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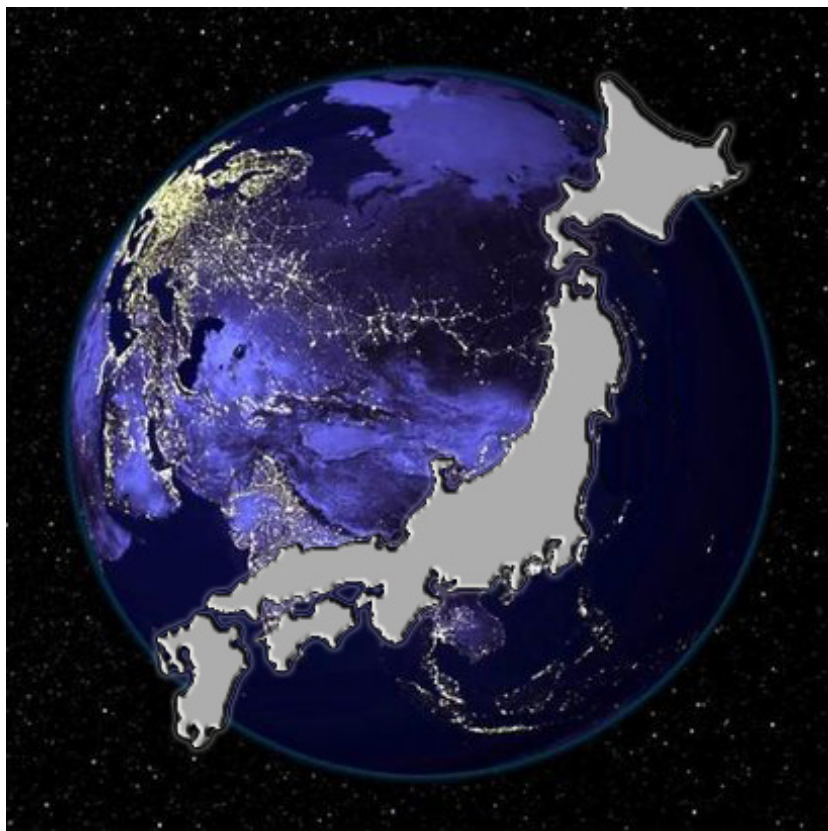
Technology - General (Citi)  
Japan

## Japanese Med Tech in a Global Context

### Can Japan's med tech Davids take on the global Goliaths?

- The global med tech industry is worth c\$350bn and characterized by steady growth and high profits. US firms are the dominant global players but in this report we focus on the Japanese market (the second largest globally, at \$30bn-\$40bn) and the competitiveness of Japan's med tech industry. Japan may be a more mature market and Japanese companies may also appear subscale versus bigger global players such as J&J, Medtronic, and Covidien, but some have strong niche positions and earnings power and are looking to expand overseas. Sysmex (blood testing) stands out here and Toshiba (imaging diagnostics) and Olympus (endoscopes) are also interesting long-term. Figure 1 inside shows how well Japanese med tech shares have performed in the last decade and we see no reason for this multi-year secular outperformance to end any time soon.

This is the latest report in our Global Context series.



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See Appendix A-1 for Analyst Certification, Important Disclosures and non-US research analyst disclosures.

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#### Recent reports on medical device industries

Analyst Name	Country	Date	Links
Hidemaru Yamaguchi	Japan	8/23/2012	Sysmex (6869) - Initiating at Buy: Aiming to be the Apple of testing equipment*
Richard Yeh	Hong Kong	11/26/2012	China Healthcare Sector - Handbook December 2012: Leaders Becoming Better
Global Healthcare team	Global	11/29/2012	Pharma: I Pay, You Pay, He Pays, Won't Pay? - Global Pharma – An Unlikely Survivor. Buy.
Masahiro Shibano	Japan	12/3/2012	Fujifilm Holdings (4901) - Upgrading to Buy: Earnings momentum and sentiment improving
Richard Yeh	Hong Kong	12/7/2012	China Healthcare Thematic - Capturing the Upcoming Value Chain Shift
Masahiro Shibano	Japan	12/18/2012	Olympus (7733) - On the recovery path but risks remain
Global Healthcare team	Global	1/3/2013	2013 Annual Nonprofit Hospital Survey - Pricing & Capex Slow in 2013, Cost Inflation Remains Benign
Global Healthcare team	Global	1/21/2013	World Champions – Healthcare Stocks - Healthcare Standouts in Global Quality amid Challenging Macro
Amit Bhalla	United States	1/21/2013	Life Science Tools & Dx - Hurdles Should Clear in 4Q; Expect Conservative 2013 Outlook
Global Healthcare team	Global	2/5/2013	European Hospital Capex Survey – Continued Deterioration in 2013
Global Healthcare team	Global	2/18/2013	Global Outlook for Hospital Capex – Our Survey Says... Still Growing, But Slower

Source: Citi Research.

#### Other recent Japan in a Global Context reports

Analyst Name	Country	Date	Links
Graeme McDonald	Japan	10/27/2011	Japanese Industrials in a Global Context - Can the success story continue?
Arifumi Yoshida	Japan	11/24/2011	Japanese Auto Parts in a Global Context - Strong competitiveness and greater independence bring longer-term opportunities
Takao Kanai	Japan	1/12/2012	Japanese Chemicals in a Global Context - Japan's chemical firms accelerating tech-driven global push
Soichiro Fukuda	Japan	1/27/2012	Japanese Games in a Global Context - Social games and cloud gaming: the next growth chapter
Nobuyoshi Miura	Japan	2/16/2012	Japanese Tobacco in a Global Context - JT's global growth potential
Arifumi Yoshida	Japan	5/16/2012	Denso (6902) - More confidence in our Global Context thesis
Kota Ezawa	Japan	9/10/2012	Japanese Consumer Electronics in a Global Context - A drama of collapse—and revival?
Hironari Nozaki	Japan	9/11/2012	Japanese Banks in a Global Context - Is the equity market undervaluing the sector?
Atsushi Ikeda	Japan	10/12/2012	Toray Industries (3402) - Sticking to its knitting: Toray in a Global Context
Kota Ezawa	Japan	12/3/2012	Japanese Consumer Electronics: Global Context Redux - Device explosion: The digital convergence cliff

Source: Citi Research.

#### Other thematic reports by the primary author of this report

Analyst Name	Country	Date	Links
Tsubasa Sasaki	Japan	1/17/2012	OLEDs - The next generation of displays
Tsubasa Sasaki	Japan	7/20/2012	Lithium-ion batteries - A Japanese tech growth story?
Tsubasa Sasaki	Japan	10/25/2012	Long Term Evolution - Innovation in communication services, devices, and handsets
Tsubasa Sasaki	Japan	1/22/2013	Touchscreen industry - Nitto Denko benefits from film shift for tablet touchscreens

Source: Citi Research.

# 1. Executive Summary

The global med tech industry is worth c\$350bn and characterized by steady growth and high profits. Interestingly, it remains fragmented both in products and companies. US firms are the dominant global players and have led the way in consolidating/gaining scale. However, in this report we focus on the Japanese market (the second largest globally, at \$30bn-\$40bn) and the competitiveness of Japan's med tech industry. We split the industry into global champions, challengers, domestics, independent niche players, and conglomerates, where med tech is just one of a panoply of operations (see Figure 7 on page 15). Japan may be a more mature market and Japanese companies may also appear subscale versus bigger global players such as **J&J**, **Medtronic**, and **Covidien**, but some have strong niche positions and earnings power and are looking to expand overseas.

**Sysmex** (blood testing) stands out here and **Toshiba** (imaging diagnostics) and **Olympus** (endoscopes) are also interesting long-term as both feature in the top of the global market share rankings. Figure 1 below shows how well Japanese med tech shares have performed in the last decade and we see no reason for this multi-year secular outperformance to end any time soon.

Another area we highlight in the report is the M&A boom globally (see Figures 34 and 35 on page 45) and in Japan in recent years, mainly driven by entrants which are facing challenges in traditional core businesses such as electronics, pharmaceuticals, chemicals, and by industry consolidators in the med tech industry itself. In Japan, the standout deals have been **Terumo's** acquisition of CaridianBCT (March 2011) and **Asahi Kasei's** acquisition of Zoll Medical (March 2012). **Samsung Electronics**, **Fujifilm**, and **Sony** are all trying to bulk up in med tech, testament to the appeal of the market.

## Japanese medical device makers: an attractive alternative

**Promise of both stable growth and high margins makes market attractive**

The global medical device market is attractive because of its potential for both stable growth and high margins. The medical device market was worth \$349bn in 2011, and we estimate it will grow by 4% annually through 2016. Although we think the growth potential of advanced markets has fallen to 1%-3% annually, we believe emerging markets will continue to grow by at least 10% annually, so we expect the overall market to continue growing steadily. Another factor making the medical device industry attractive is that, since peoples' lives are at stake, customers place more importance on quality and performance than on cost, keeping margins high. Major medical device manufacturers actively involved in the global market benefit from high profit margins, with operating margins consistently in the 15%-40% range.

**Overseas expansion and the development of niche markets making Japanese makers an increasingly attractive alternative...**

Globally, the leading medical device manufacturers of Europe and the US—such as Johnson & Johnson, Medtronic, and General Electric—are all highly competitive in a number of respects, including product competitiveness, scale, and profitability. However, there are structural issues in the US market, where companies are facing increasingly stricter FDA standards and efforts to control health care costs (see our November 29 report, [Pharma: I Pay, You Pay, He Pays, Won't Pay? - Global Pharma – An Unlikely Survivor. Buy.](#)). Although Japanese companies lag in terms of market scale versus bigger global players, some are achieving high growth and profitability through overseas expansion and the development of niche markets. For this reason, we think Japanese medical device makers are becoming an increasingly attractive investment option as an alternative to the overseas majors.

**...and Sysmex stands out**

**Sysmex**, which has a 40% share of the global market for blood cell counters, is an example of a Japanese medical device maker that is achieving high growth and profitability through overseas expansion and the development of niche markets. We believe the company will continue to see high growth in light of its robust product competitiveness and strong customer service (see our November 8 report [Sysmex \(6869\) - Initiating at Buy: Aiming to be the Apple of testing equipment\\*](#)). Sysmex was one of the 15 finalists in our January 21 report [World Champions – Healthcare Stocks - Healthcare Standouts in Global Quality amid Challenging Macro](#).

**Investment opportunities broaden as companies in other fields enter and invest in medical devices**

In recent years there has been a significant rise in the number of major companies in other fields looking to enter and invest in the medical device business. Examples include the alliance between **Sony** and **Olympus** and **Asahi Kasei's** acquisition of Zoll Medical. These companies are experiencing declines in the growth potential and profitability of their existing core businesses, such as digital consumer electronics and chemicals, and are entering the medical device field as a way of reestablishing growth. We think this will lead to reforms in the business structures of incumbent companies while offering investment opportunities in the Japanese medical device industry. In fact, we are now seeing vigorous M&A activity in this field (for details see Figure 34 on page 57).

**Application of technologies from other fields to help strengthen Japan's medical device industry**

Japan has historically been strong in a variety of industries, including electronics, chemicals, and machinery, as well as enjoying a high level of basic technology in a wide range of fields, including IT, materials, and mechatronics. Historically, the country has not had many companies aggressively involved in the medical device industry, so these basic technologies have not necessarily been utilized in medical devices. Today, an increasing number of companies are entering the medical field, so we see a growing likelihood of basic technologies from a wide variety of fields being used in medical devices.

**Applying technology from other field key to strengthening the competitiveness**

Most of the major companies that are entering or investing in the medical device business, such as **Sony** and **Asahi Kasei**, have sophisticated basic technologies in their core businesses, abundant capital strength and M&A experience, as well as previous success in global expansion in other fields. Some incumbent medical device manufacturers, such as **Sysmex** and **Asahi Intecc**, have made significant advances by applying technology from other fields to differentiate their products; we think this repurposing will be key to strengthening the competitiveness of the Japanese medical device industry.

## Japanese medical device stocks

**Terumo and Sysmex as pure plays**

In addition to pure-play manufacturers like **Terumo** and **Sysmex**, the Japanese medical device industry increasingly involves companies from other fields (mainly electronics and chemical companies) entering and investing in the medical device business as a means of generating stable profits. For that reason, when investing in Japanese medical device manufacturers, one must analyze separately pure-play manufacturers and companies from other fields.

**The majors include Sysmex, Terumo, and Olympus**

We think the Japanese medical device manufacturers with international competitiveness are **Sysmex**, **Terumo** and **Olympus**. **Sysmex** has a 40% share of the global market for blood cell counters and in our view has the highest potential for growth over the longer term thanks to its robust product competitiveness and its marketing capabilities. **Terumo** has achieved growth by securing stable cash flow from basic products while investing aggressively in leading-edge fields and in overseas sales and promotion, and we think its business model and minimally invasive treatment systems promise growth over the longer term. **Olympus** has a 70% share of the global market for flexible endoscopes, its core product, and we think the endoscope business has a promising future.

**Companies are able to achieve high earnings and have high growth potential in niche fields**

Although not among our stock coverage, there are a number of companies that have leveraged the unique nature of the medical device business—namely, that it is highly segmented owing to the large number of products it encompasses, making viable a dominance strategy through specialization in a particular field. Such companies include **Mani**, **Nakanishi**, **Medikit**, **Asahi Intecc**, **Topcon**, **Techno Medica**, and **Daiken Medical**. These companies merit attention, as they have



achieved high growth and high profits by growing sales of products that are differentiated through original technology, such as surgical needles in the case of **Mani** and guidewire for percutaneous transluminal coronary angioplasty (PTCA) in the case of **Asahi Intecc**.

**Medical devices an effective means of  
revamping earnings structure**

Although medical device businesses offer companies a chance for stable earnings growth, we note that medical devices have a long life-cycle and medical device business acquisition prices tend to be high, resulting in a heavy upfront investment burden for new entrants until existing operations are on track. We thus believe stock selection should concentrate on companies that are advancing earnings structural reform alongside the medical device business.

**Spotlighting Toshiba, Fujifilm, and Asahi  
Kasei**

From this perspective, we recommend three companies: **Toshiba**, **Fujifilm**, and **Asahi Kasei**. **Toshiba** is focusing on social infrastructure as a longer-term growth business, and we expect medical devices to expand as a core business in this area. **Fujifilm** has designated medical-related operations, including medical devices, as a growth field. We believe **Fujifilm's** medical-related operations will become profitable in FY3/14 and start to make a material contribution to earnings. Having identified dialyzers as a source of stable growth over the longer run, **Asahi Kasei** acquired Zoll Medical for \$2.2bn in 2012. Zoll Medical's annual sales have continued to increase at a double-digit pace and we believe it can contribute to longer-term growth.

**Medical devices account for a material  
part of the earnings of Hitachi, Hoya,  
Kaneka, Teijin, and Omron**

Among companies with apparently small medical device segments, we prefer **Hitachi**, whereas **Hoya**, **Kaneka**, **Teijin**, and **Omron** look less attractive because their non-medical devices businesses are struggling and their valuations look stretched. Medical devices businesses do, however, contribute a material portion of earnings, and if they continue to expand we believe investor interest in these companies as earnings structure turnaround stories could increase.

**One option for Panasonic is to sell its  
medical device business while Sony  
appears to be looking to build up**

Amongst the consumer electronics giants, we think it would be reasonable for **Panasonic** to sell its medical device business. Meanwhile, **Sony** is putting effort into medical devices as a next-generation business, as evidenced by its alliance with **Olympus**. However, at this point the direction of the business is unclear to us. We think that if the direction of **Sony's** growth strategy becomes clearer, its efforts in the medical device business, as one element of the transformation of the company's management strategy, could lead to a rerating of the stock.

## 2. Investment Strategy

### Spotlight on medical devices as a growth market

**Smartphones and tablets have been driving technology industry since 2009**

Over the past three years, the central topic for technology companies around the world has been the expansion of the smartphone/tablet market, as underscored by the explosive growth in sales of Apple's iPhone and iPad products since 2009. This had considerable benefits not only for Apple, but for a number of Apple's suppliers (chipmakers, display makers, component suppliers, EMS companies, etc.)

**Commoditization of the smartphone/tablet market is underway**

However, from 2012 the smartphone/tablet market began to mature. While we need to discuss what form this maturation will take in detail separately, our global technology team feels that the progressive standardization of device design and the expanding supplies of core components like application processors and displays means volumes in the market will increasingly be driven by low-end products. For reference, please see our November 2, 2012, report on smartphones, [Asia Pacific Technology - Device Explosion: Smartphone Shipments to Hit 1.1bn in 2013](#)).

**Need to think about what comes next after smartphones and tablets**

Our global technology team downgraded Apple to Neutral from Buy in light of slowing demand for the iPhone 5 (for reference, see our December 16, 2012 report, [Apple, Inc. \(AAPL\) - NT Cuts Bring Risks Increasingly Into Focus – Downgrade to Neutral](#)). We think this is one aspect of maturation in the smartphone/tablet market. With the appeal of a market leader like Apple as a hardware maker diminishing, we think it is time to look beyond smartphones and tablets for the next growth scenario.

**Chemical makers need to think of growth businesses to succeed petrochemicals and electronic materials**

The earnings power of chemical companies' mainstay petrochemical businesses is declining because of structural problems, including high cost structures, excess production capacity, and delays to industry reorganization. Japanese companies, particularly highly competitive electronic materials makers, are strong in high-performance chemicals, but competition with Asian firms is intensifying and slowing demand caused by the maturation of the digital consumer electronics market, centering on smartphone and tablets, is a problem. Like technology companies, we believe chemical companies need to find new growth businesses (see our report of January 12, 2012, [Japanese Chemicals in a Global Context - Japan's chemical firms accelerating tech-driven global push](#)).

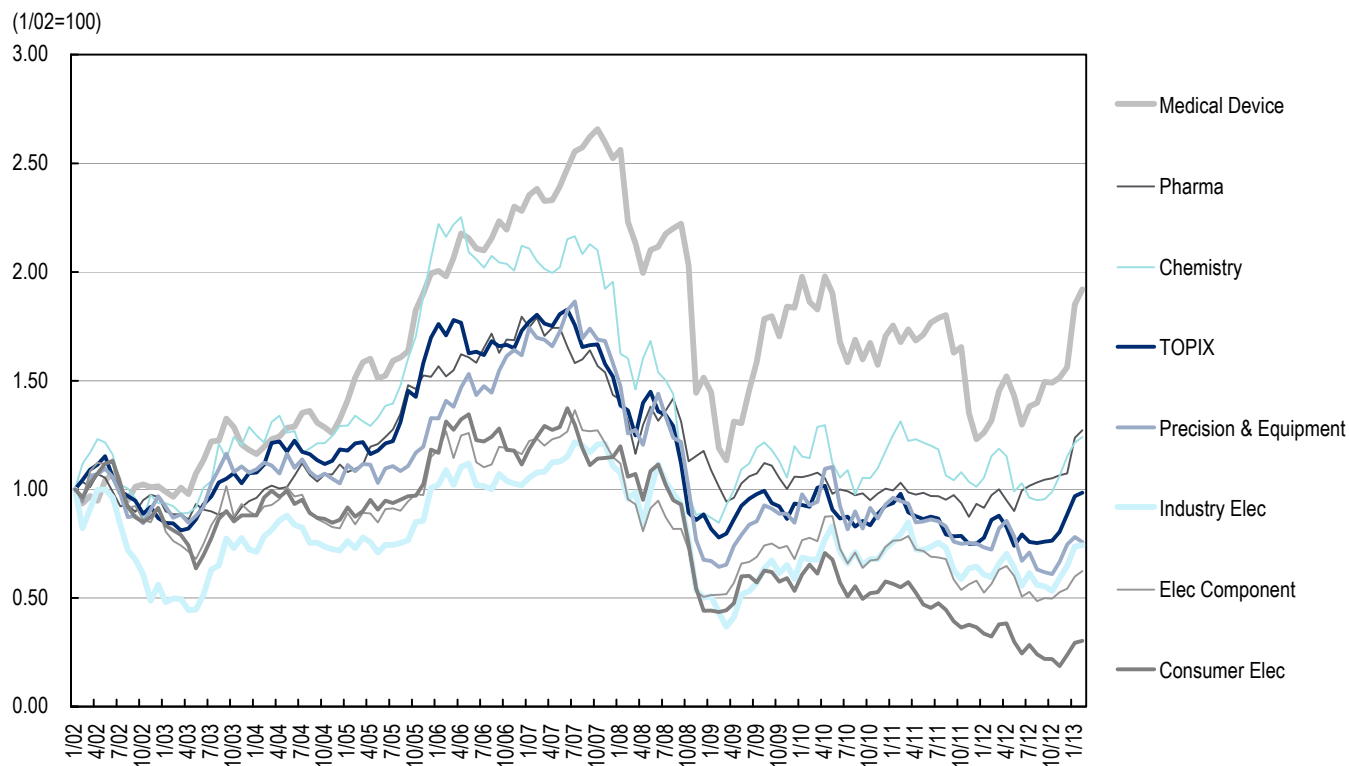
**Spotlight on medical devices as a growth industry**

Areas that could potentially succeed smartphones and tablets as the next major growth markets include medical device, household appliances, various infrastructure-related businesses (storage cells, smart grids, etc.), and cloud-related technologies. Of these, we think the medical device field holds real promise as an emerging growth market in light of 1) prospects for long-term growth and 2) high levels of profitability. We particularly note a string of initiatives by non-healthcare companies to break into or invest in medical equipment business through 2012, including Sony's tie-up with Olympus and Asahi Kasei's acquisition of Zoll Medical.

**Share price performance in the medical device sector has significantly outstripped TOPIX, electrical machinery, and pharmaceuticals**

Indeed, over the past 10 years the share price performance of the medical device sector has been significantly better than TOPIX or the electrical machinery or pharmaceutical sectors (Figure 1). The sector includes growth companies like Terumo and Sysmex, but we think the direct reason for its strong performance is appeal of medical equipment as an industry, which underlies the expansion of these companies. If not for the sharp decline in the share price of Olympus in the wake of an accounting scandal, sector share price performance would probably have been even better.

Figure 1. 10-year price performance of Japanese medical device stocks outstrips TOPIX, electrical machinery, pharmaceuticals, chemicals



Note: Subsector share price Index are the sum of the market caps of the following companies: Medical devices (Terumo, Sysmex, Olympus, Nihon Kodens, Nipro, NIKKISO, Nakanishi, Fukuda, Hitachi Medical, Eiken, Topcon, Hoya Medical). Consumer electronics (Panasonic, Sharp, Sony, Pioneer, Funai Electric, Casio). Pharma (Kyowa Hakko Kirin, Takeda, Astellas, Daiichi Sankyo, Shionogi, Mitsubishi Tanabe, Nippon Shinyaku, Chugai, Eisai, Rohto, Ono, Hisamitsu, Santen, Kissei). Industrial electronics (Hitachi, Toshiba, Mitsubishi Electric, NEC, Fujitsu). Components (Ibiden, Mabuchi Motor, Nidec, TDK, Mitsumi, Alps, Hosiden, Hirose, Rohm, Shinko Electric, Kyocera, Taiyo Yuden, Murata). Precision instruments/semiconductor manufacturing equipment (Fujifilm, Konica Minolta, Hoya, Canon, Ricoh, Nikon, Tokyo Electron). Chemicals (Teijin, Toray, Kuraray, Asahi Kasei, Showa Denko, Sumitomo Chemical, Shin-Etsu, Mitsui Chemical, JSR, Ube, Hitachi Chemical, Nitto Denko).

Source: Reuters, Citi Research.



## Investment appeal 1): Stable growth to continue

**Medical devices a growth industry, we forecast growth will be stable**

Stable growth is one appeal of the medical device industry. The medical device market was worth \$349bn in 2011 and our global healthcare team forecasts a CAGR of 4% until 2016 (Figure 3). The team forecasts growth in the developed markets of the US, Europe, and Japan will slow to 1%-3% but that growth in emerging markets, mainly the BRICs and in Latin America and Southeast Asia, will remain above 10%.

**Commoditization and generics unlikely to become structural issues for medical devices**

Other attractions are that 1) unlike digital consumer electronics, neither commoditization nor digital convergence—cannibalization of demand for existing products à la smartphone substitution—are likely to be problems for medical devices; and 2) unlike pharmaceuticals, the sudden emergence of generic products after patent expiry is an implausible threat. Medical devices do not face the kind of structural problems that place pressure on digital consumer electronics and pharmaceutical earnings and should benefit from market growth unhindered.

## Commoditization and convergence are structural problems for digital consumer electronics

**We forecast digital consumer electronics market value will peak from 2013 to 2015**

In the digital consumer electronics space, smartphones and tablet markets are becoming commoditized and their diffusion is cannibalizing demand for PCs, TVs, digital cameras, mobile handsets, and other conventional products—a phenomenon known as digital convergence. As a result, we forecast the value of the overall digital consumer electronics market will peak from 2013 to 2015 (Figure 2). We also believe smartphone and tablet market growth could peak in value terms.

**Digital convergence to have a big negative impact on Japanese companies**

Many Japanese companies have their business foundations in conventional digital electronics (PC, TV, digital cameras, mobile phones) as well as HDDs, CPUs, and other peripheral devices. We believe they are vulnerable to the effects of market stagnation. Please see our December 3 report, [Japanese Consumer Electronics: Global Context Redux - Device explosion: The digital convergence cliff](#).

**Digital convergence an improbable problem for medical devices**

But as medical devices differ depending on the treatment, the medical device industry is unlikely to face the structural problem of convergence that is accompanying smartphone diffusion (demand substitution of digital cameras, PCs, handheld games, etc.) The number of medical devices extends to several tens of thousands and the majority of them are not interchangeable.

## Patent expiry and new drug development hurdles are problems for pharmaceuticals

**Pharmaceutical market struggling with patent expiries**

Until around 2010, pharmaceutical market growth was driven by new blockbuster drugs for adult diseases, typified by Pfizer's cholesterol treatment Lipitor. But from 2010 many blockbuster drugs started to move off-patent and the emergence of generics weighed on the profits of pharmaceutical makers. Many pharmaceuticals are made from organic compounds, which are technically easy to manufacture, and competition from me-too drugs when patents expire is always a threat.

**Technical hurdles to the development of new blockbuster drugs increasing**

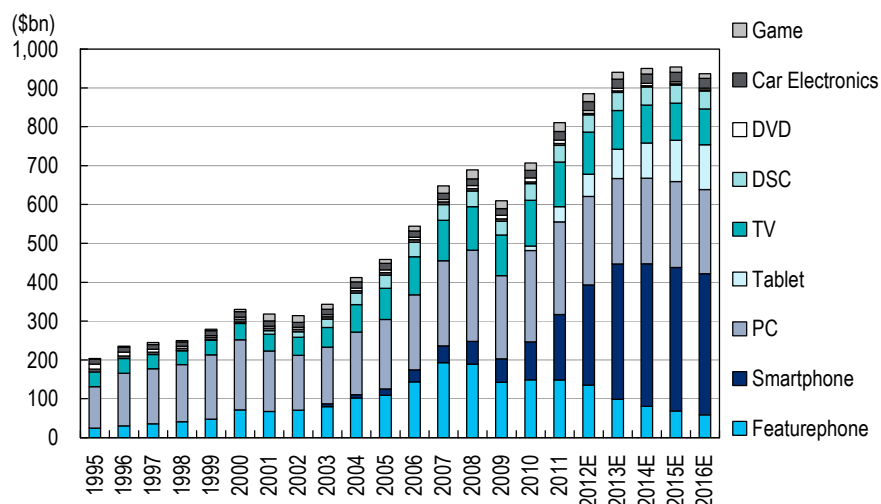
The increasing technical difficulty of developing new blockbuster drugs is another structural problem. Traditionally, drugs for adult diseases have been based on organic compounds. The development of new blockbuster drugs has been made harder by the exhaustion of target protein and organic compound series. As a result, pharmaceutical companies have been forced to devote increasing resources to such decisive therapeutic fields as cancer, Alzheimer's disease, and allergies, and

**Emergence of generic medical devices unlikely**

to the development of antibodies, which is technically complex. In short, we believe the technical hurdles to new drug development are increasing.

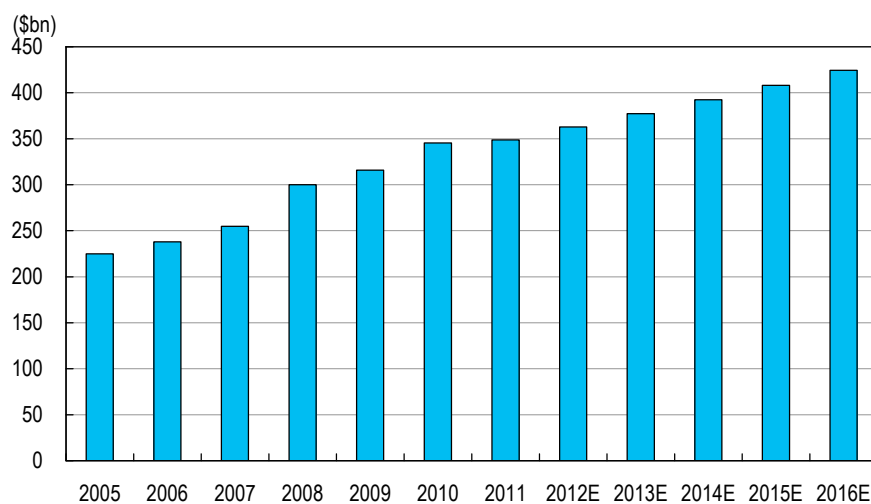
Unlike pharmaceuticals, 1) considerable know-how is required to manufacture many medical device products and 2) sales networks aimed at doctors, including after-sales service, add value for medical device makers because doctors must be trained to master product use. This makes competition from generics on patent expiry an unlikely scenario for medical devices.

**Figure 2. Global market value for major digital consumer electronics: Smartphone diffusion has hobbled market growth potential**



Source: IDC, JEITA, CIPA, DisplaySearch, Citi Research.

**Figure 3. Global medical device market growth to remain stable over the longer term**



Source: Company data, Citi Research.

## Investment appeal 2): High margins

### High margins

In addition to being a growth market, medical devices are highly profitable. According to METI industry statistics, medical devices have a value-added ratio of 49%, the third highest of all industries after cosmetics and pharmaceuticals (Figure 4). Value-added ratios for electronics products (semiconductors and electronic components, digital consumer electronics, LCD panels) range from 25%-40%, highlighting how profitable medical devices are.

Over the last few years, the OP margin of the medical device sector (Terumo, Sysmex, and the medical device business of Olympus) has been around 20%. In comparison, many big technology companies have an OP margin of less than 10% (Figure 5).

### Medical devices boast high margins because of industry characteristics

#### Industry characteristics form the backdrop to high margins

Reason for high profitability include: 1) an emphasis on quality and performance over costs because of the life-critical nature of products; 2) industry regulation, which controls price competition; 3) the absence of competition from Asian companies; and 4) the defensive nature of the sector, which means medical devices are unlikely to suffer a steep drop in demand. Because of these characteristics, medical devices are an industry that is blessed with structurally high margins.

#### 1) Quality and performance more important than costs

We believe the importance of quality and performance is the overriding reason for high medical device margins. As these products are used in the diagnosis and treatment of sickness, even the smallest of defects can be a direct risk to human life. The maintenance of the highest quality standards is a non-negotiable assumption for medical device makers. End-user doctors and hospitals will for the most part give priority to therapeutic value when selecting products. This makes it easier for medical device makers to reflect quality and therapeutic value directly in the price of products, supporting high margins.

#### 2) Regulation controls price competition

Government regulation—product approval by government departments and price controls—means the risk of price competition for medical devices is low compared with other consumer products. We believe this is another factor behind high margins.

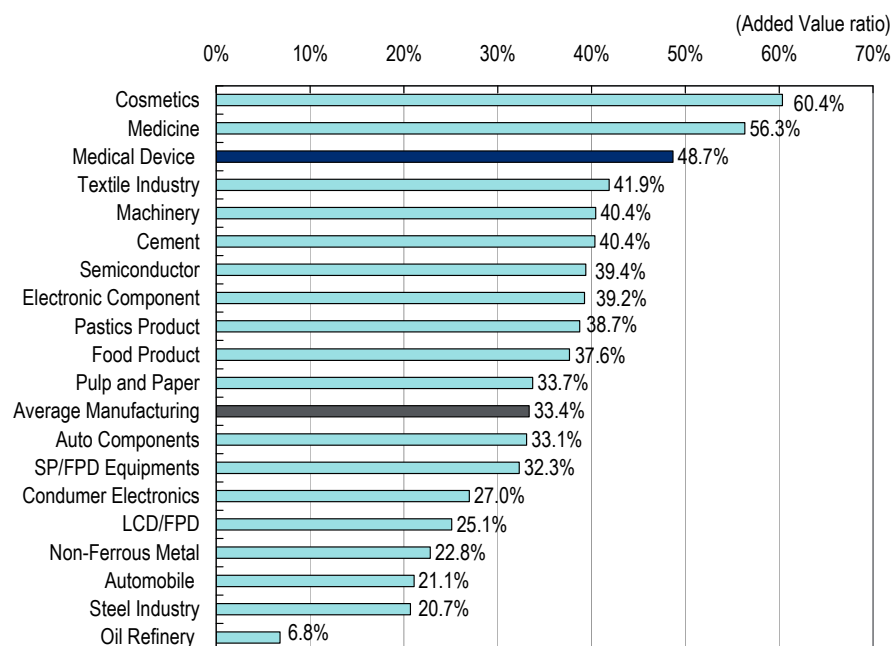
#### 3) Price competition with Asian companies unlikely

Currently, Asian companies have very little presence in the medical device market. The potential for Asian companies to emerge as threats requires a more detailed discussion, but we would note that because of the emphasis on quality and performance, it will probably be difficult for Asian companies lacking in technical expertise to use cost competitiveness as a scalpel to open the medical device market. Asian companies used cost competitiveness to capture market share for semiconductor memory, LCD panels, and lithium-ion batteries, causing industrywide margins to decline. We think a repeat in medical devices is unlikely.

#### 4) Can generate stable earnings as demand is stable

We believe the stability of medical device demand contributes significantly to the business structure of Japanese companies. The business structures of many Japanese technology companies center on electronic devices and digital consumer electronics, which are vulnerable to the economic cycle. History has repeatedly shown that earnings slump when the cycle bottoms (in 2009, Hitachi, NEC, Toshiba, Panasonic; in 2012 Sharp and Panasonic). Medical devices are a field in which it is relatively easy to maintain stable profits, and we believe this contributes to the stability of Japanese companies' earnings power.

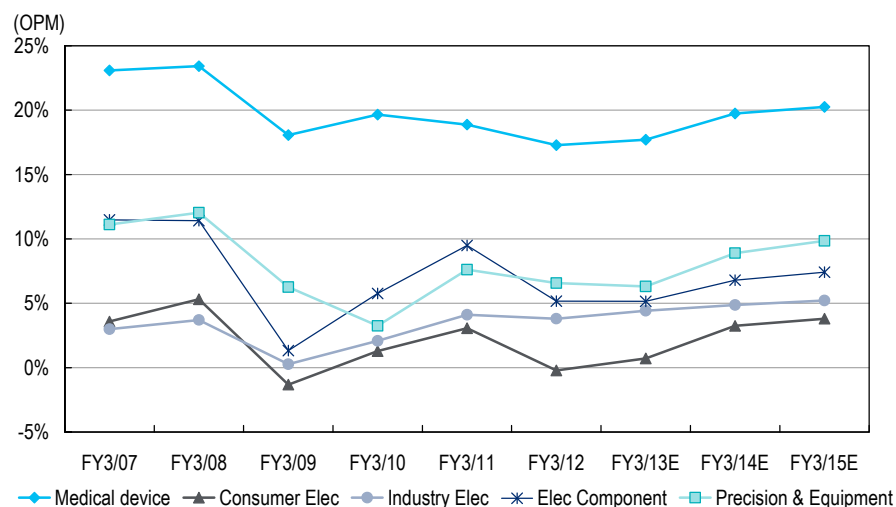
**Figure 4. Value-added ratios by industry in Japan: Medical devices has one of the highest ratios among major manufacturing industries**



Note: The added value ratio is calculated by dividing value-added by production value. Value-added is as defined in METI's Industry Statistics.

Source: METI's Industry Statistics (2010 survey), Citi Research.

**Figure 5. Sub-sector OP margins in Japan: Medical devices have high profit margins compared with electronics subsectors**



Note: Subsector OP margins are weighted averages for the following companies: Medical device (Terumo, Sysmex, Olympus medical device business). Consumer electronics (Panasonic, Sharp, Sony, Pioneer, Funai Electric, Casio). Industrial electronics (Hitachi, Toshiba, Mitsubishi Electric, NEC, Fujitsu). Components (Ibiden, Mabuchi Motor, Nidec, TDK, Mitsumi, Alps, Hosiden, Hirose, Rohm, Shinko Electric, Kyocera, Taiyo Yuden, Murata). Precision instruments/semiconductor manufacturing equipment (Fujifilm, Konica Minolta, Hoya, Canon, Ricoh, Nikon, Tokyo Electron). Forecasts as of February 18.

Source: Company data, Citi Research.

## Japan's medical device industry

**European and US companies the leaders in the global market**

European and US companies are the leading players in the global medical device industry in terms of both size and profitability. This group includes Johnson & Johnson, Medtronic, and General Electric. Olympus and Terumo are the biggest Japanese medical device makers, but from a global perspective they are only mid-tier companies. The sales and profitability of many Japanese companies are inferior to overseas companies.

**Focus on 1) companies that can compete with US and European rivals, and 2) those that can secure high earnings and growth in niche markets**

For this reason, when looking at Japanese medical device makers we believe the focus should be on either companies that can adequately compete with European and US rivals or companies that can achieve high earnings and growth in niche fields. With this in mind, we believe Japanese medical device makers can be classified into the following categories based on their business structure and management policy: 1) those with the potential to compete with overseas rivals (challengers); 2) those achieving high earnings and growth in niche fields (independents); 3) those with a business focus on Japan (domestics); and 4) those that are business divisions of integrated electronics/chemicals makers (electronics affiliates) (Figure 7).

Of these four groups, we believe the “challengers” and the “independents” are the most attractive companies. A comparison of share price performance shows these two groups have outperformed TOPIX by a wide margin, while the “domestics” have underperformed (Figure 6). The “electronics affiliates” are part of a larger organizations and it is necessary to consider the position of their medical device businesses as part of their overall management strategy.

### Four types of medical device companies: challengers, independents, domestics, electronics affiliates

**Challengers: Sufficiently competitive to take on overseas majors in the future**

Challengers are companies that are currently mid-tier in global terms but also sufficiently competitive to mount a challenge against European and US equipment makers in the future. Their characteristics include a strong desire for growth, active business development overseas, and M&A to secure sales channels and basic material technologies. Many Japanese companies list securing an industry position that ranks with overseas majors as one of their longer-term goals. Companies in this group include Terumo, Sysmex, Olympus (the three companies in our coverage). We rate Terumo Neutral as we do not believe valuations are compelling, we rate Sysmex Buy, and we rate Olympus Neutral because of lofty valuations, although we believe their endoscope business holds future promise.

**Independents: Companies that achieve high earnings and growth in niche markets**

Independents do not have big operations but have achieved high earnings and growth by differentiating themselves through proprietary products. They are companies that take advantage of the high-value-added content and market fragmentation (numerous products) that characterize the medical device industry. Many independents have an entrepreneurial culture and a strong desire for growth. While some are privately owned, in recent years many have listed in order to secure talented people and promote corporate modernization. The scale of overseas expansion differs by company; some, like Mani and Nakanishi, have expanded aggressively, while others, like Medikit, have focused on the domestic market. Companies in this group include Mani, Nakanishi, Medikit, Asahi Intecc, Topcon, Techno Medica, and Daiken Medical.

**Domestics: Business development focused on the home market**

With the Japanese medical device market valued at ¥2trn, many device makers have focused on the domestic market. In addition to market size, we believe industry regulation is another reason for the large number of medical device makers

in Japan. The Japanese market has unique needs and many companies sell proprietary products or import products that customize state-of-the-art overseas technology for the Japanese market. Some companies in this group are looking to develop overseas because of weak growth potential in Japan, but strong competition from European and US rivals and sales channel and management resource problems has resulted in most staying firmly focused on Japan. Companies in this group include Fukuda Denshi, JMS, Kawasumi Laboratories, Eiken Chemical, Japan Lifeline, Goodman, Leon, Nikkiso, and Hoya Medical.

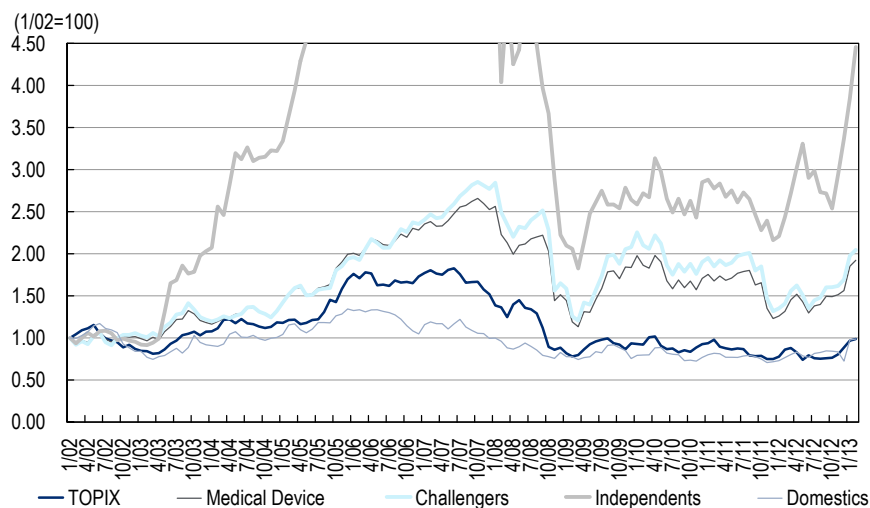
**Electronics affiliates: Medical device divisions of integrated electronics/chemical makers**

Electronics affiliates are medical device divisions of major integrated electronics companies. They mainly handle products such as diagnostic and measurement devices and their margins are low compared for medical device industry. Firms in this group include Toshiba, Hitachi Medical, Panasonic, Sony, Fujifilm, Hoya, Omron, and Shimadzu. An increasing number of electronics majors are targeting medical devices as part of growth drives and we believe strategies, including those of new entrants, will be a point to watch moving forward. Fukuda Denshi, Nihon Kohden, and Sysmex are independent makers but their core products are clinical testing equipment, bioinstrumentation and bio-information monitoring systems and from a product perspective they are close to electronics affiliates.

**Chemicals and machinery makers also capturing medical device operations**

Chemical makers like Asahi Chemical, Kaneka, Mitsubishi Chemical, Teijin and Toray and machinery makers like Mitsubishi Heavy Industries and Sumitomo Heavy Industries are leveraging basic material technologies and engaging medical device operations.

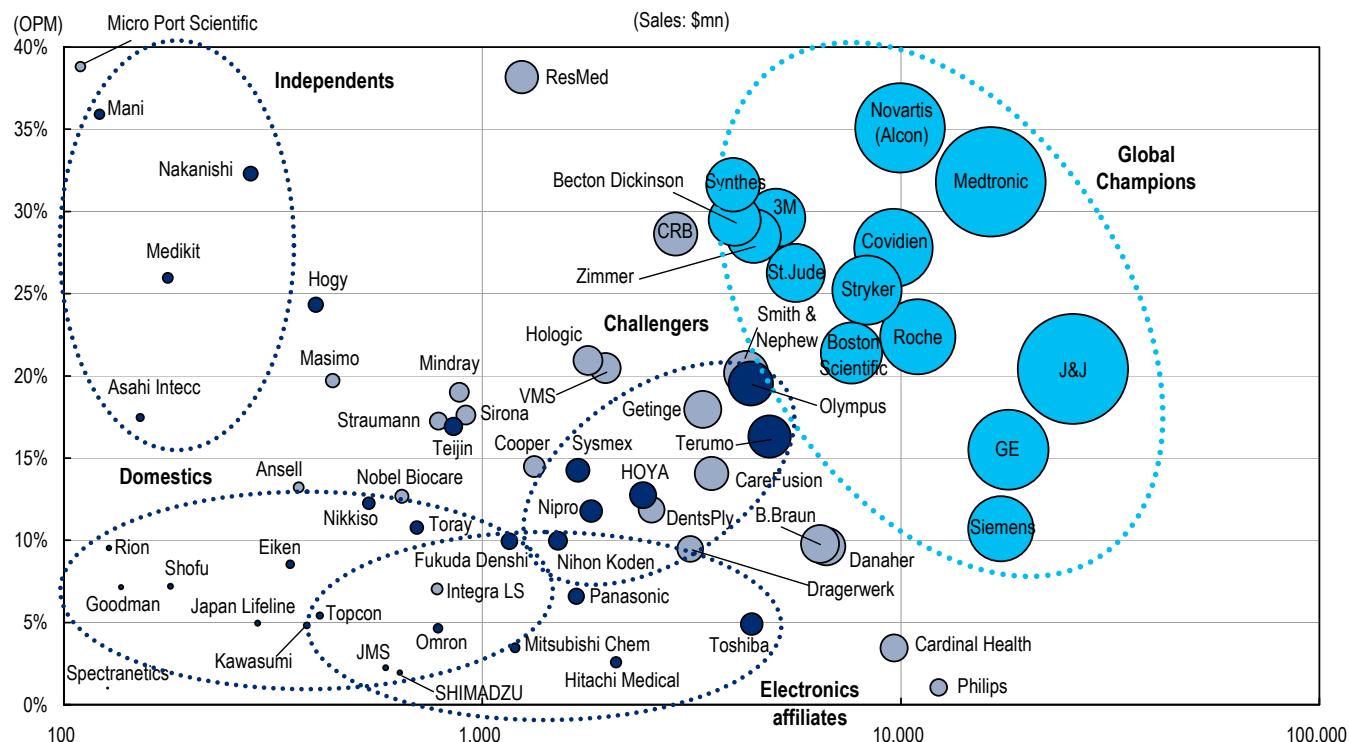
**Figure 6. Share price performance by type: Challengers and independents have outperformed TOPIX**



Note: Indexes have been adjusted to the time new firms (Mani, Daiken Medical, etc.) are listed.  
Source: Reuters, Citi Research.



Figure 7. Japanese medical device companies can be divided into challengers, independents, domestics, and electronics affiliates



Note: Based on FY2011 results. The horizontal axis shows sales (\$mn) and the vertical axis the OP margin. The size of the circles correlates to OP. Japanese companies are shown in indigo blue, Global Champion in light blue, and other overseas companies in grey.  
Source: Company data, Citi Research.

## Implications for electronics, chemical sectors

### Medical devices an effective means of revamping earnings structure

We believe medical devices offer technology and chemical sector companies an effective means of securing stable earnings power growth at a time when the growth potential and the profitability of existing mainstay businesses like digital consumer electronics and petrochemicals are declining. That said, medical devices have a long life-cycle and medical device business acquisition prices tend to be high, resulting in a heavy upfront investment burden for new entrants until businesses are on track. We thus believe stock selection should concentrate on companies that are advancing earnings-structure reform via medical devices.

### Toshiba, Fujifilm, Asahi Kasei

From this perspective, we recommend three companies: Toshiba, Fujifilm, and Asahi Kasei. Toshiba is focusing on social infrastructure as a longer-term growth business, and we expect medical devices to expand as a core business in this area. Fujifilm has also designated medical-related business, including medical devices, as a growth field. We forecast Fujifilm's medical-related business will become profitable in FY3/14 and start to make a material contribution to earnings. Having identified dialyzers as a source of stable growth over the longer, Asahi Kasei acquired Zoll Medical for \$2.2bn in 2012. Zoll Medical's annual sales have continued to increase at a double-digit pace and we believe it can be expected to contribute to longer-term growth.

**Medical devices account for a material part of the operations of Hitachi, Hoya, Kaneka, Teijin, and Omron**

Among companies with smallish medical device segments, we have Neutral ratings for Hoya, Kaneka, Teijin, and Omron, because their non-medical devices businesses are struggling and their valuations look stretched; however, we rate Hitachi Buy. Medical devices businesses do, however, contribute a material portion of their earnings, and if they continue to expand we believe investor interest in these companies as earnings structure turnaround stories could increase.

**One option is for Panasonic to sell its medical devices business**

We believe one option is for Panasonic to sell its medical devices business. Although business earnings are stable and healthy, with OP of ¥7bn and an OP margin of 5%-10%, we cannot foresee substantial growth given an overly diversified product lineup and limited marketing power. Given the premiums being paid for medical device businesses, we believe that opting to sell the business would provide a source of funds for other business structure reforms.

**Sony's medical devices business lacks direction**

Sony is another company that has designated medical devices as a next-generation business, although at this time business direction is unclear. There is a risk of additional upfront investment, but if Sony formulates a long-term strategy we think it could improve sentiment as a sign of a change in overall management strategy.

Figure 8. Earnings at medical device-related stocks (1)

(¥mn)		Sales	YoY (%)	OP	YoY (%)	OPM (%)	Pre-tax profit	YoY (%)	NP	YoY (%)	EPS (¥)
Terumo	3/11 A	328,214	3.9	62,606	-1.1	19.1	51,560	-18.7	32,338	-20.6	170.3
	3/12 A	386,686	17.8	63,049	0.7	16.3	49,650	-3.7	24,167	-25.3	127.3
	3/13 CE	410,000	6.0	60,000	-4.8	14.6			34,000	40.7	179.1
	3/13 E	398,700	3.1	53,900	-14.5	13.5	51,300	3.3	30,630	26.7	161.3
	3/14 E	449,400	12.7	68,300	26.7	15.2	66,000	28.7	40,080	30.9	211.1
	3/15 E	471,900	5.0	70,000	2.5	14.8	67,700	2.6	41,390	3.3	218.0
Sysmex	3/11 A	124,694	7.3	18,288	16.4	14.7	17,755	15.6	11,411	16.9	111.0
	3/12 A	134,743	8.1	19,205	5.0	14.3	18,958	6.8	12,007	5.2	116.8
	3/13 CE	140,000	3.9	20,000	4.1	14.3			12,100	0.8	117.6
	3/13 E	141,400	4.9	21,200	10.4	15.0	21,730	14.6	13,510	12.5	131.2
	3/14 E	173,600	22.8	31,500	48.6	18.1	32,300	48.6	20,080	48.6	194.9
	3/15 E	190,100	9.5	37,800	20.0	19.9	38,600	19.5	23,980	19.4	232.8
Hitachi	3/11 A	9,315,807	3.9	444,508	119.9	4.8	432,201	579.8	238,866	NM	49.4
	3/12 A	9,665,883	3.8	412,280	-7.3	4.3	557,730	29.0	347,179	45.3	70.2
	3/13 CE	9,000,000	-6.9	480,000	16.4	5.3	400,000	-28.3	200,000	-42.4	43.1
	3/13 E	8,969,000	-7.2	480,000	16.4	5.4	400,000	-28.3	207,000	-40.4	41.9
	3/14 E	9,114,000	1.6	555,000	15.6	6.1	550,000	37.5	293,000	41.5	60.7
	3/15 E	9,370,000	2.8	606,000	9.2	6.5	601,000	9.3	321,000	9.6	66.4
Toshiba	3/11 A	6,398,505	0.3	240,273	105.0	3.8	195,549	683.4	137,845	NM	31.3
	3/12 A	6,100,262	-4.7	206,649	-14.0	3.4	152,405	-22.1	73,705	-46.5	17.2
	3/13 CE	6,100,000	0.0	260,000	25.8	4.3	190,000	24.7	110,000	49.2	26.0
	3/13 E	5,914,000	-3.1	249,000	20.5	4.2	189,000	24.0	114,000	54.7	26.6
	3/14 E	6,200,000	4.8	358,000	43.8	5.8	298,000	57.7	190,000	66.7	44.3
	3/15 E	6,428,000	3.7	403,000	12.6	6.3	343,000	15.1	220,000	15.8	51.3

Note: Forecasts as of February 25.  
Source: Company data, Citi Research.

Figure 9. Earnings at medical device-related stocks (2)

(\$mn)		Sales	YoY (%)	OP	YoY (%)	OPM (%)	Pre-tax profit	YoY (%)	NP	YoY (%)	EPS (\$)
Panasonic	3/11 A	8,692,672	17.2	305,254	60.3	3.5	178,807	NM	74,017	NM	35.7
	3/12 A	7,846,216	-9.7	43,725	-85.7	0.6	-812,844	NM	-772,172	NM	-334.0
	3/13 CE	7,300,000	-7.0	140,000	220.2	1.9	-365,000	NM	-765,000	NM	-330.9
	3/13 E	7,133,000	-9.1	130,800	199.1	1.8	-407,200	NM	-805,800	NM	-348.6
	3/14 E	7,000,000	-1.9	264,000	101.8	3.8	251,000	NM	133,700	NM	57.8
	3/15 E	7,147,000	2.1	323,500	22.5	4.5	289,500	15.3	157,400	17.7	68.1
Sony	3/11 A	7,181,273	-0.5	199,821	528.9	2.8	205,013	661.8	-259,585	NM	-258.5
	3/12 A	6,493,212	-9.6	-67,275	NM	-1.0	-83,186	NM	-456,660	NM	-454.4
	3/13 CE	6,600,000	1.6	130,000	NM	2.0			20,000	NM	19.9
	3/13 E	6,690,000	3.0	141,000	NM	2.1	151,300	NM	1,300	NM	1.2
	3/14 E	6,953,000	3.9	213,400	51.3	3.1	195,400	29.1	52,700	3,953.8	45.4
	3/15 E	7,266,000	4.5	287,500	34.7	4.0	272,600	39.5	108,800	106.5	93.7
Fujifilm	3/11 A	2,217,084	1.6	136,356	NM	6.2	117,105	NM	63,852	NM	118.4
	3/12 A	2,195,293	-1.0	112,948	-17.2	5.1	89,187	-23.8	43,758	-31.5	83.8
	3/13 CE	2,210,000	0.7	110,000	-2.6	5.0	110,000	23.3	50,000	14.3	103.8
	3/13 E	2,189,220	-0.3	106,000	-6.2	4.8	106,000	18.9	48,000	9.7	99.6
	3/14 E	2,247,910	2.7	148,000	39.6	6.6	148,000	39.6	75,000	56.3	160.2
	3/15 E	2,278,550	1.4	175,000	18.2	7.7	175,000	18.2	92,000	22.7	191.0
Olympus	3/11 A	847,105	-4.1	38,379	-37.2	4.5	19,938	-78.0	3,866	-92.6	14.4
	3/12 A	848,548	0.2	35,518	-7.5	4.2	-9,495	NM	-48,985	NM	-183.5
	3/13 CE	740,000	-12.8	35,000	-1.5	4.7			6,000	NM	21.7
	3/13 E	736,500	-13.2	35,000	-1.5	4.8	20,000	NM	6,300	NM	22.2
	3/14 E	661,700	-10.2	73,000	108.6	11.0	53,000	165.0	27,800	341.3	92.2
	3/15 E	685,500	3.6	93,000	27.4	13.6	74,000	39.6	40,400	45.3	133.9
Hoya	3/11 A	423,063	2.3				73,920	48.5	59,579	57.3	138.1
	3/12 A	376,940	-10.9				58,530	-20.8	42,680	-28.4	98.9
	3/13 CE										
	3/13 E	363,900	-3.5				70,000	19.6	59,500	39.4	137.9
	3/14 E	380,500	4.6				66,000	-5.7	53,460	-10.2	123.9
	3/15 E	403,300	6.0				71,000	7.6	57,510	7.6	133.3
Asahi Kasei	3/11 A	1,598,387	11.5	122,927	113.3	7.7	98,341	113.5	60,287	138.4	43.1
	3/12 A	1,573,230	-1.6	104,258	-15.2	6.6	94,867	-3.5	55,767	-7.5	39.9
	3/13 CE	1,669,000	6.1	90,000	-13.7	5.4			50,000	-10.3	35.8
	3/13 E	1,665,000	5.8	90,000	-13.7	5.4	80,000	-15.7	50,500	-9.4	36.1
	3/14 E	1,755,000	5.4	113,000	25.6	6.4	106,000	32.5	68,000	34.7	48.7
	3/15 E	1,811,000	3.2	132,000	16.8	7.3	127,500	20.3	82,500	21.3	59.0
Kaneka	3/11 A	453,826	10.0	21,235	21.3	4.7	19,437	27.4	11,626	38.3	34.3
	3/12 A	469,289	3.4	13,151	-38.1	2.8	11,352	-41.6	5,403	-53.5	16.0
	3/13 CE	500,000	6.5	20,000	52.1	4.0			10,000	85.1	29.7
	3/13 E	480,000	2.3	17,500	33.1	3.6	14,000	23.3	8,500	57.3	25.2
	3/14 E	497,000	3.5	22,000	25.7	4.4	19,500	39.3	12,000	41.2	35.6
	3/15 E	514,000	3.4	25,500	15.9	5.0	23,000	17.9	14,000	16.7	41.5
Teijin	3/11 A	815,655	6.5	48,560	261.4	6.0	44,494	NM	25,184	NM	25.6
	3/12 A	854,370	4.7	34,044	-29.9	4.0	27,832	-37.4	11,979	-52.4	12.2
	3/13 CE	740,000	-13.4	14,000	-58.9	1.9			0	NM	0.0
	3/13 E	734,200	-14.1	13,000	-61.8	1.8	6,000	-78.4	-1,000	NM	-1.0
	3/14 E	774,800	5.5	19,000	46.2	2.5	9,500	58.3	1,900	NM	1.9
	3/15 E	791,800	2.2	22,500	18.4	2.8	13,000	36.8	4,800	152.6	4.9
Omron	3/11 A	617,825	17.7	48,037	267.4	7.8	41,693	309.0	26,782	661.3	121.7
	3/12 A	619,461	0.3	40,136	-16.4	6.5	33,547	-19.5	16,389	-38.8	74.5
	3/13 CE	650,000	4.9	46,000	14.6	7.1			28,500	73.9	129.5
	3/13 E	645,500	4.2	46,400	15.6	7.2	44,400	32.4	28,350	73.0	128.8
	3/14 E	680,000	5.3	52,800	13.8	7.8	51,300	15.5	32,700	15.3	148.6
	3/15 E	714,000	5.0	61,500	16.5	8.6	60,500	17.9	38,300	17.1	174.0

Note: Forecasts as of February 25.  
Source: Company data, Citi Research.

Figure 10. Sales, OP and OPM for key medical device-related companies (FY2011 basis, ¥mn)

Ticker	Company	Total Sales	Total OP	Total OPM	Medical Device Sales	Medical Device OP	Medical Device OPM	Medical Device Sales ratio	Medical Device OP ratio
4543.JP	Terumo	386,686	63,049	16.3%	386,686	63,049	16.3%	100.0%	100.0%
6869.JP	Sysmex	134,743	19,205	14.3%	134,743	19,205	14.3%	100.0%	100.0%
6501.JP	Hitachi	9,665,883	412,280	4.3%	166,237	4,271	2.6%	1.7%	1.0%
6502.JP	Toshiba	6,100,262	206,649	3.4%	350,800	17,200	4.9%	5.8%	8.3%
6752.JP	Panasonic	7,846,216	43,725	0.6%	133,600	8,800	6.6%	1.7%	20.1%
6758.JP	Sony	6,493,212	-67,275	-1.0%	NA	NA	NA	NA	NA
4901.JP	Fujifilm	2,195,293	112,948	5.1%	292,000	NA	NA	13.3%	NA
7733.JP	Olympus	848,548	35,518	4.2%	349,246	68,188	19.5%	41.2%	192.0%
7741.JP	HOYA	376,940	58,530	15.5%	192,947	24,568	12.7%	51.2%	42.0%
3407.JP	Asahi Kasei	1,573,230	104,258	6.6%	57,200	NA	NA	3.6%	NA
4118.JP	Kaneka	469,289	13,151	2.8%	10,000	NA	NA	2.1%	NA
3401.JP	Teijin	854,370	34,044	4.0%	68,000	11,500	16.9%	8.0%	33.8%
6645.JP	Omron	619,461	40,136	6.5%	62,446	2,900	4.6%	10.1%	7.2%

Note: Hitachi has group-wide medical device sales of around ¥300bn. Fujifilm and Asahi Kasei include some medical devices in healthcare division earnings. Hoya includes some eyewear lenses in lifecare division earnings. Hoya's OP is Pretax Profit.

Source: Company data, Citi Research.

## 3. Medical device industry overview

### What are medical devices?

**What are medical devices? Devices used in the diagnosis, treatment, and prevention of illness**

Essentially medical devices are devices used in the diagnosis and treatment of illnesses. To clarify the scope of medical devices, the Pharmaceutical Affairs Law defines medical devices as devices or instruments used in the diagnosis or prevention of illness in humans or animals, or devices used with the aim of influencing the physical structure or function of the body of humans or animals, and which are designated by cabinet order.

As medical devices are products related to human life, to safeguard quality, effectiveness and safety, the Pharmaceutical Affairs Law also regulates the characteristics of medical devices. Accordingly, in contrast to general consumable goods, medical devices cannot be freely manufactured and sold. Before obtaining certification, each medical risk needs to be reported to the relevant registration and certification body and devices must be reviewed by insurance authorities.

**Medical device regulations divided on the basis of medical risk into four classes**

Medical device regulations classify devices into four different classifications according to the scale of the risk posed to the human body (see Figure 11). Class 1 devices present extremely low risk to the human body and neither certification or approval is unnecessary. Examples include general diagnostic instruments and small steel instruments. Class 2 devices pose little medical risk, but because of the need for tight control these devices need to be certified by a registration and certification body. Examples of Class 2 devices include diagnostic imaging apparatuses and endoscopes. Medical risk for Class 3 and Class 4 devices, meanwhile, is high, and clinical trial-based certification is necessary. Most of the medical devices used to treat patients fall under these two classifications.

**If declared for medical use, then any device is a medical device**

An interesting feature of medical devices is that any product declared for use as a medical device will be treated as a medical device regardless, and is subject to the relevant regulations. For example, even a wooden stick similar to those used for ice-cream, when used in the medical examination of the tongue, is called a tongue depressor and is treated as a medical device and must be sterilized and packaged as a medical device.

### Medical devices encompass a wide range of products

**Medical devices encompass a wide range of products**

As different medical devices are used for different therapeutic intervention, the variety of products that exist is another characteristic of medical devices. Medical devices encompass over 4,000 different categories that include several hundreds of thousands of products. In reality, there is no one industry that consolidates medical devices, with the medical devices industry made up of a collection of innumerable products. Typical medical devices include catheters, guidewires, stents, pacemakers, artificial heart and lung devices, defibrillators, artificial bones and joints, dialysis equipment, radiotherapy equipment, respirators, surgery robots, imaging diagnostics (CT, MRI, PET, X-ray, ultrasound) equipment, biometric equipment (ECG, EEG, biometric data monitors etc.), endoscopes, clinical testing equipment, and surgical instruments (Figure 13).

**Broadly classified into therapeutic devices and diagnostic devices**

The vast array of medical devices that exist can be broadly classified as therapeutic medical devices and diagnostic medical devices and others (Figure 12). Therapeutic devices refer to devices used in patient treatment like stents, pacemakers, defibrillators, artificial heart and lung equipment, artificial bones and joints, dialysis equipment, radiotherapy equipment, and surgery robots.

Diagnostic medical devices refer to devices use to diagnose illnesses and assess patient conditions and include imaging diagnostic (CT, MRI, PET, x-ray, ultrasound)

equipment, endoscopes, clinical testing equipment, biometric monitors, ECGs and EEGs.

#### Treatment devices have higher medical risks

One difference between treatment devices and diagnostic equipment is that many products in the former category have higher medical risks. Treatment devices are often used directly on or within the patient, so have a large impact on the body. Healthcare professionals need to obtain approval to use many Class 3 and 4 treatment devices through therapeutic trials. Also, new therapeutic procedures often need to be learned to use treatment devices. In contrast, diagnostic equipment is mainly used in vitro, and apart from X-ray machines and some other products, most diagnostic products pose little direct risk to a patient's health.

#### Margins of devices that carry high medical risk tend to be high

Margins thus tend to be higher for high-medical-risk devices. Consequently, medical devices used for direct medical intervention purposes and devices used in internal procedures tend to carry high margins. For instance, although endoscopes are used for diagnostic purposes, because they are used internally and can often be used for direct therapeutic interventions such as endoscopic surgery, they feature relatively high margins compared against other diagnostic-type medical devices.

Figure 11. Medical device classification by risk

Type	Class	Classification by risk	Approval regulations	Product examples	No.
General medical device	I	Very low risk to human health	No approval or certification needed (notification/self-certification)	In-vitro diagnostic equipment, small steel instruments, dental technician supplies	1,195
Controlled medical device	II	Relatively low risk to human health and equipment must comply with compatibility certification standards (designated controlled medical device)	Certification by a registration agency	Electronic endoscopes, catheters for digestive organs, diagnostic ultrasound equipment, CT equipment, MRI equipment, diagnostic X-ray equipment	1,788
		Equipment not in the above category			
Specially controlled medical device	III	Relatively high risk to human health	Certification by a government minister (Inspection by the PMDA)	Artificial bones and joints, balloon catheters, contact lenses, dialyzers, radiotherapy equipment, ventilators	751
	IV	Direct threat to life			
				Stents, artificial hearts, pacemakers	331

Note: PMDA is the Pharmaceuticals and Medical Devices Agency of Japan.  
Source: Institute for Medicine and Engineering Integration, Citi Research.

Figure 12. Comparison of treatment and diagnostic medical device

Industry	Treatment device	Diagnostic device
Typical products	Cardiology (guidewires, catheters, stents, pacemakers, defibrillators, heart-lung machines); orthopedic implants (artificial bones and joints); therapeutic treatment (dialysis, laser therapy, radiotherapy, and surgical device)	Diagnostic imaging equipment (MRI, CT, ultrasound, and X-ray equipment), endoscopes, ophthalmoscopy equipment, clinical testing equipment, patient monitors, ECG, EEG, testing equipment
Use	Treatment of illness in patients	Diagnosis of illness in patients
	Many products are used in vivo	Many products are used in vitro
Medical risks	Mainly class 3 and 4 risk (high risk) products	Mainly class 1 and 2 risk (low risk) products
Clinical trials	Clinical trials are needed before products can be sold	Many products do not require clinical trials
Technical innovation	Development of new techniques necessary	Degree of accuracy and ease of use
Unit prices	Many products have relatively low prices	Many products have relatively high prices
Profit margins	Generally high	Generally low
Japanese companies	Weak presence apart from Terumo and a few others	Strong presence in diagnostic imaging equipment and endoscopes

Source: Company data, Citi Research.



**Figure 13. Outline of main medical device products**

Product	Product outline
Catheters	A soft hollow tube inserted into the body (blood vessels, digestive tract, thorax, abdominal cavity, etc) to facilitate such functions as the emission of body fluids or the injection of liquid medicines and contrast media
Guidewires	A fine metal wire used to guide catheters
Balloon catheters	A type of catheter with an inflatable balloon at its tip used to enlarge blood vessels, urethra, and other narrow openings during catheterization
Stents	A reticulated metal tube inserted into the body to widen blood vessels, the digestive tract, the esophagus and other passage ways
Drug-eluting stents	A drug-coated stent used to prevent restenosis (a recurrence of stenosis—the narrowing of blood vessels)
Stent grafts	A tubular device composed of special fabric supported by the stent that is used to prevent an aneurysm (bulge in the blood vessel wall) rupture
Pacemakers	A device that delivers electrical impulses to the heart to artificially regulate the heart rate
Heart-lung machines	A device that performs the functions of the lung and the heart during surgery
Defibrillators	Defibrillators deliver electric shocks to reestablish normal sinus rhythm in people with arrhythmia (irregular heartbeats). Defibrillators are divided into automated external defibrillators (AED) and implantable cardioverter-defibrillator (ICD)
Artificial bones and joints	Products used in bone and joint replacement surgery
Dialysis equipment	Equipment that replaces kidney function—removing waste from blood—in people suffering from renal failure
Radiotherapy equipment	Devices that emit radiation to kill malignant cells as part of cancer treatment
Ventilators	Devices that perform automatic respiration over a long period of time
Surgery robots	Equipment that assists with surgery. Robots do not perform surgery but rather are operated by doctors via remote control to improve the accuracy of surgery. The da Vinci endoscopy system is famous
Diagnostic imaging equipment	Diagnostic devices that measure and display data from the patient's body. Types of diagnostic imaging include CT, MRI, PET, X-ray, and ultrasound
CT	Devices that take images (mainly X-ray images) from various angles and process them digitally to generate a three-dimensional image of the inside of the body.
MRI	An imaging procedure that uses a powerful magnetic field to measure the behavior of water in the body. Like CT, MRI displays a three-dimensional image
X-ray equipment	Equipment that captures an image of the body by radiating X-rays at it
Biomedical measurement systems	Devices that measure ECG, EEG, and other bodily functions. Products include electrocardiograph and electroencephalograph machines, and patient monitors
Endoscopes	State-of-the-art imaging devices that are inserted into the body to obtain images. Endoscope types include rigid, flexible, and capsule
Clinical testing equipment	Devices used for blood, antibody, urine tests, etc.
Surgical instruments	Scalpels, pincers, knives, drills, needles, and other tools used in surgery
Disposable medical devices	Needles, blood bags, surgical gloves, and other products that are disposed after treatment

Source: Company data, Citi Research.

## Comparison with digital consumer electronics and pharmaceuticals

### Medical devices have features of consumer electronics and pharmaceutical industries

Figure 14 compares the medical device industry with the digital consumer electronics and pharmaceutical industries. Apart from the differences between the industry size and market participants, the main features of the medical device industry are 1) the diversity of the product lineup and 2) the broad range of components, materials, and technologies needed to make medical devices. While many medical device products use electronic technologies, knowledge of life sciences is also essential. Also, the industry is regulated. Medical devices can thus be said to combine the features of the consumer electronics and pharmaceutical industries.

### Comparison of medical devices and consumer electronics

We highlight the following differences between medical device and digital consumer electronics: 1) there are fewer digital consumer electronics products but the size of the market for individual products is larger; 2) digital consumer electronics centers on B2C and medical device on B2B; 3) the life-cycle of a medical device is longer, at 5-10 years versus 1-5 years; 4) medical devices are heavily regulated; and 5) from a technical perspective, digital consumer electronics centers on IT and electronic engineering, while medical device requires expertise not only in IT and electronic engineering but also pharmaceuticals, materials, and other fields.

### Comparison of medical devices and pharmaceuticals

The main differences between medical devices and pharmaceuticals are: 1) there are more medical device products; 2) patent expiry is a problem for pharmaceuticals companies but not something that is likely to become a serious issue for medical device makers; and 3) pharmaceuticals expertise basically centers on life science-related technologies (organic chemistry, molecular biology), while medical device also requires knowledge of IT and electronic engineering.

## Medical devices need to have therapeutic efficacy, be user friendly, ease the patient burden, and be safe

### Medical devices need to have therapeutic value, be user friendly, be safe during operation, and ease the patient burden

The competitiveness of digital consumer electronics is primarily determined by interface and design quality and CPU and display specs, and the competitiveness of pharmaceuticals by therapeutic efficacy and the ability to reduce side effects. Medical devices, on the other hand, must have 1) therapeutic efficacy, 2) be easy for the treatment provider to use, 3) ease the patient burden, and 4) be safe during operation. We believe specific product know-how is thus needed to improve the competitiveness of medical devices.

### Therapeutic value the top priority

Therapeutic value is unsurprisingly the most important quality of medical devices. The competitiveness of products that are used during treatment is often determined by medical technologies related to the procedure itself. This is because the practical implementation of new procedures makes it possible to provide treatment not previously available. Diagnostic equipment must be able to accurately identify diseases.

### User-friendliness particularly important for endoscopes and other “access devices”

User-friendliness is another important determinant of medical device competitiveness, particularly for products known as “access devices”, the most notable examples of which are endoscopes and guidewires. This is because access devices are hand-held and the success or failure of procedures in which they are used depends on delicacy of operation. Clinical testing equipment handles an enormous volume of samples and therefore must have high processing capabilities and a high degree of automation.

**Importance of easing the patient burden increasing**

Easing patient burden—by improving their quality-of-life and prognosis—is becoming increasingly important. X-ray dose reduction has become a major theme for products like X-ray CT machines that have a risk of exposing patients to excessive radiation. A pain-free insulin injection needle developed jointly by Terumo and Okano Industrial is an example of a product that eases the patient burden. In the field of surgery, demand for minimally invasive procedures that reduce pain as far as possible have supported sales of Olympus's endoscopes and products used in cardiac catheter procedures (catheters, stents, etc.)

**Safety during use also important**

Accidents sometimes happen at medical facilities due to human error. Ensuring the safety of medical device during operation is of utmost importance to prevent such accidents. For example, indwelling needles are used in hemodialysis to prevent needlestick injuries by a healthcare provider; once injected, these needles retract into a tube to ensure their safety.

**Are medical devices an industry in which Japanese companies can flourish?**

**Are medical devices an industry in which Japanese companies can flourish?**

In recent years, a number of electronics, machinery, and chemical companies have entered into or invested in the medical device market, giving rise to an opinion that medical devices are a good fit for the strengths of Japanese companies (because manufacturing technologies have not been standardized and product quality and performance hinges on the ability to combine various technologies) and that this is an industry in which Japanese companies can flourish. We believe 1) medical devices are an industry in which Japanese companies should be able to compete well from a manufacturing perspective, but that 2) from a management perspective, medical devices require aggressive marketing, not something for which Japanese companies are renowned, and 3) from a technology development perspective, the medical device development capabilities of Japanese companies is weak and that there are numerous issues in the way of enhanced technological abilities.

**Japanese companies should be competitive from a craft-manufacturing perspective**

Japanese companies should be competitive in medical devices from a craft-manufacturing perspective because of the hybrid nature of these products. Medical devices 1) must be of high quality and reliable; 2) in most cases, do not have standardized manufacturing technologies; 3) have a long life span; and 4) combine various technologies. We believe these characteristics fit with the strengths of Japanese companies.

For digital consumer electronics, investment scale and timing, as well as marketing power, are often decisive because individual product markets tend to be large, product lifespans are short, and many manufacturing technologies have been standardized. We feel these factors have been the downfall of Japanese companies in the digital consumer electronics space. In contrast, Japanese companies have remained highly competitive in auto and machinery industries and in some parts of the electronic devices industry (passive components, connectors, etc.) for the opposite reasons: long product lifespans, non-standardized manufacturing technologies, and the need to synthesize quality, performance, and technology. We believe the diligent work ethic and team work of Japanese employees and the stable organizational structures and technology accumulation supported by the lifetime employment system are related to the competitiveness of Japanese companies in these industries.

**Medical devices are a field that requires marketing skill and this is an issue for Japanese companies**

From a management perspective, we believe the marketing nous needed for medical devices could be a problem for Japanese companies. Health care providers must feel comfortable using a product before they will accept it. Product development therefore needs to be based on feedback from medical institutions,

and this in turn requires aggressive marketing by medical device makers. In addition to building networks of sales representatives (MRs) and sales agents, medical device makers also need to establish after-sales structures and provide scientific support via events like academic presentations and scientific seminars. In this respect, medical devices can be said to be similar to smartphones, where it is necessary not only to keep good relationships with telecom providers, but also to attract consumers with applications and services. In sum, as marketing is not the forte of Japanese companies, marketing power is likely to be a stumbling block for them in the field of medical devices.

**Issues remain on the technology development side**

Japanese companies do not have strong development capabilities for medical devices and they face many hurdles to improving their technical prowess. Medical device products combine a diverse range of technologies. While Japanese companies do have good electronic control, sensor, machine, IT, and materials technologies, their track record in the development of medical device products is weak and they do not often create innovative products. We believe one reason for this is the lack of joint development with academic and medical institutions. US companies lead the way in the development of medical devices that requires the development of new treatment procedures, and the presence of Japanese companies remains weak. They have many hurdles to overcome on the technology development side, also.

**Figure 14. Comparison of digital consumer electronics, medical device, and pharmaceuticals industries**

Industry	Digital consumer electronics	Medical devices	Pharmaceuticals
Market size (2011)	cUS\$900bn	cUS\$350bn	cUS\$900bn
Leading companies	Apple, HP, Dell, Nokia, Samsung, LG, HTC, Asus, Acer, Lenovo, Sony, Panasonic, Toshiba, Nintendo, etc.	J&J, Siemens, Medtronic, Philips, GE, Roche, Abbott, Novartis, Covidien, Boston Scientific, Stryker, Toshiba, Terumo, Olympus, etc.	J&J, Pfizer, Merck, Novartis, Roche, GSK, Sanofi, Abbott, AZN, Eli Lilly, Amgen, Takeda, Astellas, etc.
Competitiveness by region	US/European companies are strong and Asian companies are emerging. Japanese companies are a major presence but in long-term decline	US/European companies lead the industry. With few exceptions, Japanese companies only have a minor presence. Asian companies have yet to make a real mark	US/European companies are strong. With few exceptions, Japanese companies only have a minor presence. Asian companies have yet to make a real mark
Product numbers	Dozens: Centering on smartphones, tablets, PCs, TVs, digital cameras, and others for which markets are large	c400,000-500,000: Wide variety of products for each type of therapy	c20,000: Numerous drugs for each disease
Related materials	Semiconductors, displays, electronic components, HDD, batteries, etc.	Wide variety of components and materials	Natural substances, chemicals, biological materials, etc.
Method of use	By individual consumers and companies	Health care providers must learn operation procedures; maintenance required	Dosage based on prescription
Regulated by Pharmaceuticals Law	No	Yes	Yes
Product cycle	1-5 years	5-10 years	10-15 years Patent expiry a problem
Academic disciplines	Physical sciences, engineering, IT	Knowledge of technologies in a wide range of fields required	Chemistry, pharmacology, medical science
Technical innovation goals	Improve the specs of user interfaces, CPUs, displays, etc. Produce superior (thinner, smaller) designs	Improvement in therapeutic effect through technology/procedural development Improvement in user-friendliness for healthcare providers Limit burden on patients	Improvement of therapeutic effect in treatment of diseases Introduction of antibody drugs, molecule-targeting drugs, etc.,

Source: Company data, Citi Research.

## Overview of global medical devices market and industry

### Global medical devices market worth \$349bn

Our global healthcare team forecasts that the global medical devices market, worth \$349bn in 2011, will deliver 4.0% annualized growth through 2016. Particular features of the medical devices industry include 1) an especially broad scope, across multiple fields of treatment; 2) concentration in developed countries, but future growth likely to be driven by emerging markets; and 3) a very large number of players.

### Key point 1): Business comprises multiple fields of treatment

The first point to note with regard to the medical devices industry is that the business crosses multiple fields of treatment, so the scope is particularly broad (Figure 15). As previously noted, there are many different types of devices, in dozens of fields including diagnostic imaging, clinical testing, cosmetic implants, cardiovascular devices, dentistry, ophthalmology, surgical devices, and diabetes-related equipment. The largest areas in terms of market scale are diagnostic imaging, clinical testing, cosmetic implants, and cardiovascular devices; these four fields account for more than 40% of the total medical devices market.

### Key point 2): 85% of the global medical devices market is concentrated in developed countries

The second point is that at present 85% of the global medical devices market is concentrated in developed countries, and the industry is largely located in these regions (Figure 16). The two largest markets are the US and Europe, with the former accounting for more than 40% of the total and the latter for more than 30%. Japan accounts for about 10% as well, so economically advantaged regions represent the lion's share of the market.

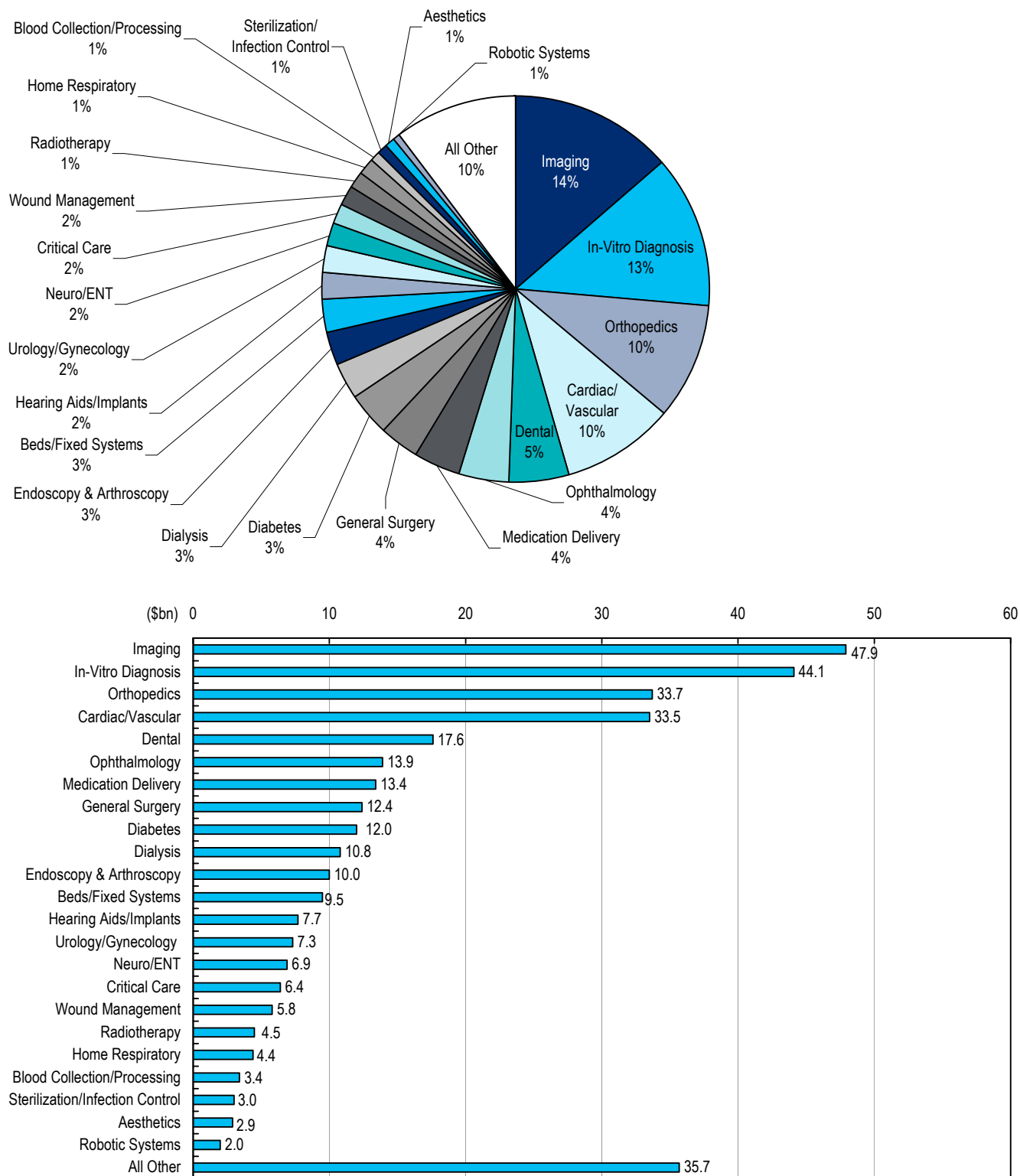
### Prospects for future growth in developing nations

However, while developing nations currently account for no more than about 15% of the global market, we anticipate continued expansion accompanying economic growth and the greying of society. We see annualized growth slipping to about 1%–3% in developed regions such as the US, Europe, and Japan, compared with stable annualized growth of 10% or more in developing regions, including the BRICs countries and nations of South America and Southeast Asia.

### Key point 3): Large number of players

The third particular point to consider is that because of the narrow fields of specialization in the medical devices industry, there are a very large number of companies participating. The world's largest maker of medical devices, Johnson & Johnson, posts annual sales of only around \$25.4bn, and many makers are operating on sales of no more than a few hundred million or a few billion dollars (see Figure 17). In fact, cumulative sales at the top 15 companies account for about half the total market, but cumulative sales for the top 30 are only about two-thirds of the total, with the remainder generated by thousands of smaller companies. The vast number of relatively small companies operating in niche fields is another special characteristic of the medical devices industry.

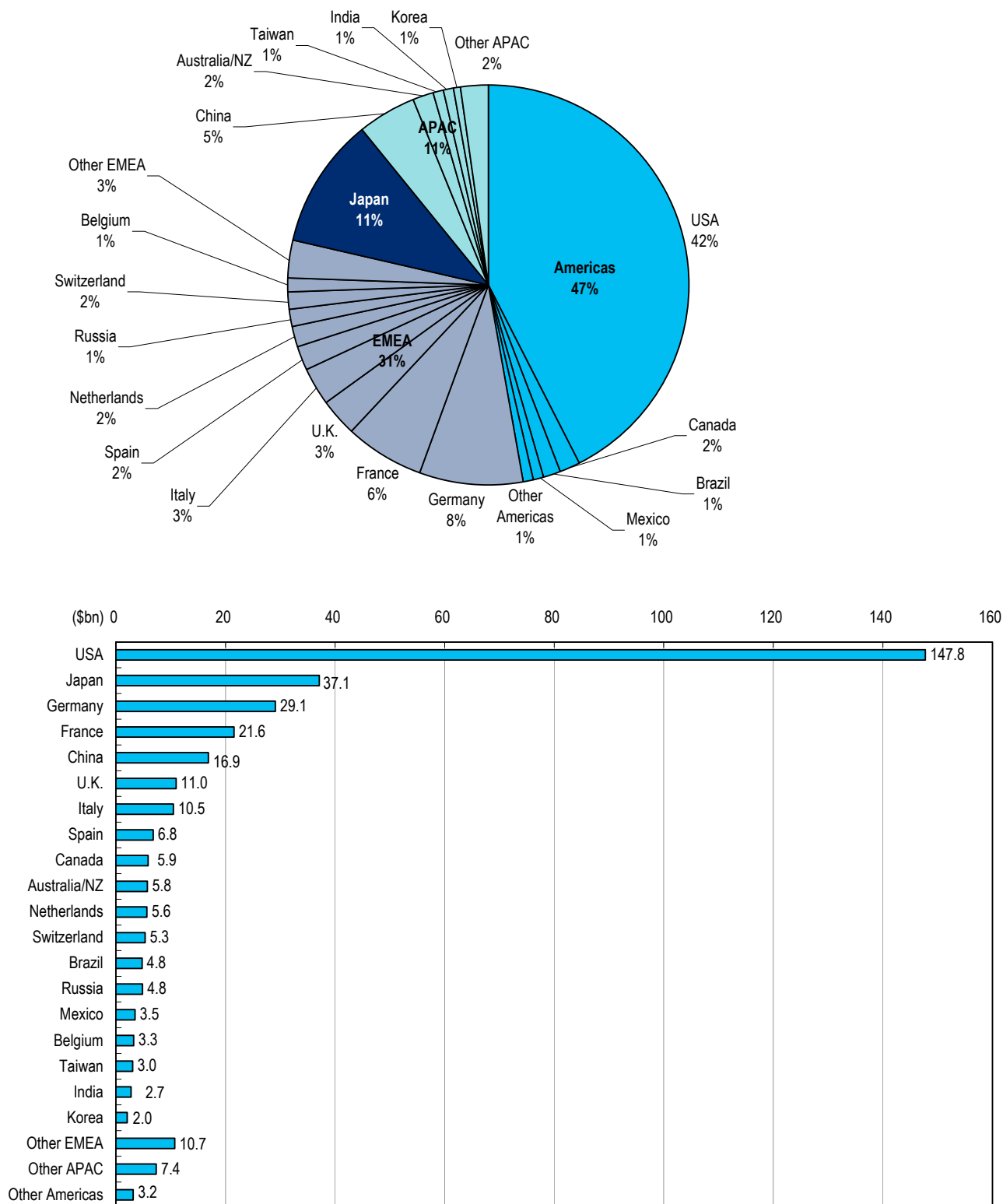
**Figure 15. Medical device market scale by area:** Overall market comprised of many areas, with the largest being imaging, testing devices, external medicine, circulatory products, dental products, and ophthalmological devices



Source: Company data, Citi Global Healthcare team.

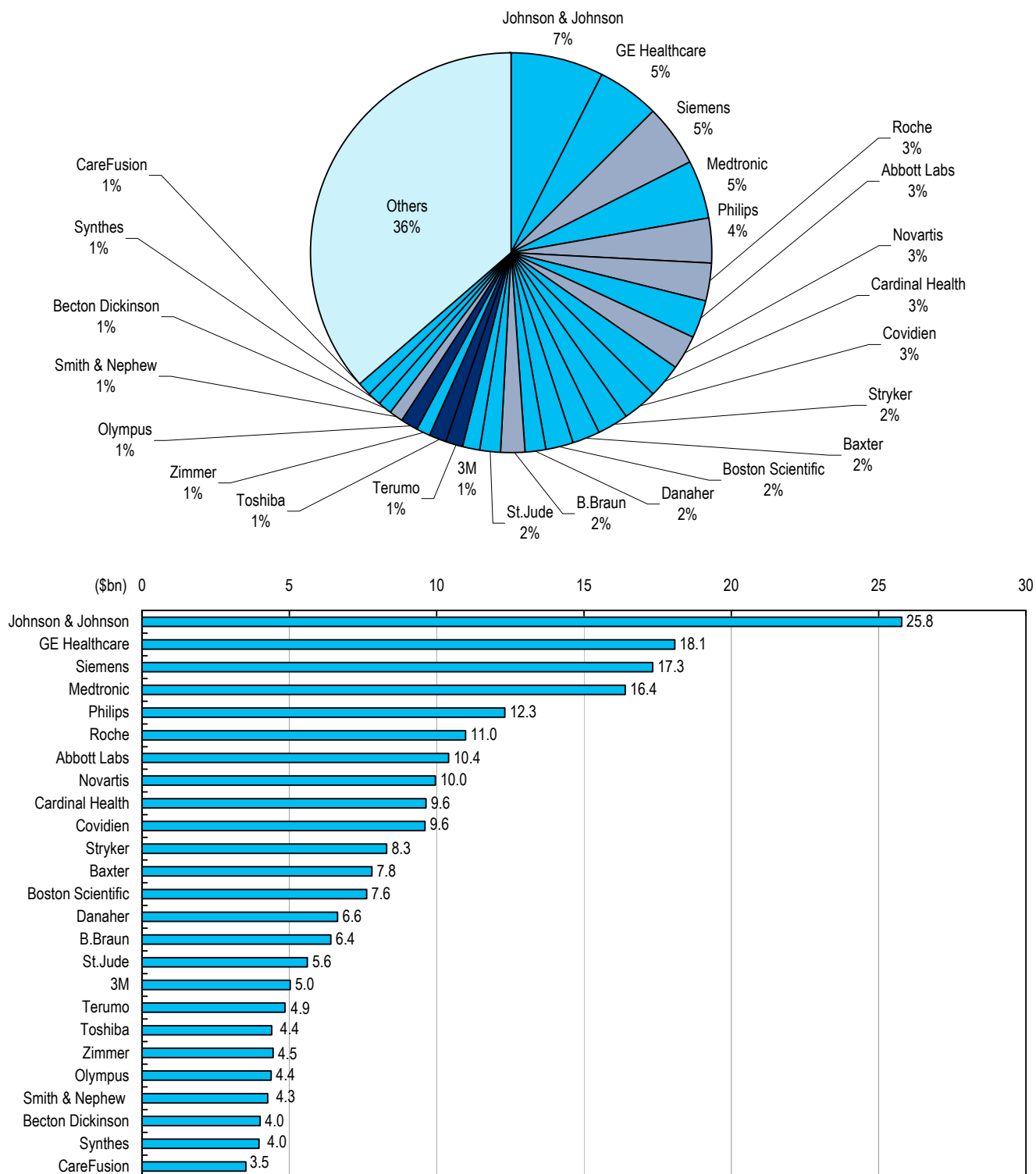


Figure 16. Regional medical device market share: Two biggest markets are North America and Europe. Japan accounts for about 10% of the market, growth potential is high in developing markets



Source: Company data, Citi Global Healthcare team.

Figure 17. Market shares and sales for medical device makers: High shares for US and European companies, Japanese firms mid-sized or smaller



Source: Company data, Citi Global Healthcare team.

## Overview of global medical device majors

**European and US majors lead the medical device industry in sales and profitability**

The competitiveness of European and US companies is a feature of the medical device industry (Figure 18). Of the world's 30 largest medical device makers by sales, 18 are from the US and 9 from Europe (Germany, Switzerland, the Netherlands, etc.) Market leaders J&J, Medtronic, and GE boast high sales as well as high profit margins. The largest Japanese medical device makers (Olympus, Toshiba, Terumo) place around 20th in the sales ranking and are mid-tier players in global terms.

**Medical device makers' profitability tends to be driven by size and therapeutic field**

While business size is one determinant of medical device makers' profitability, we believe therapeutic fields also have a large bearing. In general, the higher the medical risk associated with the product the higher the profit margin. Companies that make treatment equipment, which has high medical risk, tend to have high margins, and companies that make diagnostic imaging and measurement equipment, which have low medical risks, low margins (Figure 19).

**Margins high for treatment equipment and low for diagnostic/measurement equipment, with clinical testing equipment in the middle**

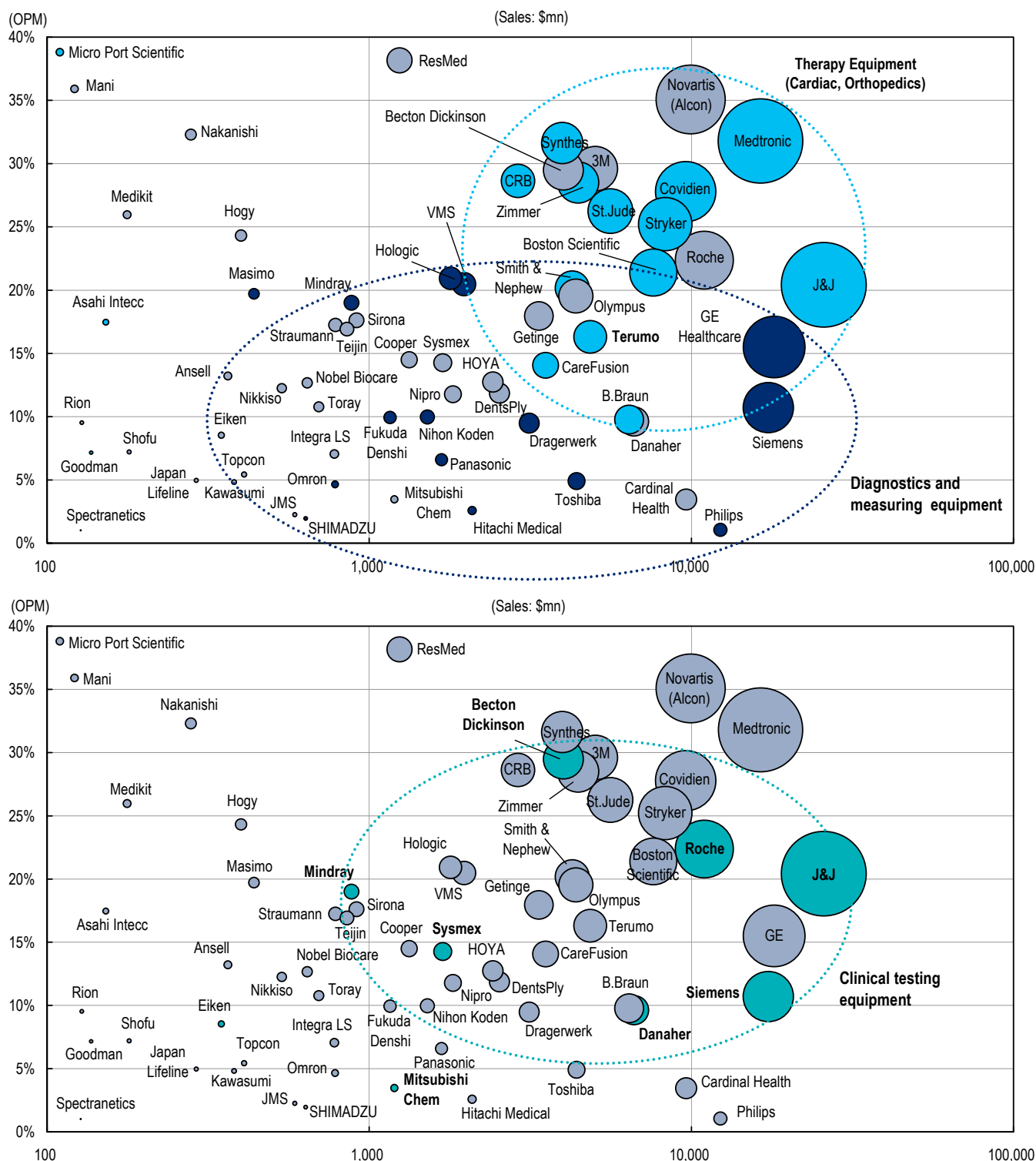
An international comparison bears this out, with relatively high margins for makers of treatment equipment, notably J&J, Medtronic, Boston Scientific, and St. Jude Medical, companies that have a strong presence in the cardiovascular equipment field, and Stryker, Zimmer, and Synthes, companies that have a strong presence in artificial bones and joints. In contrast, makers of diagnostic imaging and measurement equipment tend to have low margins: Siemens and Philips have sales in excess of \$10bn but their OP margins are less than the industry average of 17%. Also noteworthy is that the profitability of clinical testing equipment makers (Siemens, Danaher, Sysmex, etc.) is about midway between that of treatment equipment and diagnostic/measurement equipment makers. We believe this is because the business model is similar to that of copiers in that clinical testing equipment makers are able to generate profit from consumables (testing agents), which differentiates them from diagnostic/measurement equipment makers.

Figure 18. Major medical device makers: Sales, OP, OP margin (FY2011, \$mn)

Country	Company	Sales	OP	OP margin	Products
1 US	Johnson & Johnson	25,779	5,263	20.4%	Orthopedic implants, surgical devices, cardiovascular treatment devices, diabetes-related equipment, clinical testing equipment, ophthalmic products, operating equipment and supplies
2 US	GE	18,083	2,803	15.5%	Diagnostic imaging equipment, biomedical measurement systems
3 GER	Siemens	17,335	1,855	10.7%	Diagnostic imaging equipment, biomedical measurement systems, clinical testing equipment
4 US	Medtronic	16,396	5,213	31.8%	Cardiovascular treatment devices, nervous system treatment equipment, orthopedic implants, surgical devices
5 NLD	Philips	12,312	129	1.1%	Diagnostic imaging equipment, biomedical measurement systems, defibrillators
6 CHE	Roche	10,982	2,456	22.4%	Clinical testing equipment, diabetes-related equipment
7 US	Abbott Labs	10,410	NA	NA	Clinical testing equipment, cardiovascular treatment devices, diabetes-related equipment, ophthalmic products
8 CHE	Novartis (Alcon)	9,958	3,492	35.1%	Ophthalmic products (contact lens, cataract-related products, etc.)
9 US	Cardinal Health	9,642	332	3.4%	Clinical devices, operating equipment and supplies
10 US	Covidien	9,607	2,669	27.8%	Surgical devices, operating equipment and supplies, biomedical measurement systems, energy devices
11 US	Stryker	8,306	2,094	25.2%	Orthopedic implants, surgical devices, endoscopes
12 US	Baxter	7,804	NA	NA	Transfusion-related products, dialysis-related products
13 US	Boston Scientific	7,622	1,630	21.4%	Cardiovascular treatment devices, nervous system treatment equipment
14 US	Danaher	6,638	638	9.6%	Clinical testing equipment, dental equipment and supplies
15 GER	B. Braun	6,411	626	9.8%	Orthopedic implants, surgical devices, operating equipment and supplies
16 US	St. Jude	5,612	1,473	26.2%	Cardiovascular treatment devices, nervous system treatment equipment
17 US	3M	5,031	1,489	29.6%	Medical supplies, treatment equipment, dental equipment and supplies
18 JPN	Terumo	4,853	791	16.3%	Biomedical measurement systems, cardiovascular treatment devices, blood-related systems, operating equipment and supplies
19 JPN	Toshiba	4,403	216	4.9%	Diagnostic imaging equipment
20 US	Zimmer	4,452	1,269	28.5%	Orthopedic implants, surgical devices, dental equipment and supplies
21 JPN	Olympus	4,383	856	19.5%	Endoscopes, surgical devices
22 UK	Smith & Nephew	4,270	861	20.2%	Orthopedic implants, operating equipment and supplies (wound dressings)
23 US	Becton Dickinson	4,007	1,181	29.5%	Clinical testing equipment, operating equipment and supplies
24 US	Synthes	3,974	1,256	31.6%	Orthopedic implants, surgical devices
25 US	CareFusion	3,528	496	14.1%	Respiratory equipment, orthopedic implants, surgical devices, biomedical measurement systems
26 SWE	Getinge	3,365	604	18.0%	Clinical devices
27 GER	Fresenius Medical Care	3,288	NA	NA	Dialysis-related products (hemodialysis machines, dialyzers, blood circuits, etc.)
28 GER	Drägerwerk	3,138	297	9.5%	Anesthesia equipment, ventilators, biomedical measurement systems
29 US	CR Bard	2,896	829	28.6%	Cardiovascular treatment devices, surgical devices, orthopedic implants
30 US	Biomet	2,732	-577	-21.1%	Orthopedic implants

Note: J&J acquired Synthes in July 2012.  
Source: Company data, Citi Research.

Figure 19. OP margins high for treatment equipment but relatively low for diagnostic imaging/measurement equipment (top), while clinical testing equipment OP margin midway between treatment and diagnostic imaging/measurement equipment margins (bottom)



Note: Based on FY2011 results. The horizontal axis shows sales (\$mn) and the vertical axis the OP margin. The size of the circles correlates to OP. Treatment equipment makers (cardiovascular-related, orthopedic implants) are shown in light blue, diagnostic imaging/measurement equipment makers in indigo blue, Clinical testing equipment makers are shown in green, and other companies in gray.  
Source: Company data, Citi Research.

## Japan's medical device market/industry

### Japan's medical device market worth over ¥2trn

In 2011, the market for medical devices in Japan was worth ¥2,352.5bn, with the market registering annualized growth of 2% over the past 10 years (Figure 22). Consistently worth several hundred billion yen over the ¥2trn mark since the latter half of the last decade, the medical device market in Japan has become an important market, accounting for some 10% of the global market. The Japanese medical device market is characterized by the following traits: 1) in value terms, the weighting of therapeutic devices and diagnostic equipment is considerable; 2) the scale of the therapeutic device market segment is growing, while growth in the diagnostic segment is faltering; 3) imports of therapeutic medical devices continue to outweigh exports.

### Point 1): Diagnostic equipment, treatment devices, and disposable products account for a large percentage of the market

Diagnostics equipment, treatment devices, and disposable products account for a large percentage of the Japanese medical device market. In 2011, shipments of diagnostic imaging systems and biomedical measurement/monitoring systems, the main diagnostic equipment products, came to ¥511.2bn (22% of total medical device shipments); shipments of biological function support/function substitution systems and treatment and surgical products, the main treatment device products, came to ¥633.9bn (27%); and shipments of catheters and disposable products came to ¥573.2bn (24%). The combined shipment weighting of these three categories was 73%. Shipments in other categories were as follows: ophthalmology-related products ¥207.8bn (9%), dental products and materials ¥180.5bn (8%), home-use medical products ¥108.6bn (5%), and other products ¥137.3bn (6%).

### Point 2): Treatment device and disposable product shipments are expanding but diagnostic product shipments are stagnating

The second point to note is that while shipments of treatment devices and disposable products are expanding, shipments of diagnostic imaging systems are stagnating (Figure 23). Shipments of biological function support/function substitution systems and treatment and surgical products, the main treatment device products, increased from ¥490.2bn in 2002 to ¥633.9bn in 2012, a gain of 29%. Shipments of catheters and disposers, the main disposable products, increased from ¥384.5bn to ¥573.2bn, a gain of 49%. But shipments of diagnostic imaging systems and biomedical measurement/monitoring systems only increased from ¥467.2bn to ¥511.2bn, a gain of 9%.

We believe the following factors are behind the slowdown in diagnostic equipment shipments: 1) long product life-cycles—once products are installed, replacement demand is difficult to generate; 2) high unit prices for many products, resulting in the economic downturn of recent years having a large impact compared with other medical device products; and 3) intensifying price competition. On the other hand, as treatment devices and disposable products are used for surgery and therapeutic purposes, we believe demand has grown with an increase in the number of patients and the spread of advanced minimally invasive surgery.

### Point 3): There is a chronic excess of imports over exports

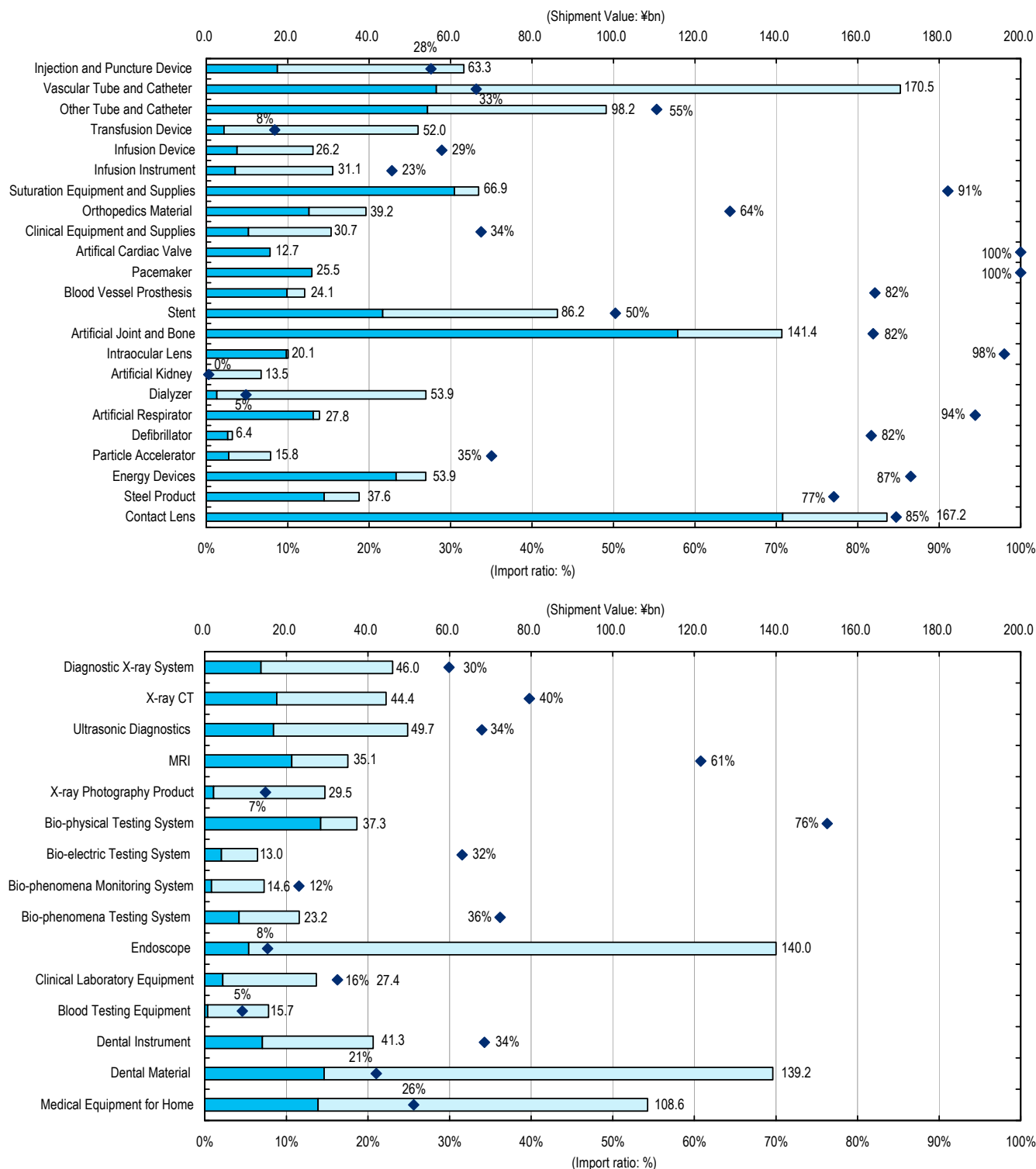
Another feature of Japan's medical device industry is that imports continue to outweigh exports. The value of imports has been consistently higher than the value of exports for the last 20 years, with the gap continuing to widen. In recent years, imports have consistently outweighed exports by around ¥600bn (Figure 22). In 2011, the trade imbalance amounted to ¥577.5bn, as exports totaled ¥480.9bn against imports of ¥1,058.4bn. Growth in imports of highly competitive medical devices from overseas makers explains why Japan continues to import more medical devices than it exports. The trade imbalance in medical devices has made a significant contribution to Japan's overall balance of trade moving into a deficit.



**High import weightings for therapeutic devices, disposable products, and ophthalmic products contributing to the trade imbalance**

Looking at import weightings in individual categories, imports make up 41% of operating equipment and supplies, 59% of devices that sustain or support vital functions, 64% of therapeutic or surgical instruments and devices, and 51% of total therapeutic devices. The import weighting is over 80% for artificial bones and joints, pacemakers, and respiratory devices, product areas where US makers are strong. The import weighting for ophthalmic products, primarily contact lenses (where Johnson & Johnson is dominant), has climbed close to 77% and with the value of domestic shipments a sizeable ¥167.2bn, this too is contributing to the export/import imbalance (Figure 20). We think the most pressing issue for Japan's medical device industry is the development of advanced therapeutic medical devices.

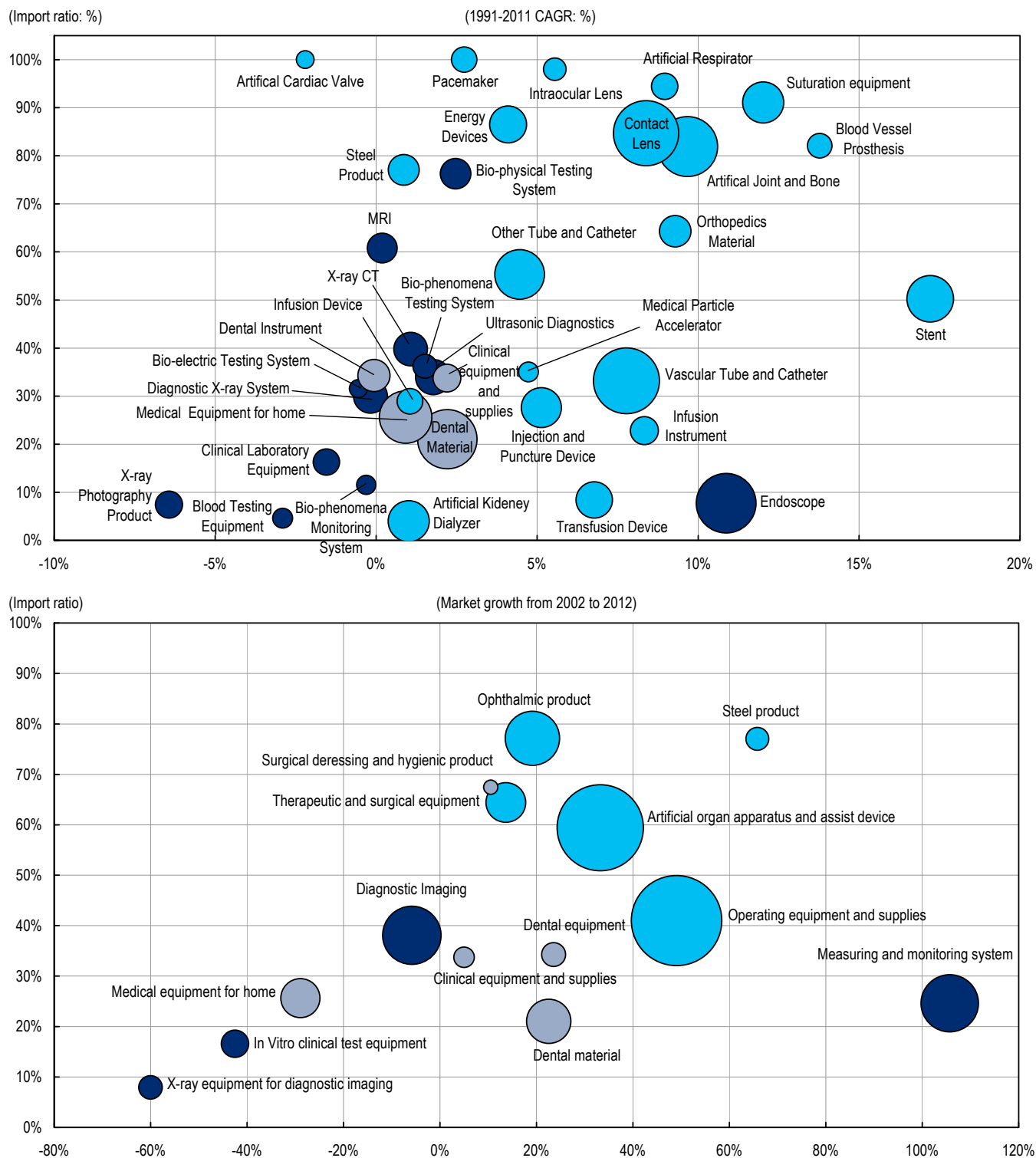
**Figure 20. Domestic shipment values and export ratios for treatment devices/disposable products (top) and diagnostic devices (bottom): Japan relies on imports for many treatment devices but many diagnostic devices are now made by domestic companies**



Note: The horizontal bars show domestic shipment value (top axis) and the diamonds import ratios (bottom axis). The light blue areas on the horizontal bars indicate import value. The Figure covers 86% of the total Japanese market.

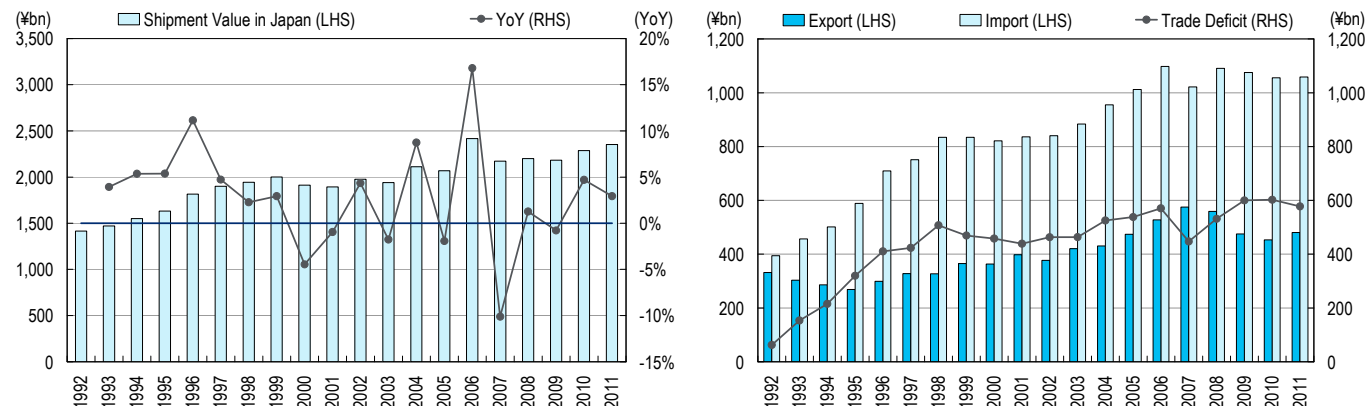
Source: MHLW medical industry statistics, Citi Research.

**Figure 21. The import ratio remains high, centering on treatment equipment, for which the growth rate is high (top chart: individual products, bottom chart: product categories)**



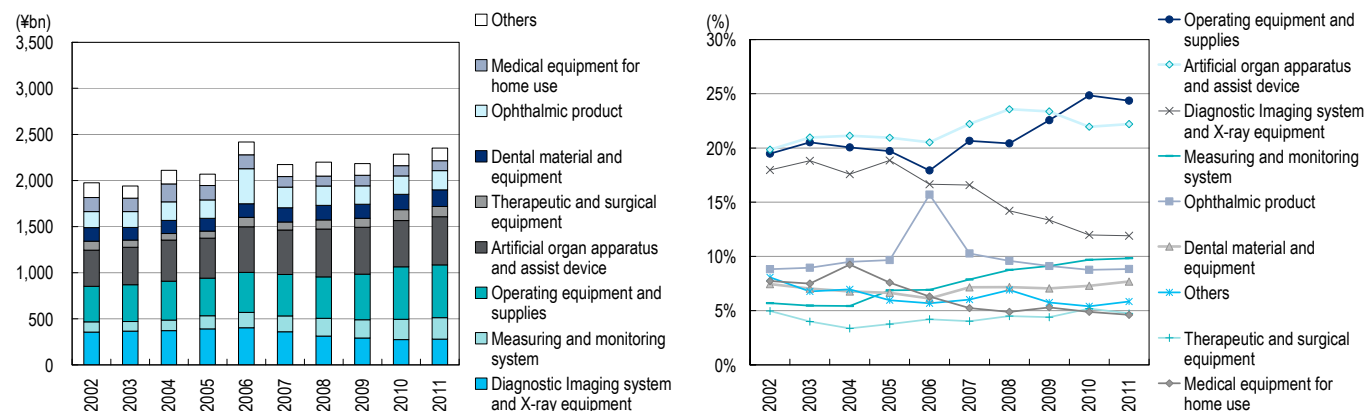
Note: Light blue indicates treatment devices and dark blue diagnostic devices. The horizontal axis in the top chart is the market CAGR for 1991 to 2011 (2001-2011 for stents). The horizontal axis in the bottom chart is the market CAGR for 2002 to 2011. Both vertical axis show import ratios. The size of circles corresponds to the size of markets. The top chart covers 86% of the total Japanese market.  
Source: MHLW medical industry statistics, Citi Research.

Figure 22. Japanese medical device shipments (LHS) and medical device imports/exports (RHS)



Source: MHLW medical industry statistics, Citi Research.

Figure 23. Medical device shipments by area (LHS) and weightings (RHS)



Source: MHLW medical industry statistics, Citi Research.

## Major Japanese medical device makers: An overview

Global comparison shows Japanese medical device makers to be inferior in terms of profitability and size

Japanese medical device makers are smaller and less profitable than overseas majors (Figure 24). Only five Japanese companies—Terumo, Toshiba, Olympus, Fujifilm, and Hitachi—have medical device sales of c¥300bn or more, and this only puts them in the mid-tier of the global industry. Including non-listed companies, there are 700 to 800 medical device makers in Japan, but the majority are small: only 30-40 have sales in excess of ¥10bn and a 10 sales in excess of ¥100bn (Figure 25). We believe the reasons for this are that 1) the medical devices market is highly fragmented, featuring an enormous number of products, and 2) regulation inhibits competition, with little progress in industry reorganization as a consequence.

Japanese companies have some presence in diagnostic equipment

Diagnostic equipment and disposable products are the mainstay products of many Japanese medical device makers, but Japan's presence in the field of treatment devices is weak. In diagnostics, Toshiba and Hitachi Medical are strong in imaging diagnostic equipment, Olympus and Fujifilm in endoscopes, and Sysmex in clinical

testing equipment, and these firms are globally competitive. We believe the reason Japanese companies are competitive in diagnostics is because of their strength in machinery and sensor technologies, which are extremely important to diagnostic devices, making it easy for them to develop medical equipment.

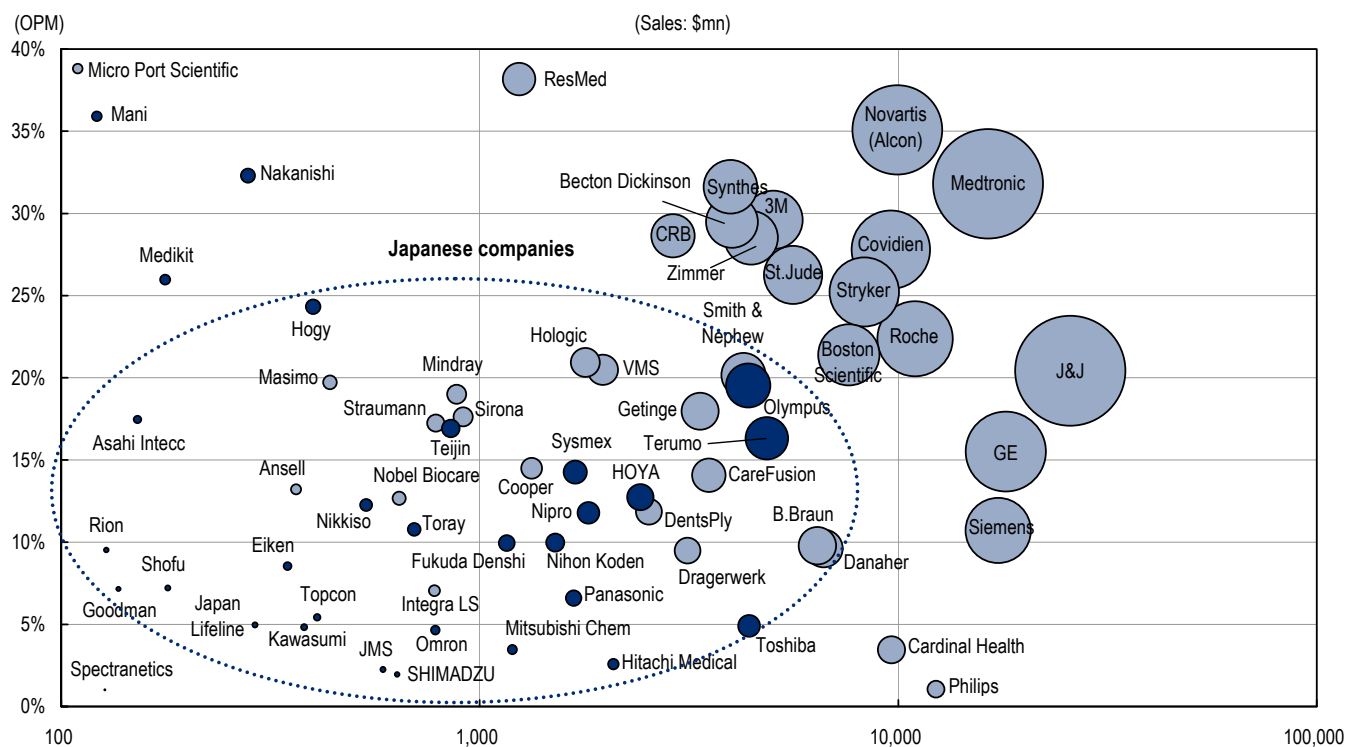
**Japanese companies do not have much of a presence in therapeutic devices**

Japanese companies continue to have only a minor presence in therapeutic devices, with the following exceptions: Terumo and Asahi Intecc, which are competitive in the field of cardiovascular treatment device, and Asahi Kasei, Nipro, and Nikkiso, which have some presence in the field of hemodialysis. We believe reasons for this include: 1) a lack of joint development with academic and medical institutions; 2) inferior medical device inspection systems to the US and Europe; 3) a medical device pricing system that makes it difficult to realize added value, even for new products; and 4) conservative management at many companies holding back entry into high-risk treatment device field. These are problems for the entire industry, in our opinion.

**Some companies have achieved high growth and earnings in niche fields**

Sysmex, Mani, and Asahi Intecc are Japanese companies that have achieved high growth and earnings by concentrating on niche fields. They have done so by capitalizing on the fragmentation of the medical device market, which makes it easier to achieve a dominant position by specializing in niche fields, and expanding sales of products differentiated by unique technologies (blood cell counters at Sysmex, surgical needle products at Mani, and PTCA guidewires at Asahi Intecc).

**Figure 24. Compared with overseas majors, Japanese medical device makers lag in terms of profitability and scale**



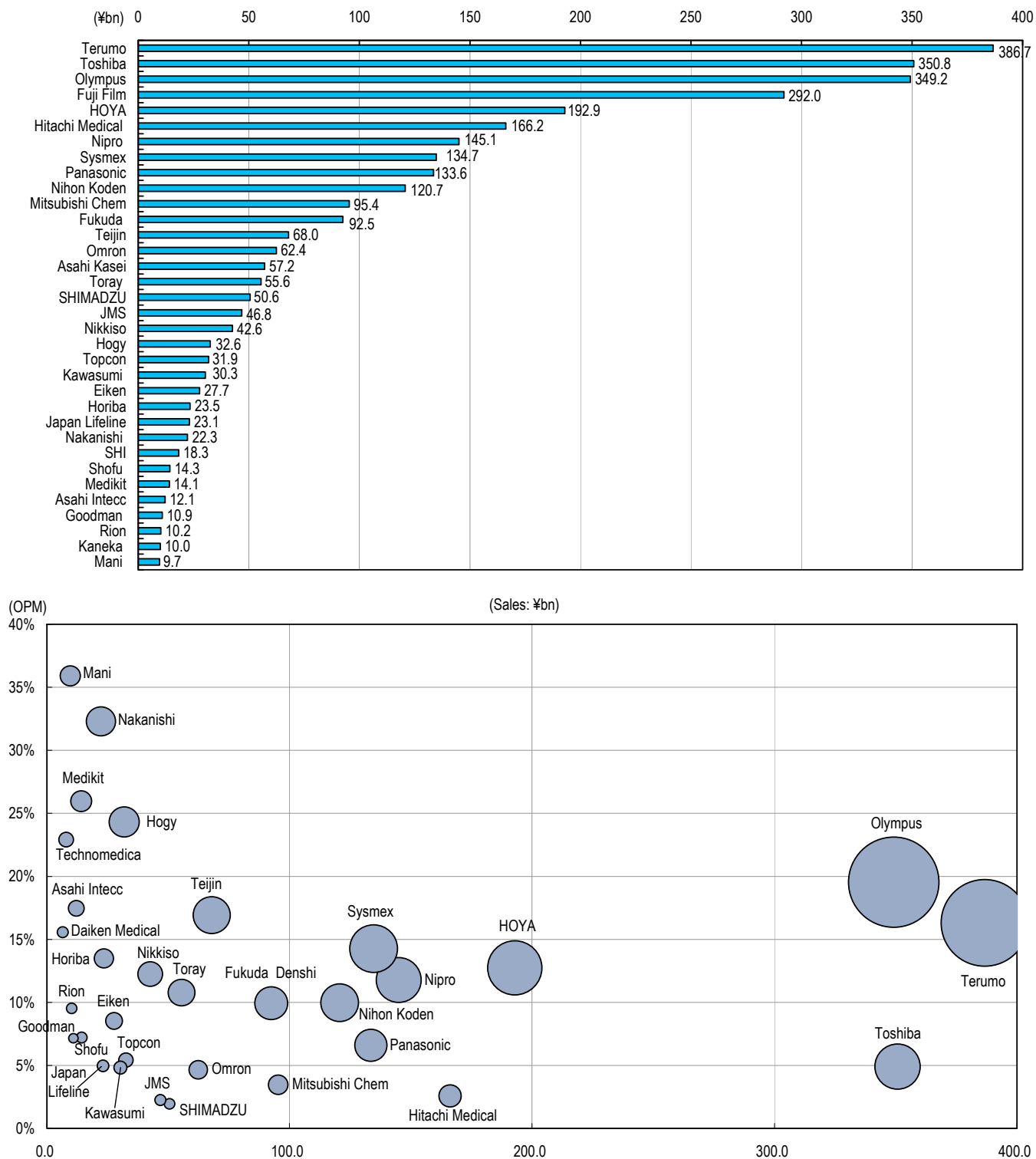
Note: Horizontal scale is \$mn, vertical scale is operating margin, circle size denotes size of OP. Japanese companies are in blue and overseas companies are in gray.  
Source: Company data, Citi Research.

Figure 25. Sales, OP, and operating margins at major Japanese medical device firms (FY2011 basis, ¥mn)

Company	Sales	OP	OP margin	Main products
1 Terumo	386,686	63,049	16.3%	Biomedical measurement systems, Cardiovascular treatment devices (catheters, stents, etc.), blood systems, disposable products
2 Toshiba	350,800	17,200	4.9%	Diagnostic imaging equipment (CT, MRI, X-ray, ultrasound)
3 Olympus	349,246	68,188	19.5%	Endoscopes, surgical devices
4 Fujifilm	292,000	NA	NA	Diagnostic imaging equipment (X-ray, ultrasound), endoscopes, X-ray films
5 Hoya	52,671	NA	NA	Ophthalmic products (intraocular lenses, contact lenses, etc.), endoscopes, orthopedic implants
6 Hitachi Medical	166,237	4,271	2.6%	Diagnostic imaging equipment (CT, MRI, X-ray, ultrasound)
7 Nipro	145,082	17,077	11.8%	Dialysis-related products (dialyzers, needles, blood circulatory products, etc.), disposable products (infusion, insulin needles, etc.), catheters
8 Sysmex	134,743	19,205	14.3%	Clinical testing equipment (mainly in hematology)
9 Panasonic	133,600	8,800	6.6%	Testing equipment, hospital operations equipment, home-use medical devices
10 Nihon Kohden	120,718	12,027	10.0%	Biomedical measurement systems (EEG, ECG, patient monitors, etc.) defibrillators
11 Mitsubishi Chemical	95,400	3,300	3.5%	Clinical testing equipment, clinical equipment and supplies
12 Fukuda Denshi	92,524	9,192	9.9%	Biomedical measurement systems (ECG, patient monitors, etc.) defibrillators
13 Teijin	68,000	11,500	16.9%	Medical devices for use at home (artificial respirators, etc.)
14 Omron	62,446	2,900	4.6%	Biomedical measurement systems (thermometers, scales, etc.)
15 Asahi Kasei	57,200	NA	NA	Dialysis-related products (dialyzers, etc.), defibrillators
16 Toray	55,554	5,981	10.8%	Dialysis-related products (dialyzers, etc.), treatment products
17 Shimadzu	50,600	987	2.0%	Diagnostic imaging equipment (X-ray related, etc.)
18 JMS	46,836	1,052	2.2%	Dialysis-related products (dialyzers, etc.), disposable products (infusion, transfusion, etc.), pump-oxygenators
19 Nikkiso	42,646	5,224	12.2%	Dialysis-related products (hemodialysis machines, dialyzers, blood circuits, etc.)
20 Hogy Medical	31,873	7,750	24.3%	Treatment products (medical-use nonwoven fabric, various medical kit products)
21 Topcon	32,598	1,766	5.4%	Ophthalmic products (testing equipment and laser therapy equipment)
22 Kawasumi	30,347	1,462	4.8%	Dialysis related products (dialyzers, etc.), disposable products (infusion, transfusion, etc.), stent grafts
23 Eiken	27,702	2,363	8.5%	Clinical testing equipment
24 Horiba	23,485	3,166	8.5%	Clinical testing equipment (blood testing instruments)
25 Japan Lifeline	23,140	1,147	5.0%	Cardiovascular treatment devices, treatment products
26 Nakanishi	22,266	7,191	32.3%	Dental equipment
27 Sumitomo Heavy Industries	18,300	NA	NA	Radiotherapy equipment (PET, BNCT, proton therapy etc.)
28 Shofu	14,329	1,032	7.2%	Dental equipment and materials
29 Medikit	14,126	3,667	26.0%	Dialysis safety needles, vein indwelling needles, catheters, etc.)
30 Asahi Intecc	12,133	2,118	17.5%	Cardiovascular treatment devices (PTCA guidewire)
31 Goodman	10,924	781	7.1%	Cardiovascular treatment devices (catheters, stents, etc.)
32 Rion	10,209	972	9.5%	Hearing aids
33 Kaneka	10,000	NA	NA	Biomedical measurement systems, treatment products
34 Mani	9,693	3,480	35.9%	Surgical devices (eyeless suture needles, ophthalmic and dental treatment instruments)

Note: Hitachi has groupwide medical device sales of around ¥300bn. Fujifilm, Toray, and Asahi Kasei include some medical devices in healthcare division earnings. Hoya includes some eyewear lenses in lifecare division earnings. This Figure does not include companies that do not disclose on their medical device operations nor non-listed firms. Source: Company data, Citi Research.

Figure 26. Sales (LHS) and sales versus operating margin (RHS) at Japanese medical device firms



Note: Horizontal axis is sales, vertical axis is operating margin, size of circle denotes size of OP. Figures are FY3/12A.  
Source: Company data, Citi Research.



## Medical device industry: an international comparison

### US competitive in a broad range of medical device fields

Figure 27 compares medical device industries in Japan, the US, and Europe. The US has highly competitive companies that command high market shares for products ranging from treatment devices to diagnostic equipment. In addition to the high-level medical technologies of universities and hospitals and an enormous home market, we feel the US medical device industry is highly competitive because the US has the business infrastructure to commercialize innovative products—namely an entrepreneurial culture and the social infrastructure willing to back and commercialize the products of start-up companies.

### Europe competitive in diagnostic imaging, clinical testing, and hemodialysis

In Europe, the major players are Siemens and Philips and the medical device divisions of pharmaceutical giants Roche and Novartis. The major products are diagnostic imaging equipment and clinical testing equipment, where a combination of medical technologies and machinery technologies support competitive businesses. However, Europe does not have a strong infrastructure of start-up companies founded on medical expertise and it does not have the presence in the field of treatment devices that the US does.

### Japan not very competitive on the international stage

Japanese companies only have a real presence in the fields of diagnostic imaging and endoscopes. Consequently, Japan relies on imports for many medical device products, centering on treatment devices, and has chronic trade deficit in this area. Most Japanese medical device makers are small and even top-class companies are only mid-tier in global terms. The Japanese industry has failed to improve its competitiveness for multiple reasons that span corporate, academia and medical institutions, and the bureaucracy and government regulations.

Figure 27. Comparison of medical device industries in Europe, the US, and Japan

Region	US	Europe	Japan
Products	A diverse range of product types	A diverse range of product types	A limited range of product types, mainly diagnostic imaging equipment and endoscopes
Fields in which companies are competitive	Cardiovascular (stents, pacemakers, defibrillators, etc.), diagnostic imaging, orthopedic implants, patient monitors, surgical instruments, in vitro diagnostic drugs	Diagnostic imaging, in vitro diagnostics drugs, orthopedic implants, dialyzers, general medical supplies	Diagnostic imaging, optical equipment (including endoscopes), general medical supplies, some radiotherapy equipment, some in vitro diagnostic drugs
Leading companies	J&J, Medtronic, GE, Abbott, Covidien, Baxter, Cardinal Health, Danaher, Boston Scientific, 3M, St. Jude, Zimmer, Stryker, etc.	Siemens, Philips, Roche, Novartis, B. Braun, Fresenius Medical Care, Smith & Nephew, Getinge, Draegerwerk, etc.	Terumo, Olympus, Toshiba, Hitachi, Sysmex, Fujifilm, Hoya, etc.
Global share	Around 50%	Around 30%	Around 10%
Industry size	6,000-7,000 companies Small, medium, and large	8,500-10,000 companies Small, medium, and large	750 companies Small, medium, and large
Balance of trade	Surplus	Surplus	Deficit
Innovation, R&D, intellectual property	High R&D investment drives innovation (10-13% of sales)	Little innovation because of low R&D investment (6% of sales)	Little innovation because of low R&D investment (6% of sales)
Fund procurement	Easy access to venture capital and capital market funds	Restrictions on fund procurement	Restrictions on fund procurement
Industry structure and integration	Active industry realignment via M&A	M&A activity within the EU relatively low	Little industry realignment via M&A
	Venture companies drive technical innovation and large companies commercialize venture technologies via M&A		Few venture companies and at this time few large companies that are capable of acting as venture incubators
Sales networks	Direct sales system	Direct sales system	Complex sales/distribution system
Skilled labor	High skill level, high productivity (sales of \$297,938/employee in 2005)	High skill level, low productivity (sales of \$98,149/employee in 2005)	High skill level, moderate productivity (sales of \$173,460/employee in 2004)
Labor market mobility	Good	Average	Poor
Doctor characteristics	High-level medical expertise Doctors are business-minded, work aggressively to commercialize technology	Level of technological expertise is high Doctors tend to have high social status, making it easy to commercialize technology	High-level medical expertise However, few doctors are businesslike
Standards and regulations	Transparent regulatory system	Transparent and efficient regulatory system	Complex government regulations an impediment to market growth
Approval speed	Has slowed because of stricter FDA standards	Relatively fast	Relatively slow but has improved in recent years
Health care costs	Large and expanding (15% of GDP)	Under control (7%-8% of GDP)	Under control (8% of GDP)
Health care cost control policy	Government and private insurers working to control costs	Government working to control costs	Government and private insurers working to control costs
Population statistics	Population: c300mn Over-65s forecast to increase from 12% of the population in 2005 to c18% in 2025	Population: c500mn Over-65s forecast to increase from 17% of the population in 2004 to c23% in 2025	Population: c120mn Over-65s forecast to increase from 20% of the population in 2004 to c30% in 2025

Source: US international trade commission report, company data, Citi Research.

## Medical device industry clusters a US strength

### Industrial clusters that foster the creation of innovative products a strength of the US

We believe industrial clusters that foster the creation of innovative products are a key strength of the US medical device industry (Figure 28). In a nutshell, universities and hospitals develop innovative medical technologies, start-up companies turn these technologies into products with the support of financial and management know-how from venture capital, and large companies sell products acquired via joint R&D with universities and hospitals or the acquisition of start-up companies to the world.

### Medical device clusters in Minnesota, Boston, and Silicon Valley

Industrial clusters in Minnesota, Boston, Silicon Valley, and elsewhere underpin the competitiveness of US medical device makers. The most well-known of the clusters is in Minnesota, which is home to several hundred medical device makers, including Medtronic, the world's largest independent medical device company, and 3M. The University of Minnesota, which has produced 20 Nobel Prize winners, and the Mayo Clinic, one of the premier general hospitals in the US, add to the wealth of medical device-related knowledge in Minnesota.

**Industrial alliances the source of innovative medical device products**

The University of Minnesota and the Mayo Clinic are the source of world-class R&D, both at the fundamental and clinical level, and they are often involved in joint development projects with medical device makers and the establishment of start-up companies to commercialize technologies. US general hospitals attract doctors from around the world on study sabbaticals and play a key role in spreading US medical technologies around the world. Medtronic and other medical device majors pick up promising technologies through the acquisition of start-ups and joint R&D projects and draw on their own development expertise and broad sales networks to build global medical device businesses.

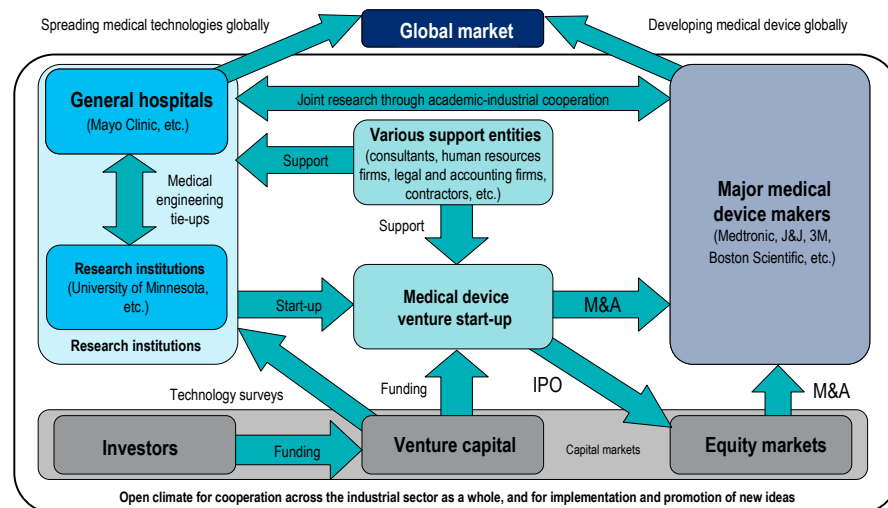
**Culture of cooperation and commercialization of new medical technologies**

An open and cooperative industrial culture and support for the commercialization of new medical technologies form the backdrop to medical device clusters. Many of the doctors and engineers at the University of Minnesota and the Mayo Clinic have excellent business and technical skills. Medical device makers contribute to the R&D activities of the university and hospital by participating in joint R&D projects and providing investment funds and other resources. There are many investors and support organizations with medical device know-how or personal connections, and the financial and personnel support they provide promotes the commercialization of medical device products through start-ups. And the US is of course the home of the entrepreneur. US capital markets are dynamic and there are many exit options available to investors in start-up companies, including company listings and corporate M&A. This all helps with the commercialization of medical technologies.

**Same mechanism as the one that has grown the technology industry in Silicon Valley**

US medical device clusters circulate personnel, technology, and capital seamlessly to promote industry growth. This is the same mechanism as the one that the Silicon Valley technology cluster used to produce Google from Stanford University.

**Figure 28. The strength of the US is an eco-system that fosters the creation of innovative medical products**



Source: Citi Research.

## Japan medical device industry faces corporate, academic, bureaucratic challenges

### Japanese industry faces challenges in corporate, academia, and bureaucratic spheres

We believe the Japanese medical industry is weak internationally for multiple reasons that span corporate, academia and medical institution, and bureaucratic spheres. In the corporate space, 1) many companies are small and few pursue overseas development or M&A opportunities aggressively and 2) there are no companies capable of driving the overall medical device industry. In the academia and medical institution space, 1) a lack of technology “seeds” and 2) limited business experience among the doctor and researcher community are hurdles to strengthening competitiveness. In the bureaucratic space, 1) there is a “device lag” issue in clinical trials and 2) pricing systems are problems for the medical device industry.

### Lack of companies capable of driving the industry

#### Lack of companies capable of assuming the mantle of industry driver a problem on the corporate side

We feel the biggest problem on the Japanese corporate side is that there are few companies capable of driving the overall medical device industry. In the US, Medtronic and J&J act as industry catalysts by conducting joint development projects with R&D institutions, supplying finance and other resources for R&D, acquiring start-up companies, and developing products on a global basis. But Japanese medical device makers are for the most part small companies, and few have overseas operations or actively pursue M&A; not many can step up as real industry drivers. We would say only Olympus, Toshiba, and Terumo could be called drivers in their specialized areas.

### Lack of business experience and technology “seeds”, and low human resource mobility are problems in the academia and medical institution space

#### Engineers and doctors lack business experience

Problems in the university and hospital space are 1) a lack of business experience among doctors and engineers, 2) a lack of technology “seeds” compared with the US and Europe, and 3) low human resource mobility. The US has universities, such as the University of Minnesota and Stanford University (Stanford Biodesign), and hospitals that produce people with the technical and business skills necessary to drive the medical device industry. Japan has doctors and engineers that would like to commercialize their own inventions, but most have little business experience or knowledge, or interest in business, and this is reflected in the almost complete absence of start-up companies based on medical technologies.

#### Technology “seeds” relatively thin on the ground

Another fundamental problem is a lack of technology “seeds” compared with the US and Europe. Japan has made some contribution to medical device innovation (it was the first country to commercialize contact lenses, endoscopes, pulse oximeters, and hearing aids), but most breakthrough medical device products, like cardiac catheters, stents, pacemakers, CT, and MRI were invented in the US or Europe. The US is still the leader in many medical technology fields, particularly medical treatment devices. Because companies still develop many medical products through joint research with universities and hospitals, we believe a lack of technology “seeds” in Japan is a reason for the weak medical device development capabilities of Japanese companies.

#### Poor human resource mobility

US hospitals and universities are very open and have many international students. This makes it easier for medical devices that are standardized in the US to penetrate global markets. Japan does not have many international students and doctor exchanges are not as common as they are in the US. It remains harder for procedures developed in Japan to make inroads in overseas markets.

## **“Device lag” and the pricing system are medical device administrative issues**

### **Device lag and the pricing system are medical device administrative issues**

Medical devices are a regulated industry and government regulation can thus have a large impact. In Japan, we highlight 1) “device lag”, caused by an inadequate inspection system, and 2) the pricing system as regulatory problems. Device lag is gradually being resolved but the pricing system remains a burden on medical device makers.

### **Device lag has been a big medical device administrative issue...**

Device lag refers to the period in which products that have already been approved in the US and Europe cannot be used in Japan because of the longer approval process. We believe an inadequate inspection system in Japan is the reason for device lag, and this in turn is due to 1) a small number of medical device examiners, where there are only dozens at the PMDA, versus hundreds in the US and Europe; 2) inspection quality that is not particularly high, because a predominance of examiners with medical backgrounds rather than engineering backgrounds.

### **...but is gradually being resolved**

Both the Ministry of Health and METI recognize device lag as a problem and in response they have decided to 1) increase the number of medical device examiners in the PDMA, to 75 in October 2011 from 29 in February 2008; 2) dispatch specialists with an engineering background from METI to the Ministry of Health; and 3) to simplify inspections and to work with respected industry and academic figures to draw up medical device inspection guidelines. These measures are being implemented with a view to eliminating the device lag problem over the next few years. There have been some signs of improvement, with cases of products tested in joint clinical trials with US receiving approval in Japan ahead of the US (although a slowdown in the FDA approval times has contributed).

### **The pricing system is the biggest regulatory problem in Japan**

We believe the pricing system is the biggest problem associated with Japanese government regulation. Under the insurance and drug pricing systems, the prices (reimbursement prices) of most medical devices in Japan are set by the Ministry of Health. Medical device reimbursement prices are decided by category or material rather than by product. This means that differences between product performance (ease of use, etc.) are not readily reflected in prices. Medical device makers are unable to pass on the value they add, even in new products, and this is a major obstacle to innovation.

### **Medical device industry needs to raise its voice about the problem of reimbursement price cuts**

The reduction of medical device prices every two years with reimbursement price revisions is another sticking point. Pressure to lower reimbursement costs is increasing in order to control healthcare costs and improve the profitability of medical institutions. Using 2002 as a base of 100, we calculate reimbursement prices have declined to around 75 in 10 years. Japan's total health care costs came to ¥38trn in 2011. The majority of this was personnel costs, with medical devices only accounting for around ¥2trn of the bill. The cut in medical device reimbursement prices should not have much impact on overall health care costs. To secure adequate profit margins, we believe the Japanese medical device industry needs to raise its voice about the impediment of reimbursement price cuts.

### **Domestic/overseas price gap a problem**

Furthermore, the prices of advanced treatment devices are higher in Japan than they are in the US and Europe. The reason for this is high distribution and marketing costs. In the US and Europe, hospitals are large and they have highly organized device maintenance systems. This keeps distribution and marketing costs down. In Japan, these costs are high, for structural reasons: hospitals are small and scattered there is less demand for products per hospital, wholesale companies are required to visit more frequently, and hospitals require various after-sales services, including maintenance services. Because high distribution and

marketing costs depress margins, we believe prices are set high to avoid the risk of overseas medical devices makers stopping the shipment of advanced products. So structurally high distribution and marketing costs not only reduce the earnings power of Japanese medical device makers but also push up medical market costs.

### **Japan's strength: basic technologies in a range of fields**

#### **Japan has strong basic technologies in a range of fields**

The strength of Japanese companies is expertise in a broad range of basic technologies. Japan has a diverse industrial base (electronics, chemicals, machinery, etc.) and strong basic technologies in fields like IT, materials, and mechatronics. These basic technologies have not been widely used in the field of medical devices as not many companies have actively entered this market. But over the last year or two an increasing number of companies have announced their intention to enter the medical field. We believe this movement will increase the likelihood of a broad range of basic technologies being applied toward medical devices. Companies like Sysmex and Asahi Intecc have applied technologies from various areas to create differentiated medical devices and we believe the creative use of technologies outside the traditional medical sphere is crucial to the competitiveness of the Japanese medical device industry.

#### **Expectations of new entrants**

A number of large Japanese companies—integrated electronics, machinery, chemicals, trading—are entering into or investing in the medical device business. In addition to basic technologies, many of these companies have strong balance sheets and M&A experience, and have successfully developed global businesses in other fields. We believe the creation of an ecosystem that engenders the commercialization of products is the biggest issue for the Japanese medical device industry. In the US, medical device clusters have promoted the circulation of personnel, technology, and capital in an open cooperative environment. We do not believe this is an environment that Japan will be able to replicate anytime soon. Our hope is that these large new electronics, machinery, chemicals, and trading company market entrants can become drivers of the medical device industry by bringing in new technologies, creating competitive technologies, businesses, and companies via M&A and alliances, and expanding medical device businesses overseas.

## Focus on the possible emergence of South Korean, Chinese firms

**Currently Asia ex-Japan firms do not have much of a presence but they may emerge in the future**

Currently Asia ex-Japan firms do not have much of a global presence, and in the medical device market, where the emphasis is on technology, quality, and performance, Asian firms without technology muscle are not, in our view, going to find it easy to emerge as global players. However, moving forward Asian firms may improve their technological capabilities and the low-end market, especially in emerging markets, may expand, so we think investors need to be cautious on the emergence of Asian firms in the medical device market in the future.

### Many local firms in China, especially in low-end market

**Numerous local firms present in China, thanks to the existence of a vast home market**

Numerous local firms are present in China, thanks to the existence of a vast home market. Leading Chinese manufacturers include Mindray, which manufactures ultrasound diagnostic equipment and clinical testing equipment, Weigao, which is mainly in disposable products (drip goods, syringes, and blood bags), dialysis equipment and drug-eluting stents, and Micro Port Scientific, a stent maker. These companies do not supply medical devices for which sophisticated technological skills are required, such as CT, MRI, radiotherapy equipment, and pacemakers, but are continuing to expand their operations, chiefly in products where manufacturing can be done domestically, such as clinical testing equipment, dialysis equipment, and stents, or by acquisition of overseas companies (Figure 29). For more on the Chinese market, see our November 26 report, [China Healthcare Sector - Handbook December 2012: Leaders Becoming Better](#), and our December 7 report, [China Healthcare Thematic - Capturing the Upcoming Value Chain Shift](#).

**Local firms do not have much of a presence in the Chinese high-end market**

Chinese firms are distinguished by their development of their operations mainly in the local low-end market. Some 25% of the Chinese medical device market is high-end, servicing mainly the wealthy, compared with about 50% in developed nations, while the low-end market is approximately 75%. In the high-end market, Philips, GE, Siemens, Olympus and other major overseas players have approximately two-thirds of the market, and Chinese firms still do not have much of a presence. We think this is because there are few Chinese firms that can supply the large and high-priced medical devices that the high-end market requires.

**Chinese firms developing their operations mainly in the local low-end market**

On the other hand, in the low-end market (75% of the total), low prices are sought after, and many Chinese firms are expanding their operations here, using cost-competitiveness as a weapon. The Chinese government gives priority approval to the products of local firms, as it is trying to grow the domestic medical device industry. However, competition in the market is intensifying, with foreign firms also entering the low-end market. Also, Mindray is proactively expanding abroad, with the 2008 acquisition of the patient monitoring division of Datascope of the US.



Figure 29. Chinese firms benefit from a vast home market

	PMD	B/W US	Color US	Biochem	Anes	CT	CR	DR	DSA	MRI	LA
<b>North America</b>											
GE/Ohmeda	○	●	●	○	●	●	○	●	●	●	-
Philips/Goldway	●	●	●	-	-	○	○	●	●	●	-
Carestream	-	-	-	-	-	-	●	○	-	-	-
Beckman	-	-	-	●	-	-	-	-	-	-	-
Varian	-	-	-	-	-	-	-	-	-	-	●
Abbott	-	-	-	○	-	-	-	-	-	-	-
<b>Europe</b>											
Siemens	-	●	●	-	-	●	○	●	●	●	●
Agfa	-	-	-	-	-	-	●	○	-	-	-
Dräger	-	-	-	-	●	-	-	-	-	-	-
Elekta	-	-	-	-	-	-	-	-	-	-	●
Bleuse	-	-	-	-	○	-	-	-	-	-	-
<b>Japan/Korea</b>											
Toshiba	-	●	○	-	-	●	○	○	●	-	-
Hitachi-Aloka	-	●	●	●	-	○	-	-	○	-	-
Shimadzu	-	-	-	-	-	○	○	-	○	-	-
Nihon Kohden	○	○	○	-	-	-	-	-	-	-	-
Fuji	-	-	-	-	-	-	●	○	-	-	-
Konica	-	-	-	-	-	-	●	○	-	-	-
Samsung Medison	-	○	○	-	-	-	-	-	-	-	-
Sysmex	-	-	-	○	-	-	-	-	-	-	-
<b>Chinese Domestic Players</b>											
Mindray	●	○	○	○	○	-	-	○	-	-	-
Wandong	-	-	-	-	-	○	○	○	○	○	-
Neusoft	-	-	-	-	-	○	○	○	-	-	-
Aeon	-	-	-	-	○	-	-	-	-	-	-

\*Market share: ○: <5%; ●: 5%~10%; ○: 10%~20%; ●: 20%~30%; ●: >30%

Source: Citi Research global healthcare team.

## South Korean firms: Samsung Electronics eager to enter the medical device market

**For Samsung, medical device is one of the five big growth fields**

Within Asia, we feel that the South Korean firms are the ones to keep an eye on, and above all Samsung Electronics. In 2010, Samsung designated five areas to follow electronics as growth areas which it would nurture in a concentrated fashion—medical device, biopharmaceuticals, automotive batteries, and solar cells, and announced plans to invest KRW23.3trn in them. In 2010, it set up a health & medical device division and set to work on bolstering its medical device and pharmaceutical operations. In last year's organization change, Samsung promoted medical devices as a business unit from a team and appointed Cho Soo In, ex-CEO of Samsung Display Co., as the head.

**Goal of KRW10trn in sales in 2020**

Samsung plans to invest KRW1.2trn in medical devices through 2020 and has set the aggressive goal of reaching KRW10trn in sales. It has designated three focal areas: blood testing, ultrasound testing, and in vitro diagnostic devices. We believe Samsung's growth strategy in medical device is 1) to acquire equipment manufacturers, 2) apply semiconductor and display technologies to the field, and 3) the synergy with Samsung medical centers and hospitals.

**Samsung has acquired several medical device makers since 2010**

The first growth strategy is acquisitions. Samsung acquired a dental X-ray diagnostic equipment maker in 2010, South Korean diagnostic equipment maker Medison in 2011, and Nexus, a heart testing equipment maker that mainly operates in the US, also in 2011. Medison ranks number five in global market share in ultrasound diagnostic devices and has been developing diagnostic devices that can handle 3D images; it is one of South Korea's leading diagnostic equipment makers.

**With plenty of funds at its disposal, we think Samsung is likely to make further acquisitions**

Samsung's annual FCF amounted to KRW7.0trn in 2012, and we expect it to rise to KRW23.5trn in 2013, so we think it has ample funding muscle and that it is thus likely to acquire medical device makers or medical system solution companies moving forward. Indeed, in January 2013, at the Consumer Electronics Show held annually in the US, Samsung announced plans to acquire MRI and CT manufacturers. Samsung announced the acquisition of NeuroLogica, a CT manufacturer in January 2013.

**Samsung to apply telecommunication, semiconductor and display technologies to medical devices**

The second strategy is to apply semiconductor, display, telecom equipment, optics and other electronics technologies to medical devices. We believe the application of telecom technologies, an area of strength, to medical devices could help differentiate existing products. However, aside from Samsung having indicated its intentions to apply 3D display technologies to medical devices and its focusing efforts on the development of applications for doctors on smartphones and tablets, there are many unclear elements to the company's approach as things stand.

**Synergy with Samsung medical centers and hospitals**

The third strategy revolves around Samsung medical centers and hospitals. These are affiliated with the Samsung group and are known in South Korea as top-drawer medical institutions. The existence of a hospital business within the group does not mean that Samsung will get its medical device business off the ground immediately, but given that 1) it has a source of end-demand within the group and 2) it is easy for Samsung to grasp medical needs within the group, we think the existence of Samsung treatment institutions may assist in the differentiation of Samsung Electronics' medical device business.

**However, medical device business entry issues loom large**

However, we think there are some large issues associated with Samsung Electronics' entry into the medical device business, as there are with Japan's electronic equipment makers, as the medical device industry structure is different from the electronics industry. We think the biggest issue is that Samsung's formula for success in the electronics industry may not pass muster here.

**Samsung's traditional formula for success may not pass muster in medical devices, as the industry structure is different to the electronics one**

In Samsung Electronics' main businesses of semiconductors, displays, and digital consumer electronics, the product life-cycle is short and the market for any given product is large. As a result, the company's organizational structure, where decisions are made from the top down, and its bold investment strategy have assisted in its rapid advance. However, much of the medical device market is fragmented, so the barriers to entry at the product level are formidable and the product life-cycle is long. As a consequence, we think that it will be hard for Samsung Electronics to apply its formula for success in electronics—expand via large-scale investment and judicious investment timing—in medical devices.

**Scant experience of acquisitions also an issue**

We also think that Samsung Electronics' scant experience of acquisitions is an issue. The bulk of the company's growth to date has been endogenous and it has almost never made a large corporate acquisition. Indeed, setting aside the exceptions such as Samsung Corning, we have seen a fair few instances of unsuccessful tie-ups with other companies, such as SBLiMotive, S-LCD, and Renault Samsung Motors. With acquisitions likely needed for Samsung to grow in medical devices, we think that its scant acquisition experience may be a risk factor.

**LG Electronics also planning to enter a wide range of medical device fields**

LG Electronics, second in size to Samsung Electronics among South Korea's electronics makers, also appears eager to enter the medical device arena, which it has designated a growth industry. LG Electronics already has healthcare subsidiaries, namely LGCNS, which carries out IT systems development for hospitals, and LG Life Sciences, a biotech firm, and the parent plans to develop a wide range of medical device products, coordinating efforts with the group as a whole.

## 4. Methods of entry into medical devices

### How can non-healthcare companies get into medical devices?

**Two methods of entry: 1) independent development via original technologies and 2) leveraging external resources secured via acquisitions or tie-ups**

There are two paths by which a company can enter the medical devices business. The first is by developing its own medical devices, and the second is by acquiring an existing maker of medical devices. While the first method may give a company a competitive advantage if it can apply technologies from a different field to medical devices, the hurdles to commercialization can be substantial and it may take considerable time to get the business on track. Acquiring an existing company, on the other hand, means that products, sales channels, and staff are in place, so entry into the business is easier, but there may be risks associated with the acquisition price or loss of staff. In recent years, a number of non-healthcare companies have entered the medical devices business, and many have used both of these methods in their efforts to commercialize medical devices.

#### Independent development requires differentiation via original technologies and know-how in medical devices

**Pursuit of medical device development based on original technologies**

Entry into the medical devices business via independent development requires 1) product differentiation based on original technologies and 2) a grasp of the know-how necessary for medical devices. We consider the application of technologies from other fields to medical devices an important aspect of differentiation. Companies that have successfully moved from other industries to pursue independent development and commercialization of medical devices, such as Asahi Intecc and Sysmex, have been able to distinguish their products from the competition through the use of technologies from other fields.

**Know-how in medical devices is a major premise underlying commercialization**

On the other hand, due to the special nature of medical devices, a grasp of specific know-how is also required. The difficulties for non-healthcare companies trying to break in include 1) a lack of understanding of medical needs, resulting in products for which there is little demand; 2) a lack of know-how regarding clinical testing, resulting in delays in gaining product approval; 3) a poor grasp of marketing channels, hampering sales; and 4) the complications of quantifying product risk/return and the long timelines involved, which make it hard to draw up business plans.

**Careful selection of business fields and full commitment of management are needed**

Avoiding such pitfalls requires a high level of commitment from management, including 1) careful investigation into the seed technologies and medical needs associated with specific products, as well as the risks attached to medical devices; 2) the potential use of external resources by recruiting experts from the medical devices industry or alliances with existing makers of medical devices; and 3) necessary spending on R&D, possibly over an extended period, to develop products.

In areas where a company lacks experience and know-how, we think it is more practical to pursue the development of products that do not require clinical trials as opposed to higher-risk products that do. In addition, we think a committed management team is essential, given that it took even companies like Asahi Intecc and Sysmex, with their focus on medical devices, a long time to get the business up and running.

**Risk of product liability lawsuits is actually limited**

Some observers also site product liability laws and potential lawsuits as a risk, but in fact there have been relatively few cases of legal action related to medical devices and we consider the risk to be limited.

## Scope of medical devices business is broad and opportunities abound

### Broad scope of business offers many opportunities

Due to the breadth of the medical devices field, we think there are many opportunities even for companies aiming to develop business independently (see Figure 30 for an overview of the technologies involved in various medical devices). In our view, manufacturers with technological superiority in other fields could develop their businesses in some of the ways outlined below

### Business idea 1: Surgical tools and steel instruments

Surgical tools such as scalpels and scissors are a global market worth about ¥800bn. US companies are especially strong in this field, but given the large number of products that can be made using materials processing and the high quality and functionality required, we feel it is an area to which Japan's manufacturers could be well suited. We think there are ample business opportunities for companies with expertise in metal processed materials and parts.

### Business idea 2: Artificial bones and joints

The domestic market alone for artificial bones and joints is around ¥140bn, and at this point imports account for 84% of this. Furthermore, given some differences in the bone structures of Westerners and Asians, we believe there are clear clinical requirements for artificial bones and joints designed for Japanese users. We think there are opportunities for chemicals and ceramics makers here.

### Business idea 3: Medical robots

The market for medical robots is only worth about ¥200bn, but going forward expect annual expansion of at least 10% in this growth field. The da Vinci surgical system used in endoscopic surgery is well known, but we think there are plenty of opportunities for Japanese machinery makers with superior technological prowess. In fact, there are already cases where Japanese machinery makers have commercialized advanced clinical equipment, including Mitsubishi Heavy's radiation therapy systems and Sumitomo Heavy's proton therapy systems

### Business idea 4: New diagnostic imaging systems

We think new diagnostic imaging systems using image processing technologies, display technologies, and IT technologies developed by Japanese machinery makers are another area of opportunity. For example, using diagnostic imaging system databases for big data analysis could facilitate early identification of cancers or diagnosis of Alzheimer's disease, and diagnostic equipment could provide clearer pictures of affected areas by using 3D displays.

### Business idea (5): Opportunities in supply of components and materials, too

In medical device, we think that there could also be business opportunities for suppliers of components and materials. In addition to the supply of components and materials in Figure 30, we think 1) electronic component makers can offer small parts suited to making medical devices portable and 2) material makers can move into medical films. Indeed, Murata is developing wireless telecom modules for medical devices and Nitto Denko, together with Dainippon Sumitomo, is starting clinical trials of a new delivery system (transdermal tape) for schizophrenia.

Figure 30. Summary of major technologies required for each medical device

	Sensor	Material	Semicon- ductor	Control Technique	Display	Signal Processing	Communi- cation	Recording Technique	Computer	Battery	Others (Drug etc)
1 Electrocardiograph		○			○	○		○			
2 Electronic sphygmomanometer	○		○	○						○	○
3 Electroencephalograph			○		○	○	○	○			
4 Evoked response testing equipment	○		○		○						
5 Respiratory function testing equipment	○					○	○		○		
6 Electronic thermometer	○				○			○			
7 Monitoring system	○				○	○	○				
8 X-ray diagnostic apparatus	○		○		○		○		○		○
9 X-ray CT	○		○	○			○	○	○		
10 Diagnostic nuclear equipment	○					○	○	○			○
11 Diagnostic magnetic equipment	○		○	○			○	○	○		
12 Ultrasonic monitoring system		○	○		○				○		○
13 Infrared monitoring system	○	○			○			○			○
14 Electronic endoscope			○				○	○			○
15 Bone density testing equipment	○	○				○					
16 Blood testing equipment			○			○					○
17 Auto chemical analyzer	○										○
18 Dry chemical analyzer		○		○			○				
19 Cardioverter-defibrillator	○									○	
20 Hyperthermic medical device	○	○		○		○					
21 Electrosurgical knife		○	○	○		○					○
22 Ultrasonic surgical device											○
23 Laser surgical device			○								○
24 Microwave surgical device				○							○
25 Medical particle accelerator							○		○		○
26 RI application product									○		
27 Treatment planning system					○				○		○
28 Concretion lithotripter	○			○		○					
29 PTCA											○
30 IABP	○	○		○						○	
31 Infusion pump	○	○					○			○	
32 Hearing aid	○		○							○	
33 Artificial kidney		○		○							
34 Oxygenator		○									
35 Biventricular assist device		○									
36 Cardiac pacemaker		○	○								○
37 Artificial ear/inner ear	○	○								○	
38 PACS					○	○	○		○		
39 SQUID equipment	○		○		○			○			
40 Laser-related products	○	○	○	○		○					

Source: JEITA, JIRA, Citi Research.

## Lessons from non-healthcare companies entering the medical devices market 1: Asahi Intecc

**Asahi Intecc was able to transform from a parts maker to a therapeutic equipment maker**

Asahi Intecc is a prime example of a non-healthcare company that was able to transform itself into a maker of medical devices by adapting its original technologies. The company was established in 1976 as a maker of industrial parts and materials, mainly wires. It made the decision to aggressively pursue business in medical devices in 1991, hiring engineers from other medical device makers and setting up a medical division to develop products in this area. The following year, it successfully developed a PTCA guidewire and a guiding catheter to help treat cardiac infarction, and in 1994 the company started marketing these products. It has subsequently bolstered its marketing network and formed an alliance with Abbott to develop business overseas, thereby extending its global reach as a medical devices maker.

**Superior guidewires developed through the application of company's materials technologies**

The PTCA guidewires that are Asahi Intecc's main products are used in percutaneous transluminal coronary angioplasty, or balloon angioplasty, a minimally-invasive procedure for the treatment of conditions like cardiac infarction. The guidewires are employed to introduce balloon catheters into patients' arteries. In order to allow access to the narrow and complex system of blood vessels, guidewires must provide superior steerability and flexibility. By applying technologies developed in its industrial materials business (including wire stretching processes and torque technologies, wire forming technologies, plastic coating technologies, and others), Asahi Intecc has been able to create guidewires that provide sure responsiveness to the smallest movement of a fingertip. These guidewires provided the launching pad for the company's ascent as a medical devices maker.

**Reasons for Asahi Intecc's success**

We see four reasons behind Asahi Intecc's success in breaking into the medical devices market. First, while medical know-how is a necessity in this field, Asahi Intecc benefited from some medical-related experience as a supplier of materials for Olympus. The second factor is the commitment of the management team. It took more than 10 years for the company to get its medical devices business on track. As an unlisted, founder-run company, it was able to keep the business going over an extended period. Third, the company was able to use original technologies to differentiate its product, developing guidewires developed based its materials technologies. Finally, the company was wise in its deployment of management resources. When first moving into the medical devices market, it focused on the development of devices in the cardiovascular field. It made efficient use of external resources as well, for example by tying up with Abbott Laboratories to market its products.

## Lessons from non-healthcare companies entering the medical devices market 2: Sysmex

**From its establishment as a new venture by an electrical equipment maker, Sysmex has become a major global producer of clinical testing equipment**

Sysmex is a prime example of an electrical equipment maker establishing a foothold in a new field that went on to become a global producer of clinical equipment. The company's original incarnation was set up by Toa Electric (presently Toa Corporation) as its arm in the new field of medical devices. In 1963, it successfully commercialized Japan's first automated blood cell counter, and after entering the market for clinical reagents in 1967, it became an independent maker of medical devices in 1972. Today, it is the world's leading specialist maker of clinical testing equipment in the field of hematology, and is highly competitive.

**Focus on niche field of hematology has supported high growth**

In the field of clinical testing equipment, US and European majors like Roche and Abbot are focused mainly on large markets such as immunological testing (viruses, hormones, tumors, etc.) and biochemical testing (liver function, kidney function, lipids, etc.). Sysmex specializes in the niche area of hematology and has enjoyed rapid growth. Over the past 40 years or more, the company has overtaken rival Beckman Coulter (acquired by Danaher) and is now the top-ranking company in the hematology field. Its strengths include strong product competitiveness and an excellent sales network; it has developed equipment that is clearly outstanding in terms of automation and speed, and at the same time has expanded its marketing structure and improved customer service, successfully setting itself apart from peers.

**Reasons for the success of Sysmex**

We see four reasons that Sysmex has been successful in the field of clinical testing equipment. First, the company's roots as an electrical machinery maker have helped it to differentiate its products. For example, the company was an early developer of automated clinical testing equipment (robotics) and built-in semiconductor lasers. The second factor is the company's selectivity and focus. Sysmex has concentrated on the niche field of hematology, where it has not had to compete with larger firms, and has thus achieved rapid growth. Third, it has built up its sales network. From early on the company established domestic sales subsidiaries and overseas bases, and the direct marketing capabilities it has developed in various regions allowed a global surge as the competitiveness of its products improved. Finally, Sysmex has made use of external resources secured through acquisitions. It has purchased makers of testing reagents and clinical trial information systems as well as sales agencies to achieve necessary improvements to basic technologies and sales channels.

**Figure 31. Asahi Intecc's medical device business development**

Date	Event
1976	Company established
1977	Begins supplying control wire for endoscopes to Olympus.
1991	Establishes medical development headquarters, recruits developers from medical device makers, and starts developing medical devices. Seto medical plant (approved medical device manufacturing plant) completed.
1992	Approved as a medical device manufacturer by the Japanese Ministry of Health. Develops PTCA guidewire and guiding catheters for the treatment of myocardial infarction.
1994	Begins sales of PTCA guide wire and guiding catheters.
1998	Acquires CE marking certification for PTCA guidewires.
2001	Thai plant completed.
2002	Receives FDA approval to sell PTCA guidewires.
2003	Concludes a distribution agreement with Abbott Laboratories for PTCA guide wire in US, Europe, and other regions.
2005	Listed on the Second Section of the TSE. Vietnam plant completed.
2006	Establishes Osaka R&D Center as a base for materials research and the development of new generation medical devices.
2010	Makes GMA a consolidated subsidiary to strengthen resin technologies.
2011	Switches from Abbott Laboratories to local sales agents in Europe.
2012	Starts direct sales of PTCA guidewires in Japan.

Source: Company data, Citi Research.

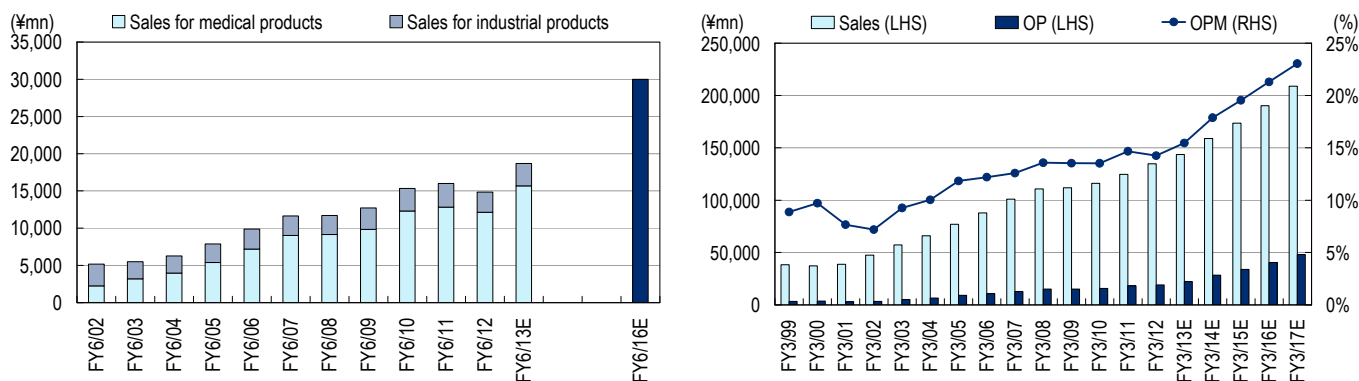


Figure 32. Sysmex's medical device business development

Date	Event
1961	TOA Electric (now TOA Corporation) decides to enter the electronic medical device market.
1963	Commercializes the CC-1001, the first automated blood cell counter in Japan.
1967	Releases, Cellkit, a dilution solution, and Saponin S, a lysing reagent. These are the first reagents developed by an electrical equipment manufacturer.
1968	Established as a sales company for products made by TOA Electric.
1972	Acquires the medical electronics equipment division of TOA Electric and starts life as specialist maker of clinical testing equipment.
1973	Establishes the Kakogawa plant in Hyogo Prefecture as an integrated base for sales, development, and production.
1970s	Opens representative offices in various countries.
1983	Releases the multi-parameter fully automated hematology analyzer E-series, which establishes the Sysmex brand overseas.
1990	Releases the world's first hematology system that fully automates the entire process from counting blood cells through the preparation of a smear samples.
1995	Listed on the Second Section of the Osaka Stock Exchange.
1998	Changes company name to Sysmex Corporation and forms a marketing and joint R&D alliance with F. Hoffmann-La Roche.
1999	Releases the XE-series, a blood cell analyzer with the world's highest processing capability.
2000	Concludes a comprehensive business alliance with International Reagents Corporation (made a wholly owned subsidiary in 2002).
2003	Switches to its own sales network in the US.
2004	Acquires a stake in CNA, making it a subsidiary (made a wholly-owned subsidiary in 2007).
2006	Becomes the world's number one seller of blood measurement and analysis devices.

Source: Company data, Citi Research.

Figure 33. Growth trajectory for Asahi Intec (LHS) and Sysmex (RHS): Explosive growth continues as the two firms have become successful medical device makers



Note: Estimates for Asahi Intec are company forecasts.

Source: Company data, Citi Research.

## Acquisitions and alliances

### Acquisitions an entry route to the medical device industry

**Acquisition of medical device maker grants entry to the medical device business**

Acquisitions and alliances offer nonmedical companies a means of entering the medical device industry. By buying a medical device maker, the acquiring company can use the assets of the purchased company (products, technologies, sales channels) to readily enter the medical device business. Entering the industry from scratch by independently developing products involves many time-intensive stages like the development of products, the obtaining of approvals, and the cultivation of sales channels. Accordingly, time-saving is a major advantage of acquisitions. Medical device maker acquisitions thus can be said to offer major cash-rich companies a reliable route into the medical device industry.

**Electric appliance makers, chemical companies, trading companies actively buying medical device makers**

Among non-healthcare companies, electric appliance makers, chemical companies, and trading companies are actively buying up medical device makers (Figure 34). Hitachi, Toshiba, Sony, Fujifilm, and Canon among electric appliance makers, Asahi Kasei and Sekisui Chemical in the chemical sector, and the likes of Itochu and Mitsubishi Corp in the trading company sector have been active buyers of medical device makers. As these companies see healthcare as a new growth area, they have made acquisitions to either strengthen or gain access to the medical device business.

**An effective means of acquiring element technology and sales channels**

Additionally, such acquisitions are an effective means for companies that already have a functioning medical device business to acquire element technologies and sales channels. Indeed, big name overseas players like General Electric, Philips, and Johnson & Johnson are steadily acquiring new companies as part of their overall growth strategy (Figure 35). Japan's leading medical device makers in like Olympus, Terumo, Sysmex, Nihon Kohden and Nipro are also actively making acquisitions.

### High acquisition price and post-merger integration issues

**High valuations for medical device makers mean lofty acquisition prices are a risk**

However, in terms of entering the medical device business by the acquisition route the possibility of elevated acquisition prices and post-merger integration difficulties should be noted. First, high valuations for medical device makers mean purchase prices can become elevated. The PER range for the medical device sector is 12-20x (growing companies are over 20x), which is higher than 14x of market average. Moreover, the greater the growth potential and the more promising the products a company has, the higher the valuations tend to climb.

**Can cost upwards of several hundred million yen to acquire a top company**

Acquisitions in recent years show that often it can cost upwards of several hundred million yen to acquire a top company. Fujifilm's acquisition of SonoSite cost it \$995mn, Asahi Kasei's acquisition of Zoll Medical cost \$2.21bn, and Terumo's acquisition of CaridianBCT cost \$2.625bn. These deals can be said to have attracted high premiums, given that at the time of acquisition, SonoSite was generating annual OP of \$27mn on sales of \$275mn, Zoll Medical was generating annual OP of \$48mn on sales of \$524mn, and CaridianBCT \$126mn on sales of \$524mn.

**Post-merger integration also an issue**

Another major issue is post-merger integration. There remain unique business customs in the medical device sector in terms of regulation and marketing. Accordingly, there is a risk that companies lacking in medical device industry experience may not be able to utilize acquired products, technologies and sales channels effectively. Caution is required, as quality problems can apparently easily ensue for medical device makers following post-acquisition management system

and culture changes. As human resources like engineers and sales personnel are essential to the medical device business, we think post-acquisition human resource outflow should also be considered.

Figure 34. Major medical device maker acquisitions and capital tie-ups since 2010 by Japanese firms (¥mn unless otherwise stated)

Date	Buyer	Seller	Acquired businesses	Details	Price paid	Sales	OP	NP
2010/01	Asahi Intecc	Zima	Medical device resins	Acquisition	291	774	103	26
2010/01	Ushio	Luminetx	Vascular imaging systems	Acquisition				
2010/02	Sony	iCyt	Cell sorting systems	Acquisition				
2010/02	Nipro	HDI	Blood glucose testing equipment	Acquisition	\$215mn	\$123mn	\$11.1mn	\$9.6mn
2010/03	Itochu	Promed Medical Tech. (Suzhou)	Cardiovascular medical devices	Capital tie-up	200-300			
2010/05	Olympus	Small Bone Innovations	Cosmetic surgical implants	Capital tie-up				
2010/06	Olympus	Spiration	Devices for lung treatment	Acquisition				
2010/07	Mitsubishi Corp.	US start-up company	Diagnostic equipment for melanoma	Capital tie-up	2,300			
2010/08	NEC	SomaLogic	Blood testing services	Acquisition	430			
2010/08	Fujifilm	Japan Tissue Engineering	Regenerative medicine	Capital tie-up	4,000	351	-1,145	-1,153
2010/09	Nipro	DA-NSW	Sales of medical devices	Acquisition	100			
2010/10	Panasonic	CardioNexus	Sales of medical devices	Acquisition				
2010/11	Hitachi Mediceo	Aloka	Diagnostic imaging equipment	Acquisition	25,645	45,811	2,451	662
2010/11	Kawanishi HD	Sansei	Medical device trading	Acquisition	1,850	15,935	288	145
2010/11	Sekisui Chemical	Genzyme	Clinical reagents	Acquisition	\$265mn	\$167mn		
2010/12	Olympus	Stryker intellectual property	Bone-related regenerative medicine	Acquisition				
2011/01	Fukuda Electronics	Arai-Medphoton Research	Photodynamic therapy devices	Capital tie-up	150			
2011/03	Terumo	Caridian BCT	Blood transfusion equipment	Acquisition	\$2,625mn	\$524mn	\$126mn	
2011/03	Nihon Kohden	Dainippon Sumitomo Pharma's cardiography business	Multifunction electrocardiographs	Acquisition				
2011/04	Canon MJ	ELK Corporation	Medical device trading company	Acquisition	3,671	21,412	71	24
2011/04	Toshiba	Vital Images	Diagnostic imaging software	Acquisition	\$273mn	\$59.7mn	\$-1.3mn	\$-1.0mn
2011/05	Denso	Unex	Cardiovascular testing equipment	Capital tie-up		325		
2011/05	Terumo	Harvest Technologies	Blood collection equipment	Acquisition		\$25.9mn		
2011/07	Olympus	Spirus Medical	Endoscope insertion support devices	Acquisition				
2011/07	Canon	Median Technologies	Medical CAD	Acquisition	€8.6mn	€1.1mn		
2011/07	Nipro	Amcor	Medical glass containers	Acquisition	\$161mn	€38.7mn		
2011/08	Toshiba	Toshiba Sumiden Medical Information Systems	Medical information systems	Stock transfer				
2010/08	Topcon	OptimMedica (part of assets)	Ophthalmic laser equipment	Acquisition				
2011/09	Sony	Micronics	Development of diagnostic equipment	Acquisition				
2011/10	Shimadzu	Planmeca	Dental X-ray equipment	Acquisition	120	AUD28.6		
2011/10	Otsuka HD	KiSCO	Spine-related products	Acquisition				
2011/11	Asahi Kasei	Tella	Regenerative medicine	Capital tie-up	297	1,322	71	16
2011/12	Fujifilm	SonoSite	Ultrasound diagnostic equipment	Acquisition	\$995mn	\$275mn	\$27mn	
2012/01	Terumo	Onset Medical	Large sheath products	Acquisition		\$0.9mn		
2012/02	Nipro	MGLas AG	Medical glass containers	Acquisition	€25.9mn	€36.9mn		
2012/02	Fujifilm	Research Institute of Systems Planning	Biometric systems	Acquisition				
2012/03	Asahi Kasei	Zoll Medical	Emergency medical device	Acquisition	\$2,210mn	\$524mn	\$48mn	
2012/03	HOYA	Digital Endoscopy	Developing medical endoscopes	Acquisition				
2012/04	Mitsubishi Corp.	Kobayashi Medical	Medical device trading company	Merger				
2012/04	Murata Mfg.	RFM	Medical device components	Acquisition	\$19mn	\$32mn		
2012/05	Asahi Kasei	Nextage	Dialysis systems	Capital tie-up	\$45mn	\$217mn	\$-15.5mn	\$-21.4mn
2012/05	JBR	Atworking	Medical device trading company	Acquisition	104	457	126	84
2012/05	Hoya	Nihon Unitec	Medical plates for bone fractures	Acquisition		1,700		
2012/09	Sony	Olympus	Endoscopes, cameras	Capital tie-up	50,000	848,548	35,518	-48,985
2012/10	Contec	DTx	Medical device IC controllers	Acquisition	\$20.8mn	\$32.4mn	\$1.9mn	\$1.3mn
2012/11	Nihon Kohden	Defibtech	Automated external defibrillators	Acquisition				
2012/11	Nipro	Nefro-Ion	Dialysis fluid	Acquisition				
2012/11	Win International	Tesco	Medical device trading company	Acquisition		8,380	396	159
2012/11	EPS	Yitong Medical Technology Co	Medical device trading company	Acquisition	52			
2012/12	Terumo	AngioCare	Renal de-nerivation catheters	Capital tie-up	13			
2013/01	Nipro	Goodman	Catheters, stents	Acquisition	3,250	10,924	781	94

Note: Some acquisitions and capital tie-ups include cases where not shares were acquired. Non-healthcare company acquisitions and capital tie-ups shown in grey.  
Source: Media reports, Company data, Citi Research.

Figure 35. Major medical device maker acquisitions since 2010 by global firms (¥mn unless otherwise stated)

Date	Buyer	Seller	Acquired businesses	Price paid	Sales	OP	NP
2010/04	Medtronic	Invatec	Intervention therapy device	500	132		
2010/05	CR Bard	SenoRx	Diagnostic imaging system (ultrasound)	210	56	-2.7	-2.9
2010/06	Covidien	ev3	Therapeutic device for neurovascular and peripheral vessel	2,709	449	29.2	41.9
2010/06	Covidien	Somanetics	Oxygen measurement system	335	50	9.9	6.8
2010/07	Alcon	LensX Lasers Inc	Femtosecond laser equipment	744			
2010/07	J&J	Micrus Endovascular Corp	Therapeutic device for neurovascular vessel	433	91	10.2	11.5
2010/08	Medtronic	ATS Medical	Cardiac valve, therapy device for ablation	370	76	-3.7	-6.3
2010/08	Medtronic	Osteotech	Therapeutic tissue for orthopedics implant	123	97	-2.9	-4.0
2010/08	Stryker	Gaymar Industries	Body temperature controlling system, pressure ulcer management system	150	80		
2010/09	3M	Arizant	Body temperature controlling system	810	180		
2010/09	St.Jude	CardioMEMS	Wireless sensor for cardiovascular disease	435	0		
2010/09	Boston Scientific	Asthmatx	Minimal invasive therapeutic bronchial device for asthma	194	0		
2010/10	St.Jude	AGA Medical	Therapeutic device for heart defect	1,300	199	14.4	-1.1
2010/10	Stryker	Boston Scientific Neurovascular	Therapeutic device for neurovascular vessel	1,500	340		
2010/11	Boston Scientific	Sadra Medical	Aortic valve system	193	0		
2010/11	Baxter	Archemix Hemophilia Assets	Hemophilia related products	315			
2010/11	Medtronic	Ardian	Catheter for high blood pressure	800	0		
2010/12	GE	Clariant	Cell imaging equipment	580			
2010/12	Samsung Electronics	Medison	Diagnostic imaging system	260>	179	26	
2011/01	Hologic	Interlace Medical Inc.	Therapy device for uterine fibroids	125			
2011/01	Boston Scientific	Atritech	Products to treat patients with atrial fibrillation who are at risk of stroke	100			
2011/02	Danaher	Beckman Coulter	Clinical testing equipment	6,800	3,663	430.7	230.7
2011/04	Endo Pharmaceuticals	American Medical Systems	Therapeutic device for prolapse, incontinency and BPA	2,900	542	154.7	87.0
2011/04	J&J	Synthes	Orthopedic implants, surgical devices	19,300	3,687	1,283.4	907.7
2011/05	Stryker	Orthovita	Alternative bone implants	304	95	-2.0	-5.7
2011/05	Therumo Fisher	Phadia	Clinical testing equipment for allergies	3,500	525		
2011/06	Hologic	TCT International	Distributor	135	10		
2011/06	Stryker	Memometal	Orthopedic implant	150	30		
2011/07	TPG Capital	Immucor	Blood testing equipment	1,970	333	126.0	89.3
2011/07	Medtronic	PEAK Surgical	Energy device	113	20		
2011/07	Medtronic	Salient Surgical Technologies	Energy device	500	100		
2011/07	Private Consortium (LBO)	Kinetic Concepts	Disposal products	6,300	2,018	446.4	256.1
2011/08	Baxter	Baxa Corporation	Syringe-type oral administration device	380	150		
2011/08	Stryker	Concentric Medical	Therapeutic device for neurovascular vessel	135	30		
2011/08	GE	PAA Laboratories	Cell culturing system		55		
2011/10	Getinge	Atrium	Cardiovascular treatment device (stent, etc.)	680			
2011/10	CR Bard	Medivance	Body temperature controlling system	250	40		
2011/11	Bain Capital	Pysio-Control	AED	487	125		
2011/11	Covidien	BARRX Medical	Therapeutic device for Barrett esophagus	393	30		
2011/11	Samsung Electronics	Nexus	Testing equipment for heart disease				
2011/12	CR Bard	Lutonix	Drug-eluting balloon	225	0		
2012/03	Covidien	Newport	Respirator, respiration monitoring system	108	40		
2012/04	Covidien	Maya Medical	Catheter for high blood pressure	230	0		
2012/04	Hologic	Gen-Probe	Clinical testing equipment	3,800	576	150.1	50.1
2012/05	Covidien	superDimension	Minimally-invasive lung therapy equipment	286	30		
2012/06	Royal DSM	Kensey Nash	Regeneration medical device for hemostasis	360	72	21.7	2.1
2012/06	Covidien	Oridion	Carbon dioxide measurement system	317	64	6.8	6.4
2012/06	GE	XPRO	X-ray diagnostic systems				
2012/07	Hill-Rom	Aspen Surgical	Surgical devices (needle, scalpel, etc.)	400	120		
2012/08	Getinge	Kinetic Concept's TSS Business	Treatment support	275	247		
2013/01	Samsung Electronics	NeuroLogica	CT				

Note: Some acquisitions and capital tie-ups include cases where not all shares were acquired.  
Source: Press material, Company data, Citi Research.

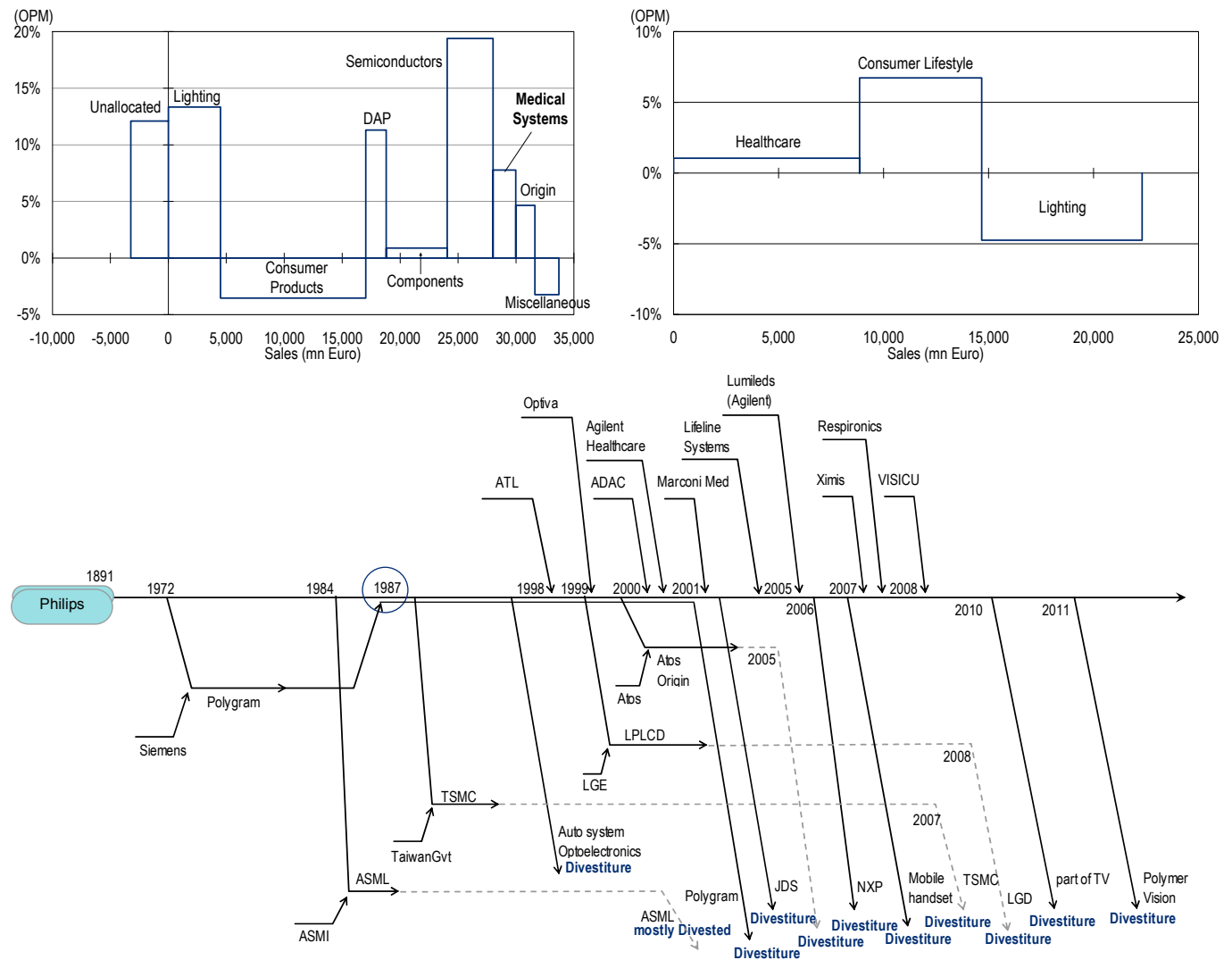
## Lessons from non-healthcare companies entering medical devices market: (3) Philips

**By selling off and acquiring businesses, Philips transformed itself from mainly a general electrical appliance maker to a medical device maker**

Philips is one of Europe's leading medical device makers. However, previously it was mainly an industrial electronics firm with a business structure similar to Japan's current industrial electronics firms, with a focus on household appliances, displays, and semiconductors. Philips' transformation into a medical device maker began in 1998. While continuing to acquire new medical device makers each year, Philips at the same time sold off its household appliances, semiconductors, displays, and other industrial electronics businesses. As a result of this selection and focus process of acquiring and selling off businesses, Philips is now structured chiefly around medical devices, lighting, and white goods (Figure 36).

The backbone of the company's medical device operations consists of low-margin imaging diagnostic equipment and given that the company's overall earnings power is not high, whether the company can be regarded as a successful company is open to debate. However, 1) the company generated over €10bn by selling off various businesses, and 2) the management strategy of Philips, which transformed itself into one of the world's largest medical device firms by strategically acquiring medical device makers, can probably be described as a good example of how to leverage acquisitions to get into the medical device industry.

Figure 36. Philips business portfolio (LHS 1996, RHS 2011) and main business spin-offs, disposals, and M&A (bottom)



Source: Company data, Citi Research.

## 5. Market outlook for medical devices

### Market growth rate outlook for medical device by field and geographical area

#### Outlook by field and geographical area

Figure 37 and 38 show our global healthcare team's estimates of the medical device market size and growth rate from 2011 through 2016 by field and by geographical area.

#### By field, non-mainstream markets are growing

Key points for the market growth outlook by field are as follows. First, areas where we expect growth potential above the average of 4% include clinical testing equipment, artificial dialysis, neurotherapeutics, wound management, radiotherapy, beauty, and therapeutic robots. On the other hand, we do not expect growth to keep up with the 4% average in traditional mainstay areas like imaging diagnostic equipment, orthopedic implants, cardiovascular devices, and ophthalmology. We think the reason that traditional mainstay areas such as cardiovascular devices, orthopedic implants, and imaging diagnostic equipment do not offer much market growth potential is that because the markets are large, technology development has been prioritized and they were quick to mature. In contrast, fields where we expect growth moving forward are in many cases ones where we see real technology development advancing from here on, with the markets having room to expand.

#### By geographical area, emerging markets are growing

Key points for the market outlook by geographical area are as follows. First, currently it is the developed markets that are large, with the US, Western Europe, and Japan accounting for approximately 83% of the total market. However, emerging markets, while currently small, have considerable market growth potential moving forward. We think the market growth potential in developed markets is only around 2%, while we foresee growth of 10% or more continuing in emerging markets.

As a result, while we see the growth rate over the coming five years as being a nearly flat 11% in developed markets, we expect emerging markets to post c1.7x growth over the next few years. Developed markets are struggling to grow because their societies have already aged, and with governments reining in medical expenses markets are maturing. However, emerging markets are in a phase in which medical treatment is reaching more people as their economies grow, and we think demand for medical device will rise in these markets.

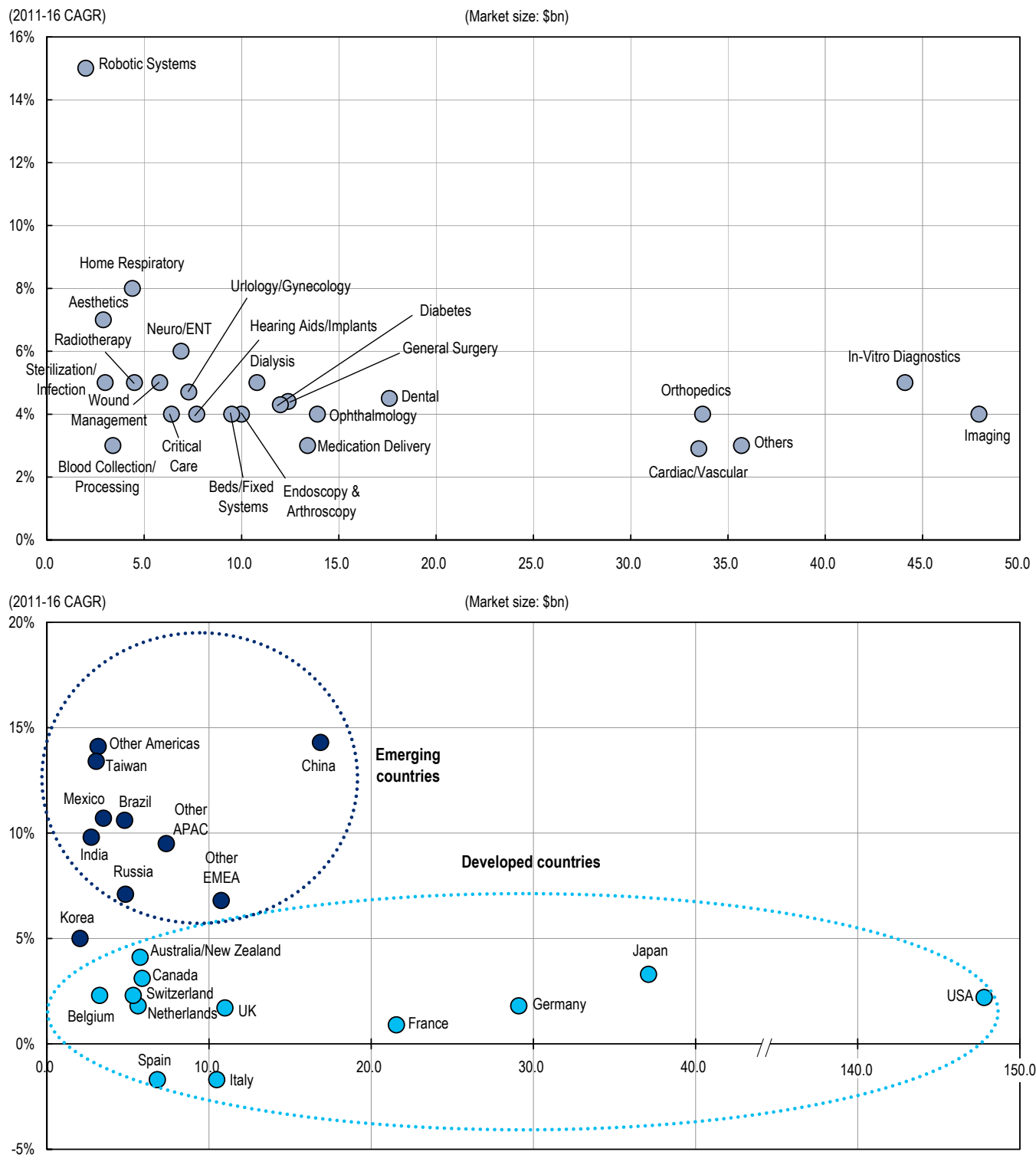


Figure 37. Market size by field and geographic area (2011), market outlook (2011=>2016)

Application (\$bn)	Market size	CAGR	Country and Region (\$bn)	Market Size	CAGR
Imaging	47.9	4.0%	USA	147.8	2.2%
In-Vitro Diagnosis	44.1	5.0%	Canada	5.9	2.6%
Orthopedics	33.7	4.0%	Brazil	4.8	10.5%
Cardiac/Vascular	33.5	2.9%	Mexico	3.5	13.5%
Dental	17.6	4.5%	Other Americas	3.2	12.9%
Ophthalmology	13.9	4.0%	Germany	29.1	1.1%
Medication Delivery	13.4	3.0%	France	21.6	0.1%
General Surgery	12.4	4.4%	U.K.	11.0	0.3%
Diabetes	12.0	4.3%	Italy	10.5	-2.9%
Dialysis	10.8	5.0%	Spain	6.8	-2.9%
Endoscopy & Arthroscopy	10.0	4.0%	Netherlands	5.6	1.1%
Beds/Fixed Systems	9.5	4.0%	Russia	4.8	12.7%
Hearing Aids/Implants	7.7	4.0%	Switzerland	5.3	2.8%
Urology/Gynecology	7.3	4.7%	Belgium	3.3	1.1%
Neuro/ENT	6.9	6.0%	Other EMEA	10.7	7.3%
Critical Care	6.4	4.0%	Japan	37.1	3.2%
Wound Management	5.8	5.0%	China	16.9	17.3%
Radiotherapy	4.5	5.0%	Australia/NZ	5.8	5.3%
Home Respiratory	4.4	8.0%	Taiwan	3.0	14.3%
Blood Collection/Processing	3.4	3.0%	India	2.7	10.4%
Sterilization/Infection Control	3.0	5.0%	Korea	2.0	10.4%
Aesthetics	2.9	7.0%	Other APAC	7.4	15.4%
Robotic Systems	2.0	15.0%	<b>Emerging Market</b>	<b>59.1</b>	<b>10.8%</b>
All Other	35.7	3.0%	<b>Developed Market</b>	<b>289.7</b>	<b>2.0%</b>
<b>Total</b>	<b>348.8</b>	<b>4.0%</b>	<b>Total</b>	<b>348.8</b>	<b>4.0%</b>

Source: Company data, Citi Research Global Healthcare team estimates.

**Figure 38. Market forecasts by product field and region: Demand expanding in non-core fields (top chart) and in emerging markets (bottom chart)**



Source: Company data, Citi Research Global Healthcare team estimates.

## Market overview and outlook by field

### Cardiovascular devices

The market for cardiovascular medical devices has a value of around \$33.5bn (2011, Figure 39). We estimate the market sizes for major devices are: pacemakers \$4.4bn, implantable cardioverter defibrillators (ICDs) \$6.9bn, stents \$5.2bn, EP mapping and ablation systems \$2.5bn, other \$14.5bn (the majority of which we believe is catheters). The major players in this field are US companies, including Medtronic, St. Jude, Boston Scientific, Johnson & Johnson, Abbott, and CR Bard. Japanese companies have little presence; the only of any real significance are Terumo, which makes catheters and stents (FY3/12 cardiovascular device sales: ¥160.6bn), and Asahi Intecc, which makes guidewires (FY6/12 sales ¥12.1bn).

### Orthopedic implants

The market for orthopedic implants has a value of around \$33.6bn (2011, Figure 40). We estimate the market sizes for major devices are: hip joints \$4.6bn, knee joints \$6.9bn, vertebral columns \$7.9bn, external wounds \$4.8bn, and other \$9.3bn. The major players are Medtronic, Zimmer, Johnson & Johnson, Stryker, and Smith and Nephew. Japanese companies have little presence; the only of any real significance are Kyocera Medical, which we estimate had sales in this field of around ¥10bn in FY3/12, and Japan MDM, which had sales of ¥8bn in FY3/12. Japan Tissue Engineering engages in a knee joint regeneration businesses using autologous cultured cartilage.

### Surgical devices

The market for orthopedic implants has a value of around \$12.4bn (2011, Figure 41). We estimate the market sizes for major devices are: energy devices (electrical scalpels) \$3.4bn, endomechanical tools \$6.2bn, and soft tissue devices \$2.8bn. The major players in this field are Johnson & Johnson (market share of just over 40%), Covidien (just under 35%), and CR Bard. Japanese companies have little presence; the only of any real significance are Olympus, which makes energy devices, and Mani, which makes surgical needles (FY3/12 sales ¥9.7bn). Also, Olympus has introduced the new Thunderbeat platform in the energy devices market. The company is now considering the optimal marketing methods for these devices.

### Clinical testing equipment

The market for clinical testing equipment has a value of around \$44.1bn (2011, Figure 42). The market sizes for major devices are: immunoseological \$12.1bn, POC \$7.2bn, biochemical-related \$6.7bn, hematology-related \$2.7bn, blood coagulation-related \$1.3bn, and other \$13.6bn. The major players in this field are Roche, Abbott, Siemens, Danaher, and Becton Dickinson. Their businesses center on the largest markets of immunoseological and biochemical testing. The major Japanese companies are Sysmex (the biggest player in the hematology field, FY3/12 sales of ¥134.7bn) and Eiken Chemical (the biggest maker of fecal occult blood testers, FY3/12 sales of ¥27.7bn). Hitachi High-Technologies and Toshiba Medical manufacture products for clinical testing equipment companies on a consignment basis.

### Diagnostic imaging systems

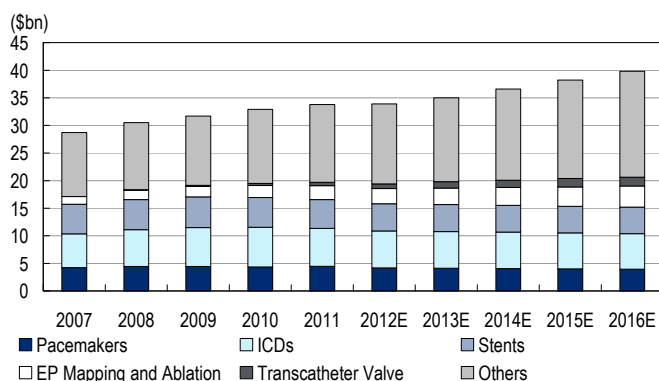
The imaging equipment and related markets are worth an estimated ¥47.9bn. Within that, the market for diagnostic imaging equipment is believed to be worth about ¥23.6bn (in 2011; see Figure 43), accounting for about half the overall market. We estimate the market sizes for major devices are: CT equipment \$4.3bn, MRI systems \$5bn, ultrasound diagnostic equipment \$5.2bn, X-ray diagnostic equipment \$6.9bn, and other \$2.4bn. The big three in this field are GE, Siemens, and Philips. They each have a 20%-30% market share for CT, MRI, ultrasound, and X-ray equipment, although there is some variation. Hitachi Medical and Toshiba are mid-tier players, with market shares for individual products ranging from single to double digits (Toshiba is competitive in CT equipment). Mindray and Samsung Electronics have entered the market for ultrasound and X-ray diagnostic equipment, mainly focusing on low-end products.

## Ophthalmology

The market for ophthalmological products has a value of around \$13.9bn (2011, Figure 44). We estimate the market sizes for major products are: contact lenses \$6.9bn, cataract treatment devices \$5.1bn, and other \$2.1bn. There are four big contact lens makers: Johnson & Johnson (market share of more than 40%), Novartis (group company CIVA Vision has a market share of around 25%), Cooper Visions (more than 15%), B&L (10%). Hoya also runs the EyeCity contact lens retailing business. The Japanese company Menicon (FY3/11 sales of ¥37.9bn) is a mid-tier maker.

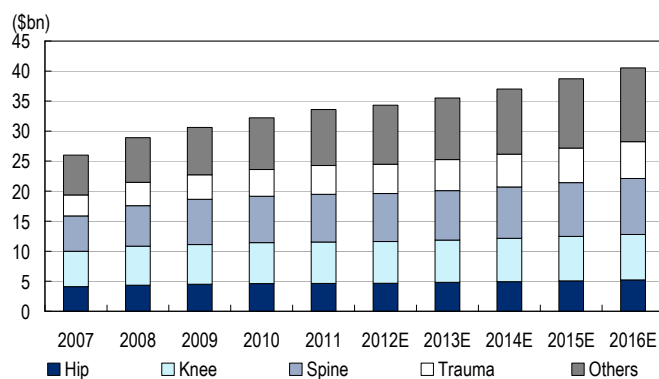
Alcon is the biggest maker of intraocular treatment products (market share of more than 50%) and has a broad lineup, ranging from intraocular lenses to treatment equipment. Hoya has the third largest share of the global intraocular lens market. Topcon (FY3/12 sales of ¥32.6bn) is a leading company in the niche fields of fundus cameras and surgical laser devices.

Figure 39. Market outlook in cardiovascular fields



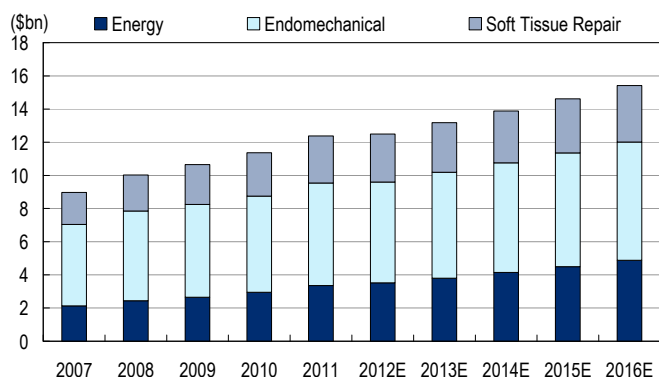
Source: Company data, Citi Research.

Figure 40. Market outlook in orthopedics implants



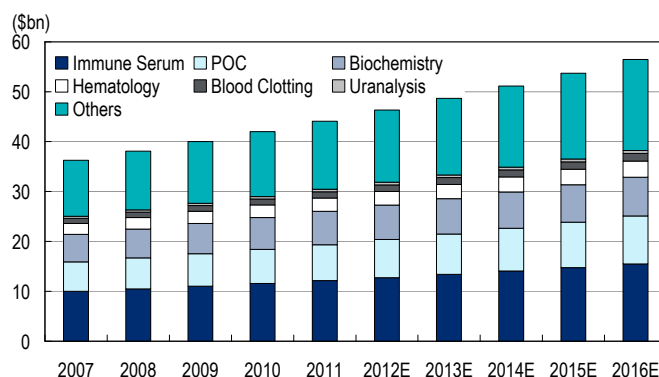
Source: Company data, Citi Research.

Figure 41. Market outlook in general surgical devices



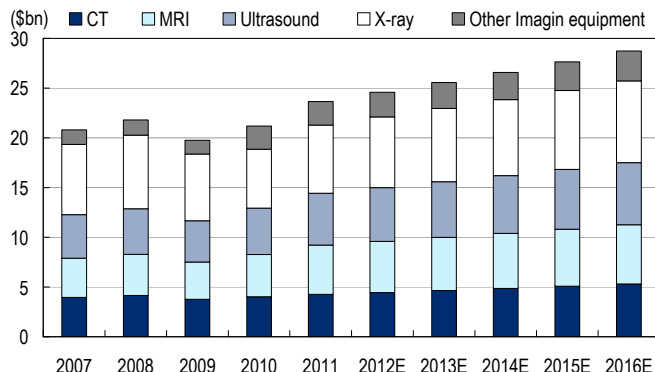
Source: Company data, Citi Research.

Figure 42. Market outlook in clinical testing equipment



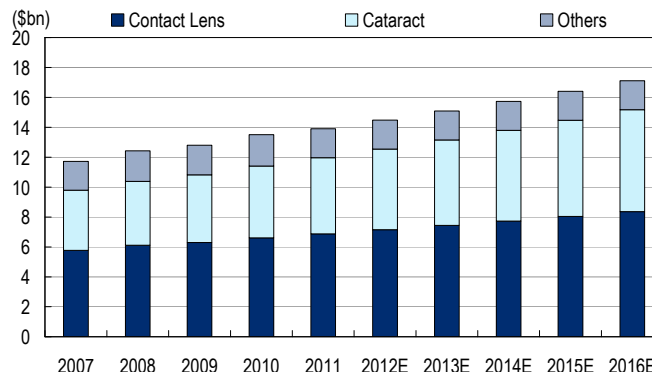
Source: Company data, Citi Research.

Figure 43. Market outlook in diagnostic imaging systems



Source: Company data, Citi Research.

Figure 44. Market outlook in ophthalmology



Source: Company data, Citi Research.

## Economic growth and healthcare system development are tailwinds for medical devices in emerging markets

### Medical expenses tend to expand with the economy

The market for medical devices in emerging markets continues to expand. In addition to aging populations, this is due to 1) the increase in healthcare expenses as a percentage of GDP accompanying economic growth; and 2) the development of healthcare systems (Figure 45). In 2010, healthcare expenses as a percentage of GDP were in double digits in most developed countries: 10% in Japan, 9%-12% in Europe, around 18% in the US. In most emerging markets they were in the single digits: around 9% in Brazil, 7% in Korea, 6% in Mexico, 5% in China, 5% in Russia, and 4% in India. We believe emerging market economies will continue to grow and that demand for medical devices will benefit not only from market growth accompanying GDP expansion but also from increased spending on healthcare as a percentage of GDP.

### Development of healthcare systems tailwind for emerging markets

We believe the development of healthcare systems in emerging markets is also contributing to the demand for medical devices. In 2009, healthcare expenditure as a percentage of government spending was above 15% in many developed nations: around 18% in Japan, 14%-20% in European countries, 20% in the US. The percentage was lower in emerging markets: China c12%, Korea 12%, Mexico 12%, Russia 8%, Brazil 6%, India 4%.

In emerging markets, we expect healthcare systems to expand and healthcare expenditure as a percentage of government spending to increase. For example, in 2009 China embarked on developing a health insurance system that will cover 90% of citizens. We expect China will continue to strengthen its healthcare infrastructure to eliminate dissatisfaction among the public. In India, where healthcare system development is lagging, the government is concentrating on improving the state health insurance plan and building out healthcare infrastructure.

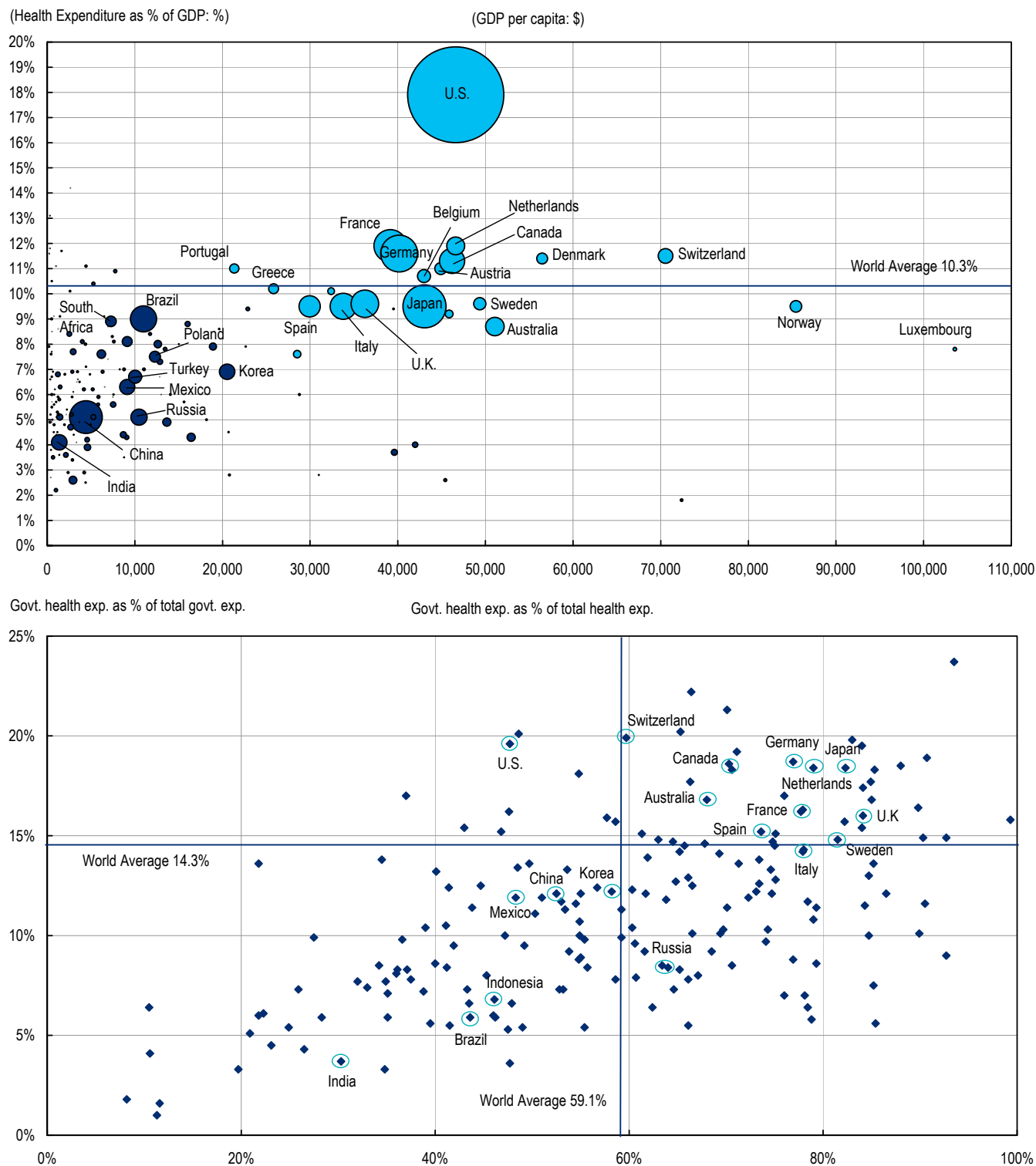
## Emerging market demand split between high-end and low-end products

### Emerging market demand split into high-end and low-end products

One feature of the market for medical devices in emerging markets is that it is divided into high-end and low-end products. The high-end market centers on the affluent and major city hospitals and the products are the same as those used in developed nations. The low-end market targets general medical facilities that serve the rest of the population and are not able to provide as high a standard of medical care. The products for this market are of inferior grade to those used in developed markets.

In China, hospitals are divided into Class 3 (500 or more beds), Class 2 (100-500 beds) and Class 1 (100 or fewer beds). Class 3 includes many major hospitals, and the highest ranked (3) hospitals, in particular, are introducing such high-end devices as CT, MRI, and radiotherapy systems and providing high level medical care using staff with overseas experience. But Class 2 and Class 1 hospitals, which account for the majority of China's hospitals and are more akin to small-town medical facilities, mainly use low-end products.

**Figure 45. Increase in healthcare expenses with GDP growth (top chart) and healthcare system development (bottom chart) driving demand for medical devices in emerging markets**



Note: Data for the top chart is from 2010. The vertical axis shows healthcare expenditure as a percentage of GDP and the horizontal axis shows per capital GDP. The size of the circles corresponds with overall healthcare costs. Data for the bottom chart is from 2009. The vertical axis shows healthcare expenditure as a percentage of government spending and the horizontal axis the percentage of overall healthcare funded by the government.  
Source: World Bank, WHO, Citi Research.



## 6. Medical device related companies

Figure 46. Medical device firms: Japanese firms (1)

Ticker	Company	Products	URL	Rating	Currency	Share Price	Target Price	Market Cap (bn)		PER			PBR	Total Sales (bn)			Total OP (bn)		
								Local	US \$	FY11 A	FY12 A/E	FY13 E		FY11 A	FY12 A/E	FY13 E	FY11 A	FY12 A/E	FY13 E
4543.JP	Terumo	Biomedical measurement systems, Cardiovascular treatment device (catheters, stents, etc.), blood systems, Disposable products	<a href="http://www.terumo.co.jp/">http://www.terumo.co.jp/</a>	2	JPY	4,235	4,400	804.1	8.8	33.3	26.3	20.1	2.28	386.7	398.7	449.4	63.0	53.9	68.3
6869.JP	Sysmex	Clinical testing equipment (mainly in the hematology field)	<a href="http://www.sysmex.co.jp/">http://www.sysmex.co.jp/</a>	1	JPY	4,915	6,200	506.5	5.5	42.1	37.5	25.2	4.94	134.7	141.4	173.6	19.2	21.2	31.5
3593.JP	Hogy Medical	Treatment products (medical-use non-woven fabric, kit products)	<a href="http://www.hogy.co.jp/">http://www.hogy.co.jp/</a>	2	JPY	4,645	4,300	73.1	0.8	15.8	14.0	14.0	1.14	31.9	33.4	34.1	7.8	8.3	8.6
6752.JP	Panasonic	Testing equipment, hospital operations equipment, home-use medical devices	<a href="http://panasonic.co.jp/">http://panasonic.co.jp/</a>	1	JPY	683	630	1,578.9	17.2	nm	nm	11.8	0.82	7,846.2	7,133.0	7,000.0	43.7	130.8	264.0
6758.JP	Sony	Monitors, digital cameras for medical use	<a href="http://www.sony.co.jp/">http://www.sony.co.jp/</a>	1	JPY	1,340	1,700	1,354.6	14.8	nm	nm	29.5	0.66	6,493.2	6,690.0	6,953.0	-67.3	141.0	213.4
6501.JP	Hitachi	Diagnostic imaging equipment, clinical testing equipment, radiotherapy equipment	<a href="http://www.hitachi.co.jp/">http://www.hitachi.co.jp/</a>	1	JPY	530	600	2,560.2	27.9	7.6	12.7	8.7	1.39	9,665.9	8,969.0	9,114.0	412.3	480.0	555.0
6502.JP	Toshiba	Diagnostic imaging equipment (CT, MRI, X-ray, ultrasound)	<a href="http://www.toshiba-medical.co.jp/">http://www.toshiba-medical.co.jp/</a>	1	JPY	424	550	1,795.6	19.6	24.7	16.0	9.6	2.07	6,100.3	5,914.0	6,200.0	206.6	249.0	358.0
6701.JP	NEC	ICT for medical use	<a href="http://jpn.nec.com/">http://jpn.nec.com/</a>	2	JPY	236	145	613.2	6.7	nm	19.2	24.0	0.93	3,036.8	3,086.0	3,067.3	73.7	119.0	109.0
6702.JP	Fujitsu	ICT for medical use	<a href="http://jp.fujitsu.com/">http://jp.fujitsu.com/</a>	1	JPY	426	470	881.5	9.6	20.8	nm	12.7	1.05	4,467.6	4,376.0	4,406.3	105.3	100.0	142.9
4901.JP	Fujifilm	Diagnostic imaging equipment, endoscopes	<a href="http://fms.fujifilm.co.jp/">http://fms.fujifilm.co.jp/</a>	1	JPY	1,802	2,100	868.0	9.5	21.5	18.1	11.2	0.50	2,195.3	2,189.2	2,247.9	112.9	106.0	148.0
7741.JP	HOYA	Ophthalmic products (intraocular lenses, contact lenses, etc.), endoscopes, orthopedics implants	<a href="http://www.hoyamed.com/">http://www.hoyamed.com/</a>	2	JPY	1,839	1,800	793.5	8.6	18.6	13.3	14.8	2.08	376.9	363.9	380.5	58.5	70.0	66.0
7751.JP	Canon	Diagnostic imaging equipment, ophthalmic products	<a href="http://www.canon.com/">http://www.canon.com/</a>	1	JPY	3,375	3,900	3,890.7	42.4	16.5	17.7	12.4	1.76	3,557.4	3,479.8	3,749.8	378.1	323.9	470.0
7733.JP	Olympus	Endoscopes, surgical devices	<a href="http://www.olympus.co.jp/">http://www.olympus.co.jp/</a>	2	JPY	2,075	2,200	580.9	6.3	nm	nm	22.5	11.53	848.5	736.5	661.7	35.5	35.0	73.0
3407.JP	Asahi Kasei	Dialysis-related products (dialyzers, etc.), defibrillators	<a href="http://www.asahi-kasei.co.jp/">http://www.asahi-kasei.co.jp/</a>	1	JPY	569	630	795.3	8.7	14.3	15.7	11.7	1.13	1,573.2	1,665.0	1,755.0	104.3	90.0	113.0
4118.JP	Kaneka	Biomedical measurement systems, treatment products	<a href="http://www.kaneka-med.jp/">http://www.kaneka-med.jp/</a>	2	JPY	507	400	170.8	1.9	31.6	20.1	14.2	0.69	469.3	480.0	497.0	13.2	17.5	22.0
4188.JP	Mitsubishi Chemical	Clinical testing equipment, Clinical equipments and supplies	<a href="http://www.medience.co.jp/">http://www.medience.co.jp/</a>	2	JPY	438	430	645.7	7.0	18.2	30.7	13.2	0.84	3,208.2	3,105.0	3,200.0	130.6	98.0	136.0
3401.JP	Teijin	Home medical devices (respirators, etc)	<a href="http://www.teijin.co.jp/">http://www.teijin.co.jp/</a>	2	JPY	219	210	215.2	2.3	18.0	nm	nm	0.74	854.4	734.2	774.8	34.0	13.0	19.0
3402.JP	Toray	Dialysis related products (dialyzers, etc.), treatment products	<a href="http://www.toray.co.jp/">http://www.toray.co.jp/</a>	1	JPY	577	590	940.1	10.2	14.6	18.3	14.6	1.50	1,588.6	1,611.3	1,706.4	107.7	88.0	104.0
3405.JP	Kuraray	Dental materials	<a href="http://www.kuraray.co.jp/">http://www.kuraray.co.jp/</a>	2	JPY	1,272	1,190	443.4	4.8	14.1	15.4	13.9	1.23	369.0	373.4	401.6	54.7	49.0	54.0
6645.JP	Omron	Biomedical measurement systems (thermometers, scales, etc.,)	<a href="http://www.omron.co.jp/">http://www.omron.co.jp/</a>	2	JPY	2,272	2,100	500.1	5.4	30.5	17.6	15.3	1.56	619.5	645.5	680.0	40.1	46.4	52.8
7011.JP	Mitsubishi Heavy Industries	Radiotherapy equipment	<a href="http://www.mhi.co.jp/">http://www.mhi.co.jp/</a>	2	JPY	525	550	1,761.5	19.2	nm	24.8	18.8	1.40	2,820.9	2,947.0	3,251.0	112.0	149.1	190.9
6302.JP	Sumitomo Heavy Industries	Radiotherapy equipment (PET, BNCT, proton therapy etc.,)	<a href="http://www.shi.co.jp/">http://www.shi.co.jp/</a>	2	JPY	405	400	248.5	2.7	12.7	16.8	12.7	0.89	624.1	600.0	587.0	47.1	32.6	34.5

Note: Sales and OP: Citi Research forecasts for companies in our coverage, Bloomberg consensus for companies not in Citi Research coverage. Share price and market cap is as of February 25. NR denotes Non-rated.

NA: Not available. NM: Not meaningful.

Source: Company data, Bloomberg, Citi Research.

Figure 47. Medical device firms: Japanese firms (2)

Ticker	Company	Products	URL	Rating	Currency	Share Price	Target Price	Market Cap (bn)		PER			PBR	Total Sales (bn)			Total OP (bn)		
								Local	US \$	FY11 A	FY12 A/E	FY13 E		FY11 A	FY12 A/E	FY13 E	FY11 A	FY12 A/E	FY13 E
4544.JP	Miraca HD	Clinical testing equipment	<a href="http://www.miraca-holdings.co.jp/">http://www.miraca-holdings.co.jp/</a>	NR	JPY	4,360	-	254.5	2.8	20.7	16.7	16.2	2.23	175.4	193.2	199.4	23.2	25.5	26.6
6965.JP	Hamamatsu Photonics	Biomedical measurement systems	<a href="http://jp.hamamatsu.com/">http://jp.hamamatsu.com/</a>	NR	JPY	3,695	-	297.1	3.2	21.7	23.9	20.4	2.12	101.9	102.4	109.2	21.8	18.5	21.6
7701.JP	Shimadzu	Diagnostic imaging equipment (X-ray related , etc.,)	<a href="http://www.shimadzu.co.jp/">http://www.shimadzu.co.jp/</a>	NR	JPY	593	-	174.9	1.9	19.3	21.8	15.4	1.08	266.3	265.8	276.3	19.4	14.5	18.7
6849.JP	Nihon Kohden	Biomedical measurement systems (EEG, ECG, patient monitors, etc.) defibrillators	<a href="http://www.nihonkohden.co.jp/">http://www.nihonkohden.co.jp/</a>	NR	JPY	3,345	-	147.0	1.6	19.3	17.3	15.6	2.17	120.7	130.5	141.3	12.0	13.6	15.3
3360.JP	Ship Healthcare	Clinical equipment, distributor (disposable products)	<a href="http://shiphd.co.jp/">http://shiphd.co.jp/</a>	NR	JPY	2,652	-	109.5	1.2	15.6	13.5	12.1	3.15	188.8	221.2	239.9	10.1	12.2	13.7
6856.JP	Horiba	Clinical testing equipment (blood testing instruments)	<a href="http://www.horiba.com/">http://www.horiba.com/</a>	NR	JPY	2,930	-	123.9	1.3	nm	16.1	14.0	15.44	3.8	124.5	131.1	0.3	12.4	14.2
8086.JP	Nipro	Dialysis-related products (dialyzers, needle, blood circuit, etc.), disposable products(Infusion, insulin needle, etc.), catheter	<a href="http://www.nipro.co.jp/">http://www.nipro.co.jp/</a>	NR	JPY	737	-	125.7	1.4	23.8	14.5	19.6	1.14	212.0	236.7	252.6	15.8	13.3	14.7
6376.JP	Nikkiso	Dialysis related products (hemodialysis machines, dialyzers, blood circuits, etc)	<a href="http://www.nikkiso.co.jp/">http://www.nikkiso.co.jp/</a>	NR	JPY	1,045	-	80.6	0.9	24.6	14.8	16.0	1.63	90.1	97.4	101.4	6.6	7.3	8.9
4974.JP	Takara Bio	Dental equipment and materials, Biochemical equipment	<a href="http://www.takara-bio.co.jp/">http://www.takara-bio.co.jp/</a>	NR	JPY	1,419	-	160.8	1.8	nm	nm	nm	4.18	19.6	20.8	22.2	1.5	1.7	1.9
7716.JP	Nakanishi	Dental equipment	<a href="http://www.nsk-nakanishi.co.jp/">http://www.nsk-nakanishi.co.jp/</a>	NR	JPY	10,870	-	64.0	0.7	13.9	13.6	13.1	1.88	22.3	23.6	24.5	7.2	7.4	7.7
7747.JP	Asahi Intecc	Cardiovascular treatment device (PTCA guide wire)	<a href="http://www.asahi-intecc.co.jp/">http://www.asahi-intecc.co.jp/</a>	NR	JPY	4,515	-	68.3	0.7	nm	25.3	20.5	4.99	16.0	19.3	21.7	3.2	4.0	5.0
6960.JP	Fukuda Elec	Biomedical measurement systems (ECG, patient monitors, etc.,) defibrillators	<a href="http://www.fukuda.co.jp/">http://www.fukuda.co.jp/</a>	NR	JPY	3,050	-	47.2	0.5	9.8	9.5	9.2	0.63	92.5	950.0	98.0	9.2	9.6	9.9
6910.JP	Hitachi Medical	Diagnostic imaging equipment (CT, MRI, X-ray, ultrasound)	<a href="http://www.hitachi-medical.co.jp/">http://www.hitachi-medical.co.jp/</a>	NR	JPY	1,318	-	51.6	0.6	37.4	14.5	13.2	0.71	166.2	162.6	165.7	4.3	4.7	5.5
7732.JP	Topcon	Ophthalmic products (testing equipment and laser therapy equipment)	<a href="http://www.topcon.co.jp/">http://www.topcon.co.jp/</a>	NR	JPY	942	-	87.2	1.0	nm	nm	28.5	2.72	98.8	98.3	103.4	2.1	5.2	7.8
7730.JP	Mani	Surgical device (eyeless suture needles, ophthalmic and dental treatment instruments)	<a href="http://www.mani.co.jp/">http://www.mani.co.jp/</a>	NR	JPY	3,200	-	35.8	0.4	16.7	16.3	15.2	1.89	9.7	9.9	10.5	3.5	3.6	3.8
7749.JP	Medikit	Dialysis safety needle, vein indwelling needle, catheters, etc.,)	<a href="http://www.medikit.co.jp/">http://www.medikit.co.jp/</a>	NR	JPY	3,000	-	28.1	0.3	13.8	14.0	12.9	0.91	14.1	14.7	15.3	3.7	3.3	3.7
4549.JP	Eiken	Clinical testing equipment	<a href="http://www.eiken.co.jp/">http://www.eiken.co.jp/</a>	NR	JPY	1,274	-	23.2	0.3	16.0	13.7	12.2	1.08	27.7	28.5	29.4	2.4	2.6	3.0
6678.JP	Techno Medica	Laboratory automation systems	<a href="http://www.technomedica.co.jp/">http://www.technomedica.co.jp/</a>	NR	JPY	491,500	-	14.4	0.2	13.4	12.0	10.6	1.58	8.0	10.0	11.0	1.8	2.0	2.2
7979.JP	Shofu	Dental equipment and materials	<a href="http://www.shofu.co.jp/">http://www.shofu.co.jp/</a>	NR	JPY	885	-	14.1	0.2	27.9	nm	47.6	0.77	16.0	16.1	16.5	1.0	0.8	0.9
7774.JP	J-TEC	Orthopedic implants	<a href="http://www.jpte.co.jp/">http://www.jpte.co.jp/</a>	NR	JPY	206,200	-	37.7	0.4	nm	nm	nm	11.11	0.5	0.6	1.3	-1.1	-1.1	-0.7
6951.JP	JEOL	Biochemical equipment for medical use	<a href="http://www.jeol.co.jp/">http://www.jeol.co.jp/</a>	NR	JPY	350	-	27.4	0.3	nm	20.3	12.3	1.92	83.2	79.8	85.3	-1.2	2.5	4.2

Note: Sales and OP: Citi Research forecasts for companies in our coverage, Bloomberg consensus for companies not in Citi Research coverage. Share price and market cap is as of February 25. NR denotes Non-rated. NA: Not available. NM: Not meaningful.

Source: Company data, Bloomberg, Citi Research.

Figure 48. Medical device firms: Japanese firms (3)

Ticker	Company	Products	URL	Rating	Currency	Share Price	Target Price	Market Cap (bn)		PER			PBR	Total Sales (bn)			Total OP (bn)		
								Local	US \$	FY11 A	FY12 A/E	FY13 E		FY11 A	FY12 A/E	FY13 E	FY11 A	FY12 A/E	FY13 E
7702.JP	JMS	Dialysis related products (dialyzers, etc.), disposable products (infusion, transfusion, etc), pump-oxygenator	<a href="http://www.jms.cc/">http://www.jms.cc/</a>	NR	JPY	349	-	15.1	0.2	16.0	10.5	10.2	0.60	46.8	48.0	49.5	1.1	2.2	2.3
7703.JP	Kawasumi	Dialysis related products (dialyzers, etc.), disposable products (infusion, transfusion, etc.), stent graft	<a href="http://www.kawasumi.jp/">http://www.kawasumi.jp/</a>	NR	JPY	579	-	13.2	0.1	8.8	33.1	18.9	0.41	30.3	29.0	30.5	1.5	1.4	1.5
6814.JP	Furuno	Sensor for medical use	<a href="http://www.furuno.co.jp/">http://www.furuno.co.jp/</a>	NR	JPY	491	-	15.5	0.2	nm	13.3	7.5	0.51	77.3	71.0	78.0	2.2	1.8	3.2
7775.JP	Daiken	Suction machine, disposable products (infuser, etc.)	<a href="http://www.daiken-iki.co.jp/">http://www.daiken-iki.co.jp/</a>	NR	JPY	2,139	-	15.9	0.2	39.6	19.9	16.8	3.60	6.5	7.2	7.9	1.0	1.3	1.6
7503.JP	IMI	Distributor (biomedical measurement system, respirator, etc.)	<a href="http://www.imimed.co.jp/">http://www.imimed.co.jp/</a>	NR	JPY	1,535	-	8.0	0.1	8.0	9.1	NA	0.69	7.9	9.5	NA	1.8	1.7	NA
5187.JP	Create Medic	Catheters	<a href="http://www.creatededic.co.jp/">http://www.creatededic.co.jp/</a>	NR	JPY	821	-	7.9	0.1	15.4	14.2	12.8	0.69	9.3	9.6	9.9	0.7	0.9	1.0
2744.JP	Win International	Distributor (cardiovascular fields)	<a href="http://www.win-int.co.jp/">http://www.win-int.co.jp/</a>	NR	JPY	775	-	9.5	0.1	9.9	9.4	7.8	1.30	33.0	33.8	38.7	1.6	1.7	2.0
7600.JP	Japan MDM	Orthopedic implants	<a href="http://www.jmdm.co.jp/">http://www.jmdm.co.jp/</a>	NR	JPY	252	-	6.7	0.1	nm	nm	39.4	0.60	8.1	8.3	9.2	0.3	0.1	0.5
6823.JP	Rion	Hearing aids	<a href="http://www.rion.co.jp/">http://www.rion.co.jp/</a>	NR	JPY	737	-	7.7	0.1	13.8	11.1	9.7	0.69	16.6	17.1	17.8	1.3	1.5	1.7
7575.JP	Japan Life line	Cardiovascular treatment device, disposable products	<a href="http://www.jll.co.jp/">http://www.jll.co.jp/</a>	NR	JPY	566	-	6.1	0.1	8.5	13.6	11.6	0.41	23.1	22.0	22.7	1.1	0.8	0.9
7745.JP	Japan Life line	Biomedical measurement systems (thermometers, manometer, etc.)	<a href="http://www.aandd.co.jp/">http://www.aandd.co.jp/</a>	NR	JPY	371	-	7.5	0.1	13.2	8.9	8.3	0.60	31.0	34.0	35.5	1.0	1.6	1.8
3079.JP	DVX	Distributor (cardiovascular fields)	<a href="http://www.dvx.jp/">http://www.dvx.jp/</a>	NR	JPY	1,340	-	7.6	0.1	7.9	15.1	12.2	1.28	20.5	22.2	24.7	0.9	1.0	1.2
3154.JP	Medius	Distributor (imaging, cardiovascular, ophthalmology fields)	<a href="http://www.medius.co.jp/">http://www.medius.co.jp/</a>	NR	JPY	2,200	-	6.3	0.1	14.2	9.8	8.3	1.13	132.8	136.0	139.0	0.8	1.0	1.2
7743.JP	Seed	Contact lens	<a href="http://www.seed.co.jp/">http://www.seed.co.jp/</a>	NR	JPY	1,083	-	8.3	0.1	44.5	9.9	17.9	1.46	12.7	15.0	16.0	0.3	0.8	0.9
7707.JP	PSS	Clinical testing equipment	<a href="http://www.pss.co.jp/">http://www.pss.co.jp/</a>	NR	JPY	147,700	-	13.5	0.1	nm	nm	nm	5.48	3.5	4.3	4.5	-0.1	0.1	0.2
3022.JP	Yamashitaika	Distributor (imaging, orthopedics, clinical testing equipment, etc.)	<a href="http://www.yamashitaika.co.jp/">http://www.yamashitaika.co.jp/</a>	NR	JPY	1,476	-	3.8	0.0	18.6	12.6	11.4	0.74	44.4	45.5	46.5	0.4	0.4	0.6
7535.JP	Goodmann	Cardiovascular treatment device (catheter, stent, etc.)	<a href="http://www.goodmankk.com/">http://www.goodmankk.com/</a>	NR	JPY	336	-	3.7	0.0	nm	nm	24.7	1.44	10.9	11.3	12.5	0.8	0.4	0.7
3604.JP	Kawamoto Sangyo	Disposable products (glove, sponge, etc.)	<a href="http://www.kawamoto-sangyo.co.jp/">http://www.kawamoto-sangyo.co.jp/</a>	NR	JPY	487	-	2.9	0.0	16.9	10.8	7.1	0.63	29.7	30.4	31.0	0.4	0.6	0.7
6757.JP	OSG	Water purifier	<a href="http://www.osg-nandemonet.co.jp/">http://www.osg-nandemonet.co.jp/</a>	NR	JPY	400	-	1.8	0.0	12.6	12.5	10.5	0.98	5.3	5.1	5.5	0.4	0.3	0.4
3583.JP	Aubex	Anesthesia products, guidewire	<a href="http://www.aubex.co.jp/">http://www.aubex.co.jp/</a>	NR	JPY	115	-	1.6	0.0	3.9	8.9	6.8	0.61	3.8	3.9	4.1	0.3	0.3	0.4

Note: Sales and OP: Citi Research forecasts for companies in our coverage, Bloomberg consensus for companies not in Citi Research coverage. Share price and market cap is as of February 25. NR denotes Non-rated. NA: Not available. NM: Not meaningful.

Source: Company data, Bloomberg, Citi Research.

Figure 49. Medical device firms: Global firms (1)

Ticker	Company	Products	URL	Rating	Currency	Share Price	Target Price	Market Cap (bn)		PER (x)			PBR (x)	Total Sales (bn)			Total OP (bn)		
								Local	US \$	FY11 A	FY12 A/E	FY13 E		FY11 A	FY12 A/E	FY13 E	FY11 A	FY12 A/E	FY13 E
GE.US	General Electric	Diagnostic imaging equipment, biomedical measurement systems	<a href="http://www.ge.com/">http://www.ge.com/</a>	1	USD	22.81	25.00	239.2	239.2	16.5	15.0	13.8	2.08	144,063	147,359	149,959	43,377	38,986	39,595
JNJ.US	Johnson & Johnson	Orthopedic implants, surgical device, cardiovascular treatment devices, diabetes-related equipment, clinical testing equipment, ophthalmic products, operating equipment and supplies	<a href="http://www.jnj.com/">http://www.jnj.com/</a>	1	USD	75.57	80.00	209.4	209.4	15.1	14.8	14.1	3.63	65,030	67,224	71,390	16,240	17,418	18,605
NOVN.CH	Novartis	Ophthalmic products (contact lens, cataract-related products, etc.)	<a href="http://www.novartis.com/">http://www.novartis.com/</a>	1	CHF	65.00	72.00	175.9	188.7	11.7	12.3	12.3	2.38	58,561	56,673	57,341	10,993	11,532	11,043
ROG.CH	Roche	Clinical testing equipment, diabetes-related equipment	<a href="http://www.roche.com/">http://www.roche.com/</a>	2	CHF	215.10	210.00	151.1	162.1	17.5	15.8	14.0	15.07	42,531	45,499	47,028	13,454	14,125	16,265
ABT.US	Abbott Laboratories	Clinical testing equipment, cardiovascular treatment device, diabetes-related equipment, ophthalmic products	<a href="http://www.abbott.com/">http://www.abbott.com/</a>	3	USD	34.27	29.00	53.8	53.8	19.7	21.6	22.3	4.34	21,564	21,605	22,421	4,508	4,152	4,049
SIEGn.DE	Siemens	Diagnostic imaging equipment, biomedical measurement systems, clinical testing equipment	<a href="http://www.siemens.com/">http://www.siemens.com/</a>	1	EUR	79.67	100.00	70.2	91.7	10.3	10.8	11.4	2.31	74,417	78,296	78,145	8,751	7,045	6,914
MMM.US	3M	Medical supplies, treatment equipment, dental equipment and supplies	<a href="http://www.3m.com/">http://www.3m.com/</a>	2	USD	101.75	96.00	70.2	70.2	17.1	16.1	15.1	4.54	29,611	29,904	31,339	6,178	6,483	6,853
MDT.US	Medtronic	Cardiovascular treatment device, nervous system treatment equipment, orthopedic implants, surgical device	<a href="http://www.medtronic.com/">http://www.medtronic.com/</a>	1	USD	43.88	54.00	44.4	44.4	13.0	12.7	11.9	2.89	15,932	16,396	16,540	5,015	5,213	5,238
DHR.US	Danaher	Clinical testing equipment, dental equipment and supplies	<a href="http://www.danaher.com/">http://www.danaher.com/</a>	1	USD	59.89	67.00	41.2	41.2	21.6	18.6	17.3	2.50	16,091	18,260	19,163	2,680	3,095	3,376
BAX.US	Baxter International Inc	Transfusion-related products, dialysis related products	<a href="http://www.baxter.com/">http://www.baxter.com/</a>	2	USD	67.10	69.00	36.6	36.6	15.6	14.8	14.1	5.52	13,893	14,190	14,768	3,258	3,246	3,442
COV.BM	Covidien	Surgical device, operating equipment and supplies, biomedical measurement systems, energy devices	<a href="http://www.covidien.com/">http://www.covidien.com/</a>	1	USD	61.70	71.00	29.1	29.1	15.6	14.5	13.9	3.09	11,574	11,852	12,540	2,568	2,668	2,750
CSL.AU	CSL	Transfusion related products	<a href="http://www.csl.com.au/">http://www.csl.com.au/</a>	3	AUD	58.61	51.15	29.2	30.0	0.3	0.3	0.2	0.08	4,228	4,772	5,060	1,154	1,268	1,543
PHG.NL	Philips	Diagnostic imaging equipment, biomedical measurement systems, defibrillators	<a href="http://www.philips.com/">http://www.philips.com/</a>	3	EUR	21.81	19.30	20.9	27.3	31.8	15.1	13.1	1.55	22,578	24,788	23,628	-269	1,030	2,007
FMEG.DE	Fresenius Medical Care	Dialysis related products (hemodialysis machines, dialyzers, blood circuits, etc.)	<a href="http://www.fmc-ag.com/">http://www.fmc-ag.com/</a>	2	EUR	52.32	56.20	15.8	20.7	14.8	14.4	13.4	2.01	12,571	13,744	14,692	2,075	2,334	2,471
SYK.US	Stryker	Orthopedic implants, surgical device, endoscopes	<a href="http://www.stryker.com/">http://www.stryker.com/</a>	2	USD	62.09	68.00	23.6	23.6	16.7	15.2	14.3	2.94	8,306	8,655	9,031	2,094	2,206	2,279
BDX.US	Becton, Dickinson	Clinical testing equipment, operating equipment and supplies	<a href="http://www.bd.com/">http://www.bd.com/</a>	2	USD	86.85	90.00	16.8	16.8	16.3	16.1	15.2	4.33	7,584	7,708	7,989	1,666	1,579	1,600
CAH.US	Cardinal Health	Clinical devices, operating equipment and supplies	<a href="http://www.cardinal.com/">http://www.cardinal.com/</a>	1	USD	45.22	47.00	15.4	15.4	16.1	14.1	13.0	2.70	102,644	107,551	100,168	1,514	1,790	1,929
STJ.US	St Jude Medical	Cardiovascular treatment device, nervous system treatment equipment	<a href="http://www.sjm.com/">http://www.sjm.com/</a>	3	USD	40.73	32.00	12.6	12.6	12.4	11.7	10.9	2.93	5,612	5,503	5,530	1,473	1,491	1,450
ZMH.US	Zimmer Holdings Inc	Orthopedic implants, surgical device, dental equipment and supplies	<a href="http://www.zimmer.com/">http://www.zimmer.com/</a>	3	USD	73.07	69.00	12.7	12.7	15.2	13.8	12.8	2.36	4,452	4,471	4,604	1,269	1,318	1,380
EW.US	Edwards Lifesciences	Cardiovascular treatment device, biomedical measurement systems	<a href="http://www.edwards.com/">http://www.edwards.com/</a>	2	USD	86.50	98.00	10.0	10.0	42.9	32.2	26.5	3.16	1,679	1,900	2,150	300	417	499
SN.GB	Smith & Nephew	Orthopedic implants, operating equipment and supplies (wound dressings)	<a href="http://global.smith-nephew.com/">http://global.smith-nephew.com/</a>	1	GBP	7.06	7.97	6.4	9.7	0.1	0.1	0.1	0.02	4,270	4,137	4,489	925	922	974
BCR.US	C.R. Bard Inc	Cardiovascular treatment device, surgical device, orthopedic implants	<a href="http://www.crbard.com/">http://www.crbard.com/</a>	2	AUD	98.02	99.00	7.8	8.0	15.3	14.9	16.1	4.72	2,896	2,958	2,990	829	820	736
BSX.US	Boston Scientific	Cardiovascular treatment device, nervous system treatment equipment	<a href="http://www.bostonscientific.com/">http://www.bostonscientific.com/</a>	1	USD	7.23	8.20	9.8	9.8	16.3	17.7	17.1	0.96	7,622	7,246	7,172	1,630	1,508	1,423
SOON.CH	Sonova	Hearing aids	<a href="http://www.sonova.com/">http://www.sonova.com/</a>	1	CHF	113.60	107.00	7.6	8.1	28.4	29.5	24.2	5.55	1,617	1,620	1,802	271	293	369

Note: Sales and OP: Citi Research forecasts for companies in our coverage, Bloomberg consensus for companies not in Citi Research coverage. Share price and market cap is as of February 25. NR denotes Non-rated. NA: Not available. NM: Not meaningful.

Source: Company data, Bloomberg, Citi Research.

Figure 50. Medical device related companies: Global firms (2)

Ticker	Company	Products	URL	Rating	Currency	Share Price	Target Price	Market Cap (bn)		PER			PBR	Total Sales (bn)			Total OP (bn)		
								Local	US \$	FY11 A	FY12 A/E	FY13E		FY11 A	FY12 A/E	FY13 E	FY11 A	FY12 A/E	FY13 E
VAR.US	Varian Medical Systems	Radiotherapy equipment, Diagnostic imaging equipment	<a href="http://www.varian.com/">http://www.varian.com/</a>	2	USD	69.21	63.00	7.6	7.6	20.2	18.4	16.8	6.42	2,597	2,807	3,052	588	594	632
HSP.US	Hospira	Disposable products (transfusion, waste solution, etc.)	<a href="http://www.hospira.com/">http://www.hospira.com/</a>	3	USD	29.11	27.00	4.8	4.8	9.5	14.5	14.3	1.66	4,057	4,092	4,164	669	456	470
RMD.US	ResMed	Artificial respirator	<a href="http://www.resmed.com/">http://www.resmed.com/</a>	1	USD	4.23	5.26	6.8	6.8	0.0	0.0	0.0	0.00	1,243	1,369	1,486	267	294	376
WDH.DK	William Demant	Hearing aids	<a href="http://www.demant.com/">http://www.demant.com/</a>	2	DKK	482.00	524.00	28.2	4.9	23.5	22.4	17.7	8.53	8,041	8,707	9,566	1,703	1,733	2,076
XRAY.US	Dentsply	Dental equipment and materials	<a href="http://www.dentsply.com/">http://www.dentsply.com/</a>	2	USD	40.86	39.65	5.8	5.8	20.2	18.4	16.9	3.13	2,538	2,923	3,025	301	404	463
HOLX.US	Hologic	Diagnostic imaging equipment	<a href="http://www.hologic.com/">http://www.hologic.com/</a>	1	USD	21.57	24.00	5.8	5.8	17.1	15.6	13.6	1.53	1,789	2,014	2,638	544	622	856
COO.US	Cooper Companies Inc	Ophthalmic products (contact lens, etc.)	<a href="http://cooperco.com/">http://cooperco.com/</a>	2	USD	102.33	102.00	4.9	4.9	22.8	19.8	16.8	2.36	1,332	1,445	1,626	260	288	345
SIRO.US	Sirona	Dental equipment and materials	<a href="http://www.sirona.com/">http://www.sirona.com/</a>	1	USD	70.65	80.10	4.0	4.0	33.2	30.0	25.0	4.23	914	979	1,095	161	186	209
STMN.CH	Straumann Holdings	Dental equipment and materials	<a href="http://www.straumann.com/">http://www.straumann.com/</a>	1	CHF	127.90	137.40	2.0	2.2	33.1	25.1	18.7	2.98	694	704	710	120	105	126
ANN.AU	Ansell	Disposable products (glove)	<a href="http://www.ansell.com/">http://www.ansell.com/</a>	2	AUD	15.78	16.14	2.1	2.1	0.2	0.2	0.2	0.03	1,207	1,255	1,340	137	153	169
MASI.US	Masimo Corp	Biomedical measurement systems	<a href="http://www.masimo.com/">http://www.masimo.com/</a>	3	USD	19.51	20.00	1.1	1.1	18.7	18.3	17.1	4.04	439	493	542	87	85	92
NOBN.CH	Nobel Biocare	Dental equipment and materials	<a href="http://www.nobelbiocare.com/">http://www.nobelbiocare.com/</a>	3	CHF	9.00	8.20	1.1	1.2	30.1	29.9	30.0	3.93	569	583	594	72	70	70
IART.US	Integra Lifesciences	Surgical devices	<a href="http://www.integralife.com/">http://www.integralife.com/</a>	1	USD	39.34	45.00	1.1	1.1	14.1	12.8	12.4	2.50	780	831	872	131	139	137
SPNC.US	Spectranetics	Cardiovascular treatment devices (ELA equipment, catheters, etc.)	<a href="http://www.spectranetics.com/">http://www.spectranetics.com/</a>	1	USD	17.70	17.00	0.6	0.6	nm	nm	nm	7.57	127	140	154	3	3	1
CYNO.US	Cynosure Inc	Laser equipment for medical use	<a href="http://www.cynosure.com/">http://www.cynosure.com/</a>	1	USD	26.44	36.00	0.4	0.4	nm	33.3	31.0	2.89	111	153	180	-1	12	17
MR.CN	Mindray	Diagnostic imaging equipment, biomedical measurement systems	<a href="http://www.mindray.com/">http://www.mindray.com/</a>	1	USD	36.67	36.00	4.3	4.3	23.3	20.8	17.9	3.70	881	1,053	1,243	167	200	241
1066.CN	Shandong Weigao	Disposable products (infusers, transfusion-related, etc.), dialysis-related products, stent	<a href="http://www.weigaogroup.com/">http://www.weigaogroup.com/</a>	2H	HKD	6.8	-	32.4	4.2	7.7	23.4	19.2	3.20	3,831	4,835	5,929	1,081	1,242	1,559
0853.CN	MicroPort Scientific	Cardiovascular treatment device (stent)	<a href="http://www.microport.com.cn/">http://www.microport.com.cn/</a>	1	HKD	4.83	5.20	6.8	0.9	23.6	18.9	15.2	2.68	853	1,038	1,260	331	419	526
005930.KR	Samsung Electronics	Diagnostic imaging equipment, biomedical measurement systems	<a href="http://www.samsung.com/">http://www.samsung.com/</a>	1	KRW	1,530,000	1,970,000	207.4	207.4	16.8	9.6	6.6	2.31	165,002	201,104	232,618	15,644	29,049	42,382
COH.AU	Cochlear	Cochlear implants	<a href="http://www.cochlear.com/">http://www.cochlear.com/</a>	3	AUD	70.44	54.73	4.0	4.1	0.2	0.3	0.3	0.08	810	779	783	240	215	217
CFN.US	CareFusion	Respirators, orthopedic implants, Surgical device, biomedical measurement systems	<a href="http://www.carefusion.com/">http://www.carefusion.com/</a>	1	USD	31.65	37.00	7.0	7.0	19.3	17.8	14.7	1.39	3,528	3,601	3,683	602	627	744
GETIb.SE	Getinge Group	Clinical devices	<a href="http://www.getinge.com/">http://www.getinge.com/</a>	NR	SEK	196.50	-	43.7	6.7	18.5	18.6	17.1	3.08	21,854	24,248	26,036	4,060	4,190	4,536
DRWG.DE	Drägerwerk AG	Anesthesia equipment, ventilators, biomedical measurement systems	<a href="http://www.draeger.com/">http://www.draeger.com/</a>	NR	EUR	80.97	-	0.8	1.1	11.2	11.1	10.5	1.97	2,256	2,374	2,450	215	219	231
Unlisted	Biomet	Orthopedic implants	<a href="http://www.biomet.com/">http://www.biomet.com/</a>	NR	USD	-	-	-	-	-	-	-	-	2,732	2,838	-	-577	-93	-
Unlisted	B.Braun	Orthopedic implants, surgical device, operating equipment and supplies	<a href="http://www.bbraun.com/">http://www.bbraun.com/</a>	NR	USD	-	-	-	-	-	-	-	-	4,609	-	-	450	-	-

Note: Sales and OP: Citi Research forecasts for companies in our coverage, Bloomberg consensus for companies not in Citi Research coverage. Share price and market cap is as of February 25. NR denotes Non-rated. NA: Not available. NM: Not meaningful.  
Source: Company data, Bloomberg, Citi Research.

## 7. Individual Companies

### Terumo (4543)

Hidemaru Yamaguchi

#### Can it hone international competitiveness and grow in emerging markets?

- **Overview of medical device business** — Terumo is one of the few major medical device specialists in Japan. Sales break down to around 40% cardiovascular, 20% blood management systems (including BCT), and 40% general hospital systems. Globally, Terumo ranks 18th in sales and around 12th excluding imaging diagnostics and drugs. Among Japanese firms, it ranks as one of the Big 3, the others being Toshiba and Olympus. It is an integrated maker of medical devices, handling standardized products and also developing cutting-edge products in each of the areas in which it operates. In many areas it has a commanding domestic market share; for instance, it has 60% of the market in syringes. In blood management systems, it became the global leader with the 2011 acquisition of BCT, with a global market share of around 40%. In cardiovascular products, Terumo is strong in basic products such as guidewires and introducers but a little weak in cutting-edge areas. In cerebral aneurysm coils, Terumo acquired MicroVention in 2006 and built a global foothold. Currently it has a global market share of around 30%.
- **Earnings contribution** — Terumo is a specialist in medical devices, so the earnings contribution is 100%. We are modeling an earnings decline in FY3/13, on lower NHI reimbursement prices (¥7bn negative impact), higher costs to respond to FDA requirements in the US artificial lung business, higher R&D spending, yen strength through to H1, and a lower market share for Nobori stents in the domestic market. In FY3/14, we expect almost all of these negatives to be eliminated, so we forecast higher OP, driven by growth in catheters.
- **Business strategy** — Terumo is pushing its GP-1 strategy, which aims to generate sales of ¥1trn over the long run. It is targeting OP of ¥90bn in FY3/14 but we feel this represents somewhat of a challenge. The businesses that hold the keys to growth are catheters, where Terumo is expanding into systemic vasculature, blood management systems, diabetes, and prefilled syringes. Terumo is taking these businesses global and aiming to grow in emerging markets in particular.
- **Business strengths** — We see Terumo's strengths as lying in the steady improvement in basic products in the fields into which it has advanced in Japan and overseas, the sustained launch of better products, and the resultant increase in market share, which means it can create stable cash flow. In cutting-edge development, which represents a refinement of these basic products, Terumo makes full use of its own resources, M&A, and joint research with academia, and we think it can catch up with the world's majors.
- **Investment opinion** — We rate the shares of Terumo Neutral (2), with a ¥4,400 target price. Terumo is a leading maker of medical equipment pursuing a growth strategy balanced across its two core businesses-hospital products and cardiovascular products. Hospital products business (general medical equipment, pharmaceuticals, and blood transfusion products): The company seeks to add value to general medical equipment by developing products that reduce intervention by medical staff (i.e., risk). Sales of easy-to-administer Fulcaliq infusions and prefilled syringes are strong. The key is understanding the needs of medical personnel using the products and developing products that meet these needs, and in this regard, we find Terumo to be highly competitive. Cardiovascular products (catheters and related products as well as artificial lungs): Terumo is aggressively acquiring mid-tier businesses with technological skills, such as Vascutek in vascular prosthesis and MicroVention in cerebrovascular therapy. Moreover, it developed the DuraHeart left ventricular assist system in-house and has begun marketing efforts. The drug-eluting stent Nobori was launched in Europe in February 2008, with launch in Japan coming in May 2011. We forecast peak sales of ¥15bn. In 2011, Terumo acquired blood management firm CaridianBCT for ¥220bn, and integration is proceeding.



## Sysmex (6869)

Hidemaru Yamaguchi

### Growth likely to continue for this leading maker of blood cell counters

- **Overview of medical device business** — The medical device specialist Sysmex got its start when Toa, a company producing loudspeakers, wireless equipment, and broadcasting equipment, advanced into medical engineering and formed a company in 1968 to market these products. Sysmex is the top maker of blood cell counters globally, with a 40% share of a c¥200bn market.
- **Earnings contribution** — As Sysmex is a medical device specialist this area accounts for 100% of its earnings. The company surprised the market by revising down with H1 results reflecting yen strength (at that time), boycotts of Japanese goods in China after anti-Japan demonstrations, and a delay of about three months in the US in the approval process of Sysmex's new XN Series of blood cell counting equipment. Through Q3 OP was up 11% as the impact of anti-Japanese sentiment in China appears to have been light. As Sysmex feels the issues in China have not yet been solved it has kept its full-year OP forecast at ¥20bn (+4%), but we think this is conservative and believe double-digit profit growth is possible.
- **Business strategy** — Sysmex gets high marks from medical institutions as it has improved the functionality of its blood cell counters (an area of strength) and developed the best-performing equipment in the field. In addition to top-flight performance Sysmex provides high-quality customer service. Also, Sysmex has acquired a testing reagent maker and now develops equipment and reagents together. Its strategy is to make money even after equipment has been sold via reagents and maintenance services. In 2011 Sysmex began rolling out its new XN series globally. We think the company will continue to post growth moving forward driven by expansion for the Chinese market and a rise in market share in the US.
- **Business strengths** — Development of blood cell counters requires electronics technology, optical technology, and semiconductor technology. All device production is done in Japan to prevent technology outflow. At the same time, Sysmex is increasingly producing reagents overseas. We note that Sysmex also specializes in robotics technology, something designed to link different pieces of equipment and increase testing volume. This should help it maintain an advantage over its foreign competitors.
- **Investment opinion** — We rate Sysmex Buy (1) with a ¥6,200 target price. Sysmex is the top maker of blood cell counters in a global market expected to see 6% annual growth. Its share is already 40%, and we think earnings will continue to grow backed by an increasing market share in the US and growth in China. Sysmex competes in blood cell counters with the US firm Danaher (which counts Beckman Coulter as part of its group) and the Chinese firm Mindray, but we think Sysmex will maintain its superiority in equipment performance and maintenance services. We believe investors have been excessively concerned about negatives like the strong yen and a slow start-up for the life sciences business and feel the firm's medium-term growth potential is not reflected in its share price.



## Hitachi (6501)

Kota Ezawa

### Promoting medical devices business groupwide

- **Overview of medical device business** — Hitachi has designated “social innovation” as a longer-term growth area, and medical devices are a core business within this area. The subsidiary Hitachi Medical Corporation handles diagnostic imaging systems (CT, MRI, ultrasound, X-ray, etc.) and medical information systems, while Hitachi High-Technologies Corporation handles clinical testing equipment and the Hitachi group itself deals in proton therapy equipment. In 2011, Hitachi Medical acquired ultrasound diagnostic equipment maker Aloka for ¥25.6bn.
- **Earnings contribution** — In FY3/12, Hitachi Medical posted sales of ¥166.2bn and OP of just ¥4.2bn, so at this point it is not making a significant contribution to groupwide earnings (sales of ¥9,665.9bn, OP of ¥411.3bn). For the group as a whole, medical devices accounted for sales of about ¥300bn.
- **Business strategy** — In April 2008, Hitachi opened its Medical Systems Development Center and in June 2011 it established its Healthcare Business Headquarter as part of efforts to promote medical devices business across the group. In addition to radiation therapy systems, an area of growing demand, the company is looking at a wide range of other fields, and focusing on development of diagnostic imaging and medical information systems using IT technologies. Also, the Aloka acquisition bolstered Hitachi Medical’s marketing network, which should help the company to grow its overseas diagnostic imaging business, particularly in developing countries.
- **Business strengths** — The Hitachi group’s product development and marketing competitiveness in diagnostic imaging systems have both been enhanced with the Aloka acquisition, and it now ranks third in terms of global market share in this field. In MRI systems, the company’s open MRI devices, which eliminate problems with anxiety or claustrophobia, are very competitive and demand is solid. In proton therapy systems, Hitachi’s strengths include radiation technologies that can be targeted at specific tumor forms, and as a group it ranks second in the world (following Belgium’s IBA Group).
- **Investment opinion** — We rate the shares of Hitachi Buy (1), with a ¥600 target price. We think company earnings will see a V-shaped recovery on 1) structural reform for unprofitable businesses and 2) fixed cost cuts. Moving forward, we think streamlining via the Smart Transformation Project will drive profit growth medium term. Given macroeconomic uncertainty, we think Hitachi will attract market attention due to its company-specific factors that look highly likely to drive profit growth. Management has already pushed through a number of reforms, and we think it has no desire to loosen the reins going forward. Therefore, we think streamlining benefits will produce continued profit growth and look for additional business portfolio reform as well. The shares look significantly undervalued.

Kota Ezawa

## Toshiba (6502)

### Aiming for growth in medical equipment as one of Japan's leading firms

- **Overview of medical device business** — Toshiba's healthcare-related operations are mainly carried out by the subsidiary Toshiba Medical in the medical systems unit in the social infrastructure segment. Mainstay products are imaging diagnostic devices (CT, MRI, ultrasound, and X-ray devices), as well as radiotherapy systems, clinical testing equipment, and medical data systems. By sales, Toshiba ranks 18th globally (fourth in imaging diagnostics) and, along with Terumo and Olympus, is one of the Big 3 Japanese players.
- **Earnings contribution** — Toshiba is focusing efforts on the social infrastructure segment as a longer-term growth field, and within the segment it positions medical equipment as a core business. In FY3/12, the medical systems unit logged sales of ¥350.8bn and OP of ¥17.2bn, for a sales weighting of 6% and OP weighting of 8% versus companywide sales of ¥6,100.3bn and OP of ¥206.6bn. Toshiba does not disclose earnings contributions by product but we surmise that imaging diagnostic equipment accounts for the bulk of profit. In May 2012, Toshiba announced a medium-term plan, which aims for sales in healthcare solutions operations of ¥1trn in FY3/16.
- **Business strategy** — Toshiba's business strategy here is to move overseas, especially into emerging markets, and to focus efforts on new fields. Already, some 60% or more of equipment sales in the mainstay imaging diagnostic operations are generated overseas. Toshiba plans to aim for growth in excess of the market average by expanding sales in the growth markets of India and China. In new fields, Toshiba aims to develop devices in testing and therapy based on imaging diagnostics and also plans to focus efforts on healthcare IT and cancer. It is looking to develop the business aggressively, including through M&A deals, having acquired Vital Images of the US and having made Toshiba Sumitomo Electric Medical Information Systems a wholly owned subsidiary.
- **Business strengths** — We see Toshiba's strength as its impressive technical abilities in imaging diagnostic equipment. In X-ray CT, where Toshiba effectively is second in global market share, the company has been ahead of peers in developing 0.5mm slice, 320 detector row products and has struck a balance between impressive diagnostic capability and reduced radiation doses. In MRIs, Toshiba has launched products with three-Tesla strength magnets and is in our view holdings its own in product competitiveness with overseas majors. We think that Toshiba's technical abilities are supported by its sustained investment in R&D, the reapplication of in-house technologies in areas such as semiconductors, and its global R&D system.
- **Investment opinion** — We rate the shares of Toshiba Buy (1), with a ¥550 target price. As we must start considering the limits to further miniaturization possible through the extension of current technologies, it is difficult to see how the NAND business will drive earnings at this point. On the other hand, short term we think expectations for earnings could improve rapidly on better supply/demand and higher prices for NAND. Also, the range of businesses generating profits has widened to include social infrastructure and HDDs, which we see as positive. Our sum-of-the-parts analysis suggests that Toshiba shares are significantly undervalued relative to peers.

## Panasonic (6752)

Kota Ezawa

### Sale of healthcare business is an option

- **Overview of medical device business** — Panasonic's medical businesses are handled by Panasonic healthcare companies that are part of the solutions segment. About 7,000 employees work in the medical businesses, which we expect to generate FY3/13 OP of ¥8.8bn on sales of ¥133.6bn. Diagnostic products account for 35% of the total, biomedical sales for 19%, medicom sales for 17%, age-free for 17%, and others for 12%. Diagnostic products include blood sugar sensors. Biomedical sales include extreme low-temperature refrigerators. Medicom sales include such products as billing computers and electronic prescription record systems. The age-free business is nursing facilities and nursing facility management services.
- **Business strategy** — Our analysis of recent major restructuring moves at Panasonic suggests the healthcare business can be seen as a “profitable non-core business.” By this we mean a healthy business with future prospects but not one the Panasonic group is likely to foster by devoting significant resources to stimulating its growth. We believe one option for Panasonic would be to sell the business (for details, see our September 10, 2012 report [Japanese Consumer Electronics in a Global Context - A drama of collapse—and revival?](#)). Panasonic healthcare businesses include widely diverse product ranges. We believe they would fare better as part of a company focused on medical equipment rather than a company like Panasonic, which makes such products as white goods and solar panels. Placement in a medical company would likely allow greater synergies and greater growth potential, and we would expect the company's technologies and employees both to have better future prospects as well. If Panasonic were to chose to sell the business, the cash and profits from such a sale would help to fuel necessary restructuring and allow investment in future growth.
- **Business strengths** — Panasonic's healthcare businesses comprise the former Panasonic Healthcare Co. (whose predecessor companies were Panasonic Shikoku and Matsushita Kotobuki Electronics Industries), the age-free business of Panasonic Denko, and the biomedical and medicom businesses of Sanyo Electric. By product line, diagnostic products were a business of Matsushita Kotobuki (Panasonic Healthcare Co.), the biomedical and medicom businesses were part of Sanyo Electric, and the age-free operations were part of Matsushita Electric Works (now Panasonic Electric Works). These businesses have only weak ties. They are largely independent of one another. A stronger sales network would be required to expand sales in these disparate product areas, in our view. At the May 2012 meeting for analysts and investors the company admitted that the resource it most seriously lacked here was marketing muscle.
- **Investment opinion** — We rate the shares of Panasonic Buy (1), with a ¥630 target price. We expect earnings to recover going forward following impairment and headcount reductions, mainly in LCD panels, plasma panels, semiconductors, mobile phones, and batteries. Balance sheet risk has been reduced with a string of structural reforms, removing a major risk. Valuation levels are currently low and if Panasonic is given credit for its structural reforms, we think the shares will rise. We think the focus will now shift to the second half of structural reforms. With sales of assets and non-core businesses, we think reforms can be achieved without significant damage to cash flows or the balance sheet. If this proves the case, then we think valuations could rise further over the longer term.

## Sony (6758)

Kota Ezawa

### Enters the field via investment in Olympus

- **Overview of medical device business** — Sony's medical-related business is primarily printers and monitors for medical equipment, but in recent years it has been focused on expanding its cytoanalyzers into a life sciences business. Earnings from this business are relatively small compared with other consolidated segments and going forward we believe earnings expansion will come mainly from collaboration with Olympus.
- **Earnings contribution** — Sony established a real foothold into the medical device business in October 2012 with its stake in Olympus. Given its ¥50bn investment and the fact that it will be some time before jointly-developed products hit the market this is seen as an expensive purchase for Sony, but in our view this is the price it had to pay to enter into the medical device sector, an area that is highly regulated and dominated by traditional distribution channels. Sony aims to get sales in its medical devices business up to ¥200bn by 2020, with one-third coming from Olympus endoscopes, one-third coming from Sony's own medical products (mostly printers and monitors), and one-third coming from the life sciences business (mostly cytoanalyzers).
- **Business strengths** — The medical devices field has seen advances in technology, primarily in electronics, and Sony sees entry into this field as giving it more chances for growth given its wealth of technological expertise in electronics and broadcasting/communication devices. In our view, Sony's experience in broadcasting and communication equipment has given it the ability to supply the kind of added value particular to the medical device sector (unlimited warranty, focus on low volumes and manual labor, aftercare, etc.). While the unique aspects of this sector as well as differences in traditions and distribution channels presented a high barrier to entry, Sony has been able to get a toehold via Olympus. We think over the longer term earnings will grow gradually. If in this process Sony can establish an industry position independent from Olympus its business would look even more promising.
- **Investment opinion** — We rate the shares of Sony Buy (1), with a ¥1,700 target price. Sony continues to be affected by the growth slowdown in digital consumer electronics but we expect management to take more proactive strategies with the weakening yen. We also believe that Sony can take back some market share. We see margins rising even if sales are flattish thanks to cost structure improvement. We forecast a new growth phase for the smartphone business. The rollout of new products is going smoothly and client telecom operators are also eager to market them, so we expect expansion in both regional breadth and depth.

Masahiro Shibano

## Fujifilm (4901)

### Medical equipment positioned as cornerstone of longer-term strategy

- **Overview of medical device business** — Fujifilm's medical equipment businesses comprise medical systems and life sciences, both in the information solutions segment. Medical systems include X-ray imaging diagnostic equipment (X-ray film), medical IT systems, endoscopes, ultrasound diagnostic equipment. Life sciences include pharmaceuticals (Toyama Chemical, Fujifilm Diosynth, Fujifilm Corporation, and Fujifilm Pharma), cosmetics (the Astalift series, etc.), supplements (MetabARRIER, etc.).
- **Earnings contribution** — We expect medical systems and life sciences together to generate about ¥340bn in sales in FY3/13 (around 15% of FY3/13 consolidated sales). The OP contribution has remained modest because of substantial R&D costs. However, we expect sales growth in medical systems and the likelihood of pharmaceuticals (within life sciences) moving into the black to mean that medical systems and life sciences will contribute about ¥10bn to YoY profit growth in FY3/14 (the pharmaceuticals business taken alone looks set to achieve its first profits).
- **Business strategy** — In medical IT systems, Fujifilm wants to become the world leader in terms of market share (it is currently second) in three years by expanding the range of its medical imaging systems operations. The company believes the medical IT systems market was worth over ¥200bn in 2012. In endoscopes, Fujifilm aims to boost sales by introducing highly differentiated products, particularly nasotracheal endoscopes and double-balloon endoscopes. In ultrasound equipment, the company aims to increase its share of the market for portable ultrasound machines, a specialty of SonoSite Inc., which Fujifilm recently acquired. Fujifilm currently ranks second in the world market for portable machines. The goal is to achieve annual sales of ¥60bn in five years.
- **Business strengths** — Among Japan's precision machinery companies, Fujifilm is perhaps the most invested in medical equipment and pharmaceuticals. The company's diverse product portfolio differentiates it from Hoya and Olympus, which are closer to being precision machinery specialists. Fujifilm has aggressively pursued related M&A opportunities, particularly in the recent period of yen strength. During the process of integrating acquired companies into overall operations, the Fujifilm group appears to have been successful in deploying resources to improve productivity, expand sales networks, and achieve other synergies.
- **Investment opinion** — We rate the shares of Fujifilm Holdings Buy (1) with a ¥2,100 target price (equivalent to c0.5x our end-FY3/14 BPS forecast). The company has a diverse business portfolio, and is involved in areas including films & cameras, digital cameras, FPD materials (TAC film, retardation film, etc.), medical equipment, and office equipment. While we think a miss versus the company's FY3/13 plan is largely priced in, the outlook has become clearer for an improvement in earnings momentum in the FPD materials business, where the 2012 H1 correction was deeper and longer than expected, and in the pharmaceuticals business, where there was for a long time a distinct lack of visibility on the earnings outlook.

## Olympus (7733)

Masahiro Shibano

### Dominant in endoscopes, sense of stability

- **Overview of medical device business** — What Olympus calls its medical business includes digestive endoscopes, surgical endoscope systems (rigid endoscopes), and medical treatment peripherals. Olympus has 70% of the digestive endoscope market (Fujifilm and Pentax each have a 15% share), a 25% share of the market for surgical endoscope systems (Stolz and Stryker each have a 30% share), and a 25% share of the medical treatment peripherals market (Boston Scientific has a 50% share). Olympus plans to launch a joint venture with Sony in the medical field by April 2013.
- **Earnings contribution** — Our FY3/13 forecasts assume a ¥386bn sales contribution (52% of prospective consolidated sales) and about ¥84bn in OP from the medical business. Olympus also makes digital cameras (in the imaging segment), but the profit contribution from these is negative because of stagnant final demand and problems with the cost structure. Even given an external environment characterized by efforts to lower medical costs, the market for endoscopes is expected to grow because endoscopes are compatible with minimally-invasive and preventative approaches to medicine. Olympus has assigned further expanding its medical business a high priority in its longer-term business strategy.
- **Business strategy** — In digestive endoscopes, where Olympus has an overwhelming market share, the company will focus on maintaining the customer base it has already built, mainly in developed countries, and on gaining new business in developing countries through investment in forward-looking physician training. As it will be difficult to expand market share for digestive endoscopes themselves, the company plans to invest in R&D focused on surgical applications (surgical endoscope systems and medical treatment peripherals) and others products to fuel new sales growth. On a medium- to long-term view, the company may develop peripheral areas where it can take advantage of existing product lines and sales channels to support new growth.
- **Business strengths** — The use of endoscopic equipment requires long practice to master. User familiarity (physician familiarity) with interfaces is important when choosing a brand. Olympus has a substantial advantage over competitors in that its overwhelming market share means most doctors learn how to use an endoscope using Olympus equipment, which makes them reluctant to switch to other brands later. Because endoscopes, repeatedly inserted into the body, inevitably break down and decline with years of use, the scope of a manufacturer's maintenance and service operations is important; without a certain scale it is difficult to provide users with adequate ongoing product support. Also, good support is difficult to set up initially without already having an established customer base. Evidence of that may perhaps be drawn from the fact that there has been almost no effect on earnings in the medical business from the financial improprieties that came to light at the end of 2011. For more about Olympus, see our December 18 report [Olympus \(7733\) - On the recovery path but risks remain](#).
- **Investment opinion** — We rate the shares of Olympus Neutral/High Risk (2H), with a target price of ¥2,200. Olympus is strong in gastroenterological endoscopes, with a global share of 70%. It is also raising its share in peripheral areas. The endoscope market where Olympus is strong is a point of appeal as we expect continued expansion for structural reasons, not just in developing markets but developed markets as well, backed by increasing interest in minimally-invasive treatments that put less burden on the patient as well as preventive medicine designed to detect cancer and other illnesses early. On the other hand, the company has yet to come up with a strategy that is likely to have a dramatic impact on the loss-ridden imaging business. In addition, valuations do not look particularly cheap even on our FY3/14 forecasts, when we expect imaging business earnings to improve.



## Hoya (7741)

Masahiro Shibano

### Can the lifecare business become a new profit driver?

- **Overview of medical device business** — Hoya divides its business into two main segments—information and communication (which includes glass substrates for hard disks, mask blanks, optical glass, and others) and the lifecare business. Hoya's medical businesses include eyeglass lenses, intraocular lenses, endoscopes, and retail contact lens sales, all in the lifecare segment.
- **Earnings contribution** — The lifecare segment generates annual sales of about ¥200bn (our FY3/13 forecast, a little more than half of consolidated FY3/13 sales). The information and communication segment once fueled growth at Hoya, but with growth now stagnant the lifecare segment has come to contribute about 60% of OP. The lifecare segment has its own issues, however. For example, Hoya will have to rebuild profits in the eyeglass lens business, which was hit by flooding in Thailand that destroyed Hoya's main plant there, in October 2011, resulting in a loss of customers. Hoya has voluntarily stopped supplying intraocular lenses for the time being (since December 2012), and opportunities to open new contact lens sales outlets are declining.
- **Business strategy** — We believe a higher market share (and a resultant sales recovery) in the chain store channel, where there is good potential for volume growth, will be key to future expansion for the eyeglass lens business. In intraocular lenses, a quick return to production following a reassessment of production line configurations will be important, and we see mergers with or acquisitions of domestic competitors as likely to be key in the contact lens retailing business. The company is working to strengthen the endoscope operations acquired with the 2007 Pentax purchase, mainly in niche markets (developing countries and others), but we think it will be difficult to effectively assault fortress Olympus.
- **Business strengths** — Hoya has a particularly long history in the business of making eyeglass lenses and other optometry-related products, but our impression is the company has been somewhat slower than peers to expand sales channels overseas and to take advantage of latent demand in developing countries. Since 2007 Hoya has been trying to boost its endoscope business but it has been difficult to establish more than a peripheral market position. In order for equity market expectations for Hoya's medical businesses to rise, we would have to see aggressive measures such as M&A activity that lead to groundbreaking growth.
- **Investment opinion** — We rate the shares of Hoya Neutral (2), with a ¥1,800 target price, equivalent to an FY3/14E PBR of 1.7x. Hoya's main products command impressive shares of global markets and margins are high. In mask blanks and 2.5" HDD substrates, it has 70-90% of the global markets, while in eyeglass lenses, domestic contact lens retail business, optical lenses, and large photomasks for LCDs, market share ranges between 10% and 50%. Management policy is consistent in its pursuit of high market share and high margins. However, we expect the after-effects of the Thai floods of late 2011 to linger through FY3/13 in the eyewear lens operations in particular. Also, the shares do not look particularly attractive in valuation terms.



## Asahi Kasei (3407)

Takao Kanai

### Aiming to grow by leveraging its integrated chemical maker strengths

- **Overview of medical device business** — Asahi Kasei's medical care business consists of pharmaceuticals, medical devices and critical care devices (the business of the acquired Zoll Medical). Dialyzers used in dialysis are the mainstay of medical devices, and Asahi Kasei commands a roughly 15% (second-largest) share of the global market. In addition, the company's medical device line-up also includes apheresis products, Sepacell leukocyte reduction filters, and Planova virus removal filters, all of which we believe command leading global market shares. Zoll Medical, which Asahi Kasei acquired in 2012 for around \$2.2bn, is a medical device maker that specializes in the critical care field and which holds the largest share of the US defibrillator market.
- **Earnings contribution** — We expect the pharmaceutical and medical care-related segment to generate sales of ¥133bn and OP of ¥16bn in FY3/13. Of the total, we expect medical devices to contribute around ¥58bn in sales. With yen strength also playing a contributory role, we expect the OP level to be low. As the yen weakens going forward, we forecast a recovery in medical device earnings. We forecast sales of ¥51bn and a ¥3.5bn operating loss (with goodwill amortization, etc. at around ¥11bn) at critical care business in FY3/13. We expect a return to the black in FY3/15 after amortization is complete.
- **Business strategy** — Asahi Kasei's current medium-term business plan (FY3/12-FY3/14) positions the healthcare business alongside its environment & energy-related and residential and living-related businesses as growth businesses. The company aims in particular to capture demand in growth regions to advance the globally development of medical devices.
- **Business strengths** — In medical devices, the company possesses technological advantages in areas like hollow fiber membranes and plastics processing. Synergies also exist between the company's pharmaceuticals operations. In mainstay dialyzers, global demand is growing by around 5% annually and the company is aggressively increasing capacity. It has formed a tie-up in the US with NxStage Medical and it has also acquired production bases in Europe. Planova virus removal filters are employed in blood product manufacture, bioprocessing and other processes and benefit from growth in the antibody drug market. Zoll Medical registered annual sales growth of 16% in the ten years through 2011 and we expect 18% YoY growth in FY3/13. LifeVests wearable defibrillators, which are worn by patients who are at risk of cardiac arrest, are growing sharply and we expect the business to drive substantial growth going forward.
- **Investment strategy** — We rate the shares of Asahi Kasei Buy (1), with a ¥630 target price. While improvement in demand for acrylonitrile is slow, there is little in the way of capacity increases by other firms so we think Asahi Kasei's price leadership will prove beneficial. Asahi Kasei's Thai joint venture appears to have a competitive advantage, and we think it will contribute to equity in earnings from FY3/14. Orders remain strong in the housing segment, and we look for further growth in earnings there. In pharmaceuticals we anticipate significant expansion for Asahi Kasei's two new drugs Recomodulin (an anticoagulant) and Teribone (for osteoporosis). Although the recently acquired Zoll will likely post losses after goodwill, sales are growing steadily and losses look set to shrink. At the same time, improving earnings in the struggling electronics segment is a key task. As we think profit growth is likely in FY3/14, valuations look appealing.

## Kaneka (4118)

Takao Kanai

### High profitability and stable growth in medical devices

- **Overview of medical device business** — Kaneka's life science business comprises three fields: medical devices, active pharmaceutical ingredients and intermediates, and functional food ingredients. Medical devices are subdivided into intervention (intravascular treatment) and blood purification systems. The mainstays in intervention are various types of catheters and embolization coils for the treatment of cerebral aneurysms. In blood purification, Kaneka's leading products are membrane plasma separators and LDL-cholesterol apheresis equipment.
- **Earnings contribution** — Life science division sales were ¥47bn in FY3/12. We estimate that of this, medical devices accounted for just over half of sales. Life science division OP was ¥8.4bn, but earnings in active pharmaceutical ingredients, intermediates, and functional food ingredients were weak, so we suspect that medical devices have a considerable earnings weighting. Medical device profitability is high and sales have grown steadily.
- **Business strategy** — Kaneka has positioned high-performance plastics, life sciences, and electronics as growth areas. In life sciences, Kaneka is trying to expand, such as through the acquisition of Eurogentec, which handles biopharmaceutical intermediates. Medical device is an R&D-intensive business, and Kaneka is achieving steady growth by constantly launching new products. Moving forward, it plans to expand not only in Japan but also in Asia and other regions.
- **Business strengths** — Kaneka has accumulated knowledge in life sciences, having turned bulk pharmaceuticals and intermediates into businesses early in its history. Another strength is that it has polymer and plastic processing technologies, acquired as a high-performance chemical manufacturer. We believe blood purification systems are generating steady earnings but we surmise that these days it is intervention in particular that is driving growth. Kaneka is focusing on high-value-added products and is also impressively competitive.
- **Investment strategy** — We rate the shares of Kaneka Neutral (2), with a ¥400 target price. Synthetic fiber earnings are solid, and the electronic materials segment is seeing steady expansion in polyimide film used in smartphones, heat dissipation materials, and LCD film. In chemicals, commodity-grade products are weak, but specialty PVC is firm. Meanwhile, pharmaceutical intermediates are struggling and the solar cell business continues to produce huge losses. On the valuation front, the shares are trading at a steep discount to book but we discern no undervaluation on PER. We thus see limited upside potential for the shares.

## Teijin (3401)

Atsushi Ikeda

### Japan leader in at-home therapies such as HOT and CPAP, accelerating overseas development

- **Overview of medical device business** — Teijin's healthcare-related operations are handled by the wholly owned subsidiary Teijin Pharma and consist of two fields, pharmaceuticals and at-home therapies. At-home therapy operations target the field of respiratory ailments and the main focus of effort is on home oxygen therapy (HOT) and continuous positive airway pressure (CPAP). Teijin has the leading domestic market share in both. Teijin has also been advancing overseas, acquiring a provider of at-home medical devices in North America in 2008. We estimate that the overseas sales ratio was around 20% in FY3/12. Teijin also handles NIP Nasal mask-type breathing apparatus for ventilators and, in bone disorders, sonic accelerated fracture healing systems, ultrasound therapies for bone breakages that are difficult to heal.
- **Earnings contribution** — We forecast FY3/13 at-home therapy sales of around ¥69bn and OP of around ¥12bn. The HOT market is saturated but the CPAP market continues to grow at close to 20% annually; the overseas at-home therapy operations are also expanding and we expect firm business growth to continue.
- **Business strategy** — The company positions aramid fiber, carbon fiber & composite materials, and pharmaceuticals & at-home therapy as growth drivers. In pharmaceuticals & at-home therapy, it is focusing on growth in sales of gout and hyperuricemia treatments both in Japan and overseas. In at-home therapy, it is accelerating its global push and aims to expand the range of disorders for CPAP and beef up its new model offerings in portable HOT equipment.
- **Business strengths** — We think Teijin's strengths in at-home therapy are as follows: the confidence it has built in its long track-record, having entered the market in 1982, and its meticulous and fine-tuned services, with regular inspections, regular visits to patients, as well as 24-hour emergency response and disaster response. We think that unlike drugs, which are protected by physical patents, the maintenance of a competitive edge in medical devices rests solely on the strength of a company's services. Also, Teijin has a pharmaceutical business, so we think it is easy for the company to build relationships with medical institutions and doctors. Moreover, in the pharmaceuticals business, Teijin has positioned respiratory equipment as an area of focus and we think synergies are considerable. Teijin is holding onto its leading market shares in Japan in HOT (just under 60%) and CPAP (just under 40%).
- **Investment strategy** — We rate the shares of Teijin Neutral (2) with a ¥210 target price. Given supply increases in PC resin scheduled for 2012-2015, we expect profitability to be weak over the short run. In high-performance fiber, profits are falling steeply in aramid fiber, which had been driving earnings, on demand declines and capacity increases at competitors in high-margin bulletproof applications, and other factors. In addition, the pace of improvement in carbon fiber earnings at Teijin is lagging peers. While osteoporosis drugs had been firm in the healthcare segment, competition has increased and earnings levels are falling. However, we anticipate OP growth for the first time in a while due to global TMX-67 expansion.

## Omron (6645)

Graeme McDonald

### HCB (Healthcare Business) – Medical devices for health monitoring and therapy

- **Overview of medical device business** — A rough breakdown shows that just over 50% of divisional sales are digital blood pressure monitors (BPM), where Omron claims to have a global share of 52% with a 65% share in Japan and China (and more than 40% in Russia). Since 1973 Omron has sold more than 130 million BPMs. Other products include body composition monitors (8% of sales); patient monitors (8%); nebulizers (7%); thermometers (7%); step counters (5%); and electric toothbrushes (3%). Examples of new products include a sleep duration tracker. Some of the key components including pressure sensors are sourced internally. Approx 3/4 of HCB products are made in Dalian (China), with 15% made in Vietnam and 10% in Japan. In manufacturing more than 90% of HCB products are sold to consumers, with less than 10% sold to hospitals and other medical institutions.
- **Earnings contribution** — According to Omron, HCB is expected to generate sales of ¥69.5bn (+10% YoY) and OP of ¥4.2bn (OPM of 6.1%). In the first nine months of FY3/13 HCB had achieved 75% of the sales target and 82% of the OP targets respectively. Performance in Q3 was better than expected with sales of ¥19.4bn (+15% YoY and +13% QoQ) and OP of ¥1.8bn (OPM of 9.4%). This was the highest margin for two years aided by higher volumes, yen weakness against the euro and the benefits of the company's own profit-improving measures. The long-term goal is to exceed ¥100b in sales by FY2020.
- **Business strategy** — HCB has a sales presence in 110 countries worldwide and in FY3/13 Japan is expected to make up 42% of HCB revenues, ahead of Europe (22%), the Americas (15%); China (14%); and the rest of Asia including India (5%). Note that sales in Europe include Russia, while Brazil is included in the Americas. Omron has a clear strategy of expanding sales in these emerging markets and has invested in developing its own sales channels. Omron believes that a combination of improving living standards, adoption of Western diets and other lifestyle changes such as a greater awareness of one own's health provides the basis for increasing sales of HCB products in these markets.
- **Business strengths** — The main strengths of Omron's healthcare business include a wide range of high quality, accurate and reliable products, the top global share in blood pressure monitors, a sales network that spans the world, strong brand recognition and low-cost manufacturing. Given the broad range of products manufactured by Omron there is a wide range of competitors including Tanita, Panasonic, A&D, Andon Health (China), Jiangsu Yuyue (China), Microlife (Taiwan), Braun (EU) and Philips (EU).
- **Investment opinion** — We rate the shares of Omron Neutral, with a ¥2,100 target price. The company is a diversified maker of discrete control equipment, components and solutions and the main driver of earnings is the industrial automation business (IAB). In H1 FY3/13, this business accounted for 43% of sales and nearly 75% of operating profits. Omron has a strong position in Japan in the supply of discrete products (PLCs, sensors, temperature controllers etc) but the principal driver of sales growth is expansion overseas, especially in Europe and China. In H1 FY3/13, Greater China (including Hong Kong and Taiwan) made up 18% of total revenues, about 30% of OP and approx 25% of total production. Omron has a strong track record in terms of shareholder returns with a minimum payout ratio of 20% and a target dividend on equity (DoE) ratio of 2%. Omron also has a US listed ADR with ticker OMRNY.

## Summaries of other medical device companies

### Eiken Chemical (4549; NR)

Eiken Chemical manufactures clinical diagnostic equipment and DNA diagnostic equipment. The company handles a wide range of clinical diagnostic equipment (its core product field), among which its fecal occult blood testing equipment (used to detect colorectal cancer) and its DNA diagnostic equipment (which uses a DNA amplification technology known as LAMP) are highly competitive. We understand that DNA diagnostic equipment using LAMP technology is highly promising as a means for testing for tuberculosis and other infectious diseases. In FY3/12 the company recorded sales of ¥27.7bn and OP of ¥2.4bn, and in FY3/13 it targets sales of ¥28.5bn and OP of ¥2.6bn.

### Nikkiso (6376; NR)

Nikkiso manufactures dialysis-related equipment and industrial pumps. Its main products are dialysis systems, dialyzers, and blood tubing (medical segment), and reciprocating pumps, canned motor pumps, and LNG pumps (pump segment). In the dialysis field, Nikkiso has a high share of the domestic markets for dialysis systems and blood tubing, but Fresenius Medical Care and Gambro have high shares of the overseas markets for these products, so Nikkiso mainly does business in the domestic market (c80% of sales). The company is seeking to enter emerging markets, and to that end has formed a joint venture with China's Weigao; it began shipping product to China in September 2012. In the pump field, in 2009 Nikkiso acquired Germany's Lewa, the top manufacturer of reciprocating pumps. In FY3/12 the company recorded sales of ¥90.1bn and OP of ¥6.6bn, and in FY3/13 it targets sales of ¥97.0bn and OP of ¥7.0bn.

### Techno Medica (6678.JP;NR)

Techno Medica is a medical equipment maker that manufactures blood collection tube preparation systems. The company's main products, machines that prepare blood collection tubes, are systems that automate preparatory procedures for blood testing. These are beginning to be used more often mainly in the domestic market because they improve operational efficiency of medical services and help to prevent mix-ups of specimens and other errors. The company has about 90% of the Japanese market for such equipment, and sales have grown rapidly as the market for blood collection tube preparation systems has taken off. The company posted ¥1.8bn in OP on sales of ¥8.0bn in FY3/12 and is aiming for OP of ¥2bn on ¥10bn in sales in FY3/13.

### Nihon Kohden (6849; NR)

Nihon Kohden is one of Japan's largest pure-play medical device manufacturers. Among companies that make medical devices exclusively, it ranks behind only Terumo, Nipro, and Sysmex in size. It handles wide range of main products, including biometric devices (such as electroencephalographs and electrocardiographs), biological data monitors, defibrillators, and blood cell counters. Nihon Kohden says its strengths include sensor technology used in medical devices and in-house production of systems. These strengths enable Nihon Kohden to secure earnings from sales of consumables to device buyers, and support a broad product lineup through the horizontal application of technology. With a view to bolstering its therapy equipment operations, in November 2012 the company acquired Defibtech, a US maker of AEDs. In FY3/12 the company recorded sales of ¥120.7bn and OP of ¥12.0bn, and in FY3/13 it targets sales of ¥130.0bn and OP of ¥13.0bn. In May 2010 the company unveiled a long-term vision

whose objectives for FY3/120 are sales of at least ¥200bn, OP of at least ¥25bn, and an overseas sales ratio of at least 40% (versus 17% in FY3/12). GE and Philips are highly competitive in the biometric device and biological data monitor fields.

### **Fukuda Denshi (6960; NR)**

Fukuda Denshi is one of Japan's largest pure-play medical device manufacturers. Among companies that make medical devices exclusively, it ranks behind only Terumo, Nipro, Sysmex, and Nihon Kohden in size. It has wide range of main products, including biometric devices (such as electrocardiographs, blood cell counters, and ultrasound diagnostic equipment), biological data monitors, catheters, and cardiovascular devices (including pacemakers manufactured by overseas companies). It does most of its business in the Japanese market; in FY3/12 Japan accounted for 97% of sales. Its strengths include a wide-ranging product lineup and a sales network that covers all of Japan. In FY3/12 the company recorded sales of ¥92.5bn and OP of ¥9.2bn, and in FY3/13 it targets sales of ¥94.0bn and OP of ¥9.4bn. In May 2012 it announced medium-term earnings targets for FY3/15 of sales of ¥98.0bn and OP of ¥9.4bn.

### **JMS (7702; NR)**

Based in Hiroshima Prefecture, JMS's main products include dialysis-related products (including dialysis systems, dialysis fluid, and indwelling needles for dialysis), infusion and transfusion-related products (including blood bags and infusion sets), cardiovascular device-related products (including artificial heart/lung machines and catheters), and disposable products (including rubber gloves and masks). In FY3/12 the company recorded sales of ¥46.8bn and OP of ¥1.1bn, and in FY3/13 it targets sales of ¥48bn and OP of ¥2bn. The domestic market accounted for 75% of sales in FY3/12, but we understand the company intends to expand overseas (mainly in emerging countries) as a growth strategy.

### **Kawasumi Laboratories (7703; NR)**

Kawasumi Laboratories manufactures dialysis-related equipment and products in the blood and blood vessel field. Its main products are dialysis-related products (including dialyzers and blood tubing) and blood and blood transfusion products (including blood collection kits, transfusion sets, and blood bags). In FY3/12 the company recorded sales of ¥30.3bn and OP of ¥1.5bn, and in FY3/13 it targets sales of ¥28.3bn and OP of ¥0.8bn, with earnings weakened as a result of flood damage to the company's manufacturing facilities in Thailand. Production of blood tubing for the domestic market and blood transfusion sets for the US market has resumed, but since a new plant for manufacturing blood bags for overseas markets will not go into operation until FY3/14 H2, the company is now conducting substitute manufacturing in Japan. As a new business field, the company is developing stent grafts for thoracic aortic aneurysms; it plans to launch sales of this product in April.

### **Mani (7730; NR)**

Based in Tochigi Prefecture, Mani's main products are eyeless needles used in surgery, ophthalmic knives used in ophthalmic treatment (surgery segment), dental reamers and files used in dentistry, and dia-burs (dental segment). The company is highly competitive on a global basis in all of these areas. Mani's strengths include a high degree of technological and cost competitiveness, product differentiation through metal-processing technology, and high profit margins through a high-quality, low-cost overseas manufacturing system. In FY8/12 the company recorded sales of ¥9.7bn and OP of ¥3.5bn, and in FY8/13 it targets sales of ¥10.0bn and OP of



¥3.6bn. Earnings growth has been slow for the past several years owing to increased competition and the strong yen.

### **Topcon (7732; NR)**

Topcon manufactures ophthalmic-related devices and industrial surveying equipment. Its main products are retinal cameras for ophthalmic treatment and therapeutic laser devices (eyecare segment), surveying equipment for infrastructure and construction machinery and agricultural machinery (smart infrastructure segment), and advanced GPS equipment for construction machinery and agricultural machinery (positioning segment). Topcon says its strengths are a high degree of technological capabilities and a global sales network. Albeit a niche field, the company has a large share of the global market for ophthalmic-related devices. In its positioning segment, the company counts major construction equipment manufacturers among its customers. In FY3/12 the company recorded sales of ¥98.8bn and OP of ¥2.1bn, and in FY3/13 it targets sales of ¥98.0bn and OP of ¥5.0bn. A deterioration in earnings owing to yen appreciation has become a problem in the past few years (the forex sensitivity of Topcon's OP is -¥0.3bn for each ¥1/\$ of appreciation and -¥0.1bn for each ¥1/€ of appreciation). Because of this the company is restructuring its operations, efforts that include reducing headcount and consolidating manufacturing bases. In June 2012, the company unveiled a medium-term plan whose goals include FY3/15 sales of ¥130.0bn and OP of ¥16.5bn.

### **Asahi Intecc (7747; NR)**

Asahi Intecc manufactures PTCA guidewire for cardiovascular treatment. The company says its strength is its technological capabilities, and it has achieved major advances by utilizing materials technologies developed in its industrial materials business in the creation of guidewire that faithfully transmits fine fingertip motion to a terminal. In FY6/12 the company recorded sales of ¥14.9bn and OP of ¥2.0bn, and in FY6/13 it targets sales of ¥18.7bn and OP of ¥3.6bn. In May 2011, the company unveiled a medium-term plan whose goals include FY6/16 sales of ¥30.0bn.

### **Medikit (7749; NR)**

Medikit manufactures products related to blood and blood vessels. Its main products include indwelling needles for dialysis, venous indwelling needles, and blood vessel catheters for diagnosis and treatment (angio field). Venous indwelling needles retract after sticking the patient, and their use is spreading as a means of preventing medical accidents (needle-stick injuries) and assuring safety. This is helping to increase demand for Medikit's products. We understand that demand is also growing in the angio field as the adoption of minimally invasive therapy spreads. In FY3/12 the company recorded sales of ¥14.1bn and OP of ¥3.7bn, and in FY3/13 it targets sales of ¥14.7bn and OP of ¥3.3bn. The domestic market accounted for 19% of sales in FY3/12, and as a growth strategy, the company intends to expand overseas. As a growth field, the company is conducting clinical trials of drug-eluting balloon catheters for dialysis shunts.

### **Japan Tissue Engineering (7774; NR)**

Based in Aichi Prefecture, Japan Tissue Engineering (known as J-TEC) is a start-up that manufactures medical devices related to regenerative medicine. Its main products include JACE, an autologous cultured epidermis used to treat patients with severe burns by growing skin, and JACC, an autologous cultured cartilage used to treat patients with knee-joint cartilage defects and osteochondrosis (ailments that



athletes are vulnerable to) by growing cartilage. JACE was approved in 2007 and covered by NHI in 2009, while JACC was approved in July 2012 (and is now under review for NHI coverage). In FY3/12 the company recorded sales of ¥473mn and incurred an operating loss of ¥1,107mn. Its targets are as follows: FY3/13, sales of ¥643mn and an operating loss of ¥1,066mn; FY3/14, sales of ¥1,392mn and an operating loss of ¥647mn; and FY3/15, sales of ¥2,124mn and an operating loss of ¥305mn. In 2010, the company signed a capital and business alliance agreement with Fujifilm and raised ¥4bn in capital through a third-party share placement taken on by Fujifilm (which gave that company a 41% stake).

### **Daiken Medical (7775; NR)**

Based in Osaka, Daiken Medical's main products are suction machines used in medical facilities (the Fit Fix business) and pressurized drug infuser devices (the Syrinjector business). The company has a high share of the domestic markets for these products. The company says its strength is its product development capabilities, and over the past several years it has enjoyed high growth, mainly from highly convenient Fit Fix products. In FY3/12 the company recorded sales of ¥6.5bn and OP of ¥1.0bn (record-high profits), and in FY3/13 it targets sales of ¥7.1bn and OP of ¥1.2bn. Growth fields include critical care, lung diseases, cancer treatment, and minimally-invasive treatment. The bulk of sales now come from the domestic market, and we understand that going forward the company intends to expand overseas.

### **Shofu (7979; NR)**

Shofu is a Kyoto-based manufacturer of dental materials. Its main products are artificial teeth (denture materials), abrasives, metal materials, processed products (dental fillings), cement (dental adhesive), and appliances. In FY3/12 the company recorded sales of ¥16bn and OP of ¥1bn, and in FY3/13 it targets sales of ¥16.1bn and OP of ¥0.8bn. The domestic market accounted for 76% of sales in FY3/12, but with the domestic dental materials stagnant, the company intends to expand overseas. In May 2012, it unveiled a medium/long-term strategy whose targets for FY3/22 are sales of ¥50bn and OP of ¥7.5bn. Note that Shofu's roots are in the dental materials business operated by company founder Kajo Shofu, who was an artisan who made Kiyomizu-yaki porcelain. Shofu Industries (which no longer exists) was an insulator manufacturer notable for being the company that Kyocera founder Kazuo Inamori joined upon graduating from university.

### **Nipro (8086; NR)**

Nipro is one of Japan's largest pure-play medical device manufacturers. Among companies that make medical devices exclusively, it ranks behind only Terumo in size. Its main products are wide ranging and include dialysis-related products (such as dialyzers, indwelling needles for dialysis, and blood tubing), injection and transfusion equipment (such as syringe needles and transfusion sets), and catheters. In FY3/12 the company recorded sales of ¥212.0bn and OP of ¥15.8bn, and in FY3/13 it targets sales of ¥241.0bn and OP of ¥13.5bn. The company's long-term objectives include sales of ¥500.0bn in 2020, and it is aggressively expanding overseas and acquiring other medical device manufacturers (in FY3/12, overseas sales of medical devices accounted for 57% of sales). Note that in February 2012 the company raised ¥20.0bn by conducting a public offering and issuing convertible bonds, and that between 2010 and 2012 it increased its stake in Nippon Electric Glass to over 17%.

## Appendix A-1

### Analyst Certification

The research analyst(s) primarily responsible for the preparation and content of this research report are named in bold text in the author block at the front of the product except for those sections where an analyst's name appears in bold alongside content which is attributable to that analyst. Each of these analyst(s) certify, with respect to the section(s) of the report for which they are responsible, that the views expressed therein accurately reflect their personal views about each issuer and security referenced and were prepared in an independent manner, including with respect to Citigroup Global Markets Inc and its affiliates. No part of the research analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendation(s) or view(s) expressed by that research analyst in this report.

### IMPORTANT DISCLOSURES

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Citigroup Global Markets Inc. owns a position of 1 million USD or more in the debt securities of Danaher Corp

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Citigroup Global Markets, Inc. is acting as financial advisor to Ceradyne, Inc. in 3M's acquisition of Ceradyne, Inc. Citigroup Global Markets Inc. owns a position of 1 million USD or more in the debt securities of 3M Co

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Due to Citi's involvement in the announced early termination agreement relating to the Medtronic Weigao Orthopaedic Device Co., Ltd Joint Venture, Citi Research is restricted from publication of new research reports, and suspended its rating and target price on 4th December, 2012 (the 'Suspension Date'). While Citi Research may continue to publish research on the Company, it will not express a view about the proposed transaction, nor will its financial model(s) take into account the transaction. Additionally, the Company price chart available on the Citi Research disclosure website, is current only through the Suspension Date and, accordingly, does not reflect that Citi Research suspended its rating and target price on the Suspension Date.

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Citigroup Global Markets Inc. owns a position of 1 million USD or more in the debt securities of St. Jude Medical Inc

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Citigroup Global Markets Inc. owns a position of 1 million USD or more in the debt securities of Medtronic Inc

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Citigroup Global Markets Inc. owns a position of 1 million USD or more in the debt securities of Samsung Electronics Co Ltd

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A member of the household of Tsubasa Sasaki, Analyst, is an officer of Fujifilm Holdings.

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