in IT investment capacity which boosts the *IIP* production index by 1.5% pt and the *IIP* shipments index by 1.3% pt. Meanwhile the contribution by IT consumer goods with low added value – as indicated by the smiling curve – is very small. However, considering the shift of production of IT consumer goods to overseas production sites, it is difficult to find an indirect link between the rise of domestic demand for IT consumer goods and the increase of production of IT producer goods. In other words, the positive

contribution by IT producer goods stems from the rise of demand for IT consumer goods such as digital consumer electronics.

Chart 15: A Breakdown of the Contribution by the IT Index to *IIP* (a comparison with the peak and trough of the previous economic expansion)

	(2000=100, % pt)	Index level			Contribution to composite index	
		2000 Oct-Dec	2002 Jan-Mar	2004 Apr-Jun	Apr-Jun 2000	
					2000 Oct-Dec	2002 Jan-Mar
Production	Indices of industrial production (composite)	101.8	89.2	101.3	-0.5	13.6
	IT index	107.1	75.8	112.3	0.9	7.6
	IT consumer goods	104.5	80.9	97.3	-0.2	0.4
	Informatization-related consumer goods	109.7	79.7	78.8	-0.4	0.0
	Household electronic machinery	98.5	82.2	118.9	0.2	0.4
	※Digital consumer electronics	108.2	87.0	122.7	0.2	0.5
	IT capital investment	112.7	72.1	90.0	-1.1	1.0
	IT investment	107.3	86.8	71.5	-1.1	-0.5
	Production facilities for IT products	121.8	47.6	120.7	0.0	1.5
	IT producer goods	105.3	76.4	124.8	2.2	6.2
Shipments	Indices of industrial production (composite)	101.3	90.5	103.5	2.2	14.4
	IT index	106.9	81.2	116.5	1.9	7.8
	IT consumer goods	105.7	89.1	116.8	0.3	0.9
	Informatization-related consumer goods	109.6	81.7	78.2	-0.4	-0.1
	Household electronic machinery	101.6	96.7	156.5	0.8	0.9
	※Digital consumer electronics	110.7	97.4	162.1	0.7	0.9
	IT capital investment	110.5	79.4	90.1	-1.2	0.7
	IT investment	106.3	90.8	79.2	-1.2	-0.6
	Production facilities for IT products	122.1	48.4	119.6	0.0	1.3
	IT producer goods	105.1	80.2	131.4	2.8	6.2

Note: "Digital consumer electronics" are special entries. "IT producer goods" are equivalent to informatization-related producer goods.
Source: MHRI, based upon data released by the Ministry of Economy, Trade and Industry.

(2) The qualitative characteristics

The previous section provided a quantitative account of the impact of the IT and digital sector upon production activity among manufacturers. In this section, we shall focus upon the qualitative features of the digital boom.

a. Japan is a pioneering market

In many aspects, Japan is driving the current digital boom. However, a note is necessary to avoid a misunderstanding. It is not "Japan's final demand" but the "characteristics of the Japanese market and the wealth of cutting edge technology" that is providing the driving force.

Firstly, we must mention the vital role played by Japan's domestic market. Japan is at the vanguard of the world of digital appliances. Japan has a proven record in the dissemination of camera–equipped cellular telephones, flat–panel TVs, and broadband services (Note 7). Given the Japanese market's expansion ahead of the world, it is extremely important to gain an accurate understanding of the needs and whims of Japanese consumers and to target the market with competitive products. The Japanese market is also a test lab for the digital industry. This is underscored by the fact that proven hits in Japan have a high chance of succeeding in overseas markets such as China.

The foregoing provides a sharp contrast to the PC market – the main battleground in the IT boom. The Japanese market was a slow starter in the marketing of PCs. The main concern among major PC makers centered merely upon how to customize PCs for the Japanese market. PC customization for the Japanese market was very limited in the rules of the market set forth by the Intel = Microsoft alliance. In the digital boom, it is precisely the needs of the Japanese market that determine the global standard regarding digital consumer electronic appliances.

b. "Integration" is the key, based upon the accumulation of industrial technology in Japan

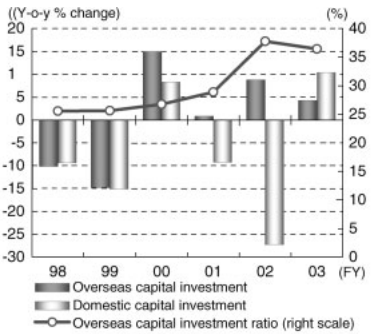
The next important factor is Japan's brilliance in "integration", resulting from the accumulation of a wide range of technologies. In addition to the obvious necessity for high digital technology, the cornerstone of the digital boom is the accumulation of technologies in a wide range of sectors including the materials and metal products industry necessary for the fruition of such high technology. Products based upon well–established technologies – in other words highly modularized products – can be manufactured in any part of the world today. Thus, the competitiveness of such products would ultimately be determined by cost factors such as labor and location of production sites. It may be possible to upgrade the level of technology in specific fields by concentrated investment in research

& development and/or the employment of skilled engineers. In today's world, however, technological advancement in limited specific fields would not suffice for the development of new products. New product development would only be possible through "intregration" crossing over industrial sectors, based upon the accumulation of technologies in a wide spectrum of industries.

c. Japan is the optimum site from the perspective of "integration"

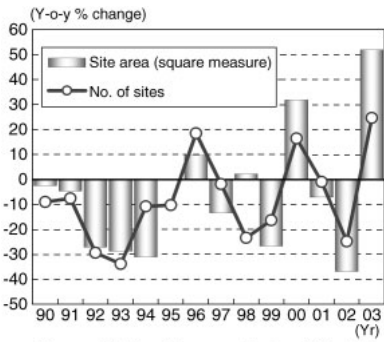
"Integration" is the key factor spurring a U–turn of production and R&D sites to Japan (**Charts 16 and 17**). Given the globalization of Japanese corporations, Japan is no longer attractive merely as a production site due to high costs of various factors such as energy and labor. Nevertheless, Japan ranks among the top positions in terms of technological accumulation necessary for "integration". The return of production and R&D sites to Japan is the result of companies selecting optimum sites in consideration of such technological accumulation.

Chart 16: Overseas Capital Investment Ratio



Note: In the BOJ *Short-Term Economic Survey of Enterprises in Japan ("TANKAN")*, overseas capital investment was surveyed last in December 2003. The graph above is based upon actual investment in FY2003 and planned investment in FY2003 (as of December).

Chart 17: A U-Turn of Production and R&D Sites to Japan



Source: Ministry of Economy, Trade and Industry.

d. Corporate capital investment strategies are changing

Massive prior investment is necessary in order to survive as the "winners" in the world of IT and digital appliances. The rules of the game apply to both the IT boom and the digital boom. Such massive prior investment is fraught with the potential risk of overcapacity.

However, unlike practices during the IT boom, companies are taking every preventive measure to hedge the risks of overcapacity. One of these preventive measures is joint investment by more than one company. The joint research and development efforts on plasma display panel (PDP) technology by Fujitsu Ltd. and Hitachi, the Sony–Samsung joint investment in liquid crystal panel technology and the trilateral investment in liquid crystal panels by Hitachi, Toshiba and Matsushita are some of the examples of strategic investment by more than one company. In the case of Toshiba's new semiconductor plant, the costs of capital investment are shared with SanDisk, its joint venture partner.

The approach and procedures regarding business fixed investment are also changing. Recently, the common practice in plant construction is to construct buildings with only several production lines at first rather than starting with a full range of production lines. This enables companies to increase production lines on a flexible basis with a close eye upon trends in demand so as to avoid the risks of excessive investment.

3. The "New Three Sacred Treasures" – changing lifestyles and tastes

In this section, we shall examine the New Three Sacred Treasures which comprise one of the characteristics of the digital boom.

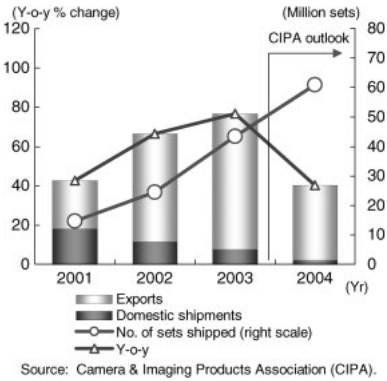
(1) Update on the New Three Sacred Treasures

a. Digital cameras

The proliferation of digital cameras has run its course in Japan. According the *Consumer Confidence Survey* of the Cabinet Office, the proliferation rate of digital cameras doubled in a time span of just two years from 22.7% in March 2002 to 51.8% in March 2004 (**Chart 19**). A proliferation rate of approximately 50% is easier to grasp by taking the example of PCs. After the proliferation rate of PCs among households rose above 50% in March 2001, the ensuing marketing strategy turned to target potential customers buying second PCs with additional features such as enhanced audiovisual functions and compact models for mobile usage. Likewise for digital cameras, core domestic demand is shifting to replacement of old models, second cameras or models with advanced features such as single–lens reflex (SLR) cameras. In particular, there is strong demand for ultra–thin breast pocket–size models and cameras with special features such as image stabilizing functions.

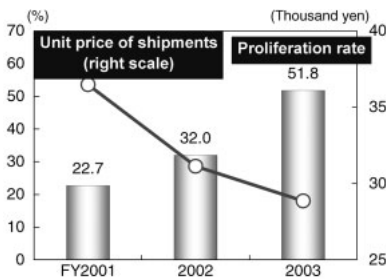
Industry statistics underscore these trends. In 2003, 88% of domestic camera shipments were comprised of digital cameras. Furthermore, while domestic shipments accounted for 33% of total shipments in 2001, the percentage fell to a mere 15% in 2003 (**Chart 18**). While shipments are projected to increase by 17.49 million sets and reach 60.9 million sets in 2004, 95% of this figure is bound for exports. In June 2004, domestic shipments dropped 12.6% y–o–y, dropping below the previous year for the first time since statistics were compiled in this format. Although shipments grew 0.6% y–o–y in July 2004, rising above the previous year level, it is evident that the market is saturated.

Chart 18: Outlook on Digital Camera Shipments



Source: Camera & Imaging Products Association (CIPA).

Chart 19: Unit Price and Proliferation of Digital Cameras



Note: Shipments are expressed as fiscal year averages and the proliferation rate is based upon data as of the end of the fiscal year (March 31st).

Sources: Cabinet Office, Camera & Imaging Products Association (CIPA).

Moreover, price falls are accelerating along with market proliferation. Although the unit price of shipments surpassed 40,000 yen in FY2001, the price sank under 30,000 yen in FY2003, bringing the level down to the upper half of the 20,000 yen–level. A clear demarcation is emerging along with the fall of prices. In contrast to high earnings among widely recognized top–tier brands possessing large global market share, earnings growth is slowing down among makers having meager market shares.

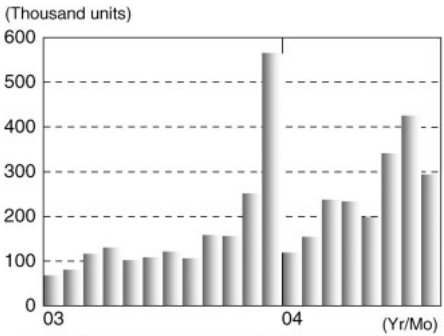
Looking forward, shipments should keep increasing along with the rise of the proliferation rate overseas. However, the contribution to corporate earnings in terms of shipments (i.e. sales) will turn out to be limited due to ongoing price falls. We also expect shifts in the mode of production. While production of key devices such as lens and CCD will remain in Japan, assembly and low value–added processes will be transferred overseas to the source of demand.

b. DVD recorders

DVD recorders are continuing to sell briskly. Given Sony's market entry, prices of DVD recorders dropped below 100 thousand yen during the year–end sales campaign last year, prompting its widespread domestic market proliferation. The number of sets

shipped since the end of last year topped that of VTRs, indicating a full–scale replacement of VTRs with DVDs. Moreover, the fact that the Athens Olympic Games started at midnight in Japan also spurred the demand for recorders (**Chart 20**).

Chart 20: Shipments of DVD Recorder and Players



Source: Japan Electronics and Information Technology Industries Association (JEITA).

Despite the entry of new makers such as Hitachi and Mitsubishi Electric to the marketing campaign in view of the Athens Olympic Games, business prospects are turning dim already. While Sony's drive to overtake Panasonic for top market share by launching new products such as *Sugoroku* (DVD recorder with high–capacity HDD) and PSX has succeeded in increasing its market share, Sony has acknowledged that its profit margin is sagging. Sony's choice to stay out of the Olympics marketing campaign and focus instead on the Christmas shopping season may be interpreted as the result of its prioritization of profitability.

A word of mention is necessary that DVD recorders are becoming increasingly modularized, although on a lesser degree than DVD players. Since DVD players can be manufactured easily once key components are available, Chinese makers benefiting from low labor costs are sweeping the globe. Due in part to the bitter lessons learned, Japanese makers have taken measures to prevent

the outflow of technology to produce key components. Thus, the deterioration of profitability is milder in the case of DVD recorders. For Japanese makers, a more important factor for profitability, is how to manufacture key devices such as semiconductors and pickups within their own companies. Even so, the odds are high that DVD recorders will become modularized following in the steps of DVD players. Furthermore, once the market matures, the production of DVD recorders will move overseas much in the same way as digital cameras.

The key to the future for Japanese companies is whether they can develop the next–generation DVD format while they are the leaders in the production of DVD recorders. The battle for the next–generation DVD format is in a flux. In the previous race for the global standard for video tape recorders and players, when the Betamax format lost against the VHS format, the competition was confined narrowly to the household electrical appliance industry. The competition for the next–generation DVD format between the Blu–ray Disk (BD) and HD–DVD is much larger in scope, encompassing PC makers and the digital contents industries (**Chart 21**). Japanese companies would have to attain a competitive edge above companies of the US, Taiwan and Korea.

Chart 21: Advocates of BD and HD–DVD Standards

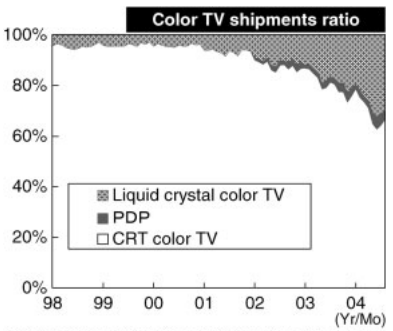
	Blu-ray Disk	HD-DVD
Household electric appliance makers	Sony Matsushita Electric Hitachi Samsung, Sharp	Toshiba Sanyo Electric
PC makers	Dell HP	NEC IBM
Hollywood entertainment companies	Sony Pictures MGM (20th Century Fox)	(Time Warner)

c. Flat–panel TVs

Like DVD recorders, another appliance which was

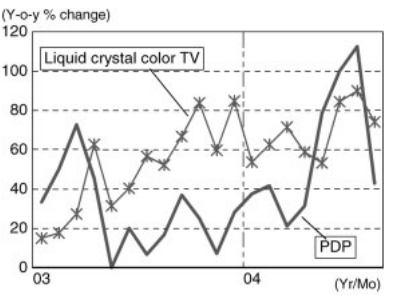
widely–anticipated to spread due to the Olympic Games this year is the flat–panel TV. The percentage of flat–panel TV shipments in color TVs is in fact on the rise, indicating that its proliferation is indeed under way (**Charts 22, 23**).

Chart 22: Color TV Shipments



Source: Japan Electronics and Information Technology Industries Association (JEITA).

Chart 23: PDP and Liquid Crystal TVs



Source: Japan Electronics and Information Technology Industries Association (JEITA).

There are two important points with respect to flat–panel TVs. One is the diversification of standards along with the advancement of technology. Second is the successive entry of PC makers such as Epson and Dell into the world of flat–panel TVs.

Up until last year, the general consensus on plasma display panels (PDPs) and liquid crystal displays (LCDs) was that: (1) PDPs are viewable from wider angles and thus suitable for large wall–mounted TVs but are not suitable for PCs due to the high electrical power voltage necessary, and (2) LCDs are suitable for small displays such as PCs. However, note that there are many other platforms for flat–panel TVs. Many makers are now touting rear–projection (Rear Pro) displays. Despite the downside that it is difficult to produce Rear Pro displays in flat formats, they are spreading in the US and Chinese markets due to its low cost. Among other formats are the surface–conduction electron–emitter display

(SED) developed jointly by Canon and Toshiba and the organic electroluminescence (EC) display, which is said to be most suitable for flat–panel displays given its preclusion of the necessity for back lights. Sales trends indicate that existing platforms are progressing on a path of peaceful coexistence according to types of usage. LCDs are used widely in displays up to 32 inches while PDPs are the hot sellers with respect to displays larger than and including 40 inches. In the 60–inch and larger range, Rear Pro, instead of PDP, may turn out to dominate the Japanese market as in the case of the US. Furthermore, in the eve of the practical application of organic EL, the winner in the long run still remains uncertain.

Another important factor is the entry of PC makers. This is because flat–panel TVs (=displays) are the key device serving as the gateway to bi–directional communications in the age of computerization and digitization. The scramble for supremacy in the key device serving as the gateway is extremely important not only for household electric appliance makers but also for PC makers.

(2) Characteristics of digital consumer electronic appliances

The market trends of the New Three Sacred Treasures in the foregoing section sheds light upon the common characteristics of household consumer electronics which may be summarized in three main points.

The first point is the very large potential demand.

Demand for DVD recorders and flat–panel TVs is phenomenal even when limiting the potential demand to the replacement of existing appliances such as VTRs (proliferation rate as of end of March 2004: 82.6%) and color TVs (proliferation rate as of the end of March 2004: 99.0%) within Japan. The demand for flat–panel TVs is much stronger even in comparison with the other two "Sacred Treasures". This stems from the following features of the Japanese market: (1) most Japanese households have more than two TV sets, (2) limited space in Japanese dwellings, and (3) the boost to demand by the transition from analog to digital broadcast format. Furthermore, in view of its role as the gateway to bi–directional

communications, the demand for flat–panel TVs is far larger than digital cameras and DVD recorders.

Furthermore, even after the maturation of the domestic market, there is potential demand in overseas markets. For example, there is huge potential demand for digital cameras overseas subsequent to the maturation and saturation of the Japanese market. The same holds true for DVD recorders and flat–panel TVs which are proliferating in the domestic market.

The second point is that the magnitude of potential demand in macroeconomic terms does not necessarily contribute to the earnings of companies. In the world of digital consumer electronics – characterized by sharp price falls along with technology advances and fierce competition – only a handful of companies with high productivity and technology levels are able to keep reaping profits. In the overseas market proliferation phase mentioned above, prices will fall further, making it difficult for volume–based demand to contribute to corporate sales and earnings.

The third and last point is the need to secure preeminence in key technologies and devices and the necessity for massive capital spending. In the words of Kunio Nakamura, President of Matsushita Electric Industrial Co., Ltd., key technology is expressed as "black box technology" which is defined as unrivaled technology and knowhow which cannot be imitated by others because of (1) protection by intellectual property rights such as patents, (2) the absence of clues on how the device is built even by dismantling the device, and (3) the containment of the entire production process within the company. In addition to the image stabilizing function of digital cameras cited as an example by Nakamura, Sharp's technology to mass produce LCD at its Mie plant and Sony's new semiconductor (CELL) also fall into this category. The containment of such cutting–edge technology will provide companies with the source of competitiveness not only in terms of prices and will lead to the generation of profits. Nevertheless, it is impossible to maintain absolute predominance with respect to such technology on a long–term time span. For example, conventional TV makers claim

that they have an entrenched superiority in graphic display technology in TVs in the face of the entry of PC makers into the flat–panel TV market. While it is true that they have a great advantage based upon graphic display knowhow nurtured since the days of cathode–ray tubes, their superiority is not eternal. Without research and development in new technologies, they may lose their market share in flat–panel TVs.

(3) The expansion of digital consumer electronics and the shift of the New Three Sacred Treasures to newer appliances.

When we limit our perspective to Japan's domestic market, the digital camera is falling out of its position as one of the New Three Sacred Treasures. The PDA market is also shrinking due to competition with cellular telephones. Although flat–panel TVs should retain their position as a "sacred treasure" for some time, DVD recorders are fast falling out of league of coveted appliances. One characteristic of digital consumer electronics is the fast change of products in vogue stemming from rapid technology advances. Low–resolution digital cameras are being replaced by camera–equipped cellular telephones enabled by the miniturization of CCDs and PDAs are now competing with cellular telephones as a result of high–resolution liquid crystal technology. At the moment, hard disk audio appliances such as the "i–Pod" are sweeping the market. This was also enabled by technology to produce miniscule hard disks.

The vicissitudes of digital consumer electronics has a double meaning, namely that (1) market entry is easy for newcomers, and that (2) it is difficult to maintain market initiative for a long period of time. Although the ease of market entry by newcomers injects the market with momentum and provides customers with benefits in the form of lower prices and better functions, the difficulty to keep the initiative for a long period of time provides companies with extreme hardships since they cannot remain at the top unless by investing colossal sums in research and development.

4. How to survive: insights for Japanese companies

Keeping in mind the discussions thus far, this section focuses upon how Japanese companies can survive in the IT and digital electronics industry.

At the moment, Japanese companies have a clear advantage in terms of its "pioneering domestic market" and "cross–industrial technology accumulation". If Japan can maintain its competitive edge in these aspects through accurate and appropriate industrial policy initiatives, Japanese companies would be able to retain their lead in the race for product development.

Most important in product development is the development of the key "one and only one" technology. Companies would have to develop "black box" technologies that cannot be readily imitated by rivals. By taking advantage of Japan's wealth of accumulated technologies crossing over industrial sectors, "integration" of the key technology with other technologies would enable prompt product development.

Even so, "black box" technology will not retain its competitive edge forever. Others will eventually overtake the position as top runner. As a result, companies must spend massive sums in order to mass–produce the developed product while it still possesses the competitive edge and to secure market share. Large–scale prior investment is necessary in order to reap the fruits of key technology at an early stage. The recent business tie–ups and large–scale capital projects in the area of liquid crystal and flat–panel displays correspond to this phase. Of course, such prior investment is perpetually subject to the risks of over capacity. Companies are deciding whether or not to engage in such prior investment by weighing the risks against the scale of potential demand (the returns) for the product.

Financial soundness and mobility is important at the stage of

prior investment. Admittedly, Japanese companies have become more financially sound amid the pervasion of cash flow management. However, given its risk–averse management strategy regarding prior investment, companies are failing to take advantage of their mobility. In some instances, Japanese companies are falling behind their foreign counterparts.

Lastly and most importantly is to avoid being complacent with existing key technologies. Companies must develop new key technologies while they can still reap the profits of existing key technologies. The secret to survival as "winners" is the creation of a cycle of key technologies and products.

5. Concluding remarks

In retrospect, the digital boom may be regarded as a surge of the IT and digital sector. Looking forward, the digital electronics sector will enter a period of maturation, thus drawing closer to an end.

The IT and digital sector will gain a closer affinity with the overall economy. For example, there is now a narrow subcategory within household electric appliances known as digital consumer electronics. Note however that in the future, all types of household electric appliances will become digitized. The same is also true for automobiles. The automobile is referred to already as a "digital box", and we expect the range and proportion of digital equipment installed in cars to follow an upward curve. At the moment, Japan is dominating the world of car electronics. The maintenance of Japan's competitive edge in the field of car electronics benefits not only upstream electronics parts and devices industry but will also lead to the further growth of the automobile industry.

The digital boom is nearing its end in the positive sense that the digital boom is no longer an exceptional phenomenon and is starting to be integrated into the entire Japanese economy.

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Notes:

1. This paper does not comment on the adjustment of production in the IT and digital sector.
2. For further details, refer to the “Supplement”.
3. There are no construction goods due to limitation to the IT and digital sector.
4. The 13th economic cycle (Jan 1999~Jan 2002) is defined as the IT boom. The expansion phase extends from January 1999 to October 2000 and the recession phase extends from October 2000 to January 2002.
5. There is not much of a fall in the numerical quantity of shipments since it includes reshipments accompanying imports. A prominent example is the production of cathode ray tube color TVs, most of which has been transferred overseas.
6. The term, “smiling curve”, was first coined by Stan Shih, Chairman of Taiwan–based Acer Inc., to describe the characteristics of the added value in the PC production process. The term describes the phenomenon that the added value is high at the upstream and downstream processes and low at the midstream processes.
7. Japan’s domestic broadband services have reached top performance in the world. Note, however, that the market is still under–developed in terms of software.

Supplement: Composition of the IT Index

Goods	Unit	Production index Weight	Shipments index Weight
Alkaline storage batteries	Thousand Ah	21.5	21.5
Lithium ion storage batteries	Thousand Ah	41.9	33.4
Resistors	Million	22.8	19.8
Fixed capacitors	Million	87.6	76.1
Transformers	Thousand	28.2	24.5
Quarts crystal units	Thousand	10.8	9.9
Connectors	Thousand	57.5	55.0
Electronic circuit boards	Million	117.5	97.5
Magnetic heads	Thousand	15.9	13.0
Active matrix LCD (Large)	Thousand	52.9	67.8
Active matrix LCD (Middle and small)	Thousand	28.6	36.7
Passive matrix LCD	Thousand	30.3	38.9
Silicon diodes	Thousand	9.9	10.2
Transistors	Thousand	33.7	39.3
Optical electronic devices	Thousand	42.9	51.5
Linear integrated circuits	Million yen	75.1	71.8
Bipolar IC	Million yen	9.3	7.7
Metal oxide semiconductor IC (Micro computer)	Million yen	84.7	79.9
Metal oxide semiconductor IC (logic lcs)	Million yen	150.0	141.5
Metal oxide semiconductor IC (Memory)	Million yen	116.3	109.7
Metal oxide semiconductor IC (Charge coupled devices)	Million yen	13.0	9.3
Hybrid IC	Million yen	41.0	32.8
Silicon wafers	Sq meters	46.8	39.7
Informatization-related producer goods		1138.2	1087.5
Producer goods (total)		1138.2	1087.5

Goods	Unit	Production index Weight	Shipments index Weight
Digital and full color copying machines	Set	35.4	57.2
Key system telephone equipments	Set	4.8	5.6
Facsimile	Set	8.0	16.1
Personal handy phone system	Set	2.0	1.5
General purpose computers	Million yen	9.2	15.7
Mid range computers	Million yen	16.2	27.6
Personal computers	Set	50.5	85.7
External storage	Million yen	33.3	53.8
Input-output units	Million yen	40.4	66.3
Terminal equipments	Million yen	16.4	25.9
Communication wire and cables	conductor t	3.6	4.9
Optical fiber for communication wires and cables products	km core	11.4	7.9
Electric switching systems	Million yen	24.4	29.0
Digital transmission equipments	Set	26.5	31.4
Fixed communication equipments	Set	11.0	13.6
Basic exchange for mobile customer premises equipments	Set	5.5	6.4
Informatization-related capital goods		298.6	448.6
Semiconductor products machinery	Million yen	130.3	126.9
Flat-panel display manufacturing equipment	Million yen	25.2	22.5
Semiconductor characteristic measuring equipment	Million yen	24.3	15.8
Capital goods for production facilities		179.8	165.2
Capital goods (total)		478.4	613.8

Goods	Unit	Production index Weight	Shipments index Weight
Cellular telephones	Set	88.3	84.6
Personal handy phone system	Set	4.7	3.4
Personal computers	Set	33.6	57.1
Informatization-related consumer goods		126.6	145.1
Color televisions	Set	10.6	24.8
Liquid crystal televisions	Set	2.2	3.1
Video tape recorders	Set	5.4	11.6
DVD-Videos	Set	6.8	6.8
Video cameras	Set	26.8	34.7
Digital cameras	Set	16.0	21.6
Car navigation systems	Set	13.1	10.6
Headphone stereos	Set	2.6	2.5
Car stereos	Set	24.8	25.6
Household electronic machinery		108.3	141.3
Consumer goods (total)		234.9	286.4

Producer goods (total)		1138.2	1087.5
Capital goods (total)		478.4	613.8
Consumer goods (total)		234.9	286.4
IT Indices		1851.5	1987.7

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