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PEER REVIEW OF THE KOREAN SHIPBUILDING INDUSTRY AND RELATED GOVERNMENT
POLICIES

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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 25 November 2014. No substantive comments were received and delegates agreed to declassify the report. The report will be made available on the WP6 website: www.oecd.org/sti/shipbuilding.

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Executive summary

The Korean shipbuilding industry made a significant contribution to the country's rapid industrialisation in the post-World War 2 period, and it is now one of the top global players, leading by value and second only to China by volume. Korean shipbuilders' output approximately tripled from 2000 until 2011, when the effects of the global financial crisis began to be reflected in yard activity, and the Korean industry accounted for 35% of global vessel completions (in gross tonne terms) in 2013. The industry represents just under 2% of Korean value added and a sizeable share of exports, around 10% in 2011. It forms an integral part of a wider maritime cluster, with marine equipment and steel comprising key inputs.

Shipbuilding in Korea is dominated by nine major companies, with the largest (by vessel completions) being Hyundai Heavy Industries, Daewoo Shipbuilding and Marine Engineering and Samsung Heavy Industries. The vast majority of firms in the industry are privately held (i.e. not listed on the stock exchange), and some have relatively complex ownership links and affiliates operating in areas beyond shipbuilding. While a number of smaller firms have closed in recent years, the larger Korean shipbuilders have been increasing their presence abroad since the mid-2000s, mainly in Asia.

The industry produces a wide variety of shiptypes, but there is a significant share of high-value, large vessels, such as container ships, very large crude oil tankers, and gas tankers. In addition, offshore vessels and structures, such as anchor handling tug supply, platform supply vessels and fixed production platforms, are an important part of the industry's output. Korea's average vessel value is twice that of the global average, and Korean shipbuilders have consistently accounted for more than 30% of the global market in value terms since 2007. Looking ahead, Korea currently accounts for a third of the global orderbook, with an ongoing focus on large vessels.

The prominence of high-value outputs has been supported by the industry's R&D spending and skilled workforce. Notably, the major companies continued to invest in innovation despite the economic crisis, and new R&D facilities (including some dedicated to naval R&D) are in the pipeline. Skilled workers are also an important input, and shipbuilding appears to be one of the higher-paying industries in Korea. There are increasing numbers of university-educated R&D and engineering workers in the shipbuilding workforce, and the industry is strengthening its links to universities and investing in training to boost staff competencies. Labour productivity was particularly strong from 1998 to 2007; this corresponded to the boom period in the global industry and may have been partly driven by increased investment by Korean shipbuilders.

However, the financial performance of Korean shipbuilding companies has suffered in the wake of the global economic crisis, and firms appear to be faring worse than their counterparts in other shipbuilding economies. Operating profits are low and companies have been experiencing liquidity problems; as a consequence, debt levels have increased substantially and firms' ability to service debt has become a major concern for policy makers and financial supervisory bodies. The difficult financial situation has led to an increase in ownership stakes held by government-related agencies in several large shipbuilding companies.

From a policy perspective, the crisis precipitated a surge in government policy attention to the shipbuilding industry, with the introduction of a restructuring and competitiveness plan, followed by a plan to develop the offshore plant industry. The latter has a strong emphasis on increasing local production of engineering, parts and equipment; it forms part of Korea's wider efforts to establish a "creative economy" based on technology.

However, given its relatively recent introduction, it is not yet clear how the offshore plan will practically impact on policy. Korea currently offers R&D support that is focused on developing “next-generation” ships and provides funding for key research organisations; it also supports less-specific “maritime development” R&D that may yield relevant results for the industry. Ship financing is provided through two state-owned export credit agencies, both of which played a key role in the restructuring and competitiveness plan through increasing lending and insurance for yards. In addition, finance arrangements provided for the shipping industry are likely to have an impact on shipbuilders, via increased demand for vessels. There is also some support for the marine equipment industry, which the offshore plant development plan appears to reinforce, and support for human resources development.

Looking ahead, the financial difficulties of the industry appear to be the most immediate challenge. The increase in government exposure to the industry, via ownership and export credit policies, increases the risk to the government’s finances, should the industry’s performance worsen. The large size of key shipbuilding firms, and their ownership links, also raises concerns about the employment effects of any possible restructuring and potential domino effects through the industry and wider economy. Some restructuring and reorientation in the industry appears necessary, but any government action will need to have an eye to managing the state’s exposure to risk, as well as endeavouring to maintain a level playing field.

The government’s plan in support of the offshore plant industry envisages a strong push into high-value, high-technology vessels and marine equipment, and supports the industry’s own efforts to build and maintain a strong competitive advantage in this sector. However, the goals for localisation are ambitious and the government should be cautious not to disadvantage its shipbuilders by unintentionally raising input costs. Similarly the government’s efforts to support technology development need to complement those undertaken by industry and avoid crowding out private initiatives.

Finally, like other developed shipbuilding economies, continuing to attract skilled workers to the shipbuilding industry is a challenge, as society ages and young workers have a wider range of industries to which they can apply their talents. The industry currently draws on an increasing share of subcontracted workers, but while this strategy aids flexibility, it may not aid efforts to build worker skills or boost the attractiveness of the industry.

In sum, Korea’s shipbuilding industry has been a success story, but the global economic crisis has dented its finances and it now faces serious challenges to set itself back on a solid footing. The role of the government in the Korean industry has changed significantly over the last 50 years, and the government commented that government support is not now a critical engine for industry success. However, the events of the past 5 or so years have resulted in an increase in government policy attention to the industry, as in other shipbuilding economies, and have highlighted questions about optimal ways of dealing with struggling businesses that are relevant for all players in the industry.

1. Introduction to the study

In 2012 the OECD’s Council Working Party on Shipbuilding (WP6) 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. To date, Japan and Portugal have been the subject of WP6 peer reviews (OECD, 2013a and OECD, 2013b).

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.

The WP6 already compiles an “inventory” of government support measures, which covers a range of 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 have the opportunity to actively debate and discuss drafts of studies, with a view to promoting transparency and experience-sharing within the group.

This third WP6 peer review analyses the Korean shipbuilding industry and related government support policies. It follows a similar format to that of the Japanese and Portuguese reviews, to aid comparison across WP6 economies.

The report is structured as follows:

- Section 2 provides a brief introduction to the Korean industry, in terms of its contribution to the economy;
- Section 3 looks at the structure of the industry and its facilities;
- Section 4 describes Korean government policies affecting the shipbuilding industry;
- Section 5 analyses the performance of the industry, drawing on a range of data. In the wake of the crisis, it includes an investigation of the shipbuilding industry performance;
- Section 6 draws together the information and data provided, with a discussion of industry challenges and responses;
- Section 7 proposes some questions for discussion by the WP6.

This report was prepared by Secretariat staff. The information in the report is drawn from public information sources, statistical series available to the Secretariat, and the Korean government’s response to the generic peer review questionnaire, prepared by the Korean Ministry of Trade, Industry and Energy (MOTIE) in collaboration with the Korea Offshore and Shipbuilding Association (KOSHIPA). The report also benefited from discussions held in Seoul between the Secretariat and staff from MOTIE and KOSHIPA, and a Secretariat visit to the Hyundai Heavy Industries (HHI) shipyard in Ulsan, arranged by MOTIE and KOSHIPA. The Secretariat thanks Korea for its co-operation.

2. An introduction to Korea’s shipbuilding industry

Korea’s industrialisation in the post-World War 2 period has created a sophisticated manufacturing base, of which shipbuilding has been an integral part. Starting with labour-intensive light manufacturing sectors, Korea gradually moved up the value-added chain towards more sophisticated products by assimilating technology from overseas and building up its domestic research and technology (R&D) and scientific capabilities (OECD 2009a, pp. 58-60). In the mid-1970s, Korea moved into heavy industries such as chemicals and shipbuilding, and established government research institutes, including one for shipbuilding. Over time, shipbuilding has become one of Korea’s high-technology, innovative industries.

According to KOSHIPA data provided by the Korean government, as of 2013 there were 80 shipbuilding companies in Korea, nine of which were large and 71 of which were small- and medium-sized enterprises (SMEs).¹ More than 100 shipbuilding SMEs operated in the industry in the early- to mid-2000s, but their numbers gradually declined, in particular after the financial crisis. The concentration of the industry is a notable feature of the Korean shipbuilding industry – the number of shipbuilding SMEs in Korea is relatively small compared to Japan and Portugal (OECD, 2013a and OECD, 2013b). In part, this is a structural feature of the Korean economy more generally, with *chaebol* (large

business groups owned by a family, with control over subsidiaries in various industries) and other large business groups accounting for a significant part of GDP compared to SMEs (OECD 2009a, p. 62; OECD 2014a). Table 1 shows the nine major shipbuilding companies and their associated yard locations in Korea.

Table 1. Major Korean shipbuilders
KOSHIPA members

Shipbuilding company/group	Yards in Korea
Hyundai Heavy Industries (HHI)	Ulsan Gunsan
Samsung Heavy Industries (SHI)	Geoje
Daewoo Shipbuilding & Marine Engineering (DSME)	Okpo
Hyundai Samho Heavy Industries	Samho
Hyundai Mipo Dockyard	Ulsan
STX Offshore & Shipbuilding	Jinhae Busan Goseong
Sung Dong Shipbuilding & Marine Engineering	Tongyeong
Hanjin Heavy Industries & Construction	Yeongdo
Dae Sun Shipbuilding Engineering	Busan
SHINAsb Yard	Tongyeong

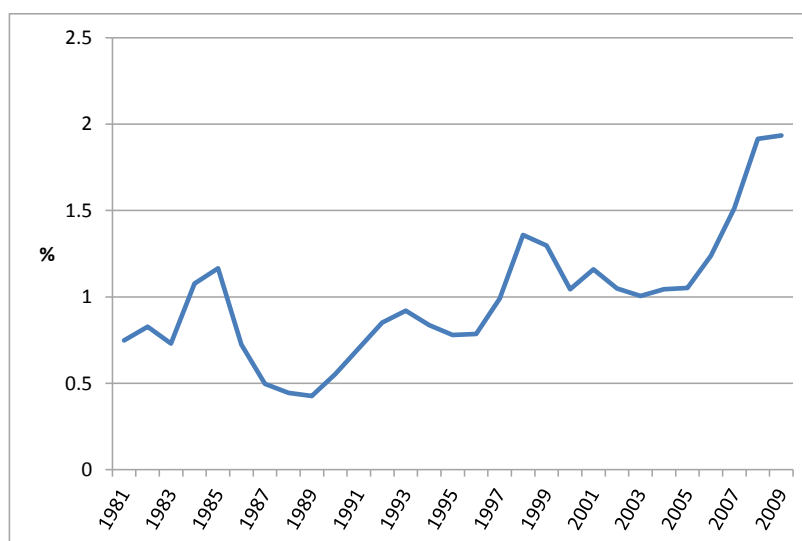
Source: KOSHIPA website, www.koshipa.or.kr/eng/koshipa/koshipa3/facilities.htm (accessed 28 April 2014).

2.1 Contribution to output

The contribution of Korean shipbuilders to Korea's gross domestic product (GDP) has trended upwards since the late 1980s. Shipbuilding's share of Korean value added reached just under 2% in 2009 (Figure 1), the latest year for which data are available from the OECD's STAN Database (Box 1). This was not far behind the post and telecommunications sector (2% of value added) or the iron and steel industry (2.1% of value added). As a cross-country comparison, in 2009 the weight of the shipbuilding industry in the Korean economy was around ten times greater than that of the Japanese shipbuilding industry in the Japanese economy (see OECD 2013a).

More recent Bank of Korea figures provided by the Korean government suggest that the share of shipbuilding in the Korean economy may have fallen slightly since 2009. Their data show shipbuilding's contribution to GDP was 1.9% in 2010 and 2011, falling to 1.8% in 2012.

Figure 1. Shipbuilding in the Korean economy
Share of shipbuilding in value-added, 1981-2009 (%)



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

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

Box 1. OECD data on the Korean shipbuilding industry

Several figures in this report use data from the OECD's STAN Database for Structural Analysis (OECD, 2010a). While the data are available only from 1981 to 2009 (2006 for specific variables such as employment), their level of detail and comparability with data from other WP6 countries makes them a useful addition to the analysis.

As was the case for the WP6's peer reviews of Japan (OECD, 2013a) and Portugal (OECD, 2013b), 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 Korean shipbuilding industry.

Methodological changes in the industrial classification system were recently incorporated in a new version of the STAN database (OECD, 2013c). For some charts in this report, this new version of the database has been used to obtain information that goes beyond 2009, although it only covers 15 economies so far. The industrial classification used is ISIC Rev. 4. The relevant category for shipbuilding is D301 *Building of ships and boats*, which includes the sub-categories *Building of ships and floating structures* and *Building of pleasure and sporting boats*. This new category does not include repair and maintenance activities.

OECD data on Korean shipbuilding exports used in this report are obtained from the Bilateral Trade Database by Industry and End-use Category (OECD 2013d), a subset of the STAN database. The industrial classification used here is ISIC industry category C351 Building and Repairing Ships and Boats, described above.

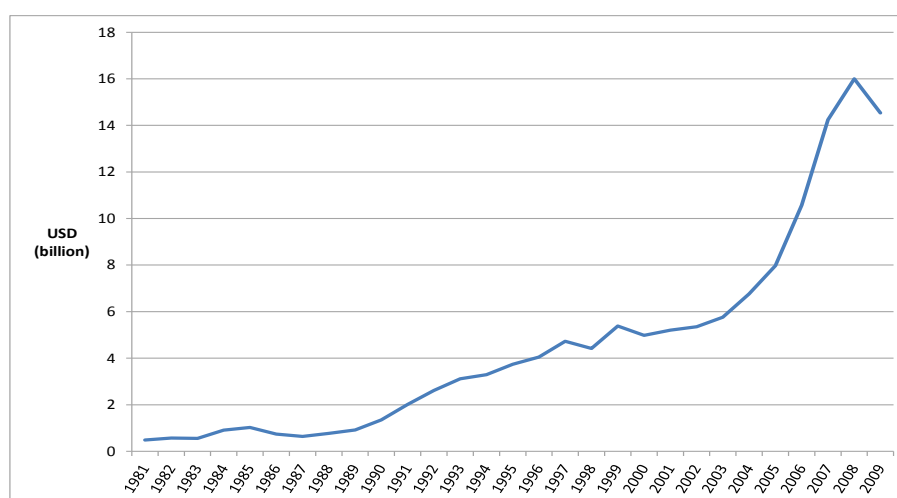
Finally, this report uses shipbuilding industry information from KOSHIPA, provided by the Korean government. Data obtained from KOSHIPA sources may differ from OECD data for the following reasons:

- OECD data are obtained through national statistical offices, whereas KOSHIPA's are obtained from the industry.
- KOSHIPA data mainly focus on member companies and additional selected non-member companies. While they do not exhaustively cover the industry, they provide a good approximation, as KOSHIPA members and selected companies account for the bulk of the output and employment in the industry.

- OECD data follow the ISIC classification system, thus may include some non-shipbuilding companies. This is the case with the inclusion of the repair and maintenance industry under ISIC rev. 3.
- Further differences specific to employment data may arise due to whether non-regular workers are included in the statistics.

Figure 2 shows the relatively steady growth in value added in the Korean shipbuilding industry, in US dollar terms (current prices). The period of volatility at the time of the Asian financial crisis marked a step-change for the industry, with average annual growth accelerating from 11.9% (1989 to 1997) to 16.2% (2000 to 2008). The final year of data shows a drop in value added, but this is driven by currency movements – value added in Korean won (KRW) continued to rise from 2008 to 2009.

Figure 2. Korean shipbuilding value-added
USD (billion)

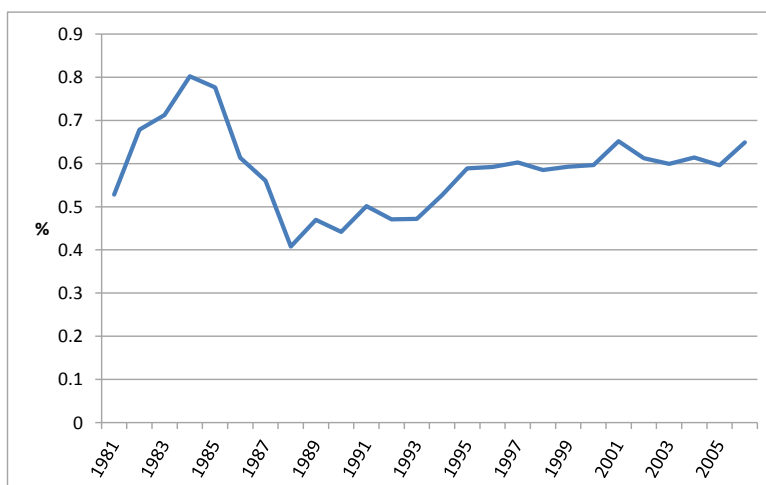


Note: Data refer to ISIC category 351: Building and repairing ships and boats (current prices).

Source: Calculations based on OECD (2010) *STAN Database for Structural Analysis* (ISIC Rev. 3) and OECD (2014b) *Reference Series: Monthly Exchange Rates* dataset.

2.2 Contribution to employment

OECD data on employment in the Korean shipbuilding industry suggest that the industry accounted for around 0.65% of Korea's total employment in 2006 (Figure 3) – or just over 150 000 people (Figure 4). (In comparison, in 2008 Japanese shipbuilding employed around 91 000 people, or 0.14% of total Japanese employment. In Portugal the 2006 figures were 6 000 people and 0.12% of total employment.) After a steep fall from 1984 to 1988, when the share of shipbuilding in employment halved, the sector gradually increased its share of Korean jobs. The period from 1995 to 2005 saw the sector maintain a relatively steady share of total employment, as the upward trend in shipbuilding employment numbers tracked the general employment situation.

Figure 3. Share of shipbuilding in total employment, 1981-2006

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

Figure 4. Employment in shipbuilding, 1981-2006

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

2.3 Contribution to exports

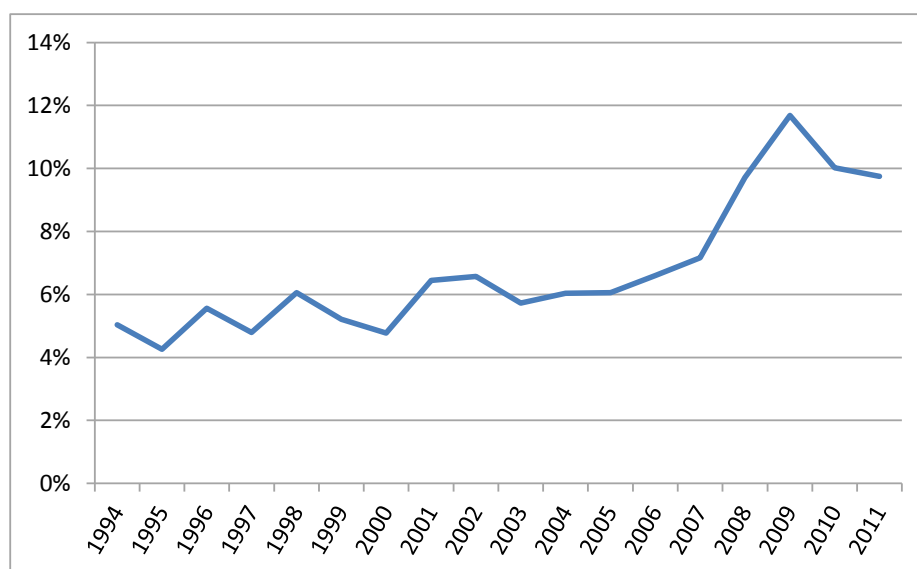
The shipbuilding industry in Korea makes a significant contribution to Korean exports. Korean exports of vessels (on a completion date basis) have increased almost constantly in terms of both value and share of total Korean exports (the latter is displayed in Figure 5). In 1994, vessels exported by Korea totalled USD 4.9 billion, accounting for 5% of total Korean exports. Supported by a boom of newbuilding contracts before 2008, vessel exports increased significantly to USD 42 billion in 2009 (11.7% of total exports). In comparison, in 1994 Japanese vessel exports totalled USD 11.7 billion (2.9% of Japanese exports), but by 2009 these had only grown to USD 22 billion (although spiking to 3.8% of total exports). In the case of China, exports shot from USD 0.5 billion in 1994 to USD 28.4 billion in 2009 (and from 0.5% to 2.4% of total Chinese exports). After 2009, the share of shipbuilding exports declined to about 9.7% of Korea's total exports in 2011. This is explained by a slower growth of shipbuilding exports, when

compared to other sectors of the economy; shipbuilding exports in value grew 27.4% between 2009 and 2011, while total Korean exports increased by 52.7% over the same period.

Contrary to other industries in Korea, shipbuilding exports did not decline during the financial crisis. While shipbuilding exports grew at an annual rate of 53.8% in 2008 and 3.7% in 2009, total Korean exports grew by 13.6% in 2008 but declined 13.9% in 2009. The impact of the financial crisis on shipbuilding exports may only be reflected in post-2011 figures because of the nature of shipbuilding activity, where there can be a significant time difference between a new order and completion/delivery.

Figure 5. Korean shipbuilding exports

As a share of total exports, 1994-2011



Note: Calculated as shipbuilding export values divided by total exports. Values are provided in current US dollars. Shipbuilding industry defined as the ISIC Rev. 3 category C351: Building and repairing of ships and boats.

Source: Secretariat calculations, based on data from OECD (2013d).

2.4 *The wider maritime cluster*

The shipbuilding industry is part of a sophisticated marine cluster, with upstream and downstream links as well as connections to other clusters including logistics and electronics. The shipbuilding value chain is composed of many different activities from design to post-sales, and the high degree of modularity in the industry means that production can be fragmented across different production units and, indeed, countries, in a global value chain (OECD, 2013e).

One important domestic link is with the steel industry. Korea is the world's sixth largest producer of steel, producing 66.1 million metric tonnes (mmt) in 2013 (or approximately 4% of global steel production) and employing 159 970 people in 2012. Shipbuilding has been a major driver of steel consumption in Korea, and in 2012 it accounted for 20.8% of the country's total demand for steel, behind construction (28.1%) and automobiles (25.1). Total shipments of steel to the shipbuilding sector stood at 5.6 mmt in 2012, and as much as 77.6% of Korean steel plate shipments went for shipbuilding (KOSA, 2013).

The marine equipment industry is another vital part of the shipbuilding supply chain, and also stands as an important industry in Korea in its own right. Around 80% of Korea's marine equipment output is

produced by members of the Korea Marine Equipment Association (KOMEA).² These companies recorded production worth KRW 13.2 trillion in 2011 (approximately USD 11.9 billion). Around 58% of this was in the engine and machinery segment, while outfittings accounted for a further 27% and electrics/electronics accounted for 14%. Hulls accounted for most of the remainder. According to the Korea International Trade Association (KITA), exports of marine equipment amounted to USD 2.4 billion in 2013, corresponding to 6.5% of Korea ship exports of USD 37.14 billion, representing both a challenge and a potential for a key upstream industry. In particular, the figure reflects not only the weakness of Korean marine equipment industry but also a vast opportunity to grow sizeably as the world's top 6 shipyards in terms of new order receipt last year are located in Korea.

3. Structure and features of the shipbuilding industry in Korea

3.1 Facilities

Korea's shipbuilding cluster is located in the region of Gyeongnam, in the south-east of the country. Yards are located primarily in the Ulsan, Busan and Geoje districts, which have deep waters and are free from sandbanks.

Assessed by recent shipbuilding outputs, the capacity of the Korean shipbuilding industry was considered to be 36 million GT in 2011, the second largest after China (IHS, 2014). Table 2 provides yard facility data for Korean shipyards featuring in the top global 100 as measured by CGT orderbooks. These large shipbuilding companies have many "mega" docks/berths, enabling construction of a series of mega-sized ships, a recent trend of newbuilding contracts.

Table 2. Yard capacity - dock statistics

Korean yards featuring in the top global 100 by CGT orderbooks

Shipbuilder	Yard	# docks	# berths	Largest dock length (m)	Largest dock beam (m)	Yard ranking by global orderbook
Hyundai H.I.	Ulsan	9	1	672	92	1
	Gunsan	1	-	700	115	45
DSME	Okpo	5	5	530	131	2
Samsung H.I.	Geoje	8	1	640	131	3
Hyundai Mipo	Ulsan	4	4	380	76	4
Hyundai Samho	Samho	3	2	594	104	5
STX Shipbuilding	Jinhae	2	1	385	74	6
	Goseong	-	-	-	-	61
SPP Shipbuilding	Sacheon	1	-	310	26	19
	Goseong	1	-	230	45	60
Sungdong S.B.	Tongyoung	3	8	545	126	34
Daehan S.B.	Haenam	1	-	-	-	66
Hanjin H.I.	Busan	3	4	302	50	85
Dae Sun S.B.	Pusan	2	3	191	40	89

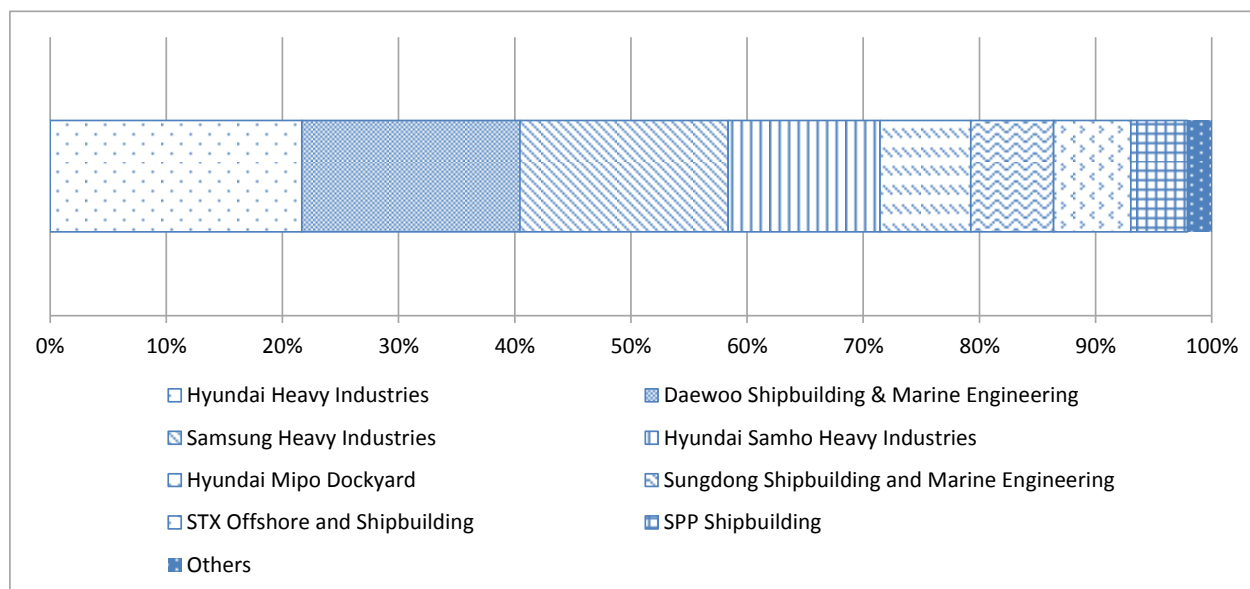
Source: Clarkson Research Services (2014), pp. 22-23.

KOSHIPA member companies account for about 95% of total domestic production. Data from IHS Fairplay also suggest that the industry is concentrated – in 2013, the top three companies in terms of completion measured by GT accounted for 58.4% of total Korean output. The share of the top eight companies was 97.9% (Figure 6). Meanwhile, a number of the main SME shipbuilders in Korea have closed during the last decade (Table 3). Some of these shipyards had been operating since the 1980s or

early 1990s. While still open, a small number of shipyards either have been sold/taken over or have no orderbook.

Figure 6. Company shares of completion in Korea

2013



Note: "Others" include 9 shipbuilding companies: ShinaSB Yard, Orient Shipyard, Samho Shipbuilding, Korea Yanase, Samwon Heavy Industries, Samkwang Shipbuilding and Engineering, Nam Yang Ship Building, Geumgang Shipbuilding and DH Shipbuilding.

Source: IHS (2013).

Major shipyards focus on large and high value-added products, while the small- and medium-sized yards build small and coastal vessels. Together, the Korean yards produce a wide variety of shiptypes, although there is a heavy share in high value "mega ships" such as container ships, very large crude oil tankers (VLCC) and LNG tankers (Table 4). Total output of cargo-carrying vessels in 2013 was approximately 23.7 million GT, about 35% of global output. In addition to this traditional shipbuilding segment, the Korean industry has also been increasingly active in the offshore sector, which comprises a wide variety of mobile and fixed vessels/structures.³ Some data on Korea's offshore outputs are discussed later in the report.

Table 3. Closures of SME shipbuilders in Korea

Shipyard	Date of establishment	Location	Status
21Century Shipyard	Feb. 1999	Gyeongsangnam-do	Closed (2013)
C&Heavy Industries	Nov. 2006	Jeollanam-do	Closed (2009)
Dae Hyoung Shipyard	Oct. 1991	Chungchengnam-do	Closed (2009)
Daehan Shipyard	Sept. 1987	Jeollanam-do	Trust management by DSME
Dongbang Shipyard	Sept. 2003	Jeollanam-do	Closed (2009)
Il Heung Shipyard	Apr. 1988	Jeollanam-do	Sold to Sung Kwang (2012)
Jinse Shipyard	Dec. 2000	Busan	Closed (2011)
Jio Marine& Shipbuilding	May 1999	Busan	Closed (2009)
Korea Shipyard	Dec. 1986	Jeollanam-do	Receivership (legal management)
Kwang sung Shipyard	Oct. 2004	Jeollanam-do	Workout
Mokpo Shipyard	Aug. 1943	Jeollanam-do	No orderbook
Nokbong Shipyard	Jan. 1997	Gyeongsangnam-do	Taken over by Lim cheon Industries
Orient Shipyard	Aug. 1995	Busan	Corporate rehabilitation proceeding
Samho Shipyard	Jun. 1994	Gyeongsangnam-do	Closed (2012)
Seko Heavy Industries	Dec. 2007	Chungchengnam-do	Closed (2012)
SeKwang Heavy Industries	Jun. 1999	Gyeongsangnam-do	Closed (2012)
SeKwang Shipbuilding	Jan. 1965	Jeollanam-do	No orderbook
Shinan Heavy Industries	Jan. 2005	Jeollanam-do	No orderbook
Sinwoo Shipbuilding	Jul. 2006	Gyeongsangnam-do	Closed (2011)
SNC Shipbuilding		Jeollanam-do	Closed (2009)
Wonyoung Shipyard		Busan	Closed (2009)
YS Heavy Industries	Jan. 2008	Jeollanam-do	Turning to repair

Note: The table reports closures of "main SMEs" in Korean shipbuilding. No expansions of building facilities were reported. SPP and Sundong Shipbuilding & Marine Engineering were reported to be still operating.

Source: Information provided by the Korean government.

Table 4. Production record (type of vessels built) in Korea
Completion of cargo-carrying vessels, 2013

Type of vessel	No. of vessels	GT	Share, by GT	CGT	Dwt
Container Ship	113	10 042 843	42.30	4 778 857	10 776 209
Crude Oil Tanker	46	4 569 898	19.25	1 531 956	8 655 159
Bulk Carrier	50	2 043 814	8.61	920 226	3 649 859
Chemical/Oil Products Tanker	61	1 834 175	7.72	1 043 930	3 064 164
LNG Tanker	15	1 509 866	6.36	1 211 033	1 265 778
Ore Carrier	6	965 293	4.07	260 076	1 855 512
Vehicle Carrier	10	606 753	2.56	334 282	206 094
LPG Tanker	20	599 571	2.53	421 830	662 191
Oil Products Tanker	15	597 376	2.52	298 969	1 052 457
General Cargo Ship	14	501 335	2.11	308 164	706 127
Ro-Ro Cargo Ship	7	300 924	1.27	183 825	174 922
Heavy Load Carrier	1	91 784	0.39	40 507	116 173
Chemical Tanker	2	48 545	0.20	37 597	84 904
Bitumen Tanker	2	31 214	0.13	23 576	38 644
Total	362	23 743 391	100.00	11 394 828	32 308 193

Source: Secretariat calculations using data from IHS Fairplay *World Shipbuilding Statistics*, Table 4A (various editions in 2013).

3.2 Ownership and internationalisation

The global shipbuilding industry is characterised by a high share of companies that are privately held, *i.e.* not publicly traded (OECD, 2013f). The Korean shipbuilding industry is no exception; only six out of 80 shipbuilding companies are listed in the Korean Stock Exchange.⁴ Table 5 below provides information on the top five shareholders of publicly listed companies.

The ownership of shares in large shipbuilding companies by government-related agencies has increased since the financial crisis, but these investments are foreseen to be temporary. The Korean Development Bank (KDB), the Financial Services Commission (FSC), the Korea Finance Corporation (KOFC), the Export-Import Bank of Korea (KEXIM), and the National Pension Service (NPS) hold significant positions at the major Korean shipbuilding companies (Table 5).⁵ As an example, due to severe financial difficulties faced by Daewoo Shipbuilding & Marine Engineering (DSME) during the financial crisis, and more recently by STX O&S, the KDB is currently the largest shareholder in both companies. Under financial pressure, STX O&S has recently issued shares for a debt-equity swap (Lloyd's List, 2014a) — debt was converted into equity as a way to avoid default. The KDB, KOFC and KEXIM (among other creditors), now hold important stakes at the company.

The participation of KDB in shipbuilding companies' results from debt that was sold to the bank under market arrangements, according to the reply of the Korean authorities to questions made within the scope of this report. These answers also indicated that the management ought to be in the hands of the private sector and that the shares are planned to be sold as soon as market conditions allow. In effect, attempts have been made, over the last four years, to sell the KDB stake at DSME (Lloyd's List, 2013a). It was also mentioned that, private financial institutions have been playing an increasingly important role in the shipbuilding industry either through equity positions or as key creditors.

Table 5. Top 5 shareholders of listed shipbuilding companies

	Investor #1	Investor #2	Investor #3	Investor #4	Investor #5
HHI	Jeong (Mong Jun)	Hyundai Mipo Dockyard Co Ltd	National Pension Service	The Asan Social Welfare Foundation	Hyundai Heavy Industries Co., Ltd. Employees
% Share	10.15	7.98	6.09	2.53	1.55
DSME	Korea Development Bank	Financial Services Commission	National Pension Service	Samsung Asset Management Co., Ltd.	BlackRock Institutional Trust Company, N.A.
% Share	31.46	12.15	9.11	1.34	1.01
SHI	Samsung Electronics Co Ltd	National Pension Service	Mirae Asset Global Investments Co., Ltd.	Samsung Life Insurance Co., Ltd.	Korea Investment Management Co., Ltd.
% Share	17.62	6.05	5.00	3.52	2.40
STX	Korea Development Bank	NongHyup Bank	Korea Finance Corporation	Export-Import Bank of Korea	Woori Bank
% Share	35.97	25.10	17.50	13.50	10.69
Hanjin HI	Jo (Nam Ho)	J.P. Morgan Asset Management (Hong Kong) Ltd.	Dimensional Fund Advisors, L.P.	Kim (Yeong Hye)	Jo (Won Guk)
% Share	46.50	3.71	1.31	0.64	0.61
Hyundai Mipo	Hyundai Samho Heavy Industries Co., Ltd.	National Pension Service	Mirae Asset Global Investments Co., Ltd.	Hyundai Mipo Dockyard Company Ltd Employees	BlackRock Institutional Trust Company, N.A.
% Share	45.21	7.38	1.40	1.28	1.08

Note: Government-related agency shares are shaded.

Source: Prepared by the Secretariat, based on data from Thomson Financial, as of 11 April 2014.

Although Table 5 suggests that in recent years there has been little inward foreign investment in Korean shipbuilding, the Korean government noted that outward foreign investment by its shipbuilders has rapidly grown since 2002. At the start, investment was mainly focused on shipbuilding equipment production; however, since 2005 it has begun to move towards shipyards. The main reasons behind the expansion of overseas business operations include the difficulties in finding additional land for shipyard expansion in Korea, the company management environment (notably, opportunities to leverage existing links between Korean groups and foreign partners, to expand shipbuilding abroad), better conditions for business, and local content. Table 6 below gives some information on selected overseas business operations by Korean shipbuilders.

Table 6. Overseas business operations by Korean shipbuilders

Company	Location	Yard location	Output in 2013 (000 CGT)	Orderbook at end of 2013 (000 CGT)
Samsung Heavy Industries	China	Ningbo	21	196
		Rongsheng	Not available	Not available
Daewoo Shipbuilding and Marine Engineering	China	Weihai	Not available	Not available
	Romania	Mangalia	113	500
Hyundai Mipo Dockyard	Vietnam	Vinashin	185	578
STX	China	Dalian	189	1,284
	Finland	Turku	48	260
	France	St. Nazaire	199	189

Source: Clarkson data, provided by Korean government.

Despite the global economic crisis, the Korean government noted that the overseas business operations of Korean shipbuilders have “avoided the worst case”, meaning closure or sale to other firms, with new orders now boosting activity. In 2010, Daewoo-Mangalia had only five new orders, but it took 18 new orders worth around USD 1 billion in 2013. Hanjin Heavy Industries & Construction (HHIC) Subic yard (in the Philippines) secured orders worth around USD 2 billion for 26 container vessels and 8 LPG vessels in 2013. And Hyundai’s Vinashin yard in Vietnam diversified from its focus on bulk carriers into new business areas such as tankers in 2013, with a 50% increase in its orderbook (to 30 ships) by the end of 2013.

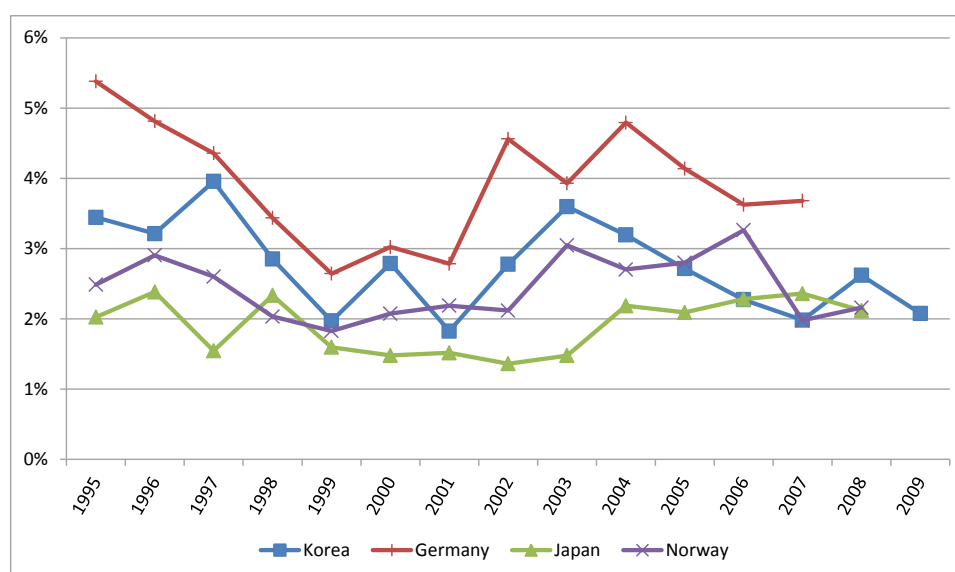
3.3 *Technology*

Technology and innovation have contributed to Korea’s ascent in the global shipbuilding industry. As it now faces increased competition in new and advanced technologies, and stricter safety and environmental standards, Korea is continuing to make efforts to maintain a superior technological edge over rivals through innovation and to develop high-tech, high-value-added and fuel-efficient vessels.

3.3.1 *R&D investment*

R&D investment in the Korean shipbuilding industry has grown in recent years. In 2011, total R&D investment in the Korean shipbuilding industry was 74% higher than in 2005.⁶ In terms of R&D intensity, Korean shipbuilders were investing around 2% of value added in R&D activities in 2009 (Figure 7). Between 2001 and 2007, average R&D investment intensity was 2.6% in Korea, compared to 3.9% in Germany, 2.5% in Norway and 1.9% in Japan.

Figure 7. R&D intensity in the shipbuilding industry
1995-2009 (or latest available)



Note: R&D intensity is calculated as the ratio of R&D expenditures to value added for selected WP6 members. Shipbuilding data corresponds to the ISIC Rev. 3 category C351: Building and repairing of ships and boats.

Source: Secretariat calculations, based on data from STAN Indicators (ISIC Rev. 3).

Big shipyards, in particular, have played a dominant role in the development of Korea's shipbuilding technology. Despite the sharp downturn of the global shipbuilding industry, Korean shipbuilders have increased their R&D investment (Table 7). Big shipbuilders such as HHI and Samsung Heavy Industries (SHI) are concentrating on eco-friendly and fuel-efficient shipbuilding technologies, and promising offshore sectors such as FLNG and FPSO (HHI 2012, SHI 2012). Shipbuilders are also keen to maximise the efficiency of their existing facilities – the Korean government mentioned four production methods in particular that move away from conventional practices to raise efficiency (on-land construction, assembly of “giga-blocks”, skid-launching, and underwater dams).

Table 7. R&D investments by KOSHIPA member companies

KRW billion

2005	2006	2007	2008	2009	2010	2011	2012
121.2	165.2	147.7	182.5	230.7	256.9	245.2	281.0

Source: KOSHIPA (2013a).

On top of the increase in R&D investment, according to unconfirmed press reports big shipbuilders are also making efforts to strengthen their physical R&D capabilities. DSME announced it will set up a global shipbuilding and marine engineering R&D center in Seoul by 2017, while SHI planned to complete its new R&D center located near Seoul by 2014 and relocate all of its researchers there (Digital Times, 2013). There is also new investment in naval shipbuilding technology. DSME opened a R&D center specialising in warships in February 2014 – the country's first (Korea Times, 2014b). The center plans to focus on converging ICT into warships, thereby strengthening naval forces and helping promote the country's “creative economy,” which is one of the major goals that President Park wants to achieve over her five-year tenure.⁷ In fact, a number of Korea's large shipbuilders are involved in the naval industry. For instance, DSME is building submarines for Indonesia and providing technology and knowledge transfer,

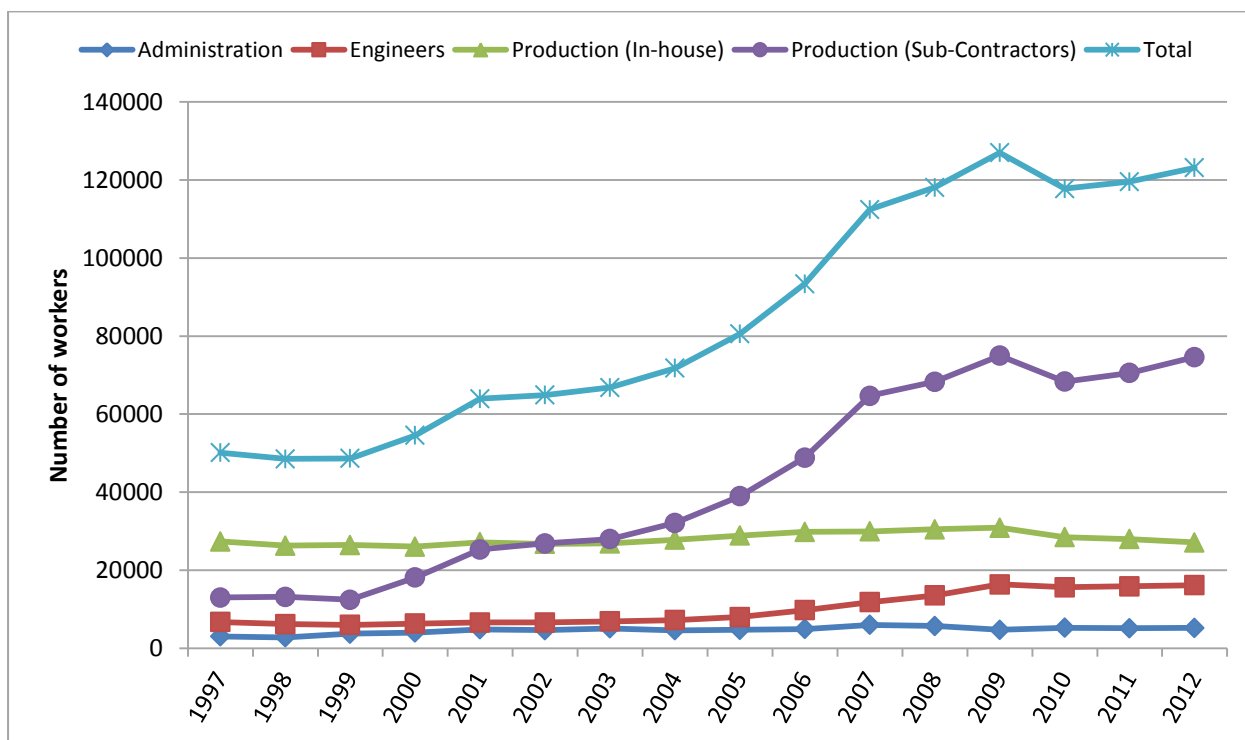
including via training 206 technicians and experts from Indonesia (Jakarta Post, 2014). HHI is the preferred bidder for the “next generation landing ship project” for the Korean Navy, announced by the Defense Acquisition Program Administration and worth KRW 1.5 trillion (USD 990 million) (Asiasis, 2013b). STX O&S has contracts to build coastal patrol ships for Peru’s Ministry of Defense and coastal patrol vessels for Colombia’s Ministry of Defense (Asiasis, 2013c).

There are several Korean organisations involved in shipbuilding-related research and innovation, to which Korean shipbuilders can turn for inputs and guidance as they seek to develop new products, including:

- Korea Institute of Ocean Science and Technology (KIOST): KIOST is a government-funded research institute that conducts ocean research and development in fundamental and applied technology. The institute was previously named the Korea Ocean Research and Development Institute (KORDI). Its functions cover basic and applied research to promote the efficient use of coastal and ocean resources, scientific research in polar and tropical regions, and technologies related to coastal and harbour engineering, ships and ocean engineering, and maritime safety. KIOST was established in 1973, and has a total of 622 researchers.⁸
- Korea Marine Equipment Research Institute (KOMERI): Established through approval from MOTIE in 2001, KOMERI plays a major role in marine equipment R&D. As an accredited international testing laboratory, it provides authorised testing services to Korea’s marine equipment firms. It also allows domestic maritime equipment suppliers to attach the KOMERI mark after they pass KOMERI’s conformity test and factory inspection. It has a total of 150 researchers.⁹
- Research Institute of Medium & Small Shipbuilders (RIMS): This institute mainly focuses on R&D related to shipbuilding and marine leisure equipment technologies which are appropriate for small and medium shipbuilders. It supports and co-operates with small and medium shipbuilders toward the development of shipbuilding and marine leisure equipment technologies. RIMS was set up and also approved by MOTIE in 1996.¹⁰

3.4 Workforce

The Korean shipbuilding workforce can be divided into three different groups: management & administration; engineers (design, production management, and R&D); and production workers (including subcontractors). At the end of 2012, 82.6% of the shipbuilding workforce was production workers, 13.1% was engineers, and 4.2% was management and administration. While the number of in-house production workers remained stable over the last 15 years, the number of engineers more than doubled between 2005 and 2009 and then stabilised. The number of production workers who are sub-contractors has increased substantially, going from around 33% of the workforce in 2000 to more than 60% in 2012 (Figure 8) (KOSHIPA, 2013a). The majority of workers are employed at KOSHIPA member companies; at the end of 2012, the responses to the questionnaire sent to Korean authorities showed that 154 288 people were working at these companies (including people working in non-shipbuilding departments) – 7 196 in management, 20 761 engineers, 35 989 technical and skilled workers, and 90 342 subcontractors. Total employment at non-KOSHIPA companies stood at around 16 000.

Figure 8. Breakdown of Korea's shipbuilding workforce

Note: Workers in non-shipbuilding segments are excluded. Statistics include KOSHIPA member companies and also: Sungdong Shipbuilding & Marine Engineering, Daehan Shipbuilding, 21Century Shipbuilding, Samho Shipbuilding, SPP Shipbuilding, SeKwang Heavy Industries, and Orient Shipbuilding. Samho Shipbuilding (since 2011) and SeKwang Heavy Industries (since 2012) have been excluded from the data because they were subject to liquidation decisions.

Source: KOSHIPA 2013a, p. 12.

Shipbuilding appears to be one of the higher-paying industries in Korea. According to JSTRA (2012), in 2009 remuneration per head was about KRW 46 million (around USD 36 000), fourth in the ranking of remuneration by industry, behind workers in refineries, railways and petro-chemistry industries (Table 8).

Table 8. Comparison of remuneration, by industry

2009

Industry	Total remuneration	Number of employees	Ranking by number of employees	Remuneration per head	million KRW
					Ranking by remuneration per head
Petroleum refinery	578 117	10 487	18	55.12	1
Railway	234 598	4 834	20	48.53	2
Petro-chemistry	2 063 416	44 123	12	46.76	3
Shipbuilding	6 042 589	131 367	3	45.99	4
Civil aviation	359 380	7 851	19	45.77	5
Semiconductor	3 852 534	91 906	4	41.91	6
Steel	3 177 962	78 595	7	40.43	7
Automobile	9 662 510	250 069	2	38.63	8
Display	2 573 256	68 434	9	37.60	9
Communication apparatus	2 756 380	81 533	6	33.80	10

Source: JSTRA (2012).

Remuneration in the shipbuilding industry may partly reflect education levels, skills and the need for wages to compensate for what may be considered a “dirty” or “hard” job. Some data on the educational levels of the shipbuilding workforce are available. For instance, 64.2% of engineers have a Bachelor’s degree, 6.4% have a Master’s degree, and 3.4% have PhDs. The remaining engineers are high school or college graduates (KOSHIPA, 2014). In the shipbuilding R&D workforce, the number of Masters and Doctoral degree holders has increased over time, according to data provided by KOSHIPA (Table 9).

Table 9. Qualification of shipbuilding R&D manpower

Number of persons

	2005	2006	2007	2008	2009	2010	2011	2012
Doctoral degree holders	123	123	129	128	143	194	209	257
Master’s degree holders	677	694	733	696	706	818	848	973
Other	1 610	1 691	581	584	539	479	495	583
Total	2 410	2 508	1 443	1 408	1 388	1 491	1 552	1 813
Doctoral degree holders as share of R&D manpower	5%	4.9%	8.9%	9.1%	10.3%	13%	13.5%	14.2%

Source: KOSHIPA, provided by Korean government.

The shipbuilding industry is strengthening its general linkages to universities. For instance, SHI launched a diploma course with Pusan National University’s Shipbuilding and Marine Engineering Department as part of expanding opportunities to foster shipbuilding-specialised skilled workers and develop the capabilities of its employees. In 2012, DSME also established the DSME Heavy Industries Academy, which targets high school graduates who want to become shipbuilding experts and then guarantees graduates’ employment at DSME.

However, the knowledge and skills learned in higher education do not fully meet the demands of the shipyards. Accordingly, most big shipbuilders set up their own training centres for employees. According to KOSHIPA, eight major Korean shipbuilders including HHI, SHI and DSME trained a total of 4 430 employees at their training centres in 2012 (KOSHIPA 2013a). For SMEs, with more limited resources, employee training must rely on externally-provided vocational education and training courses. This underlines the importance of good quality vocational education, and other OECD work has noted the potential for Korea to reap benefits from investment in these domains in order to enhance the growth of its SMEs (OECD 2014a).

3.5 *Marine equipment*

According to the Korea Marine Equipment Association (KOMEA), there are around 1 000 marine equipment firms in Korea. Korea's combined marine equipment workforce stood at about 63 600 persons in 2012. Engine & machinery accounted for a large share with 20 674 workers, followed by electric & electronics (18 825), outfitting (17 014) and hulls (7 040). 177 marine equipment companies were members of KOMEA, accounting for roughly 80% of Korean marine equipment sales as of the end of 2012 (KOMEA, 2013). Table 10 below provides the segment breakdown of KOMEA's members as of February 2013, as provided by the Korean government.¹¹

Table 10. KOMEA member orientations

Business focus	Number
Auxiliary arrangement	52
Electric/electronics	30
Piping equipment	21
Other outfitting	17
Accommodation equipment	16
Mooring/cargo arrangement	12
Nautical equipment	9
Safety equipment	6
Propulsion arrangement	3
Other	11
Total	177

Source: KOMEA, provided by the Korean government.

In 2012, the sales volume of the 190 members of KOMEA reached KRW 12 trillion (USD 10.7 billion), a slight decline from 2011. KOMEA members accounted for roughly 80% of total Korean marine equipment sales. The engine & machinery segment accounted for the bulk of sales, recording KRW 6.8 trillion (USD 6.0 billion), followed by outfitting with KRW 3.0 trillion (USD 2.7 billion), electric & electronics at KRW 1.6 trillion (USD 1.4 billion) and hulls at KRW 602 billion (USD 535 million) (KOMEA, 2013).

The exports of KOMEA members reached USD 2.25 billion in 2012 (Table 11 below gives some statistics for earlier years). China was the largest export market for Korean marine equipment in 2012 at USD 760.1 million, followed by Japan (USD 272.2 million), the United States (USD 125.3 million), and Singapore (USD 138.1 million) (KOMEA, 2013). Engines and machinery are the largest category of exports (see Table 12 below). Imports reached USD 1.55 billion in 2011, with a third coming from Japan (KOSHIPA, 2013a).

Table 11. Exports of marine equipment (KOMEA)
USD million

2008	2009	2010	2011	2012
2 554.4	2 419.1	1 922.8	2 755.9	2 251.2

Source: KOMEA, provided by Korean government.

Table 12. Marine equipment exports, by category
USD million

Rank	Category	2011		2012		2013	
		(1 st half)	(2 nd half)	(1 st half)	(2 nd half)	(1 st half)	(2 nd half)
1	Engine & machinery	738	677.9	571.9	559.5	340.8	411.6
2	Outfitting	333.4	395	354.5	248	209.6	189.9
3	Electric & electronic	162.3	229.4	187.5	150.5	103.8	108.6
4	Hull	87.7	132.1	106.4	72.9	81.1	50.2
5	Others	0.007	0.03	0	0.01	0.03	0.6
Total		1 321.4	1 434.5	1 220.3	1 030.9	735.3	760.9

Source: KOMEA, provided by Korean government.

Some large shipbuilding companies also have dedicated marine equipment departments. In 2012, about 18% of the workforce employed in large shipbuilding companies focused on the production of marine equipment.¹² As an example, in HHI the engine and machinery and electro-electric systems segments accounted for 11.2% of total company's sales. As discussed later (section 6), the extent to which large companies also produce marine equipment may affect the scope for SMEs to act as equipment suppliers and may pose additional challenges for SMEs attempting to integrate in the value chain.

In line with the strategies of Korea's major shipbuilders and the government (see next section), the marine equipment industry is focusing on the development of eco-friendly and high-efficiency green ship equipment and offshore plant equipment. For its part, KOMEA signed a Memorandum of Understanding (MOU) with the Ministry of Trade, Industry & Energy (MOTIE) and Korea's Offshore & Shipbuilding Association (KOSHIPA), with the objective of supporting sustainable and inclusive growth of the industry, the national economy and beyond. The tripartite MOU, reflects the new global paradigm for inclusive and sustainable growth, and features creative connectivity and co-operation in four areas: technical co-operation, manpower development, reinforcement of marine equipment capacity, fair trade and sharing of co-operation benefits.

4. Korean government policies affecting the shipbuilding industry

The Korean Ministry of Trade, Industry and Energy (MOTIE) is the key ministry responsible for policies related to maritime strategy. MOTIE is in charge of shipbuilding and offshore plants.¹³ However, other ministries are also involved in maritime strategy. In particular, the Ministry of Oceans and Fisheries (MOF) is responsible for shipping, developing maritime resources, and modernising domestic coastal ships.¹⁴

4.1 Historical policy development and the economic crisis

The Korean government identified the origin of Korea's shipbuilding industry policy as the 'Act on the Encouragement of Shipbuilding' of 1958. This Act did not lead to any significant achievements due to

budget shortages and other factors, but from this time on, shipbuilding featured in Korea's regular economic plans (see Annex B).

From 2008, shipbuilding policy became focused on dealing with the effects of the economic crisis. The Korean government described the effects as occurring on two dimensions. First, direct and short-term damage appeared as the ship finance market shrank along with the general financial markets. New shipbuilders investing in facilities and vessel construction preparations were affected first, as new loans were suspended. Next, the majority of shipbuilders suffered liquidity problems as new orders and advance payments were suspended due to difficulties with ship financing. Second, medium- and long-term effects began to appear, as sea-transport volumes dwindled and over-capacity of freight space became evident. Ship-owners began cancelling or postponing orders for ships, and also dismantling older ships.

In response, the government announced the 2009 'Shipbuilding Industry Restructuring and Competitiveness Reinforcement Plan', with the participation of several ministries including MOSF, the Ministry of Knowledge Economy (now MOTIE) and the Financial Supervisory Commission (FSC). This aimed to restructure delinquent shipbuilding companies and resolve temporary difficulties related to funding at existing shipyards. The plan:

- Identified seven shipbuilding companies as targets for restructuring and supported their conversion into other fields or business types. The government noted that this aimed to respond proactively to address excess supply and to curb new facility expansions. Creditor financing institutions led judgements on sale, business conversion and closure of companies, giving consideration to the competitiveness of the respective firms.
- Provided KRW 9.5 trillion (approximately USD 8.2 billion)¹⁵ support for shipbuilders experiencing temporary cash flow difficulties due to unavoidable circumstances, ship-owners' payment delays, cancellation of contracts and ship price cuts. The majority of this funding (KRW 7 trillion) went to small- and medium-sized shipyards.

4.2 *Korea's current maritime strategy*

Korea's maritime strategy is now focused on shipbuilding and offshore plants, with the offshore industry regarded as a new growth engine. In 2012, MOTIE announced the 'Plan to Develop Offshore Plant Industry', and in line with this, the name of the shipbuilders' association changed from the Korea Shipbuilders' Association to Korea Offshore & Shipbuilding Association (KOSHIPA) as of April 2013. In November 2013, MOTIE announced an updated and more comprehensive version of its offshore plan, under which it plans to invest around KRW 900 billion (USD 822 million) with the private sector and create over 10 000 new jobs by 2017. The plan aims to achieve three goals by 2020:

- Increase marine industrial plant orders up to USD 80 billion from USD 25.7 billion in 2011.
- Raise the percentage of critical engineering and components manufacturing that can be carried out in the country from 40% in 2011 to 60%.
- Strengthen the competitiveness of the parts and equipment industry for offshore plants to the extent that the rate of localisation jumps from 20% in 2011 to 50% (MOTIE 2013).

In order to effectively implement its policy initiatives, the government set 4 strategies and 12 tasks (each strategy includes 3 tasks). These are noted in Table 13 below.

Table 13. Plan to Develop the Offshore Plant Industry
4 strategies and 12 tasks

Strategy	Tasks
1. Localising parts and equipment for offshore plants	1) Increasing R&D investment 2) Supporting advances towards overseas markets 3) Expanding foreign inward investment
2. Enhancing engineering capability by nurturing professional manpower	4) Developing high quality human resources 5) Strengthening retraining of current workers 6) Supporting global exchange of professional manpower
3. Securing excellent offshore plant capability	7) Developing the offshore plant system for extreme environment such as sub-sea and the arctic 8) Building a world class research water tank for deep sea engineering 9) Supporting advances towards overseas service markets
4. Reinforcing competitiveness of smaller yards	10) Vitalising mutually co-operative business between large and smaller yards 11) Supporting the development of specialised vessels 12) Expanding ship financing

Source: MOTIE's website, http://www.motie.go.kr/motie/ne/rt/press/bbs/bbsView.do?bbs_seq_n=78495&bbs_cd_n=16.

4.3 Key support measures and other relevant policies

The practical impact on policies of the government's plan to develop the offshore plant industry is not yet clear. This section sets out information on recent and current policy settings, drawn from the WP6 inventory and from other information available to the Secretariat.

4.3.1 R&D

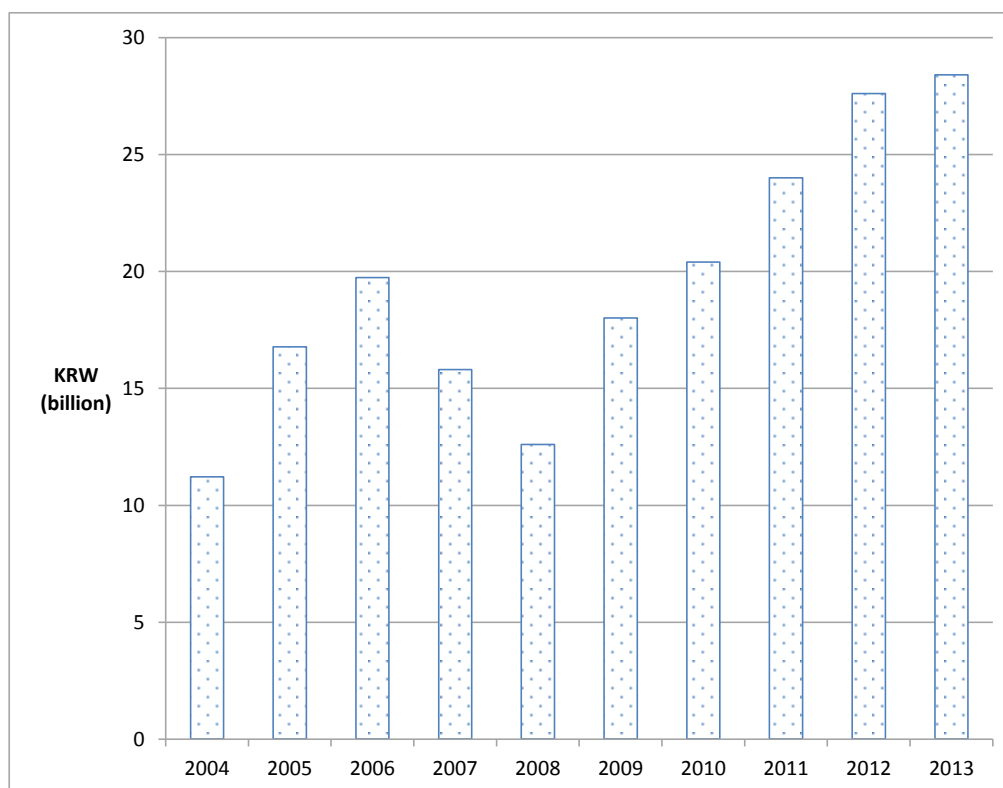
Korea's R&D support for shipbuilding is mainly delivered through the programme 'Shipbuilding Core Technology Development'. This has a budget of KRW 23.8 billion / USD 21.8 million in 2014, and aims to support the development of key shipbuilding technologies, and thereby strengthen the competitive edge of the shipbuilding industry. Shipbuilding project managers at the Korea Evaluation Institute of Industrial Technology (KEIT) develop candidate projects to meet the needs of the programme, through engagement with diverse science and technology communities, industry and government. After MOTIE makes a final decision on whether to select particular projects among the candidate projects, awardee selection begins with the announcement of the competition (KEIT, 2014a).¹⁶

Data from the WP6 inventory of government support measures show that Korean government support for shipbuilding R&D has increased over time, reaching KRW 28.4 billion (USD 25.9 million) in 2013 (more than doubling from 2008) (Figure 9). This amount of R&D support by the government is equivalent to about 9% of the R&D investments by KOSHIPA members (Table 7). The government R&D support and industry R&D investments show a similar increasing trend, suggesting concerted efforts are being made by both government and industry.

The Korean government noted that its technology development support for the shipbuilding industry is now focused on basic R&D support for development of next-generation ships, and that the level of support is very low, given that the industry is mature and has assets to pursue R&D itself. It stated its support has been equivalent to around 0.15% of total government R&D spending since 2010.¹⁷

Figure 9. Support for R&D

Moneys committed each year



Source: WP6 Inventory, various editions (OECD 2008, 2010b, 2011a, 2012a, 2013g).

In addition to shipbuilding-specific R&D programmes, the MOF's R&D support for marine development may sometimes yield valuable results for the shipbuilding industry. In 2014, MOF budgeted KRW 293 billion (USD 267 million) for 22 maritime development R&D programmes, several of which touch on shipbuilding and offshore plants (MOF, 2014). For instance, the 'Marine Safety and Transportation Facilities Technology' programme covers marine safety technology including e-navigation, and eco-friendly shipbuilding technology such as test, certification and standards systems for eco-friendly ships. Also, the 'Marine Equipment and Infrastructure Development Technology' programme supports the development of marine equipment technology aimed at developing marine resources of deep waters and the Arctic, and the building of marine research infrastructure such as a research water tank for deep sea engineering and an Offshore Plant Industry Support Centre¹⁸.

4.3.2 Ship financing

Export Credit Agencies (ECA) provide shipbuilding financing through two state-owned export credit agencies: K-Sure under MOTIE and the Export-Import Bank of Korea (Korea Eximbank – KEXIM) under MOSF. Both K-Sure and KEXIM provide ship financing in accordance with the OECD's Sector Understanding on Export Credits for Ships (SSU). K-Sure mainly deals with export credit insurance, while Korea Eximbank mainly handles export credit loans.

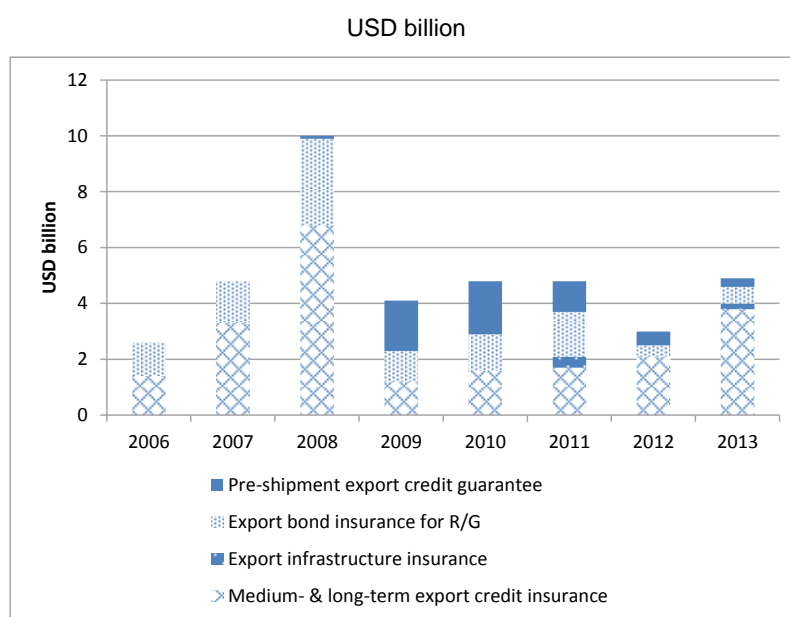
K-Sure was established in 1992 as the official export credit agency of Korea, pursuant to the Export Insurance Act 1968. Its major role is to provide export credit insurance services to cover non-payment risks

related to the exportation of goods and services in a diverse range of industrial fields. K-sure runs different types of ship finance programmes (a view of its financing over time is provided in Figure 10 below):

Export Credit Insurance: this covers lender's losses against buyer's non-payment on loans.

Export Credit Guarantee: this covers a refund of a ship owner's advance payment to the shipbuilder (Refund Guarantee), or non-payment of a shipbuilder on account-receivable- financing in relation to SME suppliers.

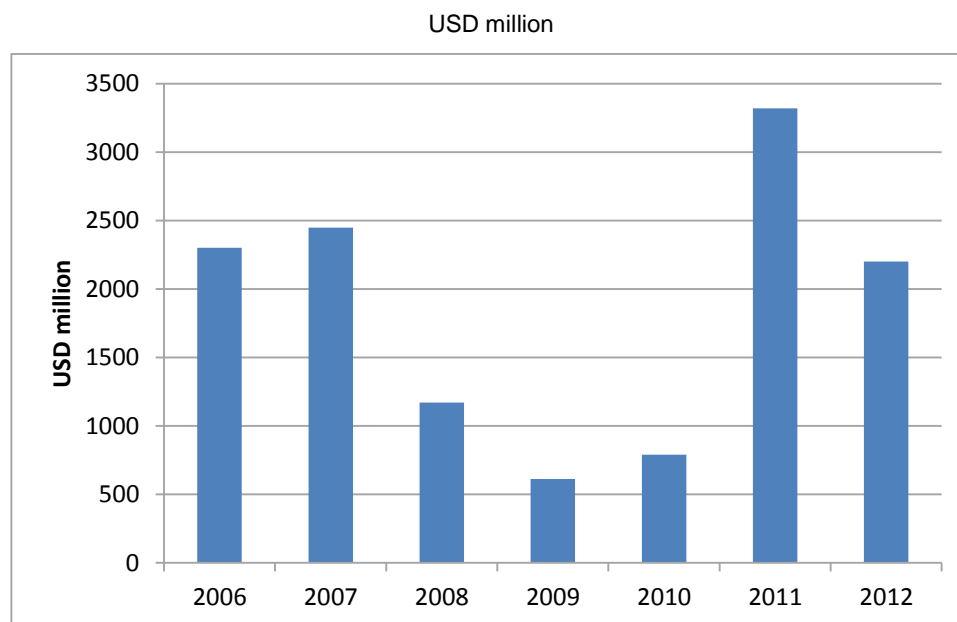
Figure 10. K-sure ship finance volume



Source: K-Sure (2014).

KEXIM provides export-related financing in order to support Korean enterprises that export or conduct overseas business, including the ship sector. Under its mandate, KEXIM provides direct lending and guarantees to foreign buyers who purchase Korean goods and services. Other support includes pre-shipment loans to exports, with a maturity of 6 months to 1.5 years, depending on the construction period, and with terms and conditions comparable to those commercially available. Korea Eximbank describes its shipbuilding finance options as follows (data on its finance volumes are shown in Figure 11 below):

- *Direct loans* offer loans to ship owners directly.
- *Financial guarantees* cover a ship owners' repayment of loans offered by commercial banks.
- *Bond Guarantees* guarantee the repayment of bonds which a ship owner issues and insurers or securities firms buy.
- *Pre-shipment loans* are provided to Korean shipyards for the funds needed in producing the vessels (Korea Eximbank, 2013). These loans are provided during the construction period as a form of working capital.

Figure 11. Korea Eximbank ship finance volume

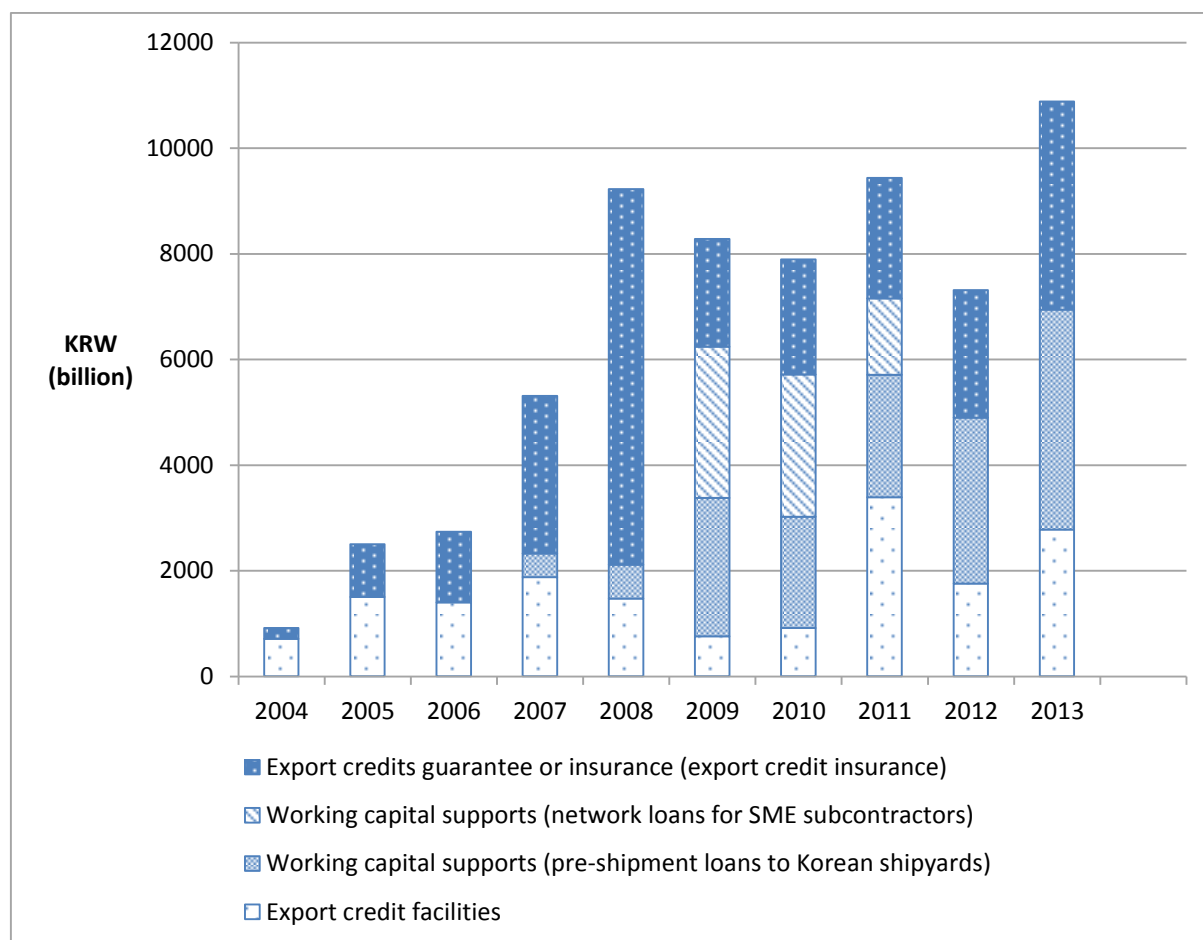
Source: Korea Eximbank (2013).

The export credit agencies (ECAs) were an important part of the Korean government's response to the economic crisis. The 2009 'Shipbuilding Industry Restructuring and Competitiveness Reinforcement Plan' included the expansion of working capital supports by both ECAs to shipbuilders and equipment suppliers, especially SMEs that had problems with cash flow. This approach enabled the utilisation of general support mechanisms to provide support to the shipbuilding industry. According to the plan, the government asked Eximbank to increase its lending to yards and suppliers by KRW 2.8 trillion (USD 25.6 billion), and K-Sure to increase its insurance by KRW 2.0 trillion (USD 18.3 billion) (MOSF, 2009).

The increased support from ECAs is also shown by the data in the WP6 inventory of government support measures. Monies committed for export credits and working capital supports increased considerably – by 2013 they were around ten times larger than in 2004 (Figure 12). Among the three kinds of supports available, export credit guarantees and export credit facilities increased significantly. As a result, financial exposures (mainly export credit guarantees) at the end of each year increased as well (Figure 13). Table 14 summarises the WP6 inventory data on export credits and R&D from 2004 to 2013. The increase of the support by ECAs is explained mainly by the dramatic change in payment terms of ship building contracts during the economic crisis in 2008. After the crisis, almost all payment terms were "heavy-tail," with smaller instalments during the construction period, and larger payments at the delivery point. Due to shortages in working capital, many shipyards had greater demand on pre-shipment loans.

Figure 12. Export credits

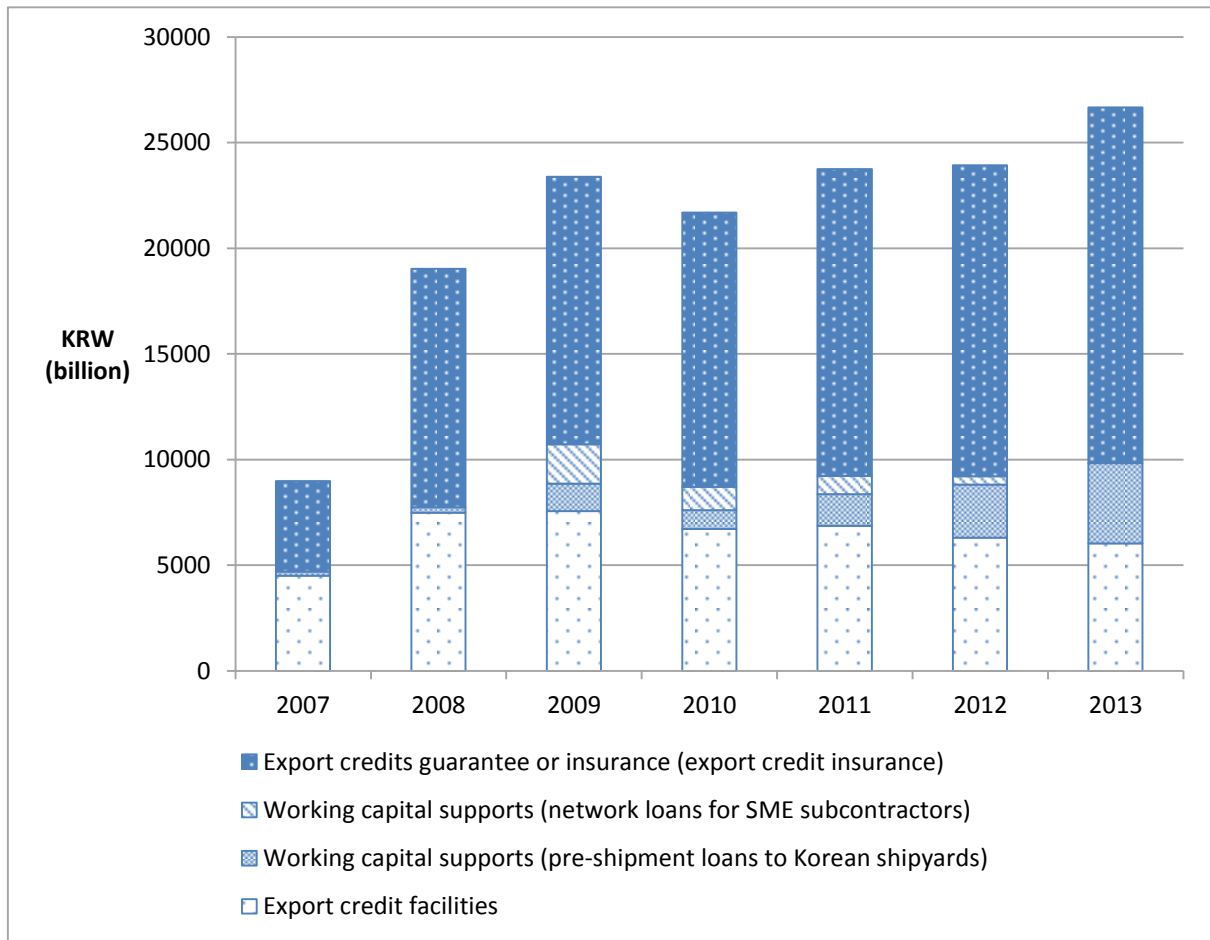
Monies committed each year



Note: In 2013, "network loans" were included in "pre-shipment".

Source: WP6 Inventory, various editions (OECD 2008, 2010b, 2011a, 2012a, 2013g).

Figure 13. Maximum financial exposure at year end



Source: WP6 Inventory, various editions (OECD 2008, 2010b, 2011a, 2012a, 2013g).

Table 14. Support measures to the Korean shipbuilding industry
2004-2013

KRW (billion)										
Monies committed	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Export credit facilities	713	1 505	1 401	1 877	1 473	760	915	3 389	1 756	2 777
Working capital supports (pre-shipment loans to Korean shipyards)	-	-	-	446	640	2 618	2 108	2 320	3 143	4 164
Working capital supports (network loans for SME subcontractors)	-	-	-	-	-	2 860	2 690	1 443	0	n/a
Export credits guarantee or insurance (export credit insurance)	201	998	1 337	2 984	7 109	2 041	2 180	2 283	2 415	3 940
Support for R&D	11	17	20	16	13	18	20	24.0	28	28
Total	925	2 520	2 757	5 322	9 235	8 297	7 913	9 459	7 342	10 909
Total in USD (million)	806	2 452	2 839	5 672	7 315	6 498	6 842	8 541	6 517	9 966
Maximum financial exposure at year-end	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Export credit facilities	-	-	-	4 508	7 495	7 565	6 724	6 872	6 312	6 040
Working capital supports (pre-shipment loans to Korean shipyards)	-	-	-	206	260	1 310	896	1 501	2 507	3 804
Working capital supports (network loans for SME subcontractors)	-	-	-	-	-	1 850	1 103	865	392	n/a
Export credits guarantee or insurance (export credit insurance)	-	-	-	4 272	11 272	12 667	12 968	14 519	14 717	16 823
Support for R&D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total	0	0	0	8 986	19 027	23 392	21 691	23 757	23 928	26 667
Total in USD (million)	0	0	0	9 578	15 131	18 321	18 753	21 451	21 237	24 977

Source: WP6 Inventory, various editions (OECD 2008, 2010b, 2011a, 2012a, 2013g).

4.3.3 Support for the maritime equipment industry

The Korean government has continued making efforts to reinforce the competitive edge of its domestic marine equipment industry. MOTIE established the Korea Marine Equipment Global Service Centre (KOMECE) in 2009, and supports KOMECE in helping domestic marine equipment providers to establish networks with global A/S (After-sales Service) companies abroad. The networking with A/S is considered to give domestic providers opportunities to expand their business brand as well as new market openings through enhancing the credibility of their products. As part of the network with global A/S companies, MOTIE supports inviting engineers of global A/S companies to Korea and training local workers how to operate and repair domestic maritime equipment. MOTIE also supports KOMECE in holding export consultations and exhibitions for domestic marine equipment industry so that domestic companies can easily access the export market (KOMECE 2014).

MOTIE also plans to establish an equipment testing centre in 2014, where Korea's maritime equipment SMEs can share testing equipment and test their products. The plan was drawn from the fact that many equipment SMEs in Korea lack the testing equipment necessary to meet the demands of high performance equipment from abroad (Etnews 2013).

4.3.4 Human resources development

Until 1973 there were just three universities with shipbuilding engineering departments. Under its industry plans of the time, the government increased recruitment of students for shipbuilding engineering departments and established a policy to enable private universities to found new departments. Now, 21 universities, 18 colleges and 16 graduate schools related to shipbuilding engineering are major sources of nurturing the shipbuilding workforce. The Korean government reported that the number of entrants to these universities and colleges reached more than 2 100 in 2012, with a further 229 students enrolled at the graduate schools.

The Korean government is now strengthening efforts to develop high quality human resources related to offshore plants. The government plans to gradually increase the number of 'Specialized Universities in Offshore Plant' (currently three) to foster professional engineers. It will also set up an 'Offshore Plant Meister High School' where students are scheduled to enrol from 2015 (MOTIE 2013). With support from MOTIE, KOSHIPA is running several training programmes related to offshore plants. It operates the 'Offshore Plant Engineering Programme' in collaboration with Seoul National University and the "big 3" shipbuilders (HHI, SHI and DSME). The programme provides high quality students, who undertake to be employed with the shipbuilders, with a scholarship and a tailored special curriculum. KOSHIPA also offers current shipbuilding employees working in the area of offshore plants with special training programmes focusing on offshore plants design (KOSHIPA 2013a).

4.4 Policy evaluation

There do not appear to be any formal evaluations of Korean policy measures affecting the shipbuilding industry. In its comments on how industry performance was affected by its interventions, the Korean government noted that with the repeal of the Shipbuilding Industry Promotion Law in the 1980s, the industry has grown against a background of market competition. Government interventions in the 1960s and 70s were part of wider infant industry promotion, and now that the industry is a major player in the global industry, government support is not a critical engine for industry success. The government noted that Korean shipbuilders are in fact treated unfavourably compared to their peers in some other countries, who received strong government support aimed at promoting the shipbuilding industry as a key industry.

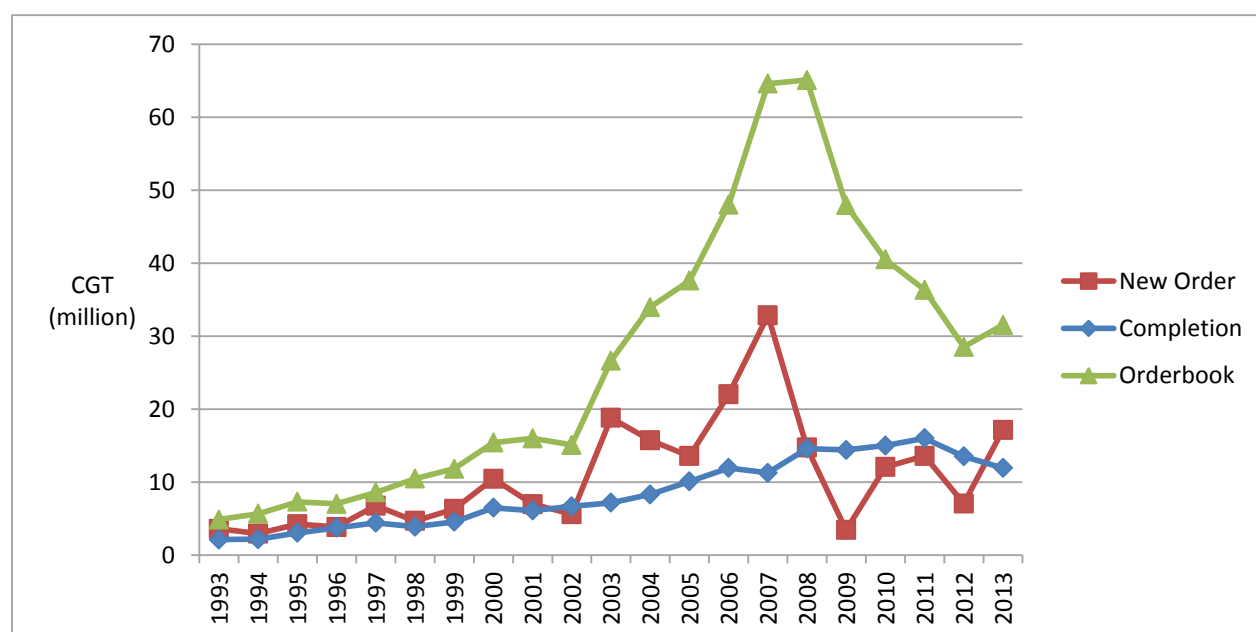
5. The performance of the Korean shipbuilding industry

This section of the report investigates the performance of the Korean shipbuilding industry, measured by a wide range of indicators, and compares it to other major shipbuilding countries where possible. It looks particularly at trends in shipbuilding outputs and market shares in terms of vessel completions, orders and the orderbook. The section also discusses the export performance and labour productivity trends of the Korean shipbuilding industry. Finally, it overviews the financial performance of the Korean shipbuilding industry in terms of profitability and debt indicators.

Figure 14 below provides an overview of key Korean production statistics between 1990 and 2013. Annual completions have been gradually increasing since 1990, with a few exceptions in 1993, 2000 (possibly due to the Asian crisis) and more recently in 2012. The consolidation of Korea as a major shipbuilding country during the last decade is well reflected in new orders and the corresponding fast expansion of the orderbook during the 2000s. The sharp reduction in orders (and consequently the orderbook) during the aftermath of the recent financial crisis was just starting to be reflected in 2012 completions. The increase in new orders during 2013, hints at early signs of recovery for the Korean shipbuilding industry.

Figure 14. Key Korean shipbuilding statistics

New orders, completions and the orderbook



Source: IHS World Shipbuilding Statistics, various editions.

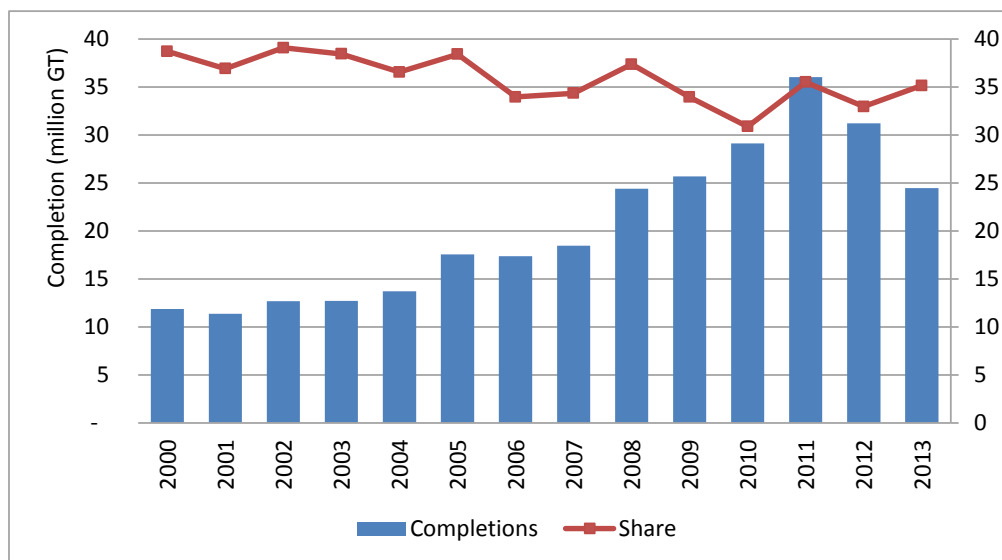
5.1 Output

The output of the Korean shipbuilding industry has increased considerably since 2000, even though its share of the global shipbuilding market fell slightly during the same period (Figure 15). Korean completions (cargo and mobile offshore vessels) hit a record high of around 36 million GT in 2011, an approximate tripling of year 2000 output levels. However, since 2011 output has gradually declined, to 24.5 million GT in 2013, reflecting a sharp drop in new contracts after the financial crisis. The Korean share of global shipbuilding completions has oscillated between 30-40% since 2000, with the drop in the

mid-2000s likely due to the significant growth of the Chinese shipbuilding industry. Figure 16 shows the surge in Chinese shipbuilding output from the mid-2000s. It is notable that Korean output kept reasonable pace with the expansion of Chinese output, while Japan's output was relatively static.

Figure 15. Korean shipbuilding completions

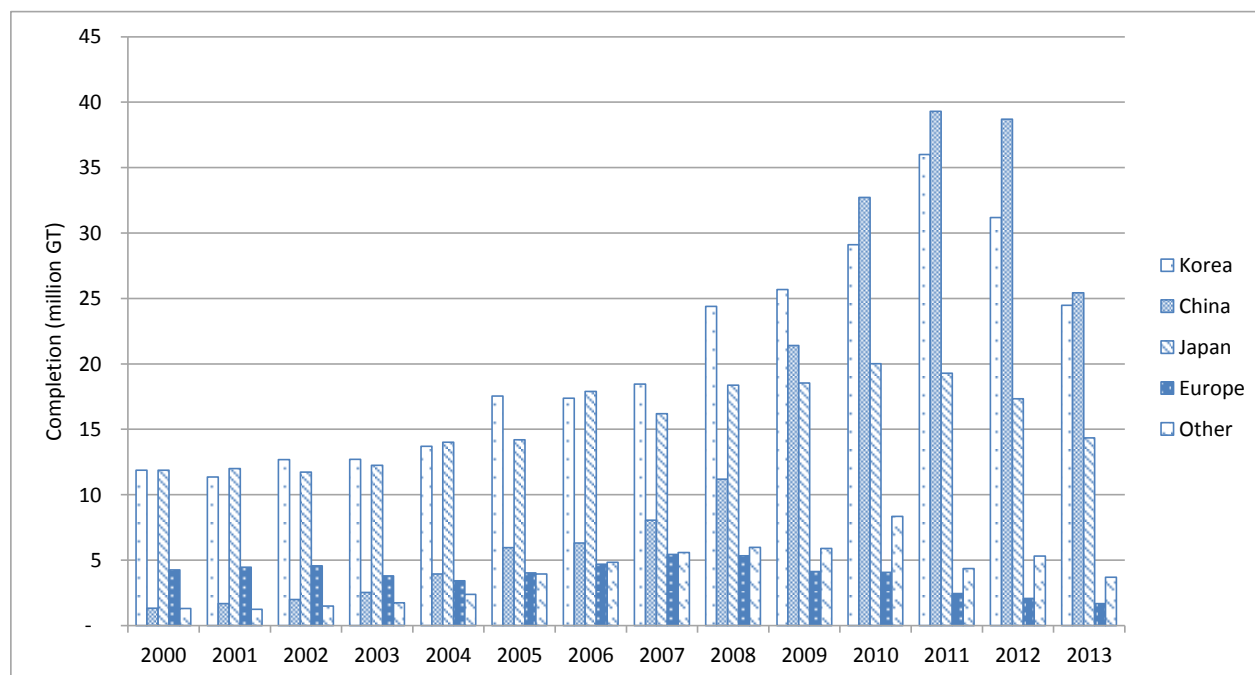
Total and as share of world completions (by GT)



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

Figure 16. Completions by GT

2000-2013

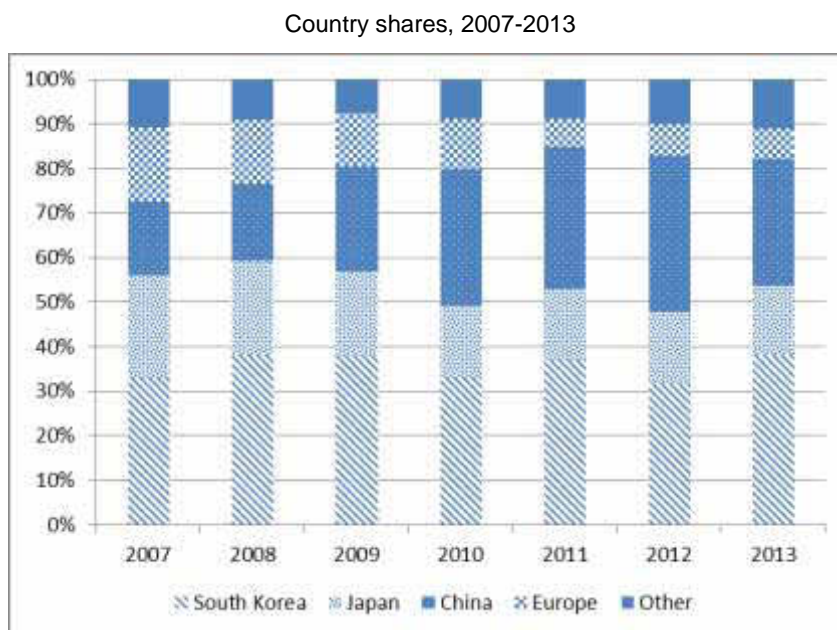


Source: IHS, *World Shipbuilding Statistics*, various editions.

5.5.1 Deliveries by value

Since 2007, the Korean shipbuilding industry has consistently accounted for more than 30% of global market share, measured by value (Figure 17). Although there was a decrease in the combined shares of Japan and other countries from 50.4% in 2007 to 33.3% in 2013 mainly due to the rise of China, Korea did not lose its share and has successfully maintained its share above that of China (except in 2012). “Other” shipbuilding countries had the same share of the market by value in 2013 as in 2007.

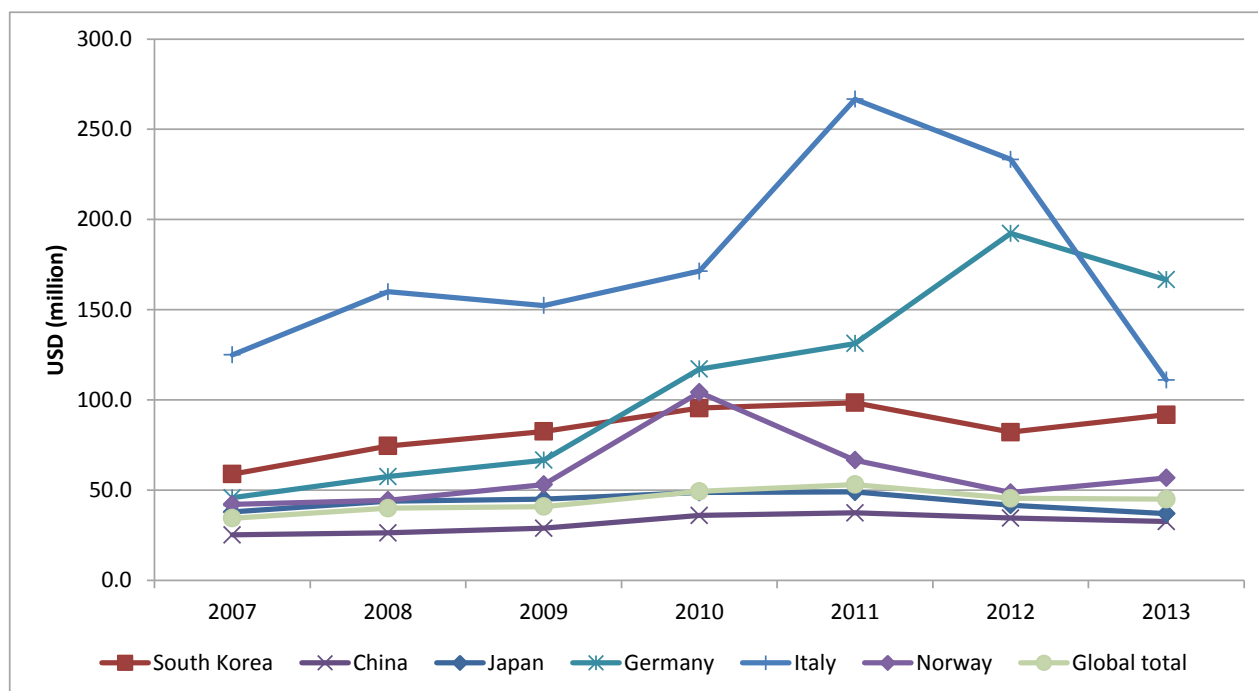
Figure 17. Total vessel deliveries by value



Note: Europe comprises Croatia, Finland, Germany, Italy, Norway, the Netherlands and Turkey.

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

From 2007 to 2013, the average value per vessel built in Korea increased by 55.9%, a larger increase than the global average of 30.7%. In 2013, Korea’s average vessel value was USD 91.8 million, compared to USD 45.0 million for the global average. Korean average ship prices were also higher than most of its competitors (except Germany and Italy). Figure 18 show the trends in average value per vessel for selected economies for which data were available. The three major shipbuilding economies – China, Japan and Korea – showed similar trends: the values steadily increased until 2011, when they peaked, and then slightly decreased. Among these economies, Korea’s increase during this period was the largest, while in Japan the average value in 2013 was lower than in 2007.

Figure 18. Average values of vessels delivered, 2007-2013

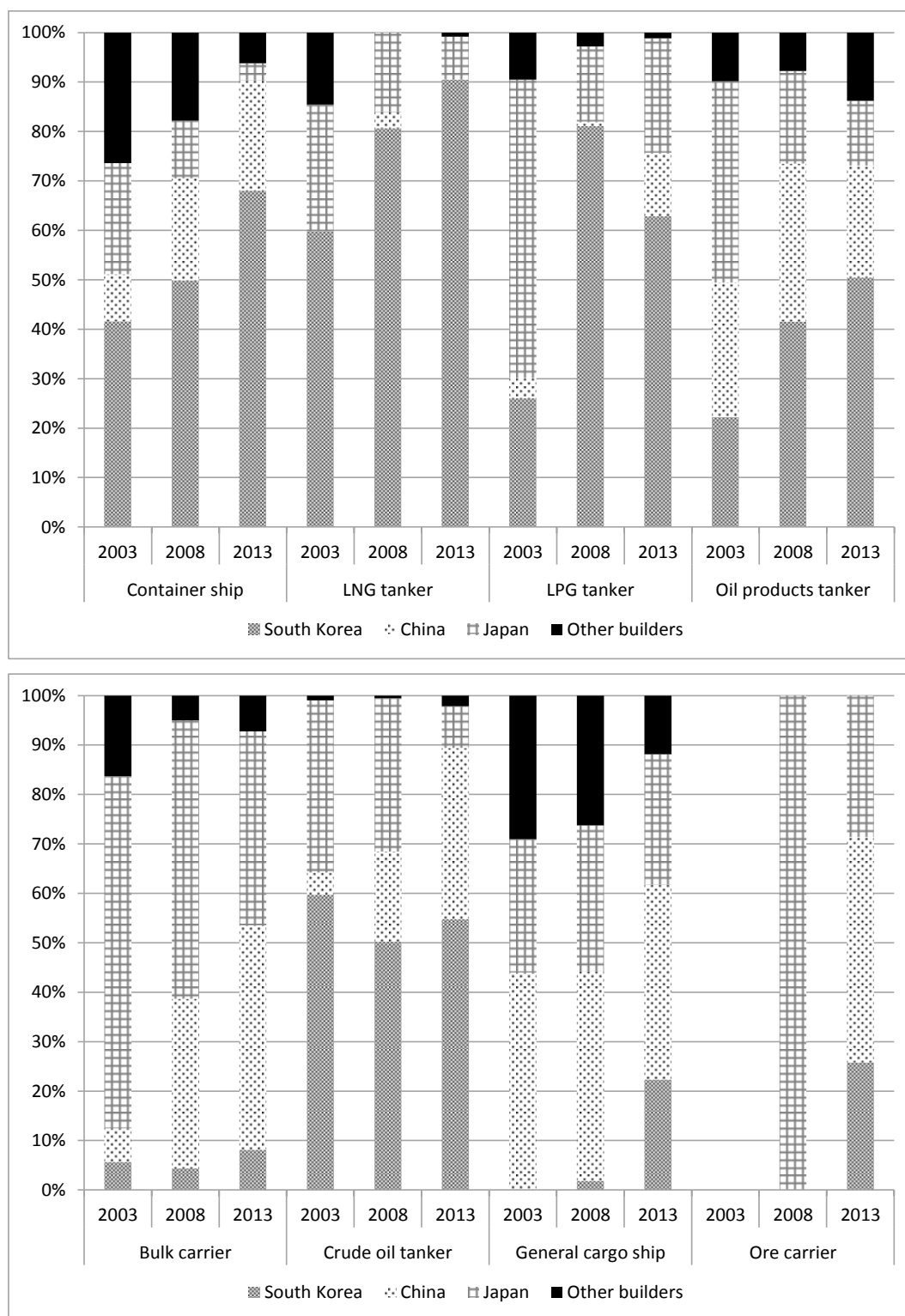
Source: Secretariat calculations based on data on deliveries by country/region, from Clarkson Research Services *World Shipyard Monitor*, various editions.

5.5.2 Completions by ship-types

In the past 10 years, Korea has increased its market shares in most major cargo shiptypes and now has more than 50% of the global market for LNG tankers, container ships, LPG tankers, crude oil tankers and oil product tankers (Figure 19). Regarding LNG tankers, Korea accounted for approximately 90% of the global output in 2013. According to Clarkson's *Offshore Yard Monitor*, in 2013, new building contracts and deliveries of Korean yards in the offshore segment amounted to 32 units and 36 units, respectively.

Figure 19. Share of completions, by selected shiptype

2003, 2008 and 2013

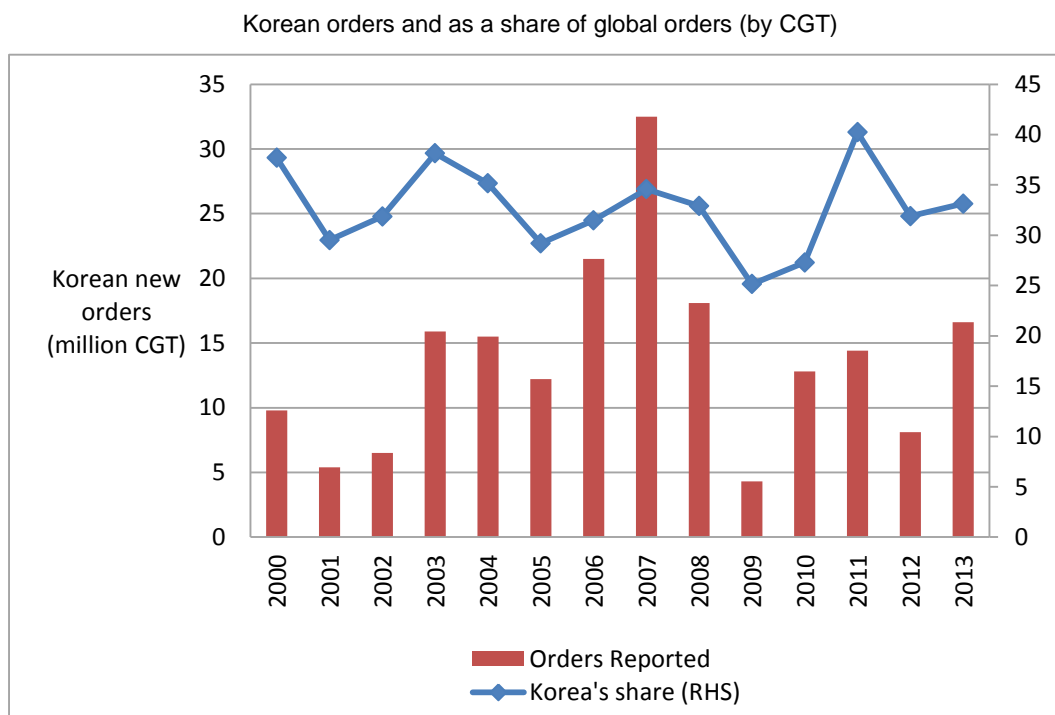


Source: Secretariat calculations, based on data (GT) from IHS Fairplay *World Shipbuilding Statistics* (quarterly editions from 2003, 2008 and 2013), table 4B.

5.2 *New orders and the orderbook*

Reflecting the global boom and bust, Korean shipbuilders' new orders increased gradually until 2007 and plummeted in 2009, but by 2013 had recovered to about half of their previous peak (Figure 20). Korea's share of new orders has fluctuated between 25% and 40% of the global market, marking approximately 33% (16.6 million CGT) in 2013.

Figure 20. Korean shipbuilding orders



Source: Clarkson, *World Shipyard Monitor*, Contracting by Country/Region, various editions.

Korea had an orderbook of approximately 60 million GT at December 2013, accounting for a third of the global orderbook (Table 15). Based on Korea's peak shipbuilding output in 2011 of 36 million GT, this orderbook could be considered to be equivalent to work for yards for around 20 months. The data in Table 15 suggest that Korea focuses on building larger vessels than its competitors. The average size of vessels to be built in Korea appears to be almost twice as large as those built in China and Japan (68 100 GT for Korea, 33 800 GT for China and 31 600 GT for Japan).

Table 15. Total world orderbook

At December 2013

Location of build	No. of vessels	GT (million)	CGT (million)	Share of orderbook (by GT)
China	2 161	73.04	36.65	39.94
South Korea	890	60.62	31.17	33.15
Japan	825	26.09	13.62	14.27
Philippines	90	4.67	2.41	2.55
Brazil	167	4.16	2.72	2.28
Chinese Taipei	42	1.98	1.05	1.08
Vietnam	227	1.94	1.49	1.06
Rest of the world	1 592	10.36	11.28	5.66
Total	5 994	182.86	100.39	

Source: Secretariat calculations using data from IHS Fairplay (2013), Statistical Notes 2.

Although the Korean shipbuilding industry produces almost every type of ship, it has a particular focus on container ships and LNG tankers, which account for 55.7% of the Korean total orderbook, measured by CGT. As discussed earlier, Korea dominates the market segments for a number of different ship types such as LNG tankers, container ships and LPG tankers. The orderbook statistics at December 2013 suggest that this may continue for the coming few years (Table 16).

Table 16. Composition of the Korean orderbook

Cargo-carrying vessels, as of December 2013

Type of vessel	No. of vessels	GT	Share of orderbook by GT	CGT
Container Ship	161	20 182 436	36.26	8 727 513
LNG Tanker	80	8 680 968	15.60	6 793 697
Crude Oil Tanker	84	7 609 500	13.67	2 637 663
Chemical/Oil Products Tanker	231	6 544 515	11.76	3 817 376
Bulk Carrier	81	6 327 633	11.37	2 219 735
LPG Tanker	73	2 487 726	4.47	1 675 592
Vehicles Carrier	23	1 463 900	2.63	792 435
Oil Products Tanker	27	827 888	1.49	459 851
Ore Carrier	6	789 600	1.42	230 117
Ro-Ro Cargo Ship	12	465 876	0.84	294 765
Chemical Tanker	6	156 465	0.28	130 007
General Cargo Ship	4	82 000	0.15	60 771
Fruit Juice Tanker	2	28 000	0.05	22 160
Passenger/General Cargo Ship	1	12 000	0.02	11 016
Passenger/Ro-Ro Cargo Ship	2	5 200	0.01	10 634
Total	793	55 663 707		27 883 332

Source: Secretariat calculations using data from IHS Fairplay (2013), Table 4A.

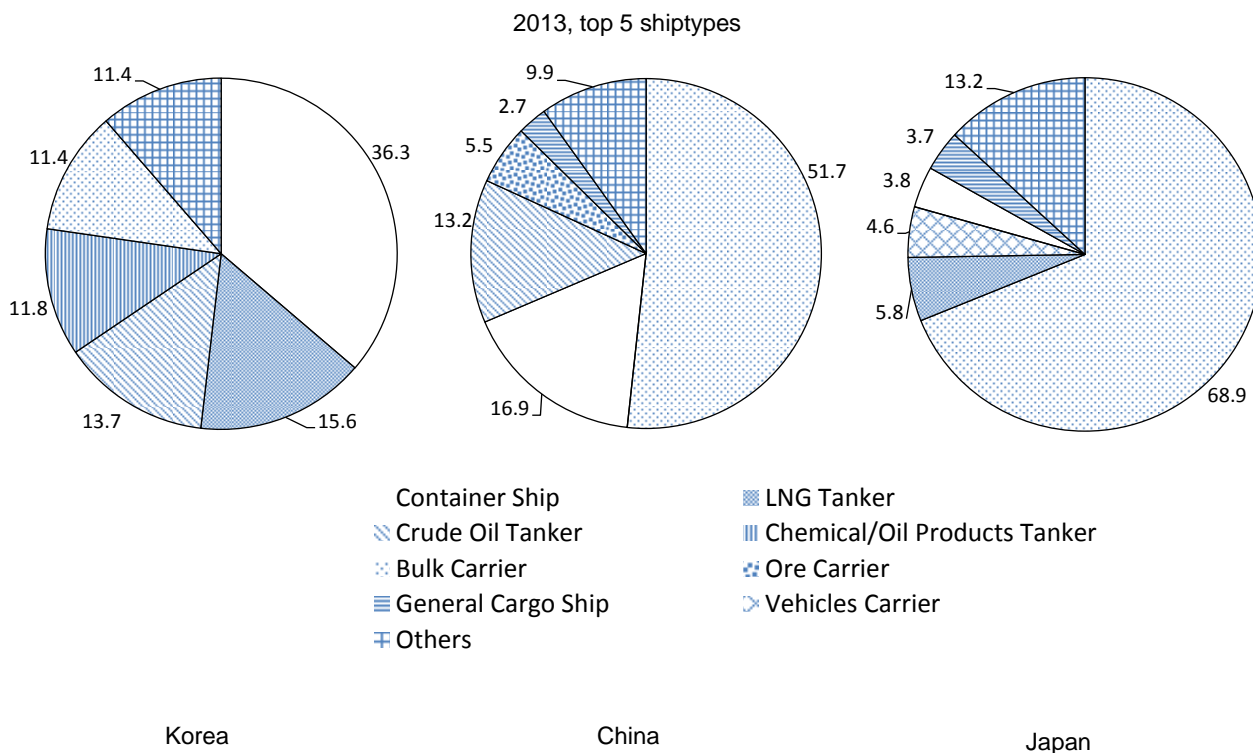
Table 17. Composition of the Korean offshore orderbook
as of January 2014

Type of vessel	No. of vessels
Mobile offshore Drilling	58
Construction vessel/Barge	4
Life Boat / Installation	1
Accommodation	1
MSV/DSV/ROV Support	2
Mobile offshore production	23
Logistics	9
AHTS > 8,000 bhp	3
PSV/Supply > 3,000 dwt	6
Total of mobile offshore fleets	107
Fixed structure	7

Source: Clarkson's Offshore Intelligence Monthly (January 2014).

However, while around 65% of the Korean orderbook consists of container ships, LNG tankers and crude oil tankers, the composition of the Korean orderbook is still more balanced than that of China, where two shiptypes (bulk carriers and containership) account for about 68%, as well as that of Japan, where bulk carriers alone account for 69% of the orderbook (Figure 21).

Figure 21. Breakdown of orderbooks of Korea, China and Japan



Source: Secretariat calculations using data from IHS Fairplay (2013), Table 4A.

Korea has already secured orders to be delivered in both 2014 and 2015 to a level equivalent to its 2013 outputs: about 22.8 million GT in 2014 and 26.2 million GT in 2015 (around 93% and 108% of 2013 completions, respectively).

Figure 22. Delivery schedule

Shares of future orderbook

Location of build	Due for delivery in 2014 (GT)	Share of 2014 deliveries due (%)	Due for delivery in 2015 (GT)	Share of 2015 deliveries due (%)	Due for delivery in 2016+ (GT)	Share of 2016+ deliveries due (%)
China	31 891 135	40.8	25 333 588	36.5	15 814 037	44.9
South Korea	22 846 049	29.2	26 249 412	37.8	11 528 350	32.7
Japan	13 324 944	17.0	9 826 329	14.2	2 937 704	8.3
Brazil	1 909 267	2.4	981 642	1.4	1 272 600	3.6
Philippines	1 861 286	2.4	2 525 000	3.6	285 700	0.8
Chinese Taipei	774 667	1.0	672 464	1.0	529 300	1.5
Vietnam	1 099 094	1.4	478 855	0.7	365 552	1.0
Rest of world	4 546 723	5.8	3 336 812	4.8	2 472 503	7.0
Total	78 253 165		69 404 102		35 205 746	

Source: Secretariat calculations using data from IHS Fairplay (2013), Table 2A.

5.3 Origin of buyers

Historically, the Korean shipbuilding industry has been very export-oriented. During the strong growth period of the Korean shipbuilding industry between 1990 and 2007, the share of new orders heading for export was very close to 100%. However, in 2008, new orders for export started to decrease and the share of production to be exported (by CGT) fell to approximately 89% in 2012.¹⁹ This appears to have been an effect of the global economic crisis, as 2013 data show new orders for export rising again, at 94% (by CGT).

Data from KOSHIPA, reflects this switch towards domestic buyers in delivery data (which lags new order trends). Table 19 shows that from 2008 there was a step-change in the number of Korean buyers of Korean-made vessels. The types of vessels purchased by domestic buyers in 2012 were bulk carriers, containerships and car carriers (Table 20).

Table 18. Deliveries to domestic and foreign buyers

KOSHIPA members only

	Domestic buyers		Exports		Total	
	# vessels	CGT	# vessels	CGT	# vessels	CGT
2000	2	17 760	178	6 029 189	180	6 046 949
2001	1	4 950	206	6 441 664	207	6 446 614
2002	1	18 285	209	6 805 870	210	6 824 155
2003			223	7 264 881	223	7 264 881
2004	1	10 576	259	8 716 096	260	8 726 672
2005	4	38 100	281	10 171 085	285	10 209 185
2006	1	8 570	314	11 096 597	315	11 105 167
2007			340	10 294 146	340	10 294 146
2008	8	305 123	368	12 160 870	376	12 465 993
2009	8	157 584	382	12 103 400	390	12 260 984
2010	15	465 649	361	12 233 448	376	12 677 603
2011	20	591 072	406	12 968 020	426	13 559 092
2012	13	294 709	363	11 429 278	376	11 723 986
2013	19	496 000	282	9 541 000	301	10 037 000

Source: KOSHIPA, provided by Korean government.

Table 19. Domestic and foreign buyers, by type of vessel

KOSHIPA production, data as at end-2012

Shiptype	For domestic buyers		Exports		Total	
	# vessels	CGT	# vessels	CGT	# vessels	CGT
Tanker			92	2 965 820	92	2 965 820
Product carrier			26	544 374	26	544 374
Chemical tanker			2	47 184	2	47 184
Bulk carrier	6	170 655	110	2 208 560	166	2 379 215
Containership	4	39 608	101	4 779 759	105	4 819 366
LNG carrier			1	80 817	1	80 817
LPG carrier			5	66 577	5	66 577
Car carrier	2	65 572	5	174 479	7	240 050
Drillship			8	266 613	8	266 613
Other	1	18 873	13	295 096	14	313 969
TOTAL	13	294 709	363	11 429 278	376	11 723 986

Note: Tanker category includes shuttle tankers, crude oil tankers and VLCCs.

Source: Data provided by the Korean government.

With respect to foreign buyers, Greece is currently the largest client, accounting for 7% of Korean orderbooks if excluding major flag nations of convenience such as Panama, Marshall Islands and Liberia. The next two largest buyers are Singapore, followed by Hong Kong.

Table 20. Korean orderbook by origin of buyer, top 15

December 2013

Buyer origin	Number of ships on order	Share (%)	CGT on order	Share (%)
Greece	56	6.4	2,227,262	6.9
Singapore	43	4.9	1,598,611	5.0
Hong Kong	30	3.4	1,323,408	4.1
Denmark	16	1.8	1,164,508	3.6
Malta	29	3.3	1,041,508	3.2
Bahamas	28	3.2	1,002,087	3.1
Italy	14	1.6	595,023	1.8
Malaysia	7	0.8	539,006	1.7
Germany	9	1.0	503,957	1.6
Norway	15	1.7	491,213	1.5
Bermuda	7	0.8	400,329	1.2
Marshall Island	171	19.5	4,375,192	13.6
Panama	116	13.2	3,138,730	9.7
Liberia	83	9.5	3,571,440	11.1
Others	253	28.8	10,302,372	31.9
TOTAL	877	100.0	32,274,646	100.0

Source: KOSHIPA

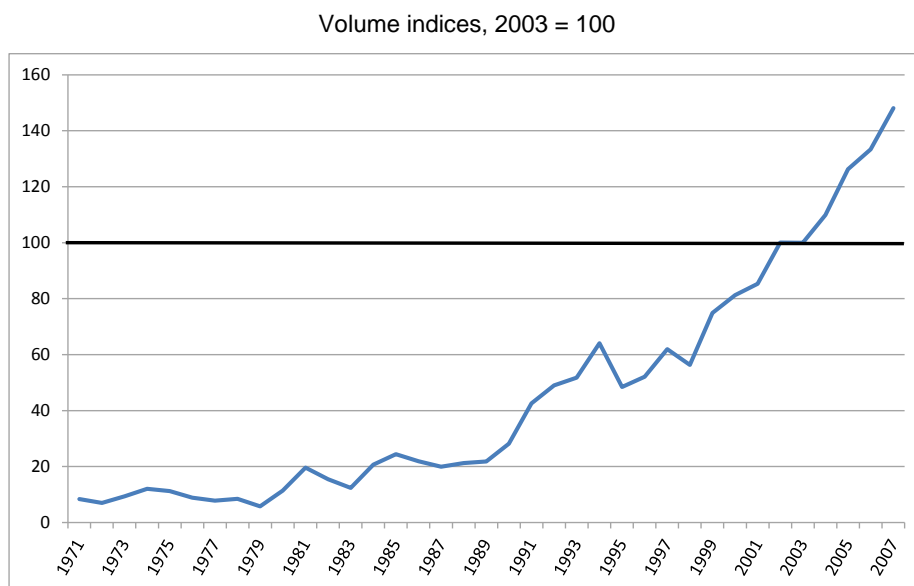
5.4 Productivity

5.4.1 A historical perspective on labour productivity in the shipbuilding industry

Figure 22 depicts the evolution of labour productivity in the Korean shipbuilding industry between 1971 and 2007, the latest year for which data are available. Between 1971 and 1989 the growth in productivity was modest. Labour productivity in the Korean shipbuilding industry grew at an average annual rate of 5.5%. During this period, shipbuilding in Korea was starting to develop and efforts were being made to encourage the industry. From the 1990s, labour productivity in the Korean shipbuilding industry steadily increased.

Between 1989 and 2007, the Korean shipbuilding industry experienced two periods of fast-rising productivity levels. The first, from 1989 to 1994, saw average annual labour productivity growth reaching 24% (mainly due to annual growth rates of 29% in 1990 and 52% in 1991). This period coincided with rationalisation measures in the industry that might have induced companies to make the most of their available structures and workforce, thus leading to a steep increase in productivity. The second period of fast productivity growth, from 1998 until 2007, relates to the last global shipbuilding boom on the one hand, and to the rise of Korea as a key player in the global shipbuilding market on the other. During this period, labour productivity grew at an average annual rate of 11.2% (10.3% after 2003).

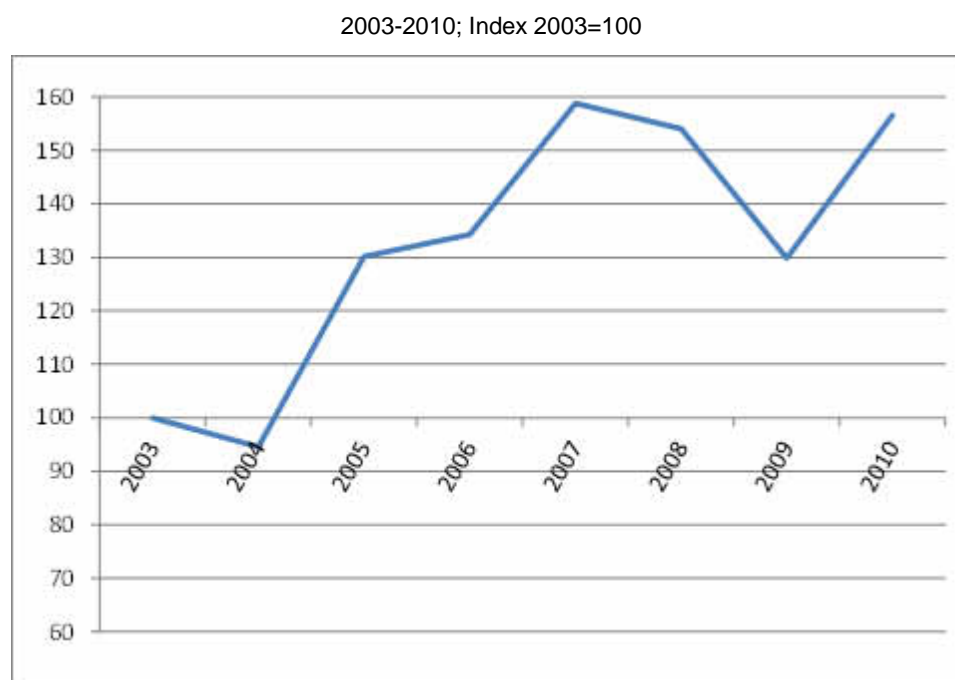
The productivity declines in 1982-83 and 1995 both reflect periods when the number of employees in the shipbuilding industry increased, but without a corresponding growth of value-added (c.f. Figures 2 and 4). Between 1994 and 1998, labour productivity declined at an average rate of 3.2% per year. The slight break in 1998 could be explained by the repercussions of the Asian financial crisis, after which labour productivity picked up again.

Figure 23. Gross value added per hour worked

Note: Labour productivity index is calculated as the ratio of real value-added to total number of hours worked. Shipbuilding data corresponds to the ISIC Rev. 3 category C351: Building and repairing of ships and boats.

Source: EUKLEMS (2009).

In order to complement the analysis of labour productivity and extend it to recent years, an exploratory exercise focusing on four large shipbuilding companies was carried out. Figure 24 shows the evolution of labour productivity between 2003 and 2010 for these firms.²⁰ It shows that amongst these large firms, labour productivity levels were 56.6% higher in 2010 than in 2003. However, labour productivity growth was not smooth and has been irregular during recent years. Recently, in 2008-2009 productivity decreased, possibly due to low global shipbuilding demand in the aftermath of the crisis. This decrease is also in line with the reduction in value added described in Section 2.1, Figure 2 and may also reflect exchange rate movements. These results should be regarded with caution as they only reflect productivity in a very small sample of large shipbuilding companies.²¹

Figure 24. Labour productivity levels for selected large companies

Note: A simple measure of labour productivity was used and consisted in logarithm of the ratio of turnover to employment (headcounts). Turnover was deflated using STAN output deflator at ISIC rev.4, 3-digit industry level D301 *Building of ships and boats*. Employees include the number of both full- and part-time employees of the company. It excludes i) seasonal employees and ii) emergency employees. Productivity was calculated for the following companies: Daewoo Shipbuilding & Marine Engineering Co., Lt; Hyundai Heavy Industries Co., Ltd., STX Offshore & Shipbuilding Co., Ltd and Samsung Heavy Industries Co., Ltd. Information used here refers to shipbuilding companies as a whole, thus might reflect shipbuilding as well as other business segments of shipbuilding companies. Please refer to subsection 5.6.5 for further information on shipbuilding segments of Korean companies.

Source: Secretariat calculations, based on data from OECD STAN Database for Structural Analysis (ISIC Rev. 4) and Factset.

Due to data limitations, it is currently not possible to extend this analysis to cover a broader sample of shipbuilding companies. In particular, sufficient information on smaller shipbuilding companies to calculate comparable productivity indicators is not available. However, it has been recently noted that, under a challenging environment for shipbuilding companies, a number of smaller yards are highly efficient (Lee, 2013).²² An important question, discussed later in the report, is whether there are any impediments to the operation of these smaller but productive yards that can be usefully addressed, while facilitating the conversion of less productive yards either into other activities (e.g. repair), into the value chain of larger shipbuilding companies, or closure.

5.5 Financial performance

Financial performance provides a good indication of how strong and successful a company and an industry is. However, financial data are usually difficult to obtain because only publicly-listed companies are required to disclose their main accounts. This section uses both firm-level information obtained from a commercial data provider (Factset, see Box 2), as well as industry-level data on gross operating surplus from OECD sources, to investigate financial performance in Korean shipbuilding.

Box 2. Financial information from Factset

Factset is a commercial data provider of financial information on a standardised basis. The data are therefore comparable across countries. Information from company filings was not further validated by the Secretariat; when necessary, the information was complemented with further desk research.

The overall sample of shipbuilding companies obtained from Factset covers the period 1992-2012 and includes 53 publicly-traded shipbuilding companies in 1992 and 296 companies in 2012, across the world, resulting in 2093 firm-year observations. For data quality reasons (increasing coverage and data representativeness) the analysis was restricted to the period 2005-2012. The sample of companies accounts for roughly 83% of Korean shipbuilding gross output by value as of 2009, using ISIC rev. 3 industry category C351: Building and repairing of ships and boats.

In this exploratory comparative exercise, firm-level profitability ratios and other indicators are aggregated at the year-country level using a weighted average, where the weights represent the share of total output of each company in the sample. This approach ensures that outliers with negligible share of the market do not distort the results.

The firm-level financial information refers to companies as a whole. Therefore the financial indicators in this report may reflect not only shipbuilding activity, but also other business segments of shipbuilding companies. Nevertheless, for most large shipbuilding companies in Korea, shipbuilding activity accounts for the lion's share of sales and operating profitability (refer to subsection 5.6.5 on shipbuilding segments).

5.5.1 Aggregate profitability

National accounts data can provide a crude indication of the overall profitability of an industry by comparing gross operational surpluses to total output.²³

Figure 25 depicts the evolution of aggregate profitability in the shipbuilding industry between 1994 and 2009. The aggregate profitability of the Korean shipbuilding industry was above 14% during the late 1990s, but then declined over the first half of the next decade, down to 7% in 2005. In line with the pick-up in world new orders that started in 2002 and was more marked between 2005 and 2007 (OECD 2012b, Table 2), the aggregate profitability of the Korean shipbuilding industry rose back up to 14% in 2008, before the recent financial crisis. Figure 25 also plots the evolution of aggregate Norwegian shipbuilding industry profitability.²⁴ During the period between 1994 and 2009 the Korean shipbuilding industry has always been more profitable than the Norwegian counterpart, but at the same time, profitability levels have been more volatile in Korea than in Norway.

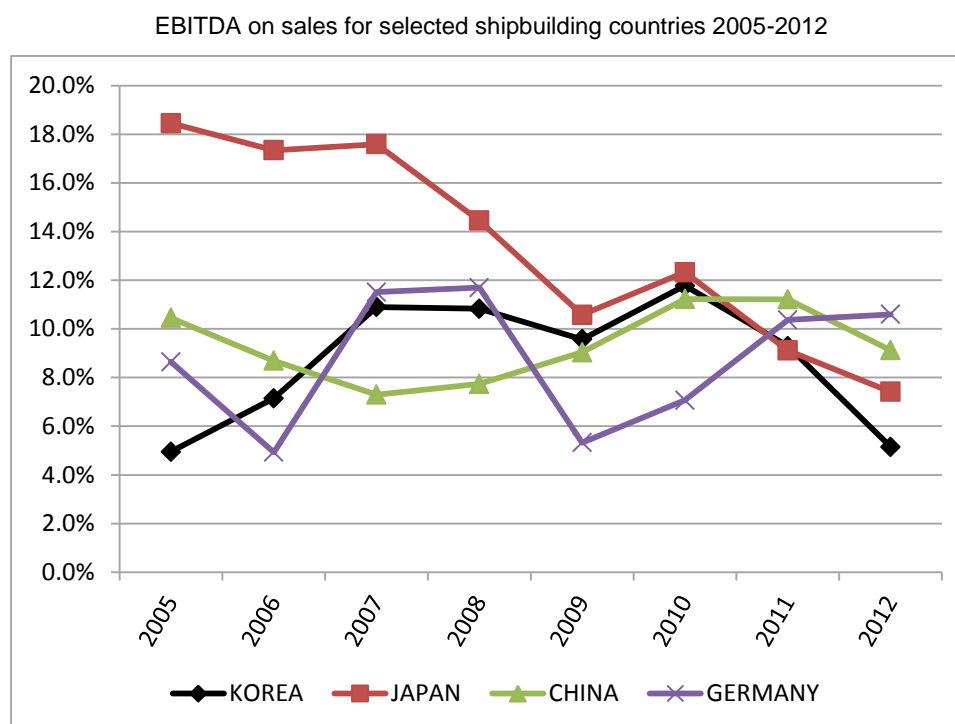
Figure 25. Evolution of aggregate profitability in the shipbuilding industry

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

5.5.2 Firm-level profitability

Using information from financial statements, obtained from Factset, on the largest and publicly-traded shipbuilding companies, Figure 26 depicts the evolution of a commonly-used operating profitability ratio (EBITDA on sales) across selected countries.

Profitability of publicly-traded Korean shipbuilding companies in 2012 was low (5.1%) when compared to 2008 (11%). In addition, the 2012 figures fall short of the levels experienced by publicly-traded shipbuilding companies in Japan (7.4%), China (9.1%) and Germany (10.6%). Nevertheless, profitability in Korea is still slightly above the levels experienced in 2005 (4.9%).

Figure 26. Profitability of publicly traded shipbuilding companies

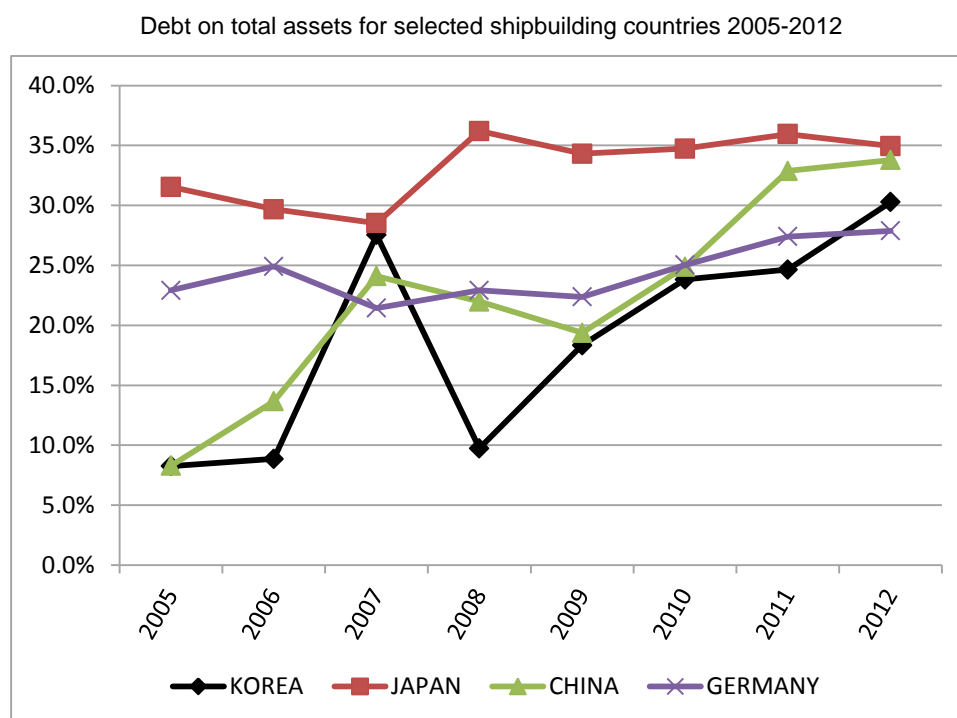
Note: Firm-level information used here refers to shipbuilding companies as a whole, thus might reflect shipbuilding as well as other business segments of shipbuilding companies. Please refer to subsection 5.6.5 for further information on shipbuilding segments of Korean companies.

Source: Calculations based on information obtained from Factset.

5.5.3 Indebtedness

When firms face difficulties in attaining positive cash-flows, they increasingly resort to external funding, usually in the form of debt (bonds and loans). The average level of indebtedness of shipbuilding companies in Korea as well as across the world is notably high. Debt accounted for more than 30% of total shipbuilding assets in 2012 (Figure 27). These figures stand below Japanese (35%) and Chinese (34%) shipbuilding companies, but above German companies (28%).

The ability of Korean shipbuilders to generate enough profits to pay debts has significantly decreased since 2007. As a rule of thumb, in order to maintain financial sustainability, debt levels should not be more than three times as large as profits (EBITDA) in a given period. While in 2007 Korean shipbuilding companies' average debt levels were less than one and a half times as large as their profits, in 2012 this ratio was above six. These figures are well below record levels of 10.6 experienced by Chinese companies but above other key shipbuilding economies. Also, Korean companies have been increasingly focusing on short-term debt (above 50% in 2012), in contrast with Japanese companies whose liabilities are mostly due on the long term (27% of short-term debt).

Figure 27. Indebtedness of publicly traded shipbuilding companies

Note: Firm-level information used here refers to shipbuilding companies as a whole, thus might reflect shipbuilding as well as other business segments of shipbuilding companies. Please refer to subsection 5.6.5 for further information on shipbuilding segments of Korean companies.

Source: Calculations based on information obtained from Factset.

5.5.4 Key financial indicators for selected companies

Table 21 summarises information on key financial indicators for selected large shipbuilding companies in Korea for which information is publicly available. In terms of profitability (EBITDA on sales), only two companies, Hanjin Heavy Industries and Samsung Heavy Industries, performed better in 2012 than in 2007. In terms of free cash-flow, all major Korean companies had to resort to external funds to compensate losses during the 2012 fiscal period. Over the longer term this can be problematic, as a longstanding situation of negative free cash-flow may result in mounting debt levels and underinvestment.

Table 21. Profitability of selected publicly traded shipbuilding companies

Comparison of key indicators in 2007 and 2012

Company Name	Year	EBITDA on Sales	Free CF on Sales	ROA	Free CF on Debt	% Short-t Debt	Interest Coverage	Price-to-Book
Dae Sun	2007	6%	5%	5.16	87%	13.68	35.79	0.96
	2012	-41%	-48%	-21.10	-36%	100.00	-8.05	
	% change	-756%	-1127%	-509%	-142%	631%	-123%	-100%
DSME	2007	5%	20%	3.76	305%	28.50	9.49	5.59
	2012	5%	-10%	1.35	-25%	54.62	2.12	1.10
	% change	-1%	-151%	-64%	-108%	92%	-78%	-80%
Hanjin HHI	2007	5%	-45%	0.62	-25%	25.30	0.82	3.48
	2012	8%	-6%	-0.78	-4%	46.07	0.52	0.35
	% change	62%	-86%	-225%	-84%	82%	-37%	-90%
HHI	2007	15%	25%	7.89	968%	69.35	52.52	5.03
	2012	5%	-8%	2.00	-29%	57.50	4.74	0.88
	% change	-63%	-133%	-75%	-103%	-17%	-91%	-83%
Samsung HI	2007	8%	7%	4.91	160%	42.03	40.45	4.82
	2012	10%	-11%	4.87	-46%	45.49	61.17	1.58
	% change	31%	-257%	-1%	-129%	8%	51%	-67%
STX O&S	2007	10%	14%	8.87	135%	18.82	13.65	4.72
	2012	-8%	-12%	-5.09	-16%	77.45	-2.79	0.84
	% change	-185%	-189%	-157%	-112%	312%	-120%	-82%

Note: Firm-level information used here refers to shipbuilding companies as a whole, thus might reflect shipbuilding as well as other business segments of shipbuilding companies. Please refer to subsection 5.6.5 for further information on shipbuilding segments of Korean companies.

Source: Calculations based on information obtained from Factset.

Preliminary information available from the Bank of Korea on the financial performance of shipbuilding companies, suggests that the difficult financial situation has further deteriorated in 2013 (BOK, 2014a). On average, Korean shipbuilding companies experienced negative operating profitability figures and higher debt levels than in 2012. Recent exchange rate movements have also created financial difficulties for the export-oriented Korean shipbuilding industry. The Korean won has been appreciating and, even though it is considered to be “moderately undervalued” (IMF, 2014), it has raised concerns amongst Korean shipbuilding companies (Asiasis, 2014b).

5.6.5 Large groups and shipbuilding segments

The Korean shipbuilding industry is dominated by a small number of very large companies. However, according to the government, the share of shipbuilding activity within these large companies is decreasing. KOSHIPA commented that fierce competition in both shipbuilding and offshore markets is driving shipbuilding companies to diversify into other activities within or even beyond the maritime cluster. Since financial accounting is usually consolidated within business groups, it is sometimes challenging to disentangle the share of activity corresponding specifically to shipbuilding.

Table 22 below summarises the specific financial performance of the shipbuilding segment in four selected large groups (HHI, DSME, SHI and STX O&S). To a large extent, with the exception of HHI, these companies focus essentially on shipbuilding. The contribution of shipbuilding activity is above 75% in terms of sales — only 34% for HHI — and above 80% in terms of operating profit.

Profitability of the shipbuilding segment in HHI is higher (5%) than its overall profitability level (2%). In contrast, losses of the shipbuilding segment of STX were particularly heavy when compared to other departments. In SHI, the profitability level of the shipbuilding department has been in line with the remaining parts of the house.

Table 22. Key financial indicators for shipbuilding segments

Selected companies, 2012

Company	Sales	Operating Profit	Annual Sales Growth		Annual Profit Growth		Profit Margin	
	% SB	% SB	Total	SB	Total	SB	Total	SB
HHI	34%	82%	0.7%	-4.4%	-63%	-64%	1.9%	4.5%
DSME	99%	.	0.9%	0.8%
SHI	94%	97%	6.2%	8.2%	6%	2%	9.1%	9.4%
STX	79%	85%	-17.4%	-20.8%	-7185%	-1224%	-11.2%	-12.1%

Note: Non-shipbuilding segments include Offshore and Engineering for HHI and Shipbuilding Equipment for STX. Shipbuilding segment includes Marine and Special Ship for DSME.

Source: Secretariat calculations, based on data from Companies' audit reports, 2012.

5.6.6 Small and medium-sized shipbuilding companies

Due to data limitations, it is currently not possible to extend the analysis above to smaller shipbuilding companies. However, a number of comments suggest that SMEs face an extremely challenging situation. The Korean government's response to the peer review questionnaire noted a number of shipyards have been closed over the past 10 years. In addition, cancellations in smaller shipyards amounted to 5.1% of total CGT in 2009 and 1.9% in 2010, compared to 3% and 0.8% respectively for larger shipyards (Lee, 2013). Small firms may also have more difficulties in meeting the credit rating conditions required to obtain the government Refund Guarantee, which adds to financial challenges that may lead to a low number of new orders for SMEs.

Korean Shipbuilding Industry and Restructuring and Competitiveness Reinforcement Plan approved in 2009 gives particular emphasis to SMEs facing temporary cash-flow difficulties due to special reasons, through its Financing Support for Ship Production assistance package. Additionally, the plan to develop the offshore plant industry, also foresees SMEs with recovery prospects to be eligible for ship financing such as the Refund Guarantee.

6. Industry challenges

Overall, the analysis in this report shows that the Korean shipbuilding industry has performed generally well in the recent past. In a highly competitive global shipbuilding market, where China and other emerging economies have been playing an increasingly important role, Korea has maintained its position as one of the leaders in the global shipbuilding industry. Challenges and opportunities for improvements remain, however. For its part, the Korean government highlighted the issues of responding to environmental change and the “green ship” trend, and dealing with an ageing population and its impact

on industrial employment. Here, the particular issues of financial performance and government exposure, SMEs and localisation, technology and market niches, and workforce are discussed.

6.1 Financial performance and government exposure

The recent global shipbuilding crisis has clearly had a severe impact on Korean shipbuilding companies' finances. Profitability levels are low and debt is mounting to unsustainable levels in some firms. Larger companies have been surviving thus far, but some shipbuilding companies are now in the hands of (bank) creditors, and others face concerns about their ability to repay debt and avoid bankruptcy.

The difficult financial situation has led to an increase in government involvement in the shipbuilding industry. To start with, government-related agencies have emerged with a boosted ownership role in the industry — namely in large shipbuilding companies such as DSME and STX. Furthermore, recent unconfirmed information from the media suggests that shipbuilding companies in Korea have fallen under tight supervision from the Financial Supervisory Service (Business Korea, 2014). According to the same source, the regulators have been prompted by companies' severe financial difficulties to act and stabilise the financial market. In addition to Hanjin, STX and Sundong Shipbuilding (already under supervision), Daesung, Hyundai and SPP have been added to a list of main debtor companies. Finally, as well as its ownership and oversight role, the government has also become more exposed to risk via the increased volume of export guarantees granted to the shipbuilding industry, as discussed in Section 4.3.2.

The increased level of government involvement and exposure makes it essential to ensure that the government both maintains a level playing field and manages its risk. The Korean government commented that the increased ownership role was based on market transactions and would ideally be temporary. In the meantime, as with all cases of government ownership, it is important to keep an eye to the principles of competitive neutrality that ensure a level playing field between public and private entities (OECD, 2013f; OECD, 2014d). With regards to support measures such as guarantee schemes, it is important to understand the risk-sharing arrangements so that the government's exposure is transparent and can be managed to avoid unduly large risk to the government's finances.

An interesting issue is whether the size of Korea's shipbuilding companies adds to the risks, both for the government but also for the firms themselves. Complex ownership links between large companies and affiliates can further aggravate and spread the effects of financial difficulties, which in the case of Korea with its *chaebols*, is a notable systemic concern. The size of some shipbuilding companies and the financial links they feature could mean that any severe financial difficulties could have serious direct consequences in terms of employment as well as indirect costs related to the robustness of the financial sector. Indeed, the Korean government expressed concerns about the significant costs in terms of (localised) job losses that could result from failure of a large shipbuilding company. However, signalling that large shipbuilding companies have a "safety net" may result in moral hazard issues and disincentivise companies to make needed structural changes. In dealing with the ongoing aftermath of the crisis, and any further downturns in the industry, the government will need to consider carefully the potential costs and benefits of public intervention.

6.2 SMEs and localisation

The situation of shipbuilding SMEs is particularly challenging, but not without opportunities. These firms have been experiencing a high number of cancellations and are under severe financial pressure. With a smaller scope for financial manoeuvre, some SMEs have been forced to close or sell yards. Nevertheless, a number of smaller companies appear to be productive and efficient. Even though shipbuilding SMEs in Korea account for a small share of employment and output, ensuring that high-performing SMEs can

contribute to value creation in the shipbuilding industry or the wider maritime cluster could yield valuable employment and diversification benefits.

In the plan for restructuring the shipbuilding industry, the government gives particular attention to SMEs, for example by providing financial support for productive yards under difficult financial situation for special reasons. Additionally, the government foresees that SMEs could play a bigger role as suppliers in the value chain of large shipbuilding companies (e.g. providing marine equipment). This dovetails with the government's expressed aim to increase "localisation", i.e. domestic production of certain maritime equipment, notably in the offshore industry. The government commented on the important contribution of effective shipbuilding clusters, with a stable supply of parts and materials (steel plates, engines, auxiliary parts, components) within clusters that have been formed along the coastline of Korea. The proximity of relevant parts, materials and equipment enterprises, as well as colleges, has the advantage of facilitating effective co-operation among shipyards, equipment companies, R&D providers and other stakeholders.

However, expanding the activity of shipbuilding and marine equipment SMEs may be challenging due to the structural set-up of the industry. The high degree of concentration in the Korean shipbuilding industry may result in difficulties for SMEs to find their market niche and/or to act as suppliers for larger companies — particularly when large shipbuilding companies also have their own dedicated departments for marine equipment. And some parts of the shipbuilding and marine equipment industry are clearly most efficient when operating at scale. This suggests that government efforts to support SMEs should perhaps focus on reducing any competitive barriers to SME's activities, guarding realistic expectations about what might be achieved by government interventions in the Korean market context.

Furthermore, efforts to increase domestic inputs should not hamper the shipbuilding industry from sourcing from the most cost competitive suppliers. As in other tradable industries, firms need to weigh up the supply chain risks, exchange rate risks, and cost-quality trade-offs of various supply options, be they domestic or foreign. Shifting from foreign to domestic supply could entail transition costs, and it is not clear to what extent eventual technological spillovers might be accrued by encouraging domestic supply options.

6.3 Technology and market niches

Data presented in this report have shown that the industry has been focusing on new technology, investing in R&D, and increasing the number of patents in the shipbuilding area. This is no doubt one of the reasons why average vessel values in Korea already rank amongst the highest in the world. Large benefits can accrue when R&D investments and other efforts to innovate successfully translate into product innovations as well as process innovations that drive increased productivity.

Furthermore, the Korean government highlighted the use of technology in the Korean shipbuilding industry's self-rescue efforts in the wake of the economic crisis. It noted that the large shipyards use their manpower to invest in technological innovation, and are coping with the crisis with a new focus on special vessels, green ships, and offshore plant, along with diversification strategies. The government also noted a number of specific industry practices stemming from technology use and innovation that contribute to productivity and competitiveness. These included:

- A significant shortening of the construction period via process innovation, outsourcing, outdoor dock utilisation, leveraging the product mix, etc.
 - Enhancing production process efficiency by outsourcing ship block assembly, except for core parts such as the bow, stern, etc.

- Enhancing production flexibility, especially after the mid-1990s, by employing a product mix that enables simultaneous production of diverse types of ships at the same docks.
- Enhancing dock turnover rates by assembling ship blocks into 2-3 at outdoor locations near docks.
- Introducing information technology to the construction process via standardisation of ship design and processing, automation and mobilisation of robots.

The focus on technology should serve Korea well in its future shipbuilding activities in segments such as the offshore market as well as in more technically challenging segments. Korea already performs well in several high-value and technologically-advanced parts of the shipbuilding industry. The growth of the offshore energy business is likely to yield increasing opportunities in this sector, although this will also encourage increased competition from other shipbuilding economies, with consequent pressures on margins and markets. Indeed, a recent news article reported that the China State Shipbuilding Corporation and Mitsui Engineering and Shipbuilding intend to enhance their co-operation in LNG and offshore, due to the higher margins available compared to commercial vessels (Lloyd's List, 2014b).²⁵

Looking ahead, it is not yet clear how the government's plan for developing the offshore industry will practically impact on existing policies for R&D. The plan indicates a number of different actions and it will be important to complement industry initiatives and avoid crowding out private sector spending and activities. Co-ordination across the various public and private sector stakeholders will also be important so as to maximise opportunities for knowledge transfer. On this, naval technology research carried out by some Korean shipbuilders may also provide relevant inputs to commercial shipbuilding, although for security/defence purposes there are clearly limits to information dissemination. In general, the extent to which there are substantial technological spillovers from naval to commercial activities, and whether companies involved in both activities can gain significant competitive advantages from their government naval work, is a difficult topic and one that could benefit from further discussion.

6.4 Workforce

The increase in qualifications and skills of the workforce along with the development of technical schools and specialised university courses has undoubtedly contributed to labour productivity gains in Korean shipbuilding. Furthermore, the existence of a sector council to promote the development of human resources should help in addressing any future skill mismatches and ensuring that the industry is provided with a qualified labour force.

Nevertheless, the Korean government and KOSHIPA noted that, despite the existence of tailored educational and training programmes as well as the relatively high remuneration offered by the industry, it is still challenging to attract talented young people to the shipbuilding industry. On the one hand, shipyards are usually located far from big metropolitan areas such as Seoul. Large and dynamic large cities tend to be much more attractive for young people. On the other hand, competition in the job market is tough and the nature of jobs in other industries such as electronics or gaming is argued to be much more attractive to young people than working in the shipbuilding industry. The Korean government also noted that an ageing population (also described in OECD, 2014a) can add to these challenges. The industry currently uses an increasing number of subcontractors but, while this may boost flexibility, it is not clear that this strategy aids either staff training or industry attractiveness. In this case, Korea is in a similar position to other WP6 countries that are concerned about ensuring adequate human resources for their shipbuilding industries in the future.

6.5 *Policy evaluation*

As in other countries, Korea uses a number of policy instruments that affect the shipbuilding industry. It is very challenging to understand how the different policies interact and to what extent they complement or “crowd-out” each other. Also, identifying whether specific policies are attaining their objectives is not clear-cut. Attempting to evaluate some of the policies affecting the shipbuilding industry could provide useful evidence to inform policymakers and help adjust policies accordingly. For instance, policies on R&D support or workforce training could be usefully evaluated. Admittedly, such evaluation is challenging; however, the OECD has been working on industrial policy evaluation and a discussion of methodological challenges, policy issues and further information is available (OECD, 2014e).

7. **Possible questions for discussion**

The aim of the WP6’s peer review process is 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 peer review of Korea has shown that shipbuilding is a key industry for Korea, accounting for an important share of economic activity. In recent years, the industry has generally been performing well. It has maintained a 30% share of the global market against the backdrop of tough competition, and has been forging ahead in shipbuilding-related technological areas. However, data in this report suggest that the recent crisis has left scars and a number of shipbuilding companies face considerable financial difficulties.

How the Korean government’s plan to develop the offshore industry will play out in practical terms remains to be seen. The strategy is ambitious, and involves a significant investment by the industry and government. Aside from this, a number of other policy-related issues emerge from this report, which could benefit from discussion by the WP6. In the context of the peer review process for this report, delegates may wish to discuss:

- What lessons does Korea’s approach to addressing severe financial difficulties in its shipbuilding companies hold for other shipbuilding economies?
- What does Korea’s experience suggest for government strategies to facilitate company restructuring and yard reorientation processes, noting the need to consider labour market transitions, domino effects, and fiscal risks to the government, as well as ensuring a level playing field?
- What lessons can be learnt from the increased activity of Export Credit Agencies (ECAs) that took place in Korea after the Crisis like in many other countries?
- What can/should government and industry do to create the right conditions for attracting young and talented people to the shipbuilding industry?
- What are the positive and negative implications of the increased use of subcontracted workers?
- What are the specific challenges of policy evaluation in the shipbuilding industry? What other strategies can be followed to better inform policymakers about policy effectiveness?

NOTES

1. Refer to Annex A for information on the role of KOSHIPA.
2. Refer to Annex A for information on KOMEA.
3. Offshore vessels/structures include:
 - Mobile drilling units: e.g. Jack-up drilling units, Semi-submersible / submersible drilling units, Drill ships;
 - Construction vessels: e.g. Pipe layers, Cable/umbilical/flowline layers, Heavy-lift vessels;
 - Installation vessels: e.g. Wind turbine installation;
 - Construction support: e.g. Multi-purpose support, Dive and ROV (remotely operated underwater vehicle) support;
 - Mobile production: e.g. FPSO (floating production, storage and offloading), Semi-submersible production facility, TLP (tension leg platform)/Spar;
 - Logistics: e.g. Floating storage, Shuttle tanker, SPM (single point mooring);
 - Anchor handling tug supply vessels (AHTS);
 - PSV (platform supply vessel)/Supply;
 - Fixed Production: e.g. Fixed platform.
4. Information obtained from the Korean Stock Exchange website, available at <http://eng.krx.co.kr/> (accessed 11 April 2014). Recently, STX delisted (15 April 2014), which reduces the total number of listed shipbuilding companies to five.
5. The stakes held by the NPS at five of the six largest shipbuilding companies in Korea are considerable (above 6%, and 9.11% in case of DSME) but in line with some of the positions of the NPS in large Korean companies in other sectors (Korea Times, 2014a).
6. Information obtained from OECD STAN database, R&D expenditures in Industry (ISIC Rev. 4, industry category D301: Building of ships and boats).
7. The creative economy concept involves developing the economy through convergence between information technology and other businesses.
8. See www.kiost.ac/kordi_web/main/ (accessed 25 March 2014).
9. See www.komeri.re.kr/smartcms/page/main (accessed 25 March 2014).
10. See www.rims.re.kr/ (accessed 25 March 2014).
11. Note: the number of members has fallen since 2012.
12. Information obtained from KOSHIPA (2013a, p. 12).

13 The Korean government defines the “offshore plant industry” as engaged in building, installing, and supplying the equipment necessary for developing maritime resources.

14 MOF was recreated in 2013, having been abolished in 2008 and most of its roles transferred to the Ministry of Land, Transport and Maritime Affairs (fisheries policy was moved to the Ministry of Food, Agriculture, Forestry and Fisheries). MOF is responsible for marine development, fisheries, shipping and logistics, maritime safety, and development and management of ports and harbours. Policies in these areas indirectly affect shipbuilding, offshore plants and the marine equipment industry.

15 At 2010 exchange rates.

16 There is a second programme overseen by MOTIE – ‘Maritime Leisure Equipment Technology Development’ (with a budget of KRW 2.4 billion / USD 2.2 million in 2014) – which aims at fostering the innovative capacities and responsiveness of SMEs involved in maritime leisure equipment (KEIT 2014b). However, this is less relevant to WP6 interests and is not discussed further in this report.

17 The R&D support is provided under Article 11 (Industrial Technology Development Business) of the Industrial Technology Innovation Promotion Act.

18 The Offshore Plant Industry Support Centre will be part of the Korea Institute of Ocean Science and Technology (KIOST) and is to be setup by 2015 in Geoje, South Gyeongsang Province. The centre will support the domestic offshore plants industry through technological support for design and engineering, testing and authenticating of offshore plant materials performance, support for technology commercialisation and marketing activities, and education and training of industrial manpower (see http://eng.kiost.ac/kordi_eng/?sub_num=1597).

19 KOSHIPA data on new orders, www.koshipa.or.kr/eng/koshipa/koshipa3/statistics_kor.htm

20 These firms were chosen due to data availability. Note that data challenges remain in this analysis, particularly in terms of isolating productivity levels of the shipbuilding segments from other company activities, and accounting for the use of subcontracted workers.

21 Note that there are some differences between the results for aggregate labour productivity (Figure 22) and this firm-level analysis. This may be attributed to several factors. First, the firm-level analysis is based on a sample of large firms, thus firm-level labour productivity estimates will essentially reflect the evolution of productivity in larger companies. Second, the methodologies used to construct the indicators are different. While at the aggregate level, the indicator is constructed as gross value-added per hour worked, at the firm level the indicator is constructed on the basis of turnover per employee due to data limitations — no information is available on value added nor on number of hours worked. Therefore firm-level estimates may be more sensitive to variations in the business cycle (through changes in turnover) but less sensitive to changes in labour management strategies (the denominator only varies with changes in employment levels).

22 Lee (2013) analyses the technical and scale efficiency of smaller Korean shipyards using financial data.

23 To some extent, this indicator partially replicates the ratio of earnings before interest, taxes, depreciation and amortisation (EBITDA) to total sales, a commonly used financial ratio (Rassier, 2013).

24 At this level of disaggregation, comparable information is only available for Norway.

25 The WP6’s work on the offshore sector (to be presented at the November 2014 meeting) and the wider OECD work on the future of the ocean economy (www.oecd.org/futures/oceaneconomy.htm) should provide additional information on the opportunities for shipbuilders.

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ANNEX A: INDUSTRY ASSOCIATIONS*

Korea Offshore & Shipbuilding Association (KOSHIPA)

KOSHIPA was established as a non-profit organisation in 1977, at a time when the Korean shipbuilding industry had just made inroads into the world shipbuilding market. Nine shipbuilding companies, capable of building ships of 5 000GT and over, are currently members of KOSHIPA. KOSHIPA works to enhance co-operation among its member companies and to promote their common interests. The principal activities of KOSHIPA are to:

- Promote member companies' common interests and conduct research for the shipbuilding industry;
- Carry out shipbuilding studies and publish various reports;
- Conduct human resource development activities and programmes;
- Promote international co-operation for the sound development of the world shipbuilding industry.

The Korean shipbuilding industry is also involved in a number of international collaborative fora, including the JECKU Top Executive Meeting (most recently held in Okinawa, Japan), the IMO, and the Asian Shipbuilding Experts' Forum (most recently held in China, with co-sponsorship from KOSHIPA). Korea also takes part in trilateral shipbuilding co-operation with Japan and China. These countries hold regular meetings to promote understanding of their respective positions and to exchange information on matters of common interest, including shipbuilding market conditions, supply of steel materials and reinforcement of shipbuilding manpower.

Korea Marine Equipment Association (KOMEA)

Established in 1980 under the Small and Medium Business Cooperative Act as a non-commercial organisation, KOMEA aims to promote the development of marine equipment industries, establishing a fair and efficient business environment. Its objectives are to: provide assistance to the marine equipment industry, specifically in its promotion and development; engage in public relations services to enhance trade promotion; and to undertake joint purchase and sales.

Korea Shipowners' Association (KSA)

KSA is a nation-wide organisation of owners and operators of vessels engaged in ocean transportation. Since its establishment in 1960, KSA has made an effort to ensure the development of Korean shipping as well as promoting the rights and interests of its members and boosting international shipping collaboration. In terms of objectives, the KSA conducts research and survey of shipping trends, and maintains close contact with related shipping organisations at home and abroad.

* Information provided by the Korean government.

ANNEX B: KOREAN SHIPBUILDING POLICY 1960-2000

Policies relevant to the shipbuilding industry have featured in Korea's general economic development plans as well as in stand-alone initiatives. A brief summary of the period 1960-2000, provided by the Korean government, is as follows:

1960s

First 5-year Economic Development Plan (1962-1966)

- 3-year Ship Quality Improvement Plan: To replace inefficient engines with diesel engines and dismantle old ships.
- Expansion of shipbuilding facilities: To expand the facilities of Korea Shipbuilding Corporation for domestic construction and supply of large-scale ships and establish modernisation plans (this expanded maximum shipbuilding capability to 13 000 GT, annual capacity to 60 000 GT, and capital to KRW 3 billion from KRW 1 billion)

Second 5-year Economic Development Plan (1967-1971)

- Enacted the Shipbuilding Industry Promotion Act in 1967: Major content was to encourage the domestic shipbuilding industry through optimisation of shipbuilding production and enhancement of shipbuilding technologies. Also revamped financing conditions for shipbuilding funds and created a Shipbuilding Industry Deliberation Committee (which established the basic plan for promotion of the shipbuilding industry).
- Provision of the Machinery Industry Cultivation Fund (1969): To raise the domestic self-supply rate, enhance local production and contribution to export growth.

1970s

Shipbuilding Industry Promotion Plan

This set out to raise the domestic self-supply rate of ships, expand Korea Shipbuilding Corporation's maximum shipbuilding capacity to 100 000 tonnes, and have the Society of Naval Architects of Korea develop and disseminate standard ship designs for 10 ship types.

Third 5-year Economic Development Plan (1972-1976)

This aimed to nurture shipbuilding into a strategic export industry and increase shipbuilding capabilities, including a two-fold expansion of Korea Shipbuilding Corporation's facilities.

Long-Term Shipbuilding Industry Promotion Plan (1973)

This aimed at self-supply of domestic demand for ships by 1980, export of 3.2 million CGT of ships, and enhancement of shipbuilding capability through facility expansion (from 5.45 million CGT in 1980 to

9.2 million CGT in 1985). It also chose Geoje Island as the centre of a shipbuilding industry district, due to its conducive conditions.

Support of funds for exports on a deferred payment basis

The establishment of Korea Exim Bank in 1976 saw full support of deferred-payment exports.

1980s

The 1980s saw improved deferred-payment export financing at the OECD's credit concession level, sequential integration of 110 items of equipment and materials for ships so as to expand the marine equipment industry, and selection of 58 items of machinery parts for localisation and development promotion.

Abolition of Shipbuilding Industry Promotion Act

Rescinded the Act that had protected the shipbuilding industry and enforced the Industrial Development Act 1986 to implement industrial policies based on market principles. This eliminated a number of support systems for various industries and also converted the shipbuilding industry into a self-regulatory competition system through expanded industry self-regulation.

Rationalisation measures for the shipbuilding industry

Due to a long-term economic recession in the 1980s, there was continuous emergence of shipbuilding companies facing difficulties. Rationalisation measures for the industry were implemented in 1989. Tax support was provided to those companies that had been making self-rescue efforts to improve their financial structure. Corporate mergers and acquisitions were made exempt from registration tax and acquisition tax.

1990s

A shipbuilding boom arrived in the latter half of the 1990s owing to the lifting of shipbuilding industry rationalisation measures in 1993. Easing of restrictions on construction of new facilities and facility expansion allowed enterprises to expand. Since this time, shipbuilding has been regarded as a maturing industry and government support for the industry has disappeared.