PEER REVIEW OF THE JAPANESE SHIPBUILDING INDUSTRY

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FOREWORD

This report was prepared under the Council Working Party on Shipbuilding (WP6) peer review process. Delegates discussed a draft at the WP6 meeting on 30 November 2012, and were invited to submit any final comments to the Secretariat by 14 December 2012, after which time the report would be prepared for declassification. No substantive comments were received and the report is now declassified. The report will be made available on the WP6 website: www.oecd.org/sti/shipbuilding.

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1. Introduction to the study

The OECD's Council Working Party on Shipbuilding (WP6) has introduced a peer review process, focused on support measures provided by governments to their shipbuilding sectors. Under this process, economies participating in the WP6 will each undergo an in-depth study of their shipbuilding industry and related government measures. Non-WP6 economies may also join the process and be the subject of a WP6 peer review.

The main goal of the peer review process is to strengthen the identification of government policies, practices and measures affecting the shipbuilding sector and to support discussion of these within the WP6, so that the impact of government support measures on the shipbuilding sector can be better understood. The WP6 already compiles an "inventory" of government support measures, which covers a range of subsidies and non-subsidy measures and is regularly updated and presented for discussion at WP6 meetings. However, the peer review process aims to provide a deeper analysis of support measures at the country level, accompanied by contextual detail of the industry, so as to enable a richer discussion of shipbuilding policy and its impact by the WP6.

A key element of the process is the "peer review" stage, where WP6 participants will have the opportunity to actively debate and discuss preliminary drafts of the studies, with a view to promoting transparency and experience-sharing within the group. This element of peer review differentiates this process from other recent WP6 economy-level analyses, such as the studies on China and Vietnam.[1]

This first WP6 peer review analyses the Japanese shipbuilding industry and related government support policies. Japan volunteered to be the subject of the first WP6 peer review and played an important role in developing the general procedure and questionnaire that underpin this and future WP6 peer reviews.

The report is structured as follows:

- Section 2 briefly introduces the main actors involved in Japan's shipbuilding industry and describes the general role of shipbuilding in the Japanese economy;
- Section 3 looks at the structure and features of Japan's shipbuilding industry;
- Section 4 then describes Japanese government policies affecting the shipbuilding industry;
- Section 5 investigates industry performance;
- Section 6 discusses challenges and strategies in the Japanese shipbuilding industry;
- Section 7 concludes, with a short summary and some suggested questions for discussion by the WP6.

The information in the report is drawn from public information sources, statistical series available to the Secretariat, and the Japanese government's response to the generic peer review questionnaire that was agreed by the WP6 for the peer review process. The Secretariat thanks Japan for volunteering to be the subject of the first WP6 peer review and for its co-operation in developing the report.

2. An introduction to Japan's shipbuilding industry

Data from the Japanese government suggest there are currently over 1 000 shipyards in Japan. Some of these yards are privately owned (*i.e.* unlisted) individual enterprises, while others form part of larger private or public (listed) companies that operate multiple yards. The three biggest enterprises in Japanese shipbuilding, measured by current orderbooks (in compensated gross tonnage – CGT), are Imabari Shipbuilding, Tsuneishi Holdings, and the Oshima Shipbuilding Company. These three companies, as well as Universal Shipbuilding, Mitsubishi Heavy Industries and Namura Zosensho, also feature in the top 30 shipyard groups worldwide, as measured by orderbooks (Clarkson, 2012a, p. 25). Table 1 lists the yards in Japan controlled by these six shipbuilders.

Table 1. Japan's largest shipbuilding companies

Yards controlled

Shipbuilding company/group	Yards in Japan controlled by company/group
Imabari Shipbuilding	Imabari Shipyard I-S Shipyard Co. Iwagi Zosen Co. Koyo Dockyard Co. Marugame Headquarters Saijo Shipyard Shimanami Shipyard Co. Shin Kasado Dockyard Co.
Mitsubishi Heavy Industries (MHI)	Nagasaki Shipyard and Machinery Works Kobe Shipyard and Machinery Works Shimonoseki Shipyard and Machinery Works Yokohama Dockyard and Machinery Works
Namura Zosensho	Imari Shipyard and Works
Oshima Shipbuilding Company	Oshima Shipyard
Tsuneishi Holdings	Tadotsu factory Tsuneishi factory
Universal Shipbuilding*	Ariake Shipyard Innoshima Shipyard Keihin Shipyard Maizuru Shipyard Tsu Shipyard

*At the time of writing, Universal Shipbuilding was in the process of merging with IHI Marine Limited, to form a new company "Japan Marine United". The eventual date of merger was 1 January 2013.

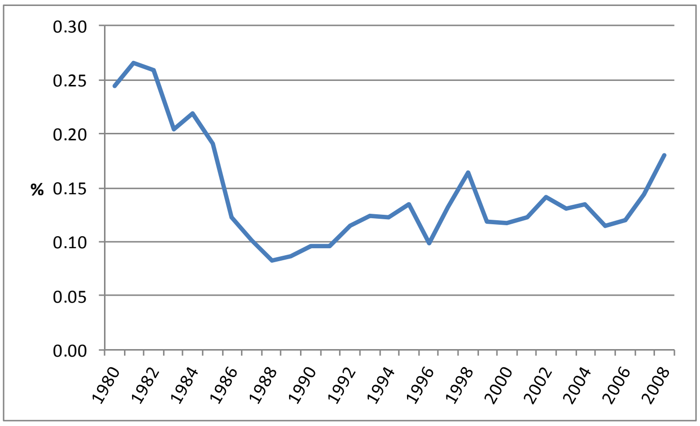
Source: Compiled by the Secretariat.

Japan's shipbuilders exist within a wider maritime cluster that provides crucial upstream and downstream products and services. Internationally, shipyards are increasingly operating as final assembly facilities, with 50-70% (and sometimes more) of the value added coming from external subcontractors and suppliers (ECORYS, 2009, pp. 35-36). Similarly in Japan, the marine equipment sector is an important part of the maritime cluster, as is the research, development and design sector (noting that some larger companies undertake this work in-house or have direct company interests in these activities). In addition, shipbuilding also generates activity related to skill development and training, regulatory compliance, and international marketing and information exchange.

The contribution of Japan's shipbuilders to the country's gross domestic product (GDP) has fluctuated over time and shipbuilding now represents a fairly low percentage of total Japanese value added. Figure 1 shows how shipbuilding's share of Japanese value added dropped significantly in the 1980s, then displayed a gradual (though volatile) upward trend from 1988 to 2008 (see Box 1 for a discussion of the OECD data used for this report). By 2008, the activity of building and repairing ships and boats accounted for 0.18% of Japanese value added.[2] Post-2008 data were not available in this dataset or from the Japanese government – however, it is likely that shipbuilding may have increased its share of value added, at least temporarily, since total Japanese value added fell following the 2008 financial crisis and economic downturn, while shipbuilding completions held up due to strong orderbooks (see Figure 6 later).

Figure 1. Shipbuilding in the Japanese economy

Share of value added (%)



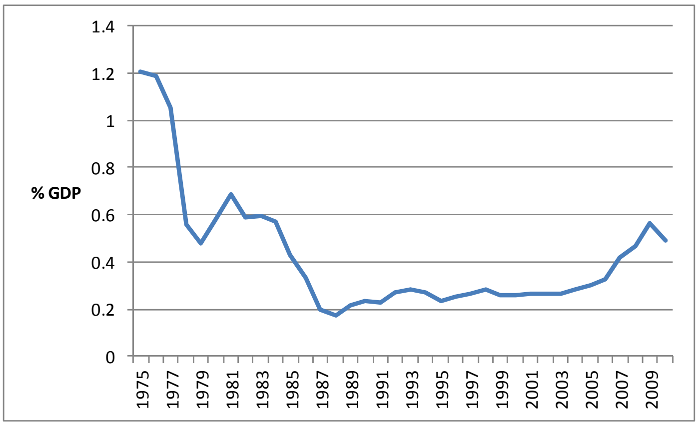
Note: Data refer to the share of ISIC category 351: Building and repairing ships and boats.

Source: OECD STAN Database for Structural Analysis (ISIC Rev. 3).

Data on the newbuilding and repair sales of members of the Shipbuilders' Association of Japan (SAJ) present a similar picture. Figure 2 shows the ratio of shipbuilding sales to Japanese GDP in 2010 was around 0.5%. The data reveal a sharp drop in sales to GDP from the mid- to late-1970s, preceding another fall in the 1980s (consistent with that shown in Figure 1). The SAJ data provide a lower-bound estimate of the ratio of shipbuilding sales to GDP, since not all shipbuilders are SAJ members.[3] The SAJ currently has 19 members, ranging from large builders such as Oshima Shipbuilding Company (which, for instance, had 114 vessels representing over 8 million DWT on its orderbooks in June 2012) through to smaller builders such as Sumitomo Heavy Industries (with 5 vessels on order in June 2012).[4]

Figure 2. Ratio of shipbuilding sales to GDP

1975 - 2010



Note: Shipbuilding data are for newbuilding and repair sales of members of the Shipbuilders' Association of Japan. Data are for fiscal years. The Japanese fiscal year begins in April and ends in March the following year.
Source: OECDStat (Dataset: Gross Domestic Product) and SAJ (2012).

In line with the data on output, employment in the shipbuilding sector is currently a relatively small part of Japan's total employment. Data provided by the Japanese government suggest that as of April 2012, around 0.13% of Japan's workforce (or 84 000 people) was engaged in the shipbuilding industry (including subcontractors, but not those in the marine equipment industry).

Box 1. OECD data on the Japanese shipbuilding industry

A number of the analyses in this report use data from the OECD's STAN Database for Structural Analysis. This database contains information that allows analysis of industrial performance at a relatively detailed level of activity across countries. It includes annual measures of output, labour input, investment and international trade, which allow construction of a wide range of indicators in areas such as productivity growth, competitiveness and general structural change. As STAN uses a standard industry list and consistent methodology, comparisons can be made across countries.

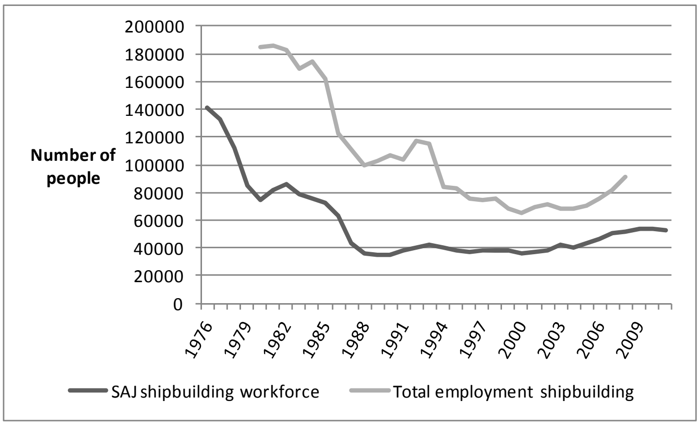
For this report, data on the STAN industry category C351: Building and Repairing Ships and Boats are used. This category comprises two sub-categories: building and repairing of ships; and building and repairing of pleasure and sporting boats. Strictly speaking, this study concerns only the first sub-category; however, data at this more disaggregated level are not available. This report assumes that the second sub-category relating to pleasure and sporting boats is relatively small in terms of both output and employment, and that the overarching category C351 provides a reasonably accurate picture of the Japanese shipbuilding industry.

The number of people employed in shipbuilding has fallen over time in Japan. Data on total employment in building and repairing ships and boats (Figure 3) show that almost 185 000 people were employed in that activity in 1980. By 2000, this had dropped to a low of 65 500 people, although it increased again to almost 91 000 in 2008. By this measure, the share of employment in shipbuilding more than halved from 1980, going from 0.33% of total Japanese employment to 0.14% in 2008.

Survey data from the SAJ tell a similar story, with the shipbuilding workforce shrinking considerably over time, although with a short upward spurt in recent years. SAJ data show its workforce steadily falling from the mid-1970s, and then expanding from 2006 to 2010 before dropping again in 2011 (Figure 3). In aggregate, the 18 companies (35 yards) surveyed from 2006 to 2011 increased their workforce by almost 6 000 over this period. As of April 2011, the surveyed yards employed around 52 800 people – this represented 0.08% of Japan's labour force (or around 0.09% of Japan's total employment).[5] In contrast, in 1976, 23 companies (51 yards) were surveyed, with their 141 575 workers representing 0.26% of Japan's labour force.

Figure 3. Employment in shipbuilding

Number of persons engaged



Note: SAJ shipbuilding workforce data equal total shipbuilding division employees (staff plus workers) plus subcontractors (shipbuilding division) of SAJ members, as of 1 April each year, at surveyed SAJ yards. Total employment shipbuilding refers to estimated number of persons engaged in ISIC category 351: Building and repairing ships and boats.

Source: OECD STAN Database for Structural Analysis (ISIC Rev. 3) and SAJ (2012).

However, the role of shipbuilding in the Japanese economy is larger when the activities of other shipbuilding-related industries are considered. As noted earlier, the shipbuilding industry sits within a wider maritime cluster of upstream and downstream activities, which contribute to economic output and employment.

For example, upstream from shipbuilding, steel and marine equipment are important input sectors. Japan is the world's second largest producer of steel after China, producing 107.6 million tons and employing over 100 000 people in 2011. In 2010, shipbuilding represented 12% of Japan's demand for steel, with estimates from the Japan Iron and Steel Federation putting shipbuilders' total consumption of ordinary steel at 5.7 million tons (JISF, 2011). For their part, SAJ members used almost 4.5 million tons of steel in 2010, with the greatest demand being for steel plates, followed by shapes and bars (SAJ, 2012). Sales of the marine equipment industry in 2011 were equivalent to around 0.2% of Japan's GDP[6] and the industry's workforce represented around 0.07% of Japan's labour force in 2010 (or 0.08% of total employment).[7]

As another example, the downstream activity of ship classification[8] is also important, as an internationally traded service employing expert technical staff. Japan's ship classification society, ClassNK, had 7 847 ships under class as of May 2012, representing approximately 20% of the world merchant fleet.[9] Vessels under the Panamanian flag accounted for 40% of ships under class, followed by Japanese vessels (13%), Singaporean vessels (10%) and vessels from Hong Kong and Malaysia (each 5%). The organisation employs 967 technical staff in its offices in Japan and abroad. The organisation also certifies shipyard and manufacturer quality assurance systems, offers consultancy and support services and provides training programmes for ship surveyors.

3. Structure and features of the shipbuilding industry in Japan

Facilities

The majority of Japan's 1 000-plus shipyards are focused on building smaller vessels. The Japanese government indicated that 264 shipyards are capable of constructing ships over 500 gross tons (GT), while a further 855 yards are capable of constructing ships up to 500 GT. In addition, shipbuilding enterprises may undertake a variety of activities alongside their construction activities, such as design, ship conversion and ship repair/maintenance. For example, the Japanese government noted that around 14% of SAJ employees (around 3 200 people) were engaged in design activities in 2011, according to a survey of 15 major SAJ members. No data were available on conversion or repair capabilities of Japanese shipyards.

The Japanese government noted that small shipyards tend to construct coastal ships, such as general cargo ships, oil products tankers, chemical tankers, coastal ferries and fishing vessels. Large shipyards construct large ocean-going ships, such as bulk carriers, crude oil tankers, container ships, large passenger ships and roll-on-roll-off (Ro-Ro) ships. In total, in 2011, general cargo ships, bulk carriers, ore/bulk carriers and oil tankers were the main vessels constructed in Japan, as measured by number of vessels and gross tonnage. A variety of other vessels were also built, giving a total of 663 vessels (or just over 19 million GT) constructed for the year (Table 2).

Table 2. Production record (type of vessels built) in Japan

2011

Type of vessel	Number of vessels	GT	DWT
General cargo ship	142	3 600 323	6 380 754
Bulk carrier	136	4 821 752	8 663 383
Oil tanker	67	3 798 592	6 863 455
Ore/bulk carrier	63	3 143 476	5 606 048
Chemical tanker	46	602 347	1 004 007
Vehicle carrier	24	1 119 807	406 651
Fishing vessel	24	3 754	0
LPG tanker	17	301 325	300 540
Other carrier	15	329 277	342 645
Container ship	11	656 774	643 665
Ro-Ro/cargo ship	5	31 410	0
Ore carrier	4	605 990	1 188 822
Cement carrier	2	6 020	8 759
Passenger ship	2	80	0
Other	105	44 725	1 730
Total	663	19 065 652	31 410 459

Source: Information provided by the Japanese government.

In terms of Japanese yards' total capacity, no single ideal measure is available. In the shipbuilding context, capacity refers to the potential output of yards (or the industry as a whole), using workers, equipment and resources to their fullest. However, no precise data on this are available, and instead capacity is often estimated on the basis of production data. On this basis, the Japanese government suggested the recent maximum construction record of 20.2 million GT in 2010 could be used as a rough estimate of yards' total capacity. Data are also available on the number of docks/berths and the size of the largest dock/berth in selected shipyards. Table 3 lists these details for Japanese yards featuring in the top global 50 as measured by CGT orderbooks, highlighting that capacity varies from yard to yard.

Table 3. Yard capacity - dock statistics

Japanese yards featuring in the top global 50 by CGT orderbooks

Shipbuilder	Yard	# docks	# berths	Largest dock length (m)	Largest dock beam (m)	Yard ranking by global orderbook
Oshima Shipbuilding Company	Oshima	1	-	299	80	8
Tsuneishi Zosen	Numakuma	5	2	380	59	15
Namura Shipbuilding	Imari	1	-	450	70	17
Mitsubishi Heavy Industries	Nagasaki	3	6	375	56	19
Imabari Shipbuilding	Marugame	2	-	370	57	22
Universal Shipbuilding	Tsu	2	4	500	75	33
Imabari Shipbuilding	Saijo	1	1	420	89	34
Sanoyas	Mizushima	3	-	270	80	41
Koyo Dock KK	Mihara	5	5	378	59	47
Universal Shipbuilding	Ariake	2	1	620	85	50

Source: Clarkson Research Services (2012b), pp. 22-23.

Geographically, the Japanese government noted that the densest areas of shipbuilding in Japan (for shipyards constructing vessels over 10 000 GT) are in the Chugoku, Kyushu and Shikoku regions, which lie in the south-west of the country. Other regions have fewer large shipyards (Table 4). The Japanese government advised that the Tohoku earthquake that struck Japan in March 2011 directly affected 37 shipyards, with damage estimated at approximately JPY 28 billion (around USD 350 million).[10] The majority of these shipyards build vessels smaller than 10 000 GT.

Table 4. Geographic location of shipyards

Yards constructing ships over 10 000 GT

Region	Number of yards
Hokkaido	1
Tohoku	2
Southern Kanto	3
Toukai	2
Kinki	4
Chugoku	11
Shikoku	10
Kyushu	9

Source: Information provided by the Japanese government.

Downsizing of yards has been more common than expansion in the last decade, at least among yards capable of constructing ships over 10 000 GT. Table 5 shows that out of ten changes to construction facilities, six involved downsizing and a further two involved closure of activity.

Table 5. Changes to construction facilities

Closures, downsizing and expansion since 2002

Date	Site	Action
27 September 2002	Aki, Hiroshima	*Closure:* The shipyard was closed
26 November 2002	Kawasaki, Kanagawa	*Expansion:* A new dock was built
25 December 2003	Kawasaki, Kanagawa	*Downsizing:* A dock was closed
5 April 2007	Onomichi, Hiroshima	*Downsizing:* A dock was closed
24 January 2008	Oita, Oita	*Establishment:* A new shipyard was established
18 October 2008	Kobe, Hyogo	*Downsizing:* A dock was closed
19 September 2009	Shimonoseki, Yamaguchi	*Downsizing:* A dock was closed
10 June 2010	Mihara, Hiroshima	*Downsizing:* A dock was closed
31 March 2011	Mihara, Hiroshima	*Downsizing:* A dock was closed
30 March 2012	Kobe, Hyogo	*Closure:* The shipyard terminated the business of constructing merchant ships

Note: This table does not include shipyards or docks whose construction capabilities are limited to ships under 10 000 GT.

Source: Information provided by the Japanese government.

Ownership and internationalisation

Many shipbuilding companies in Japan are privately owned and are small operations. Nevertheless, there are large Japanese companies that specialise in shipbuilding, such as the privately held Oshima Shipbuilding Company and Imabari Shipbuilding. These two companies also have some minor interests in other business areas – Oshima, for instance, constructs bridges and other steel structures, and has affiliated businesses in agriculture, brewing and a hotel.[11] Imabari, which has eight shipyards across Japan, also has interests in golf courses and a hotel.[12]

Those shipbuilding companies in Japan that are publicly listed companies tend to be large industrial groups with diverse ownership. The Japanese government provided information on seven companies that are listed on either the Tokyo or Osaka stock exchanges – five are listed as shipbuilding companies while the other two are listed as diversified machinery companies. Each of the firms is a large industrial group with interests beyond shipbuilding, and each is held by a range of shareholder groups (Table 6). Other publicly-listed enterprises with shipbuilding activities include Sumitomo Heavy Industries (which has a ship and marine division) and the IHI Corporation (whose domestic group companies include several ship and offshore facility constructors).[13] There is some cross-ownership between public and private companies, for instance, Sumitomo Heavy Industries is a shareholder in Oshima Shipbuilding.

Table 6. Publicly listed shipbuilding companies in Japan

Composition of shareholders

	Shareholders (%)					
Company	Financial institutions	Securities companies	Other corporations	Foreign institutions / individuals	Individuals and others	Government and local public entities
Mitsubishi Heavy Industries (MHI)	34.8	1.2	9.4	21.0	33.6	0.0
Mitsui Engineering and Shipbuilding (MES)	37.6	2.9	13.9	13.1	32.5	0.0
Kawasaki Heavy Industries (KHI)	35.6	2.1	10.2	16.2	35.9	0.0
Namura Shipbuilding	12.6	1.9	46.3	12.6	26.6	0.0
Sasebo Heavy Industries	18.6	1.5	27.8	8.5	42.6	0.9(1)
Sanoyasu Holdings	19.2	2.3	38.2	8.4	32.9	0.0
Naikai Zosen	9.6	0.5	40.3	2.1	47.5	0.0

(1) Sasebo City owns 0.9% of the stocks of Sasesbo Heavy Industries, for fund management purposes.

Source: Information provided by Japanese government.

One interesting feature of shipbuilding enterprises is the extent of internationalisation through ownership. This can be through foreign interests in domestic firms and/or through domestic firms' ownership of facilities or shipbuilding interests abroad. Such international linkages can provide new sources of innovation and skills as well as new market opportunities, and as such have an important impact on the performance of shipbuilding firms.

The information on Japanese shipbuilding companies' capital structures presented in Table 6 above shows that foreign institutions or individuals have a relatively limited ownership stake in the seven publicly listed companies described. It is likely that other public and private Japanese shipbuilders have a similar or lesser degree of foreign ownership.

However, looking outwards, several of the larger Japanese shipbuilding companies have started to invest abroad. The Japanese government reported that some companies had founded yards in other Asian countries, and one company decided to invest in a Brazilian shipbuilding company. The investments appear to be driven by competitiveness considerations (Section 6 has further discussion of this), and include:

- Kawasaki Heavy Industries (KHI) – founded shipyards in China;
- Tsuneishi Holdings – founded shipyards in China and the Philippines;
- Onomichi Dockyard – owns shipyards in Sri Lanka;

- KHI – announced that it will invest in a Brazilian shipbuilding company;
- Oshima Shipbuilding – plans to establish a new shipyard in Vietnam.

Workforce

Aside from the aggregate data reported earlier, there are few statistics available on the shipbuilding workforce and their competencies. Shipbuilding draws on a variety of skills and the total workforce is likely comprised of a number of different groups. However, disaggregated data were not available for this study. Membership of certain societies may give a very rough indication for some groups, for instance, the Japan Society of Naval Architects and Ocean Engineers (JASNAOE) reported over 4 200 regular members (including life and senior members) and almost 300 student members.[14] However, many skills are not necessarily shipbuilding-specific (mechanical engineering, for example) and so this approach is limited.

Japan has some specialised training centres for shipbuilding, which were established in response to concerns about generational change in the industry. In the early 2000s, nearly half the shipbuilding workforce was over 50 years of age. To help enhance the transfer of expertise, the government worked with shipbuilding-related organisations to establish a Shipbuilding Skill Development Center as a body of the CAJS (OECD, 2006). This centre was tasked with developing training materials and supporting regional training efforts. As part of this, Training Centers for the Development of Shipbuilding Skills were established in Innoshima, Imabari, Nagasaki, Oita and Yokohama (ClassNK 2007, p. 19). The centres currently benefit from subsidies for accredited vocational training, as part of Japan's active labour market policy – these subsidies are not specific to the shipbuilding industry and are available to any industries that need to develop their workers' abilities, in accordance with the Human Resources Development Promotion Act. There are currently no specific government training and education schemes for shipbuilding.

Various universities in Japan also offer studies in maritime-related topics. At Kobe University, for instance, the Faculty of Maritime Sciences teaches undergraduate courses in its three departments, namely the Department of Maritime Technology Management, the Department of Maritime Logistics Sciences and the Department of Marine Engineering. It also offers masters-level and doctoral-level programmes in maritime management sciences, maritime logistics sciences and marine engineering. At May 2012, the Faculty counted 940 undergraduate students, 172 masters students and 59 doctoral students.[15] Osaka University's Department of Naval Architecture and Ocean Engineering similarly offers programmes through to doctoral level, with recent students completing theses in a variety of topics related to ship design, ship structural integrity, hull design and other issues relevant to shipbuilding.[16]

ClassNK also plays a role in education and training related to shipbuilding, although its focus is on ship surveyors. In 2011, its ClassNK Academy offered courses related to hulls, machinery and electrical installations, and materials and welding, as well as damage and maintenance (ClassNK 2012, pp. 23-25). These courses were offered at nine locations in Japan; some courses were also taught abroad in countries such as Brazil, China, Korea, Malaysia and the United Arab Emirates. Class NK staff also gave lectures to technical staff at the Eastern Japan Training Centre for Shipbuilding Skills, and held technical seminars across Japan aimed at reporting on R&D activities and international trends to shipowners, shipyard staff and manufacturers.

Technology

Keeping up with the technology frontier is essential for shipbuilders wishing to move up the value chain, and is also increasingly important for meeting international regulatory standards for vessels. Listed companies more than doubled their R&D spending on shipbuilding between 2006 and 2011 (to reach JPY 12.6 billion, or USD 157 million), particularly concentrating on energy saving and environmental technologies (Kaiji Press, 2012a). For instance, Mitsubishi Heavy Industries' (MHI) R&D spending in the year to March 2012 was targeted mainly at developing eco-friendly cruise ships and other vessels, in addition to developing offshore structures and energy-efficient devices and systems (MHI 2012a, p. 28).

There are a number of Japanese organisations involved in shipbuilding-related research and innovation, to which Japanese shipbuilders can turn for inputs and guidance as they seek to develop new products. The maritime faculties of Japanese universities are one source of new knowledge, with staff and students producing research on a range of technical and practical issues with relevance for ship design and construction. There are also several research bodies, including:

- The National Maritime Research Institute (NMRI): this is Japan's core research institute for ship technology, performing research on technology for safe and efficient marine transport, effective usage of marine resources and spaces, and marine environment protection. Its research themes in 2011 included achieving zero emissions of CO_2/NO_x *etc*, improving ship performance at sea, developing and assessing hybrid propulsion systems, analysing maritime accidents, and developing offshore power generation. The NMRI seeks to collaborate with industry and universities, particularly by making available its testing facilities, which include a sea model basin that can reproduce ocean weather conditions encountered by ships. The NMRI is funded predominantly by government and in 2011 it had 169 research staff. [17]

- The Japan Ship Technology Research Association (JSTRA): this aims to develop integrated strategies for maritime R&D, international regulations and standards. It contributes to the development of technology by acting as a co-ordinator to promote co-operation between the shipbuilding/ship machinery/marine transport industries, the academic community and the government and other administrative bodies. It also engages in R&D aimed at increasing the competitiveness of the domestic shipbuilding industry and addressing technical issues related to efficiency, safety and the environment. Current research activities include work on alternative energy, particularly LNG options.[18]

- The Ocean Policy Research Foundation (OPRF): originally established in 1975 as the Japan Foundation for Shipbuilding Advancement, the OPRF works to promote research and international co-operation. It operates a Technology Development Fund that has provided finance for over 500 research projects since 1980, aimed at developing new technologies for safe maritime transportation and reduction of environmental impact, amongst other issues. The OPRF includes both a policy research department and a maritime technology department.[19]

In addition to these organisations, ClassNK also undertakes joint R&D with industry and academia, and established a "Practical R&D Promotion Division" in 2009 that seeks collaborative research opportunities as well as undertaking research into issues of social interest (*e.g.* greenhouse gas emissions). ClassNK's website lists some of its completed and in-progress research themes, which include software for management of data on ballast tank coatings, wind power propulsion, and prevention of brittle fracture on ultra-large container ships.[20] ClassNK also offers technical and practical advice to industry with respect to the application of rules and ensuring safety in the development of new systems for the production and transportation of natural gas.[21]

The role of associations

A final feature of Japanese shipbuilding is its well-established industry associations, which form part of the "institutional infrastructure" of the industry. The four main associations represent builders, owners and machinery/equipment suppliers. Representing large builders, the SAJ, mentioned already in Section 2, was established in 1947 and is a general incorporated association.[22] It has 19 members and one member association, the Cooperative Association of Japan Shipbuilders (CAJS). CAJS was established in 1959 and has 57 member shipyards. The Japan Ship Machinery and Equipment Association (JSMEA) is a non-profit body, organised by enterprises engaged in manufacturing, repair and sales of propulsion engines and auxiliary ship machinery. It has 240 regular members and 56 organisations of supporting members. Finally, the Japanese Shipowners' Association (JSA) brings together Japanese nationals who are owners, charterers and operators of ships with a capacity greater than 100 tons. Its history traces back to 1892 with the creation of the Union of Japanese Shipping Industries.

In seeking to promote the development of their sectors (Box 2), the associations often provide important international linkages for the industry. For instance, the SAJ participates in several international fora, through which it co-operates with stakeholders across the maritime industry in Asia, Europe and beyond. As well as its participation in the WP6 and tripartite (builder, owner and class) meetings, SAJ's key international relationships are with:

- JECKU: SAJ is an original member of "JECKU" (Japan, Europe, China, Korea and the United States), a forum that was founded in 1994 and which brings together shipbuilding associations and shipyard executives annually to discuss the industry. Japan is scheduled to host the 2013 JECKU "Top Executive" meeting.

- CESS: SAJ has participated in annual meetings of the Committee for Expertise of Shipbuilding Specifics (CESS)[23] since its foundation, and supports its activities practically and financially. Through the CESS, the SAJ co-operates with diverse organisations including the IMO (*e.g.* in the Maritime Safety Committee – MSC, and Marine Environment Protection Committee – MEPC), the Baltic and International Maritime Council (BIMCO), the Asian Shipowners' Forum (ASF), the Asia Classification Society (ACS), the International Association of Classification Societies (IACS), NACE International (an organisation dedicated to the study of corrosion), and the International Paint and Printing Ink Council (IPPIC).

- ASEF: SAJ has participated in meetings of the Asian Shipbuilding Experts' Forum for International Maritime Technical Initiatives since 2007.[24]

Box 2. Industry associations - objectives

The Shipbuilders' Association of Japan (SAJ)

The objectives of SAJ are to promote the sound and sustainable development of the shipbuilding industry, so as to contribute to enhancing the domestic and international economies and public welfare. In order to fulfil its objectives, SAJ carries out activities in the areas of business management, technical development, international co-operation, and data collection and analysis.

See: www.sajn.or.jp/e/

The Cooperative Association of Japan Shipbuilders (CAJS)

The objectives of CAJS are to promote the modernisation and rationalisation of the medium-and-small-size shipbuilding industry and enhancement of its technical standards, so as to contribute to enhancing the domestic and international economies and related industries. In order to fulfil its objectives, CAJS carries out activities in the areas of business management, technical development, facility management, labour management, environmental conservation and international co-operation.

See: www.cajs.or.jp/en/index.html

The Japan Ship Machinery & Equipment Association (JSMEA)

The objectives of JSMEA are to promote the progress and development of the ship machinery and equipment industry, so as to contribute to enhancing the domestic and international economies. In order to fulfil its objectives, JSMEA carries out activities in the areas of business management, technical development, international co-operation, data collection and analysis, publicity for the industry, and education and training of engineers.

See: www.jsmea.or.jp/e-top/index.html

The Japanese Shipowners' Association (JSA)

The objectives of JSA are to promote fair and free business activities in the shipping industry and to contribute to the healthy development of Japanese shipping. In order to fulfil its objectives, JSA provides a forum to exchange views among members, undertakes various activities such as research, public relations and production of statistics and data, and expresses its opinion to relevant parties.

See: www.jsanet.or.jp/e/index.html

Source: Information provided by Japanese government.

4. Japanese government policies affecting the shipbuilding industry

The Japanese Ministry of Land, Infrastructure, Transport and Tourism (MLIT) has responsibility for policies related to shipbuilding and wider maritime issues. Its Maritime Bureau includes divisions on shipbuilding and ship machinery, international shipping, coastal shipping, safety and environment policy, and maritime human resources policy, amongst others.[25]

In 2003, MLIT developed guidelines for shipbuilding industry policy, aimed at establishing a sustainable competitive advantage (OECD 2006). The vision set out in the strategy was to maintain domestic building capacity of one third of world market demand and establish technical capabilities to lead the world shipping and shipbuilding industries, by 2010. Actions were focused on improving the competitive environment both domestically and internationally, strengthening economies of scale, technology, efficiency and skills in the industry, and promoting R&D within the maritime cluster. Since 2003, the strategy has been updated to take account of international developments on ship recycling (the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, adopted in 2009) and greenhouse gas emissions (the 2011 IMO amendments to the MARPOL Convention).

Most recently, MLIT set up a joint government-industry working group – the New Shipbuilding Policy Review Committee – to develop ideas for the future of Japanese shipbuilding. The committee brought together representatives from the shipbuilding industry, the marine equipment industry, the shipping industry, trading companies, financial institutions and academics, with the task of helping the Japanese shipbuilding industry to strengthen its international competitiveness. The committee published its final report (the "New Comprehensive Policy on the Shipbuilding Industry") in 2011. It contained a number of suggestions for shipbuilders to strengthen their businesses, including overseas expansion and strengthening of design capabilities (Box 3).

At a specific policy level, the Japanese government described its current support measures for the shipbuilding industry as falling into four categories: export credits; export credit insurance; home credits; and R&D grants. These are consistent with the categories described in the WP6 inventory of support measures, and are structured as follows:

- Export credit facilities: Under this policy, officially supported export credits are provided to buyers by the Japan Bank for International Co-operation (JBIC).[26] Under its mandate to maintain and improve the international competitiveness of Japanese industries, the JBIC provides loans to support exports of Japanese ships, in accordance with the OECD's Sector Understanding on Export Credits for Ships (SSU). JBIC reported that in fiscal year 2010, shipping received 26% of total export loans granted by the organisation (JFC 2011, p. 40) – this equated to JPY 38.6 billion (USD 440 million). JBIC is the key government body involved in a new ship investment initiative that will combine industry and government funding to boost vessel orders (Box 4 provides further details).

Box 3. The "New Comprehensive Policy on the Shipbuilding Industry"

The final report of the New Shipbuilding Policy Review Committee was published in 2011. The Committee expects the Japanese shipbuilding industry to use the report to strengthen its international competitiveness and to achieve more sustainable and comprehensive growth. Key points from the report (which is not available in English) are:

- In order to avoid currency risk, shipbuilders and marine equipment manufacturers should make every effort to strategically expand overseas businesses, including manufacturing outside Japan, with the aim of expanding sales in the Japanese and overseas markets.

- In order to facilitate exports of ships, shipbuilders should consider the establishment of a ship investment fund that is capitalised by shipbuilding companies themselves.

- Shipbuilders should strengthen their design capacity to meet various needs of ordering parties.

- Shipbuilders should include the business of repair and maintenance services in their ordinary business.

- Shipbuilders should collaborate not only within the maritime cluster but also with other parties such as LNG suppliers and those who are involved in port infrastructure, to work together for the introduction and commercialisation of LNG fueled ships. This would be regarded as a core part of the strategy to ensure international competitiveness through environmental technologies.

- Maritime industries should provide young maritime engineers with various opportunities to assist them to become global project managers in the future. Such opportunities include cross-sectoral, international/domestic personnel exchanges within the maritime cluster, and participation in important projects.

Source: Information provided to the OECD Secretariat by the Japanese government.

- Export credit insurance: Officially supported export credit insurance (pure cover) is provided to buyers by Nippon Export and Investment Insurance (NEXI). This also complies with the OECD's SSU. NEXI does not provide export credit guarantees.

- Home credits: Home credits are granted to domestic shipowners or other domestic third parties (but not shipbuilders). The aim is to build up a more comprehensive and sophisticated transport and distribution network in Japan, by financing Japanese transport-related companies, including ocean-going shipping companies. Finance is provided by the Development Bank of Japan (DBJ) in partnership with commercial banks. The scheme covers finance for projects to build a wide range of maritime-related infrastructures, such as ocean-going vessels, warehouse, materials handling facilities, modernised terminals for physical distribution, *etc*. The interest rate on loans is determined by the credit rating of the company and the loan maturity.

- R&D: Since 2009, grants have been provided for the promotion of R&D for "future ships". Grants are intended for R&D into high level technologies for the reduction of CO_2 emissions from the international shipping sector. Grants are awarded for up to 33% of eligible costs. Examples of R&D funded by grants provided under the scheme include:

  – Establishment of hull forms for high propulsion efficiency ships;

  – Reduction of friction on hulls;

  – Improvement of propeller efficiency;

  – Improvement of diesel engine efficiency;

  – Establishment of efficient and environmentally sound operations;

  – Establishment of hybrid propulsion systems.

1. As rationales for these policy measures, the Japanese government proposed that home credits and export credits make it possible to assemble ship finance in cases where private financial institutions cannot take on risk alone. In the case of home credits, the Japanese government noted that more than 99% of imports (by tonnage) depend on maritime transport and thus, in view of securing societal welfare and economic development in Japan, it is essential for Japan to have its own fleet. Regarding R&D support, the Japanese government considers that environmental protection and safety assurance in the maritime sector cannot be achieved by market mechanisms alone, and that government interventions (either domestic or internationally-based) are necessary to achieve these objectives.

Box 4. Boosting demand - the Japan Ship Investment Facilitation Co. Ltd

On 23 April 2012, the Japan Ship Investment Facilitation Co. Ltd (JSIF) was established, following discussions between the Japanese government and industry on measures to strengthen Japanese shipyards' competitiveness on the export market. The JSIF is a company with capital of JPY 67.5 million (around USD 850 000[1]), capitalised principally by shipbuilders in Japan. The JSIF's role is to facilitate orders for new vessels at Japanese shipbuilding yards, by establishing special purpose companies (SPCs), arranging and co-ordinating finance, and managing the SPCs.

Under the JSIF scheme, Japan's shipbuilders essentially order vessels from their own yards; these vessels are then chartered out under long-term contracts, with a sale option at the end of the period. To order a vessel, the shipbuilder asks the JSIF to establish a SPC (to be registered offshore), as the entity to buy the ship. The SPC receives a maximum of 80% of financing from the JBIC (as an export credit) and other co-financing financial institutions, with the remaining 20% to be raised by the yard receiving the order (with or without investment from other partners). The vessel is chartered out to a foreign shipping company/owner on a long-term bareboat contract, and sold at maturity to repay the remaining debt and equity.

The company aims to facilitate USD 1.3 billion worth of newbuilding business, with a focus on environmentally-friendly ships. The collection of charter payments and loan repayment will be outsourced to Anchor Ship Partners Co. Ltd.

1: Using the August 2012 average exchange rate, as reported in the OECD Main Economic Indicators (MEI) Monthly Monetary and Financial Statistics.

Source: www.jsif.co.jp/english/index.html; Kaiji Press, 2012b; TradeWinds, 2012a.

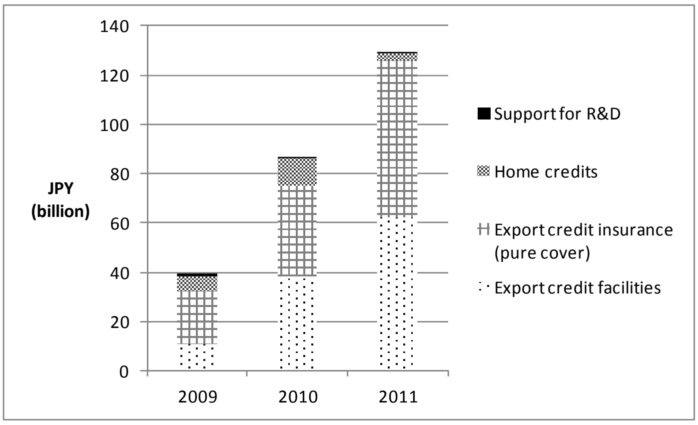
Trends in key support measures

Total support to the Japanese shipbuilding industry via the four measures described above has grown in recent years. Figure 4 shows the total monies committed each year from 2009 to 2011. By this measure, support has grown three-fold over the three-year period, from approximately JPY 39 billion (USD 420 million) to JPY 129 billion (USD 1.6 billion). This increase was not due any specific policy changes in response to the global financial crisis. However, the general shrinkage in loans provided to industry by private financial institutions in the wake of the crisis may be a factor behind the increase in export credits.

The increase from 2009 to 2011 is essentially due to rapid growth in export credits and payouts under export credit insurance. In the most recent financial year (April 2011 to March 2012), the JBIC made approximately JPY 63 billion (USD 784 million) of new export credit loans, up from JPY 11 billion (USD 119 million) in 2009. Payouts on insurance from NEXI rose similarly, from JPY 22 billion (USD 231 million) to JPY 63 billion (USD 794 million). Home credits varied over the period, while R&D spending accounted for a relatively tiny part of total support.

Figure 4. Monies committed each year

2009-2011



Note: Years are Japanese fiscal years (1 April – 31 March).

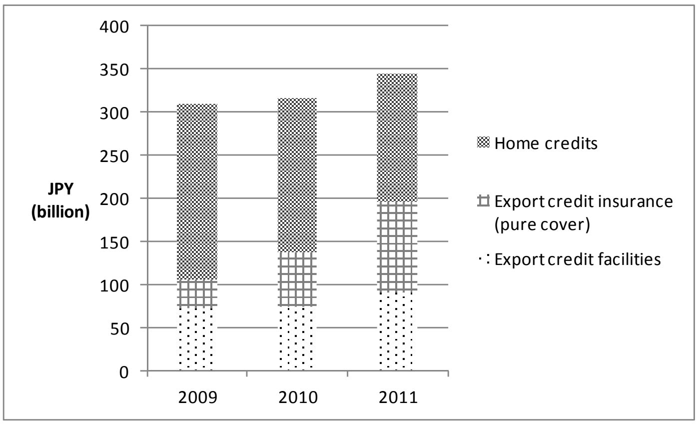
Source: OECD (2012a).

Compared to monies committed, the maximum financial exposure of the Japanese government resulting from its support measures did not increase as strongly over the recent three-year period. In total, exposure was JPY 345 billion (USD 4.3 billion) in the 2011 financial year – up from JPY 310 billion (USD 3.3 billion) in 2009. While exposure to NEXI insurance increased, exposure to the DBJ's home credits fell (Figure 5).

Over a longer period of time, information from the WP6 inventory suggests there has been a distinct shift in policy emphasis in monies committed, away from home credits and towards export credits and export credit insurance (Table 7). This might be expected to continue, noting in particular the new JSIF scheme that relies heavily on JBIC/NEXI export credit funding. There has also been an upwards step-change in the amount spent on R&D, although the amount remains small compared to the industry's own spending. In terms of financial exposure, the total has fluctuated over time, but within this there has been a clear increase in exposure to home credits.

Figure 5. Maximum financial exposure at year-end

2009-2011



Note: Years are Japanese fiscal years (1 April – 31 March).

Source: OECD (2012a).

Table 7. Support measures to the Japanese shipbuilding industry

2004-2011

JPY (billion)								
Monies committed								
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Export credit facilities	0	0	6.6	3.3	0	11.18	38.67	62.62
Export credit insurance (pure cover)	0	0	6.6	3.3	0	21.68	36.32	63.38
Home credits	40.8	17.7	50.6	24.6	49.5	5.65	11.02	3.06
Support for R&D	0.07	0.06	0.05	0.05	0.08	0.79	0.78	0.44
Total	***40.87***	***17.76***	***63.85***	***31.25***	***49.58***	***39.30***	***86.79***	***129.50***
Total in USD (million)	***377.9***	***161.3***	***548.8***	***265.4***	***479.5***	***420.0***	***989.0***	***1622.1***
Maximum financial exposure at year-end								
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Export credit facilities	86.1	80.7	83.1	89.3	74.6	73.71	75.28	91.74
Export credit insurance (pure cover)	124	81	67	37.5	19.66	32.7	63.33	104.77
Home credits	0.25	0.23	0.24	228.3	236.9	203.9	178.8	148.9
Support for R&D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total	***210.35***	***161.93***	***150.34***	***355.1***	***331.16***	***310.31***	***317.41***	***345.41***
Total in USD (million)	***1945.0***	***1470.7***	***1292.2***	***3015.5***	***3203.0***	***3316.0***	***3617.0***	***4326.3***

Source: OECD (2007a; 2010; 2012a).

While financial amounts have changed over time, policy details have remained fairly constant. Since 2004, the same four policy measures have been described in the WP6 inventory. The only notable change relates to the R&D grant. Until 2009, the R&D grant was specified in general terms – for high-level technology for ships – with a grant intensity of up to 50% of eligible costs. This changed in 2009 to focus on high-level technology for the reduction of CO_2 emissions, with a grant intensity of up to 33% of eligible costs.

Other relevant policies

In terms of support measures, some additional support was provided to shipbuilders in the context of recovery from the 2011 Tohoku earthquake. However, this support was not industry-specific, but available to all businesses in need of assistance (Box 5).

Box 5. Recovering from the 2011 earthquake - the role of government

Shipbuilders suffering damage as a result of the Tohoku earthquake have accessed several general support measures that were implemented by the Japanese government in response to the quake. These measures were provided to people and companies affected by the earthquake and were not industry-specific. Measures utilised by shipbuilders were:

- Low interest loans provided by the Development Bank of Japan (DBJ);
- Loan guarantees provided by the Credit Guarantee Corporation;
- Subsidies for reconstruction of facilities and equipment provided by the Small and Medium Enterprise Agency.

Source: Information provided to the OECD Secretariat by the Japanese government.

Turning to the specific regulatory environment for shipbuilding, the Japanese government noted that two laws aimed at controlling capacity are still active. These laws were established in the 1950s and require permission to be obtained from MLIT for certain activities, as follows:

- The Shipbuilding Act (Act No. 129 – 1950) requires persons who intend to establish docks which can be used to manufacture or repair steel vessels of 500 gross tonnage or larger, or 50 metres or longer, to obtain permission from MLIT. This act was established to keep shipbuilding capacity lower than its “adequate” level.
- The Act on Temporary Adjustment of Shipbuilding (Act No. 149 – 1953) requires persons intending to construct steel vessels (cargo vessels and cargo-passenger vessels only) of 500 gross tonnage or larger, or 50 metres or longer, to obtain permission from MLIT. This act was established to secure the sustainable development of the Japanese merchant fleet by controlling the construction of new ships. Permission is required for each ship of this size that is built. MLIT received 437 requests for permission in 2010 and 394 requests in 2011 (fiscal years).

Finally, the Japanese government noted that a number of general policy areas can have relevance for the shipbuilding industry. One such policy area is the provision of Official Development Assistance (ODA) to developing countries. Here, Japan dispatches shipbuilding experts, undertakes feasibility studies of shipping and shipbuilding, provides grants or loans for the construction of ships or modernisation of yards, and provides training programmes on shipbuilding technologies and ship inspection. The Japanese government considers that developing countries value Japan’s assistance in these areas, as it allows them to benefit from Japan’s advanced shipbuilding technology to develop and modernise their own shipping and shipbuilding industries.

Other policy areas that may be relevant for shipbuilders include competition policy, labour market policy, R&D and research policy, general industry policy and trade policy. Regarding competition policy, the Japanese government noted that no examinations into possible anticompetitive practices in the shipbuilding industry have been carried out. As noted earlier, active labour market policies are supporting training in shipbuilding, and there is some government funding of research and educational institutions that undertake maritime-related work. The general R&D tax credit available to Japanese businesses is open to shipbuilding firms, should they wish to use it.[27] Regarding general industry policy, Japan's Law on Special Procedures for Rejuvenation of Industrial Vitality (Act No. 131 – 1999) is a general law aimed at business reconstruction, undertaking new business and increasing productivity. The law will provide some benefits to Universal Shipbuilding Corporation and IHI Marine United as they effectuate their merger, for instance, a reduction of business registration and license tax and access to long-term loans provided by the Development Bank of Japan and the Japan Finance Corporation (Kaiji Press, 2012c). Finally, the government also funds trade promotion agencies, such as the semi-government Japan External Trade Organisation (JETRO) with its Shipbuilding Divisions in London, Singapore and Dalian (China).

Looking ahead, the Japanese government did not foresee any significant changes in its support measures for the industry.

Policy evaluation

The Japanese government advised that no quantitative or qualitative studies measuring the effects of its government support measures on shipbuilding were available.

5. The performance of the Japanese shipbuilding industry

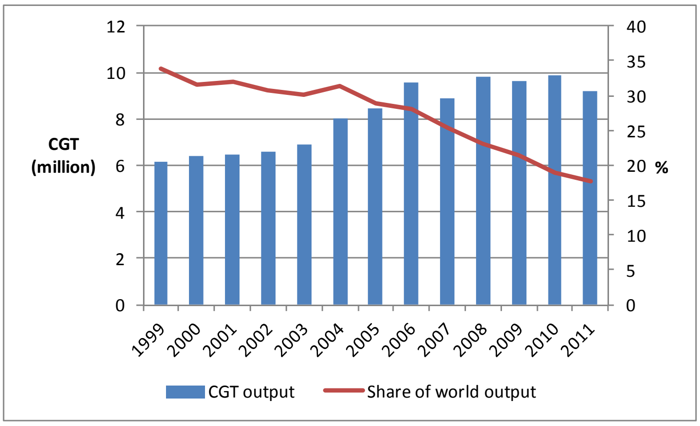
This section of the report investigates the performance of the Japanese shipbuilding industry, as measured by a number of indicators. It looks particularly at trends in output and market shares, in terms of vessel completions, orders and the orderbook. It also discusses Japanese shipbuilders' presence in export markets and provides a new analysis of productivity and unit labour costs in the industry. Together, these indicators provide a perspective on the successes and challenges of the Japanese shipbuilding industry.

Output

While Japan's shipbuilding output has generally increased over time, its share of world output is falling. Total completions in Japan, measured in CGT, grew by an annual average of 3.6% from 1999 to 2011. However, growth in total world completions was considerably stronger over this period, averaging 9.2% each year. Japan's share of world completions in volume terms has steadily fallen as a consequence, from around 34% in 1999 to 18% in 2011 (Figure 6). In comparison, China and South Korea have both increased their shares in this time, to reach approximately 39% and 31%, respectively.

Figure 6. Japanese shipbuilding completions

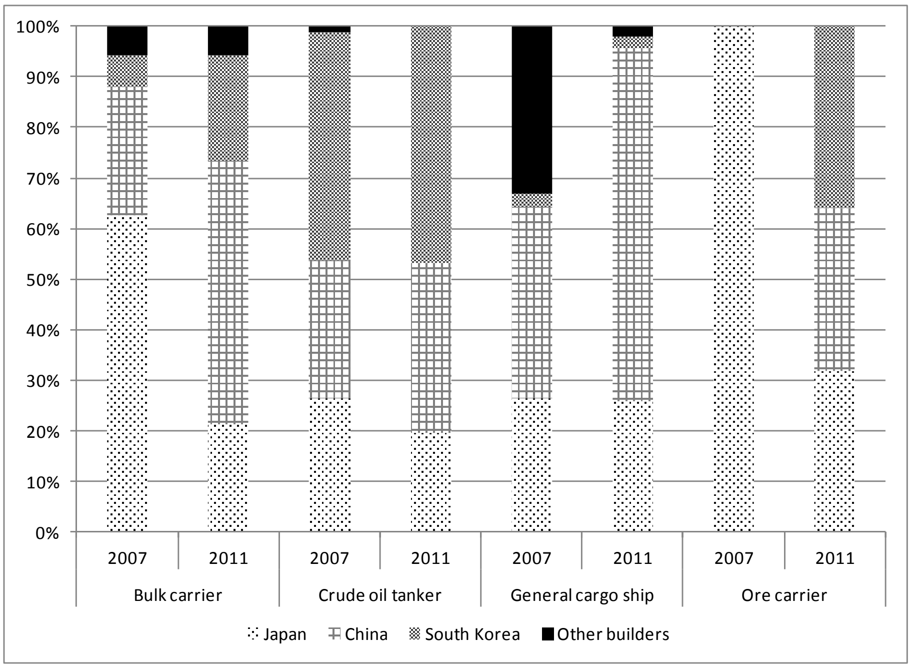
Total and as share of world completions



Source: IHS Fairplay *World Shipbuilding Statistics*, various editions.

Consistent with the trend in aggregate completions, Japanese shipbuilders' shares of completions in their four largest shiptype output categories have also dropped (Figure 7). In the case of bulk carriers, Japan's share of completions fell from around 63% to 21% between 2007 and 2011, with market share picked up particularly by China. China now also accounts for around a third of ore carrier completions, whereas in both 2007 and 2008 Japan was the sole producer of new ore carriers.

Figure 7. Share of completions, by selected shiptype

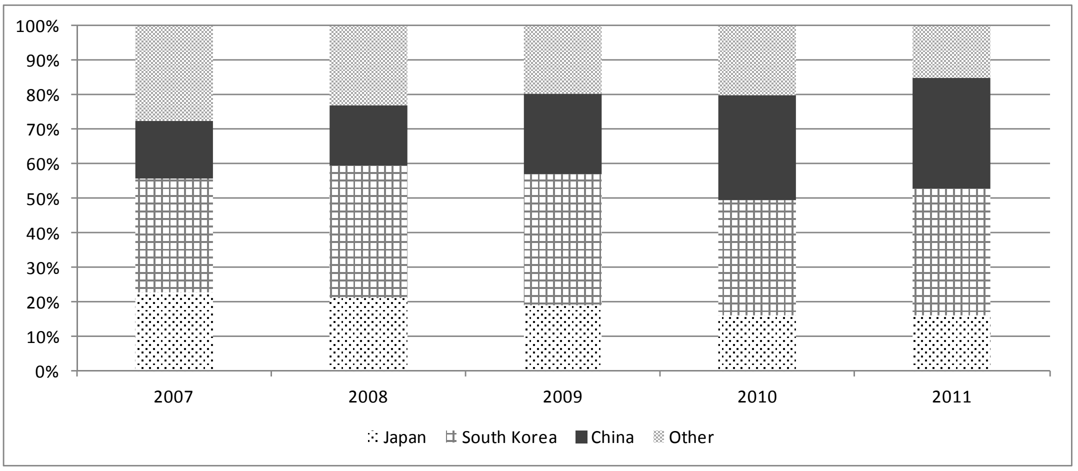


Source: Secretariat calculations, based on data (GT) from IHS Fairplay *World Shipbuilding Statistics* (quarterly editions from 2007 and 2011), table 4B.

In value terms, Japan's ship completions have also grown more slowly than total world completions in recent years. Data on ship values are less reliable than those on volumes and must be treated cautiously; however, it appears that since 2007, the total value of Japan's deliveries rose by an average 8.2% per year, while the value of world deliveries increased by an average 18.6% per year. As such, Japan's share of total world vessel deliveries by value fell from 23% in 2007 to just over 16% in 2011 (Figure 8). At the same time, China and South Korea experienced strong annual average growth in the value of their vessel deliveries, and increased their shares of total world deliveries by value. China's share rose from 17% to 32%, while South Korea's share rose from around 33% to 37%.

Figure 8. Total vessel deliveries by value

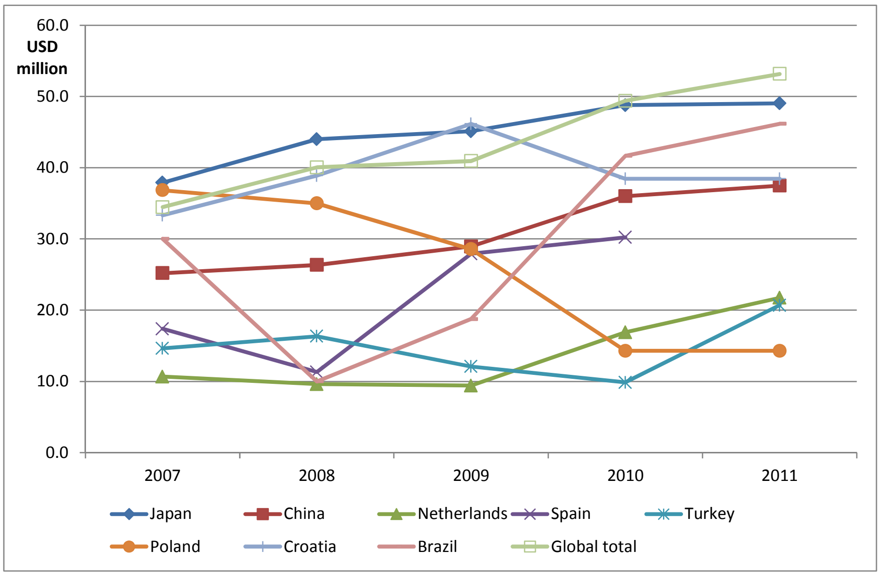
Country shares, 2007-2011

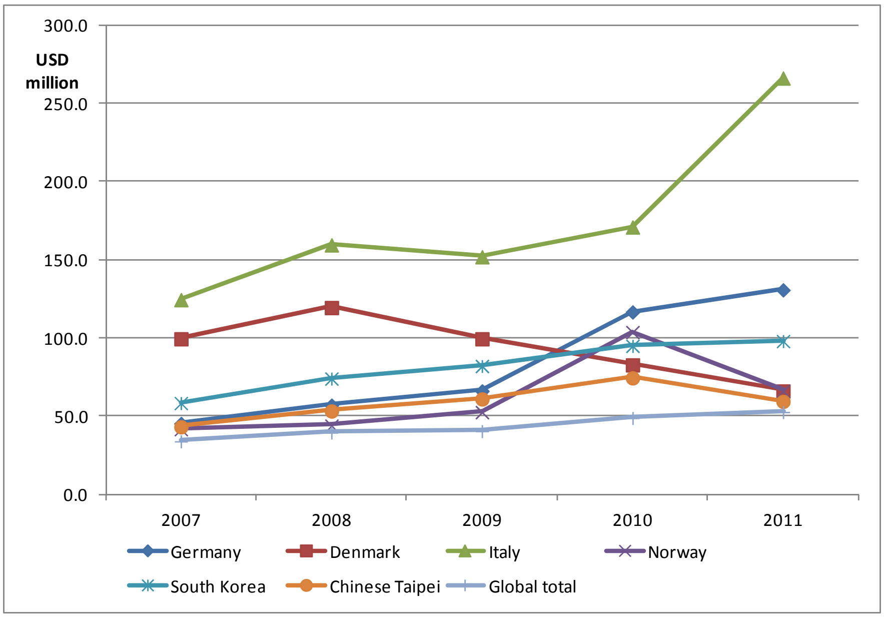


Source: Data on deliveries by country/region, from Clarkson Research Services *World Shipyard Monitor*, various editions.

The average value of new Japanese vessels has fallen slightly below the global average value, having been slightly above it since 2007. Using data on delivery values and the number of ships delivered suggests that Japan's average vessel value was USD 49 million in 2011, compared to a world average of USD 53 million. In 2007, the values were USD 37 million for Japan and USD 34 million for the world average. Figure 9 shows the trend of average vessel values for a selection of economies for which data were available. Broadly, two groups can be identified – one with average values generally below USD 50 million (the upper chart), and one with values above this (the lower chart). Japan is currently sitting in the former group, together with China, Brazil and a number of European countries. For comparison, the global total is shown in both charts.

Figure 9. Average value of vessels delivered, 2007-2011





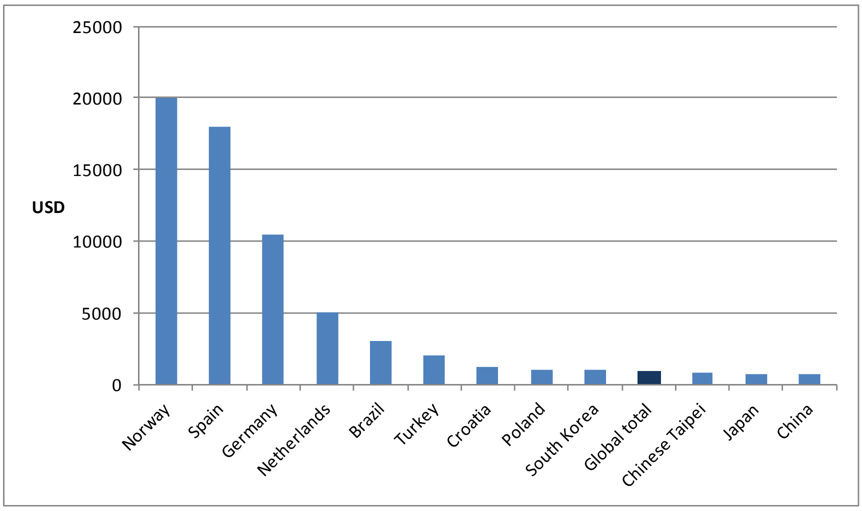
Note: Finland's data are not shown in the chart due to their outlying nature. In 2011, Finland's average vessel value was USD 300 million. Spain's data for 2011 have been omitted due to concerns over data accuracy.

Source: Secretariat calculations based on data on deliveries by economy/region, from Clarkson Research Services *World Shipyard Monitor*, various editions.

Similarly, the average value per DWT delivered by Japanese shipbuilders is also lower than the global average.[28] In 2011, Japan received an average of USD 713 per DWT delivered, compared to a global average of USD 877. China's figure was USD 673 and South Korea received USD 978, while several European countries such as Germany and Norway received substantially more per DWT delivered (Figure 10).

Figure 10. Average value of vessel deliveries, per DWT

2011, available economies



Source: Secretariat calculations based on data on deliveries by economy/region, from Clarkson Research Services *World Shipyard Monitor*, various editions.

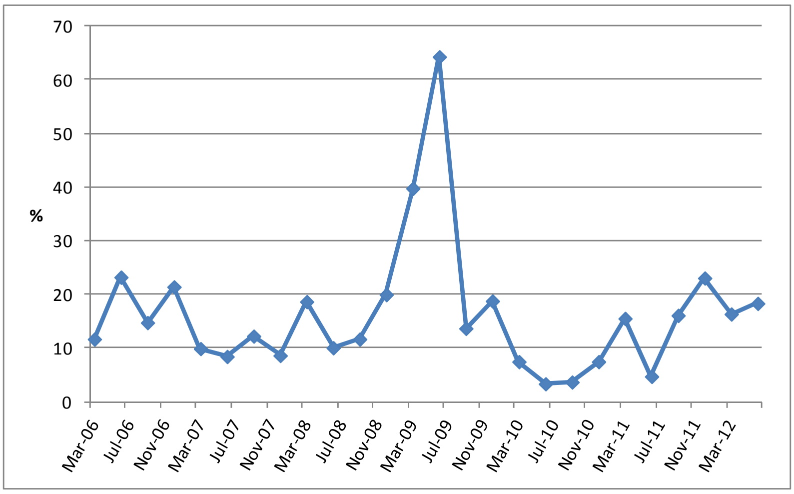
In explaining these trends, the type of ship produced is one of the key drivers. Table 2 earlier showed that the main vessels currently constructed in Japan, by both number and gross tonnage, are general cargo carriers, bulk carriers, ore/bulk carriers and oil tankers. With the exception of oil tankers, these vessels are typically less sophisticated, with an inherently lower value and potentially higher levels of competition in construction from emerging shipbuilding countries, which may keep downward pressure on prices.

Orders and the orderbook

New orders for vessels are typically volatile, and this is reflected in quarterly data on Japanese shipbuilders' share of new orders reported. Looking at the period since 2006, for example, Japan's share of world new orders has fluctuated from a low of 3% to a high of 64% (Figure 11). However, on average, Japanese shipbuilders' share of new orders was around 12% over the 2006-2011 period (not including the two quarters of extremely high shares in March and June 2009[29]).

Figure 11. Share of quarterly orders reported

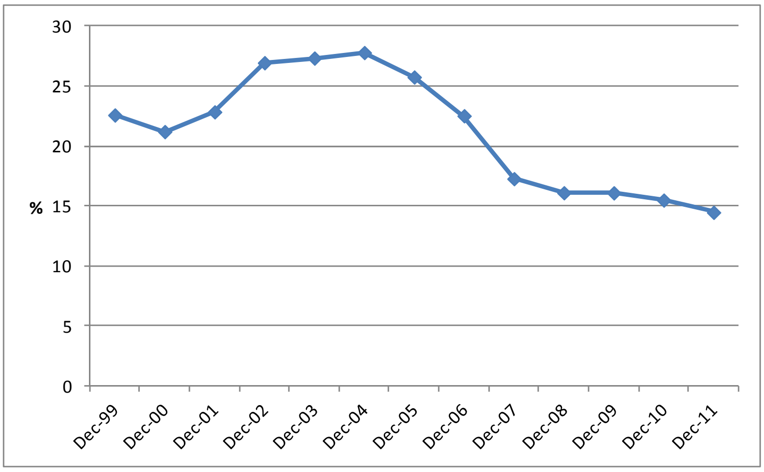
2006-2012



Source: Secretariat calculations, using data from IHS Fairplay *World Shipbuilding Statistics*, Table 3A, various editions.

After increasing in the early 2000s, Japanese shipbuilders' share of the total world orderbook has been in decline since 2004 (Figure 12). Japan's share at the end of the December 2011 quarter was approximately 14.5%, down from almost 28% in 2004.

Figure 12. Japan's share of world orderbooks over time



Note: Data as of the end of the December quarter.

Source: Secretariat calculation using data from IHS Fairplay *World Shipbuilding Statistics*, December editions 1999-2011, Table 1A.

Japan's current orderbook stands as the third largest after China and South Korea, as measured by number of ships, GT and CGT (Table 8). At the end of June 2012, Japanese shipbuilders had 833 vessels either under construction or on order, representing almost 30 million GT (around 14 million CGT). This gave Japan a 16% share of the global orderbook (in GT). This compared to a share of around 39% for China and 34% for South Korea. (The shares of all three top shipbuilding countries were slightly smaller if measured in CGT.)

Table 8. Total world orderbook

At June 2012

Location of build	No. of vessels	GT (million)	CGT (million)	Share of orderbook (by GT)
China	2164	71.97	35.38	38.72
South Korea	902	62.78	30.82	33.77
Japan	833	29.74	14.27	16.00
Brazil	150	4.11	2.43	2.21
Philippines	67	3.91	1.63	2.10
Chinese Taipei	42	1.97	1.08	1.06
Vietnam	236	1.89	1.55	1.02
Rest of the world	1816	9.52	11.43	5.12
Total	6210	185.90	98.59	

Source: Secretariat calculations using data from IHS Fairplay (2012), Statistical Notes 2.

Japan's orderbook is heavily weighted towards delivery in 2013. By GT, 30% of the orderbook is due for delivery over the remainder of 2012, with a further 47% due in 2013 and around 22% due in 2014 and beyond. On current orders, Japan's share of the future orderbook (in 2014+) is 15%, behind South Korea at almost 50% and China at around 21% (Table 9). In this aspect, Japanese shipbuilders are performing better than their Chinese competitors, whose share of the 2014+ orderbook represents a significant drop compared to their current shares in total orderbooks and completions.

Table 9. Delivery schedule

Shares of future orderbook

Location of build	Due for delivery in 2012 (GT)	Share of 2012 deliveries due (%)	Due for delivery in 2013 (GT)	Share of 2013 deliveries due (%)	Due for delivery in 2014+ (GT)	Share of 2014+ deliveries due (%)
China	31 451 615	49.06	31 085 669	40.00	9 436 452	21.41
South Korea	16 252 684	25.35	24 629 471	31.69	21 895 624	49.68
Japan	8 983 141	14.01	14 041 253	18.07	6 718 634	15.24
Brazil	705 947	1.10	1 365 148	1.76	2 041 470	4.63
Philippines	1 658 756	2.59	1 577 431	2.03	672 400	1.53
Chinese Taipei	427 657	0.67	708 296	0.91	834 074	1.89
Vietnam	1 020 214	1.59	719 017	0.93	152 534	0.35
Rest of world	3 607 196	5.63	3 595 343	4.63	2 320 537	5.27
Total	64 107 210		77 721 628		44 071 725	

Source: Secretariat calculations using data from IHS Fairplay (2012), Table 2A.

The cargo-carrying vessel orderbook for Japanese shipbuilders (which comprises the majority of the total orderbook) remains focused on bulk carriers (Table 10), despite the declining market share for Japan in this shiptype category (Figure 7 earlier). This specialisation may represent a growing risk, if demand for bulk carriers remains low. In the first six months of 2012, orders for all types of bulk carrier were significantly down on the previous year, which itself was a muted year for orders (Clarkson Research Services 2012a, p. 4).

Table 10. Composition of the Japanese orderbook

Cargo-carrying vessels

Type of vessel	No. of vessels	GT	Share of orderbook, by GT	CGT
Bulk Carrier	482	19 561 682	66.11	8 762 650
Ore Carrier	21	2 874 048	9.71	826 871
Crude Oil Tanker	13	1 400 066	4.73	448 524
LNG Tanker	8	1 096 400	3.71	796 603
General Cargo Ship	81	1 071 293	3.62	800 780
Vehicles Carrier	14	794 600	2.69	442 849
Container Ship	11	791 530	2.68	405 314
Wood Chips Carrier	12	567 270	1.92	246 739
LPG Tanker	17	341 936	1.16	255 583
Oil Products Tanker	34	333 906	1.13	231 843
Chemical/Oil Products Tanker	21	293 004	0.99	219 583
Passenger (Cruise) Ship	2	250 000	0.84	254 774
Chemical Tanker	13	80 452	0.27	107 983
Passenger/Ro-Ro Cargo Ship	9	44 889	0.15	67 149
Ro-Ro Cargo Ship	6	40 388	0.14	46 588
Refrigerated Cargo Ship	3	18 900	0.06	31 047
Self Discharging Bulk Carrier	1	17 200	0.06	11 119
Bitumen Tanker	4	10 933	0.04	16 383
Aggregates Carrier	2	1 248	0.00	2 927
Passenger Ship	..	..	..	..
Total	754	29 589 745		

Source: Secretariat calculations using data from IHS Fairplay (2012), Table 4A.

Markets

Japanese shipbuilders have a strong presence in the domestic market. The Japanese government reported that 86% of all ships delivered to domestic owners in 2011 were built domestically (the share by value was not available). Furthermore, 95% of all maritime equipment (by value) delivered to domestic shipbuilders in 2011 was domestically-built.

At the same time, many Japanese-built vessels are destined for other markets. The Japanese government reported that over two-thirds of vessels constructed in 2011 (accounting for the vast majority of the gross tonnage) were for export (Table 11). These tended to be larger vessels – as a simple indicator, based on the data provided, the average size of vessels for the domestic market was 4 348 GT, while the average size of vessels for export was 40 150 GT. Data on the current orderbook highlight that Japanese vessels are destined for a wide range of markets, although domestic buyers are more prominent in this recent data, accounting for almost 41% of the number of vessels on order (or 44.5% by GT) (Table 12).

Table 11. Domestic/export production mix in Japan

2011

Destination of vessels	Number of vessels	GT	DWT
Domestic	211	917 517	1 126 657
Export	452	18 148 135	30 283 802

Source: Information provided by Japanese government.

Table 12. Japanese orderbook, by origin of buyer

June 2012

Buyer origin	Number of ships on order	Share (%)	GT on order	Share (%)
Bermuda	1	0.1	151 100	0.5
Canada	3	0.4	80 500	0.3
Chile	1	0.1	34 400	0.1
China	5	0.7	157 700	0.5
Chinese Taipei	33	4.4	980 342	3.3
Denmark	3	0.4	77 100	0.3
Germany	7	0.9	295 800	1.0
Greece	7	0.9	261 720	0.9
Hong Kong, China	8	1.1	135 189	0.5
India	4	0.5	82 400	0.3
Isle of Man	1	0.1	151 448	0.5
Italy	1	0.1	29 500	0.1
Japan	306	40.6	13 155 311	44.5
South Korea	7	0.9	446 383	1.5
Norway	17	2.3	655 500	2.2
Poland	4	0.5	174 000	0.6
Saudi Arabia	5	0.7	220 000	0.7
Singapore	11	1.5	428 956	1.4
Spain	1	0.1	45 500	0.2
Sweden	1	0.1	61 050	0.2
United Arab Emirates	3	0.4	164 900	0.6
United Kingdom	9	1.2	638 950	2.2
United States	5	0.7	403 000	1.4
Unconfirmed	311	41.2	10 758 996	36.4
TOTAL	754	100.0	29 589 745	100.0

Source: Secretariat calculations based on data from IHS Fairplay (2012), table 5A.

The exchange rate has an important influence on firms' profit margins and the incentive to participate in export markets. Vessel prices are frequently negotiated in USD, and the Japanese yen has generally appreciated against the USD over time, with a notable strengthening in the last five years. Given the current weak market conditions, where shipyards appear to have little market power to set prices, this is likely to lead overall to a squeeze on margins, despite some relief from cheaper imported inputs. This may reduce Japanese shipbuilders' ability to compete for foreign contracts.

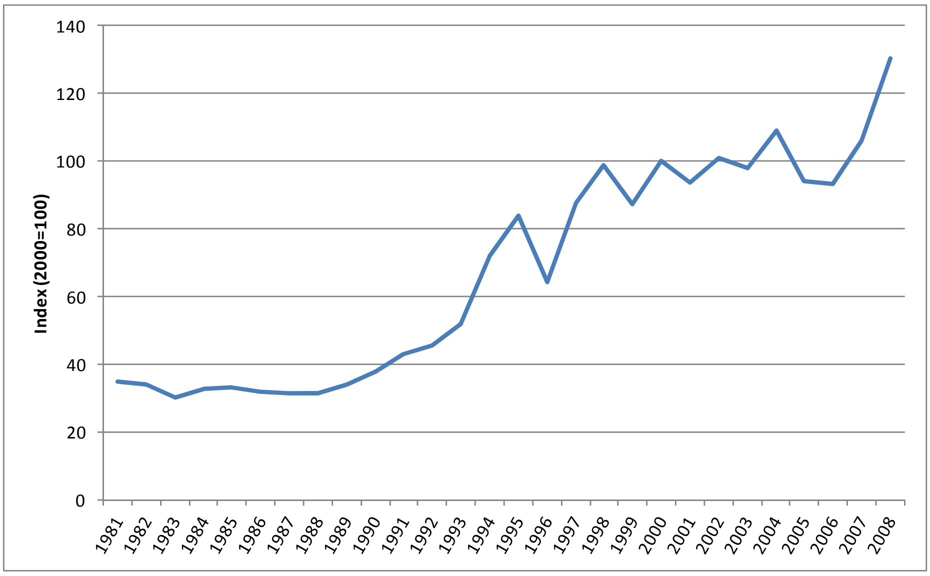
Movements in the exchange rate can create strong pressure for shipbuilders to increase their efficiency and productivity – for instance, Sasebo Heavy Industries recently commented that the "record-high foreign exchange value of the yen (was) further eroding price competitiveness against Korean and Chinese shipbuilders" and that it planned to reduce new shipbuilding related operations and execute broad-ranging reductions to fixed costs (SHI 2012, pp. 2-3). The following section looks at productivity performance in more detail.

Productivity

Labour productivity levels in Japan's shipbuilding industry have risen considerably over the past three decades, although the gains have been faster in some periods than others. Real value added per employee was steady through the 1980s then rose rapidly in the 1990s. It then essentially stood still until 2008, when there was a surge in labour productivity in the industry. Figure 13 charts the progression of labour productivity in the Japanese shipbuilding industry, and highlights how the industry has moved between periods of generally steady and growing value added per employee. A number of possible factors could be behind this, since labour productivity reflects: *i)* how efficiently labour is combined with other factors of production; *ii)* how many of these other inputs are available to workers and; *iii)* how rapidly technical change is taking place.

Figure 13. Productivity in Japanese shipbuilding

Index of real value added per employee



Note: Calculations made using nominal value added and number of persons engaged in the STAN data category C351: Building and repairing of ships and boats. As no deflator was available for this category, the value-added deflator for the aggregate category C34T35 Transport Equipment was used.

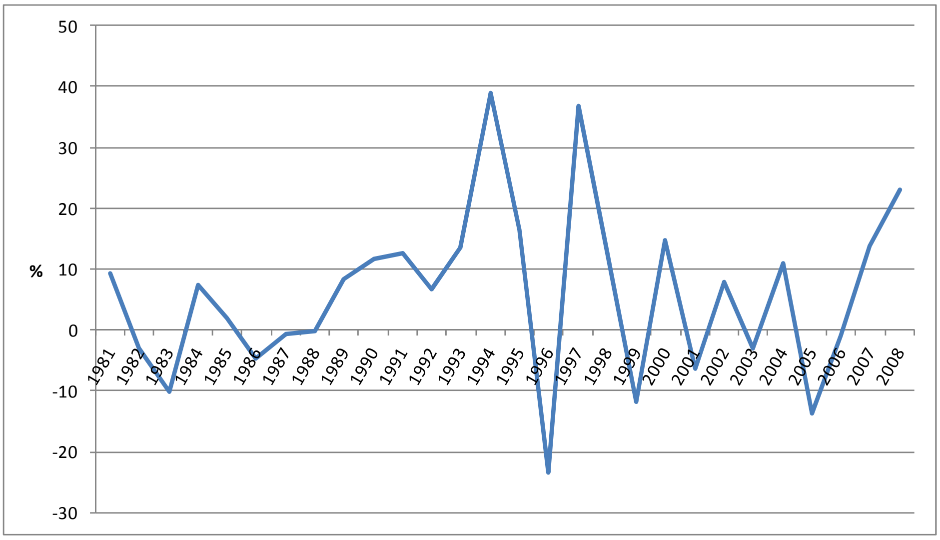
Source: Secretariat calculations, based on data from OECD STAN Database for Structural Analysis (ISIC Rev. 3).

Labour productivity growth in the Japanese shipbuilding industry has been volatile, reflecting the cyclical nature of the industry. Figure 14 below shows the annual change in real value added per employee in Japanese shipbuilding since 1981. There were sharp swings throughout the whole period, although volatility looks to have increased since the mid-1990s and productivity growth appears to have slowed (summary statistics are presented in Table 13).

Most recently, growth in real value-added per employee averaged 5.2% per year over the 2000-2008 period, although year-to-year productivity growth in that period ranged widely and the average figure was pulled up by particularly strong productivity growth of over 10% in both 2007 and 2008. Shipbuilders' productivity performance in these latter years may have reflected the relatively large orderbooks that had built up by this stage of the cycle, with consequent pressures on firms to fully use their capacity and deliver to their customers within reasonable timeframes.

Figure 14. Annual change in real value added per employee in Japanese shipbuilding

1981-2008



Note: Calculations made using nominal value added and number of persons engaged in the STAN data category C351: Building and repairing of ships and boats. As no deflator was available for this category, the value-added deflator for the aggregate category C34T35 Transport Equipment was used.

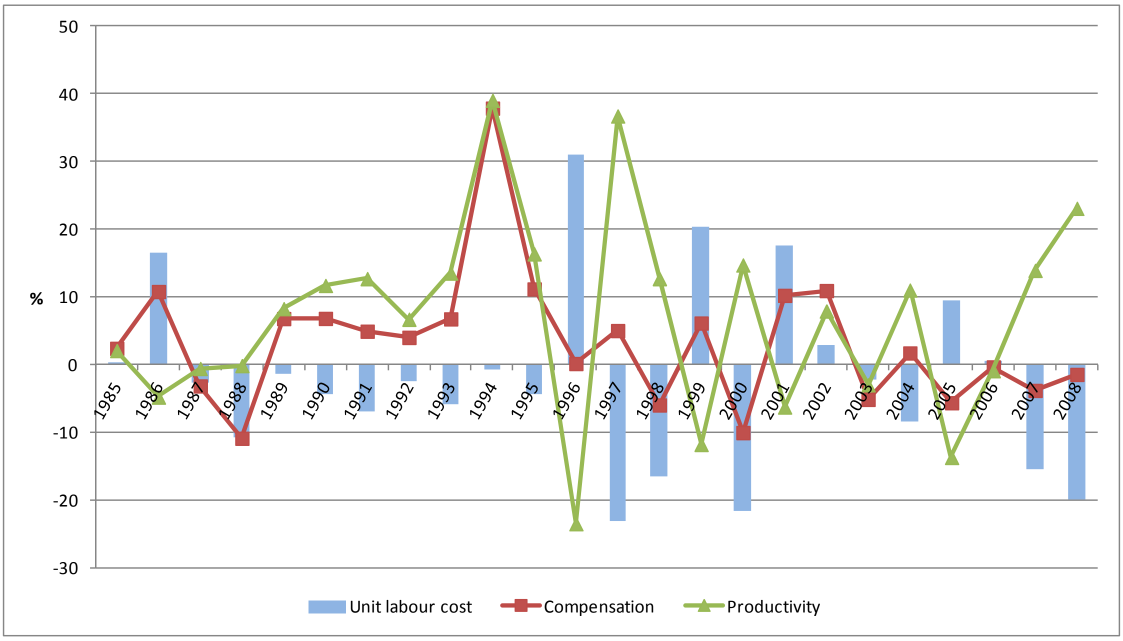
Source: Secretariat calculations, based on data from OECD STAN Database for Structural Analysis (ISIC Rev. 3).

Related to productivity, trends in unit labour cost (ULC) data can give an indication of changes in the average cost of labour per unit of shipbuilding output. When labour productivity rises in step with average labour costs, then ULC stays unchanged. In contrast, if labour costs rise but productivity does not keep pace, then ULC rises. This can be an indicator of possible pressures on output prices and/or the profit margins of the industry.[30] When ULC is adjusted to take account of general inflationary trends in the industry (giving real unit labour costs – RULC), it can provide a focused indicator of industry-specific direct labour cost pressures.

The ULC in Japanese shipbuilding has fallen on average since 1985, although changes from year to year have been volatile, reflecting the measure's link to productivity. The RULC also fell on average over the period, although by a lesser amount, as overall price declines took place in the industry. Figure 15 shows the change in ULC over time, alongside the changes in compensation per employee and changes in employees' productivity.[31] In the most recent period from 2000-2008, ULC rose then fell, with an average annual drop of 4.1% (see Table 13 for summary statistics). Similar to the productivity story, industry performance in 2007 and 2008 strongly influenced this result – ULC dropped significantly in these two years, driven by a large increase in output per employee that was accompanied by an overall reduction in compensation per employee.

Figure 15. Change in unit labour costs in Japanese shipbuilding

The contribution of changes in employee compensation and productivity



Source: Secretariat calculations, using data from OECD STAN Database for Structural Analysis (ISIC Rev. 3).

Table 13. Productivity performance in Japanese shipbuilding - summary statistics

	1981-2008	**1981-1995**	**1996-2008**	**2000-2008**
Average annual labour productivity growth	6%	7.2%	4.7%	5.2%
	1985-2008	**1985-1995**	**1996-2008**	**2000-2008**
Average annual change in unit labour cost (ULC)	-2%	-2.1%	-2%	-4.1%
Average annual change in compensation per employee	3.3%	7%	0.1%	-0.4%
Average annual labour productivity growth	6.9%	9.5%	4.7%	5.2%
Average annual change in real unit labour cost (RULC)	-0.3%	-0.3%	-0.3%	-1.5%

Source: Secretariat calculations, based on data from OECD STAN Database for Structural Analysis (ISIC Rev. 3).

As an exploratory comparative exercise, similar analyses were carried out for Germany and Korea. Data were not available for all WP6 members (or for key non-member economies), so these two economies were chosen as providing an initial comparison against different shipbuilding economy profiles. Over the period 1992 to 2006, for which data were available for all three economies, Japanese shipbuilders' average annual productivity growth sat between that of Germany and Korea, while growth in compensation per employee was lower than that in both comparator countries (Table 14). Japanese shipbuilders' ULC fell over this period, while that of German and Korean shipbuilders rose; however, the RULC recorded a slight rise over the period.[32] Figure 16 shows the change in ULC in Germany and Korea over the full period for which data were available. The German data look similarly volatile to Japan, while Korea's data appear to be less volatile from year to year.

Table 14. Comparing productivity performance

1992-2006

	Germany	Japan	Korea
Average annual change in ULC	2.3%	-0.3%	1.9%
Average annual change in compensation per employee	4.7%	4.4%	10.5%
Average annual labour productivity growth	4.5%	6.6%	9.6%
Average annual change in RULC	0.7%	0.7%	0.2%

Source: Secretariat calculations.

It is noted that some other reports compare productivity performance by measuring CGT output per worker. However, given that the construction of CGT data explicitly incorporates a measure of workload (including labour input), it is not clear how exactly a productivity measure using CGT as the output variable ought to be interpreted. Previous WP6 work has also noted that the use of CGT per employee can be misleading if the production depth of yards is not taken into consideration (OECD, 2007b).

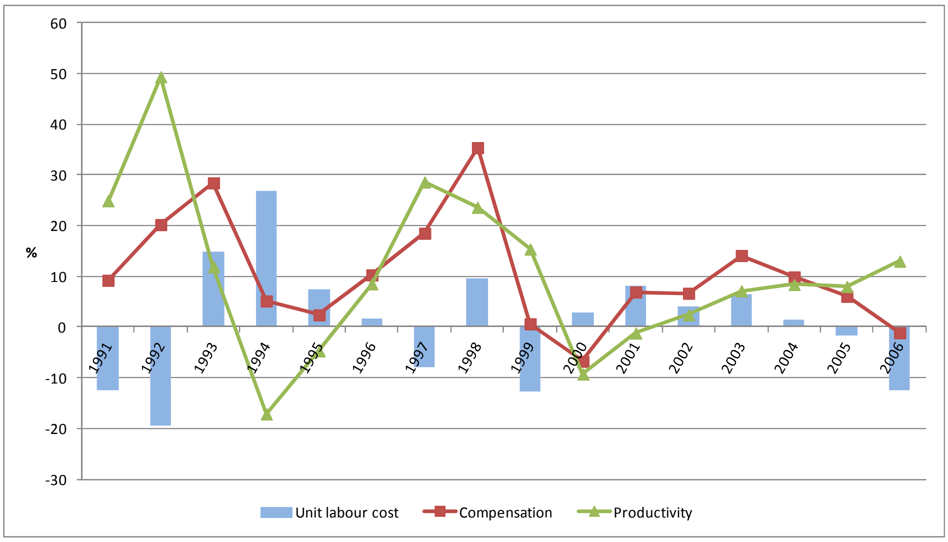
For this report, the Secretariat chose to focus on value added per employee as a productivity measure. The advantage is that the analysis uses internationally comparable data in standard productivity calculations; moreover, the use of value added also reduces the sensitivity of the results to any outsourcing that takes place in the production process. The disadvantage is that data are not available for all countries of interest in comparative analyses. The further development of productivity indicators for the industry could be an interesting area of future work for the WP6, although the data requirements may restrict the possibilities.

Figure 16. Change in unit labour costs in German and Korean shipbuilding

The contribution of changes in employee compensation and productivity

Germany

Korea



Source: Secretariat calculations, based on data from OECD STAN Database for Structural Analysis (ISIC Rev. 3).

Financial performance

As a final indicator, the financial performance of firms is a clear signal of their strength and success in the marketplace. Given that many Japanese shipbuilders are privately owned, data on this can be difficult to source. The Japanese government noted that the 15 major SAJ members achieved sales of JPY 2 400 billion (approximately USD 27 billion) in 2010. However, for individual shipbuilders, financial performance can vary enormously, even where sales look large.

The annual reports of public companies can provide some insights into financial performance, for instance:

- At Kawasaki Heavy Industries, sales of the Ship and Offshore Structure segment in the financial year ending 31 March 2012 were JPY 113.5 billion, with operating profit of JPY 3.9 billion (USD 48 million) (KHI 2012, p. 82). This implied a return on assets[33] of 3.9% (compared to -1% the previous year).

- At Mitsubishi Heavy Industries, sales of the Shipbuilding and Ocean Development division in the financial year ending 31 March 2012 were JPY 311 billion (MHI 2012a, p. 56). However, the division had an operating loss of almost JPY 8 billion (USD 94 million), implying a return on assets of -4.4%. The company suggested the loss was primarily due to the strong exchange rate (*ibid*, p. 28).

- At Sasebo Heavy Industries, the shipbuilding segment reported net sales of JPY 59 billion in the financial year ending 31 March 2012, and a segment profit of JPY 8 billion (SHI 2012, p. 28). This implied a return on assets of 39%, which was an improvement over the previous year.

This information suggests Japanese shipbuilders have been (and are) finding market conditions difficult, although clearly this is a limited sample and more data would be required to draw substantive conclusions on shipbuilders' financial performance. Indeed, the economic climate for Japanese firms in general is difficult, with long-standing deflation squeezing corporate profits and various structural impediments restraining labour productivity and firm dynamism. The most recent OECD Economic Survey of Japan (OECD, 2011) noted, for instance, that regulatory reform and increased openness to trade and investment were some of the areas that could pay dividends for Japan's overall growth performance.

6. Industry challenges and responses

The analysis above has highlighted some of the challenges currently facing Japan's shipbuilding industry. Data show that over time, Japanese shipbuilders have been losing overall market share, in both volume and value terms. Notably, their share of global completions of bulk carriers, oil tankers and ore carriers, which account for a large proportion of their vessel output, have dropped, and the average value of vessels delivered is now below that of many competitors. Japanese shipbuilders account for 16% of the current world orderbook, behind China and Korea, with orders still focused on bulk carriers, despite a declining market share in this sector. Shipbuilders report that the strong yen is affecting their competitiveness; however, data also show that their labour productivity growth has slowed compared to earlier periods. Japan's real unit labour costs have risen faster than Korea's since the early 1990s, although their trajectory was comparable to that of Germany. Publicly available financial data confirms that some Japanese shipbuilders are finding market conditions difficult.

This overview of industry performance raises some interesting questions about Japan's shipbuilders. For instance, what lies behind their market segment choices? Why do builders still focus on bulk carriers, in spite of the intense competition from China in this category? Are there barriers to diversification into higher-value vessels and structures? How can labour productivity growth be strengthened?

Recent industry-led attempts to adjust and to tackle competitiveness challenges suggest that part of the answer may lie in the Japanese industry's current features. Several approaches are emerging, particularly aiming at diversification of activities and at efficiency through modernisation, scale and internationalisation. These efforts are generally being made by the larger (often public) companies, which may have greater resources at their disposal, as well as greater shareholder pressure on them to perform. Their outcomes will have important implications for the industry's future performance.

For instance, some industry players are changing their business focus by changing the type of vessel constructed. As an example, MHI's Kobe shipyard has launched its last merchant vessel and will now focus on constructing offshore units such as research vessels and other specialised orders (Clarkson 2012c, p. 25). MHI is also putting greater emphasis on cruiseship construction; it recently contracted with Aida Cruises to construct two 125 000 GT vessels for delivery in 2015-16 (Clarkson 2012d, p. 54). KHI intends to strengthen its domestic facilities as manufacturing bases for high value-added products to meet anticipated demand associated with the marine development and gas transport markets (KHI 2012, p. 10).

Others are boosting their business focus on provision of shipbuilding services, such as design. For example, MHI has been developing its engineering business services related to shipbuilding; its activities include an agreement with an Indian shipbuilder to provide technology and design and related support, including training of engineers, and an agreement with a Chinese shipbuilding group to provide conceptual design and related technology for a new bulk carrier (MHI 2011a, 2012c). In another recent example, noted by the Japanese government, IHI Marine United has announced a contract for technical assistance with a Brazilian shipbuilding company.

Both of these strategies rely to some extent on greater efforts on R&D, to develop new products and new competencies. Section 3 earlier noted the increase in R&D spending of some of the larger firms in the industry. Within this, energy efficiency appears to be a key goal of Japanese shipbuilders' efforts. Various companies have developed new vessel designs and new technologies that seek to reduce carbon dioxide (CO_2) emissions, increase fuel efficiency and cut pollution (Box 6). In some instances, this R&D is being undertaken co-operatively between Japanese firms and other players to leverage off complementary skills. For instance, ClassNK is reported to be working with Imabari and Sanoyas Shipbuilding Corporation to test technologies aimed at meeting new EEDI regulations in actual operating environments (TradeWinds, 2012b).

Box 6. Technological developments in Japanese shipbuilding

Several members of SAJ provided information for the peer review on their technology development activities, as follows:

Mitsubishi Heavy Industries (MHI)

- MHI has developed the "Mitsubishi Air Lubrication System" (MALS), which uses air to reduce frictional resistance between ship hulls and seawater, to increase vessels' energy efficiency and reduce CO_2 emissions. Sea trials before delivery in 2010 confirmed that MALS reduced CO_2 emissions by approximately 13%. MALS is planned to be installed in various types of ships, such as passenger ships and bulk carriers.

- MHI has also completed development of a new-generation LNG carrier. The new vessel-type features a peapod-shaped continuous cover for the LNG tanks and a new turbine plant that uses thermal energy by reheating steam. These features contribute to greater structural efficiency and size and weight reductions, resulting in improvements in fuel consumption of approximately 25%.

- MHI has developed Japan's first system for supplying high-pressure gas that will enable use of natural gas as a fuel for marine engines.

- MHI is currently developing SO_x scrubbers to satisfy SO_x emission regulations under the International Maritime Organization's (IMO) International Convention for the Prevention of Pollution from Ships (MARPOL).

Universal Shipbuilding Corporation (USC)

- USC established a "Next-Generation Ship Development Department" and tasked it with the mission of developing a "super-energy-saving ship". In July 2011, USC completed development of a large bulk carrier that reduces greenhouse gas emissions by 25% compared to conventional bulk carriers. USC has set a target of reducing the CO_2 emissions of its ships by 50% by 2020.

Shin Kurushima Dockyard (SKDY)

- SKDY is currently developing energy efficient ships which can achieve a better Energy Efficiency Design Index (EEDI) rating under MARPOL.

Source: Information provided by the Japanese government.

Aside from new business lines, a further strategy has been to modernise facilities. For example, in its annual report, MHI noted it had made capital investments to upgrade and expand its ship production facilities (MHI 2012a, p. 28). At one of its yards in the Yamaguchi Prefecture, for instance, MHI acquired new equipment and re-organised the physical production site to improve work efficiency and productivity (MHI 2011b).

Companies are also engaging in mergers as well as looser forms of co-operation. In one high-profile example, Universal Shipbuilding and IHI Marine United have merged their operations into a new company, Japan Marine United. This merger aims to leverage the combined engineering resources and production facilities of the two companies to boost design and development capabilities and raise productivity (Hellenic News, 2012). At a looser level, Mitsubishi Heavy Industries (MHI) has signed a technological collaboration agreement with Imabari, related to container vessels. The intent of the agreement is to better compete in the international market and to actively explore possibilities for demand in the market (MHI, 2012b).

At the international level, Section 3 earlier described some of the foreign investments that have been made by Japanese shipbuilders. Acquisition of yards abroad has been strongly driven by a search for lower production costs, particularly in light of the strength of the Japanese yen against both the US dollar and the South Korean won. For instance, KHI was reportedly raising its stake in the Dalian Cosco Shipbuilding Industry Co to 49% so as to mitigate against the strong yen by exporting directly from China (Leander, 2012). Namura Shipbuilding recently made moves to acquire a yard in South Korea to take advantage of lower production costs, although the purchase did not ultimately take place (TradeWinds, 2012c). Overseas investments can also help shipbuilders to shift their business focus, by acquiring yards with different production capabilities and clients.

Whether government policy settings will help or hinder this industry-led adjustment is an important question. As noted earlier, there have been no studies of the impacts to date of the government's policy settings on export credits, insurance, home credits and R&D support, and the time constraints for the current study did not allow for industry consultation by the Secretariat. It is not clear whether Japanese shipbuilders would have experienced a larger decline in market share, or would have undertaken less R&D, in the absence of these policies. The lack of evidence makes it difficult to predict the future impact of these policies, and underlines the importance of governments making plans to evaluate their policies in a systematic manner. While the general macroeconomic environment obviously plays a role in explaining performance, policy settings can act to constrain or distort shipbuilders' decisions. Governments need to improve their understanding of the effects of their policy approaches.

7. Summary and suggested questions for discussion

The WP6's peer review process aims to provide a robust analysis of shipbuilding industry support measures at the country level, accompanied by industry detail, so as to facilitate discussion of shipbuilding policy and its impact by the WP6. This first study, of the Japanese shipbuilding industry, has presented information and analysis of the general role of shipbuilding in the Japanese economy, the structure and features of the industry, the government policies affecting the industry, the industry's performance over recent years, and the challenges and responses currently playing out. It provides a backdrop for debate and experience-sharing on shipbuilding policies.

Japan has over 1 000 shipyards, predominantly privately owned, ranging from small private yards to large public or private establishments forming part of industrial groups. The majority of yards focus on building small vessels, with around 260 yards capable of constructing ships over 500 gross tons. Bulk carriers, general cargo ships and oil tankers account for the majority of vessels produced, by both number and gross tonnage. While Japan's shipbuilding industry represents a fairly low percentage of total Japanese output and employment, it is part of a wider maritime cluster with important upstream and downstream linkages to industries such as marine equipment, steel and ship-related services. Six Japanese shipbuilders feature in the top 30 shipyard groups worldwide, as measured by orderbooks.

Policies for the shipbuilding industry in Japan have focused on export credits, insurance, home credits and R&D support, with export credits playing a growing role in recent years. Total monies committed under these four policies rose from JPY 41 billion (USD 378 million) in the 2004 fiscal year to JPY 130 billion (USD 1622 million) in 2011. Recent years have seen rapid growth in export credits and payouts under export credit insurance. Direct spending on R&D has increased and is now focusing on high-level technology for CO_2 emission reduction, although the sums remain relatively small (JPY 80 million or USD 0.7 million in 2011).

Analysis of indicators of industry performance highlights the challenges currently facing the Japanese shipbuilding industry. Over time, Japanese shipbuilders have been losing overall market share, in both volume and value terms. While market share is not necessarily the primary goal – instead, robust firm performance is the real target – the trends in market share can indicate underlying problems in the industry. In particular, Japanese shipbuilders' share of global completions of bulk carriers, oil tankers and ore carriers, which account for a large proportion of their vessel output, have dropped, and the average value of vessels delivered is now below that of many competitors. Japan's shipbuilders account for 16% of the current world orderbook by GT, behind China (39%) and Korea (34%). Their orderbooks remain focused on bulk carriers, despite a declining market share in this sector. While shipbuilders report that the strong yen is affecting their competitiveness, data also show that their labour productivity growth has slowed compared to earlier periods. Comparing Japanese shipbuilders' real unit labour costs to those of some competitors shows that they have risen faster than Korea since the early 1990s, although their trajectory was comparable to that of Germany. Publicly available financial data confirms that some Japanese shipbuilders are finding market conditions difficult.

The data point to potential issues with Japanese shipbuilders' market strategies and performance, and segments of the industry are indeed attempting to diversify and seek efficiencies through scale and internationalisation. Large companies are moving to produce new types of vessels, expand their design and technical services businesses and find new market niches via R&D, as well as modernise their facilities and seek wider domestic and international linkages. It is hard to judge the likely effect of government policies on these adjustment efforts, since no evaluations of the impact of shipbuilding policies have been undertaken to date. This underscores the need for more systematic policy evaluation to inform future policy making.

Looking to the future, a number of policy-related issues emerge from this review, which may benefit from wider discussion. For instance:

- What are the appropriate roles of government and industry in establishing and maintaining a skilled shipbuilding workforce?

- How can the government facilitate firms' engagement with the network of Japanese universities and research institutions that work on maritime-related issues?

- What are the impacts of export credit facilities on shipbuilders? What are some best practice policy evaluation methods in this area?

- Are R&D grants a necessary incentive for Japanese shipbuilders to embark on environment-related or other R&D projects?

- Is there still a strong rationale for providing loans via home credits to domestic shipowners or other domestic third parties?

- In facilitating industry efforts to adjust, should the policy mix in Japan be refocused to provide more/less R&D support? More/less export credit support?

- What are the main reasons for the slowdown in labour productivity growth in the Japanese shipbuilding industry? Are there any implications for government policy?

NOTES

1 The studies of China and Vietnam were published in the OECD Journal: General Papers, Volume 2010/3.

2 To give a comparison, this was equivalent to around half the size of the textile, textile products, leather and footwear manufacturing industry in Japan.

3 It should also be noted that SAJ membership is not constant over time – for instance, in 1975 there were 23 members, compared to 19 members in 2010. Data were not available on the percentage of total Japanese shipbuilding output accounted for by SAJ members at different time points.

4 Data from Clarkson Research Services Ltd (2012a).

5 Calculated using labour force and employment data from OECDStat (Dataset: Population and Labour Force). Note that 2011 data on these two variables excludes three prefectures (Iwate, Miyagi and Fukushima) struck by the Tohoku Earthquake, where the labour force survey operation was suspended for several months from March 2011. For time-series comparison, data for 2010 were also compiled on the basis of excluding the three prefectures.

6 Data provided by the Japanese government.

7 Total labour force and employment data from OECDStat (Dataset: Population and Labour Force). See footnote 5 regarding data coverage.

8 The classification process involves verification that new vessels conform to the rules applicable in a given flag administration, both at the time of construction and over their service life (IACS, 2011). These rules relate to maritime safety and pollution prevention and cover issues such as the structural strength of vessel hulls and the suitability of propulsion and steering systems, power generation and other operating systems. Ship classification societies play a dual role, developing rules and standards related to maritime safety and pollution prevention and surveying ships for compliance with these standards.

9 www.classnk.or.jp/hp/en/about/aboutNK/index.html (accessed 7 August 2012).

10 For consistency, unless otherwise stated, all USD estimates presented in this report are calculated using the average of daily national currency-USD exchange rates in a calendar year, from the OECD Main Economic Indicators database.

11 Information from company website: www.osy.co.jp/english (accessed 6 August 2012).

12 Information from company website: www.imazo.co.jp/english (accessed 6 August 2012).

13 See Sumitomo Heavy Industries www.shi.co.jp/english and IHI Corporation www.ihi.co.jp/en (accessed 7 August 2012).

14 www.jasnaoe.or.jp/en/about/general.html (accessed 10 September 2012).

15 www.maritime.kobe-u.ac.jp/aboutus_e/fast_facts_e.html (accessed 10 September 2012).

16 www.naoe.eng.osaka-u.ac.jp/eng/index.html (accessed 10 September 2012).

17 This description draws on information from www.nmri.go.jp/index_e.html (accessed 10 August 2012).

18 This description draws on information from www.jstra.jp/english (accessed 10 August 2012).

19 This description draws on information from www.sof.or.jp/en (accessed 10 August 2012).

20 www.classnk.or.jp/hp/en/research/rd/joint.html (accessed 7 August 2012).

21 www.classnk.or.jp/hp/en/about/industrycoop/index.html (accessed 7 August 2012).

22 The SAJ was founded on a private basis in 1947, and in 1951 it acquired the juridical status of an incorporated association under the supervision of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT). In April 2012, the SAJ changed its status to a general incorporated association that is not under the supervision of any national authority, in accordance with Japan's national policy on the reform of the status of incorporated associations.

23 Formerly the Committee for the Elimination of Substandard Ships.

24 Information provided by the Japanese government.

25 www.mlit.go.jp/common/000026153.pdf (accessed 10 August 2012).

26 JBIC's mission is to contribute to the sound development of the Japanese and international economies through providing a range of financial products and other services. From 1 April 2012, it became an independent incorporated financial institution, formally separating from the Japan Finance Corporation (JFC). Its functions were strengthened under new governing legislation – for instance, it may now provide export finance for sectors/areas designated by a cabinet order in developed countries (JFC 2011, p. 3). JBIC is wholly owned by the Japanese government.

27 In 2009, indirect support to Japanese business through R&D tax incentives was 0.05% of GDP (OECD 2012b, p. 162).

28 DWT is a ship size measure most suited to cargo-carrying ships and is not a perfect measure of all types of shiptype outputs. However, comparable data using GT or CGT were not available. As such, this data should be interpreted with caution.

29 This period was extremely unusual, with total world orders plummeting as a result of the economic crisis and downturn. Clarkson Research Services (2009) reported that orders of just 80 vessels, representing 1.1 million CGT, were made in the first six months of 2009. As a comparison, in the first six months of 2008, 1 177 vessels (24.5 million CGT) were ordered (Clarkson Research Services, 2008).

30 However, it is important to interpret ULC as a partial measure of cost competitiveness, since it does not take into account other production costs, such as transport costs, capital or intermediate input costs, etc.

31 Mathematically, ULC is calculated by dividing total compensation of employees by real value added (*i.e.* value added in volume terms). When changes in ULC are relatively small, the change in ULC approximately equals the change in compensation less the change in labour productivity. However, this relationship becomes less exact when changes in ULC are large.

32 This highlights the influence of the 2007-2008 results on the averages, with their exclusion here resulting in a positive average annual change in the Japanese RULC, compared with the results in Table 13.

33 The return on assets (equivalent to profits divided by assets for the company or segment in question) is an indicator of how well management are using the assets of their company to generate profits. The higher the return, the better the performance. Returns can vary widely by industry, so comparing a firm's own trends over time or with other similar companies gives a better indication of performance than cross-industry comparisons. The return on assets is just one measure of financial performance of companies, and was chosen here based on the availability of information.

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