

The basis for South Korea's ascent in the shipbuilding industry, 1970-90

Lars C. Bruno & Stig Tenold

Department of Economics

Norwegian School of Economics and Business Administration

--- Preliminary draft, please do not quote ---

One of the most striking features of Asia's increasingly important position in the global economy is the region's crucial role in the international shipbuilding market. Today, more than 90 per cent of the world's orders for new ships have been placed with Asian yards, more specifically with shipbuilders in China, Japan and South Korea. Although Japan became the world's leading shipbuilding nation in 1956, European yards still held a market share of around 75 per cent at that time. Subsequently competition from Japan, then from South Korea and latterly from China, first seriously eroded and then ended Europe's once leading position. Whereas the declining fortunes of the European shipbuilding industry - and to some extent the rise of Japan - have been well-covered in the literature, the rise of South Korea has received little attention.¹

This paper looks at the formative period of South Korean shipbuilding, the period from 1970 to 1990, which appears to be an unlikely time for the escalation of shipbuilding activities. The period was dominated by a major crisis in world shipping and shipbuilding, and saw massive yard closures in Europe. Our main question is: how did South Korean yards manage to build up a substantial market share in a period where the shipbuilding industry was in distress? Our explanations are based on both international and domestic factors, with specific emphasis on the role of policies and technological learning.

There is a substantial body of literature looking at the promotion of the heavy and chemical industries (HCIs) in South Korea, but few studies have focused solely on shipbuilding. Cho and Porter (1986) looked at the entrance of South Korea in the world shipbuilding market and emphasised the high entry and exit barriers as one of the causes of the high state involvement. Amsden (1989) used a case study of Hyundai Heavy Industry (HHI), which was the main South Korean company exporting ships during the 1970s, to analyse the breakthrough of the country's shipbuilding in the international market. The most comprehensive analysis of South Korean shipbuilding is the

¹ The overall shift in shipbuilding market shares is eminently discussed in Todd (1991); for a more concise analysis, see Cho and Porter (1986). More comprehensive presentations of the decline of European shipbuilding can be found in for instance Stråth (1987) and, focussing on the UK, Johnman & Murphy (2002). The rise of Japan is covered by Chida and Davies (1990), which also analyses the role of Japanese shipping. With regard to the growth of the South Korean shipbuilding industry, two works stand out: Amsden (1989) and Jonsson (1995).

comparative study by Jonsson (1995), where the country's experience is compared with the developments in Japan, the United Kingdom and Sweden.

The three studies mentioned above emphasise four factors that enabled South Korea to become an important provider of newbuildings: (i) government support, (ii) low labour costs and the repression of labour, (iii) favourable access to international and domestic funds and (iv) assistance in technology transfer.² This paper adds to the literature by introducing two new dimensions. First, we put the development of South Korean shipbuilding into a wider international context. Second, we address the question whether the difficult conditions in the markets for ships and shipbuilding may in fact have been an advantage for the ascendancy of South Korean shipyards.

The first part of the paper presents the main features of the development in South Korean and international shipbuilding in the period 1970-90, before giving a brief introduction to the shifts in hegemony within shipbuilding. The second part looks more closely at the international dimension of South Korea's ascent, in particular the basis for growth in what was for all practical purposes "a sunset industry".³ The third part analyses domestic factors that can explain the growing South Korean market share, emphasising the interplay between comparative advantages and the industrial policy. Moreover, we discuss in more detail how the prime movers in South Korean shipbuilding managed to obtain the technological and organisational know-how necessary to succeed. Finally, we discuss explicitly to which extent the plight of the yards in traditional shipbuilding nations might have been to the benefit of the South Korean shipbuilding industry.

1. South Korean and world shipbuilding, 1970-90

South Korea's advance in the international shipbuilding industry in the period 1970-90 was spectacular. The period was turbulent, as the crisis in the shipping sector led to a dramatic decline in the demand for new tonnage from the middle of the 1970s onwards, sparking a global shipbuilding slump. The response in Western European countries was based on a number of ingredients; nationalization, rationalization, subsidization, specialization and, ultimately, massive disinvestment and downscaling. By 1990 the Western European merchant ship completions had been reduced by around 75 per cent relative to the mid-1970s' peak - from more than twelve million gross register tons (grt) in 1975 to less than three million grt in 1990. The South Korean completions on the other hand multiplied by a factor of more than eight over the same period.⁴ Indeed, while South Korea's production in 1975 was less than a sixth of West Germany's production, by 1990 its output was larger than that of all European yards in aggregate.

The crisis of the 1970s and 1980s was a watershed in the postwar shipping market. As a result of the OPEC oil price increases, the rapid growth of tanker demand was replaced by stagnation and then absolute reduction. When the market collapsed, there was a substantial overhang of ordered, non-delivered vessels, and the second half of the 1970s and first half of the 1980s were characterised by overcapacity, substantial lay-ups and a massive reduction in the amount of new tonnage launched.⁵ As a result of huge demand for new shipping tonnage and long

² One point of disagreement is the relative importance of the pre-1973 era for the subsequent expansion of the South Korean shipbuilding industry. Amsden (1989) claims the legacy of the 1960s was of minor importance apart from the supply of skilled workers from the Korea Shipbuilding and Engineering Corporation (KSEC). Jonsson (1995), on the other hand, claims that the failed attempts to promote shipbuilding in the 1960s gave vital lessons for the policymakers, and could potentially be a source of learning-by-doing.

³ Oakes (1986:19).

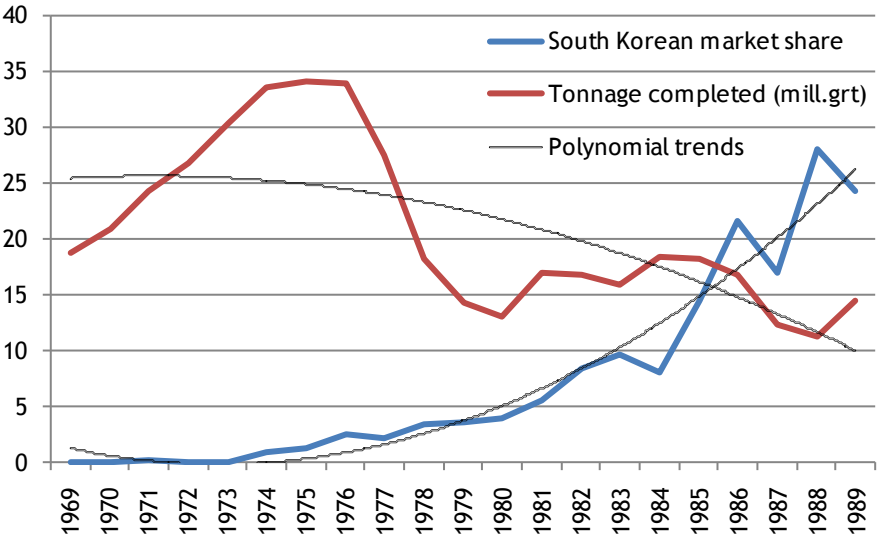
⁴ Unless otherwise stated, data on shipbuilding are taken from *Lloyd's Statistical Tables*, various years, and refer to vessels completed, measured in gross register tons.

⁵ See Tenold (2006) for the basis for the shipping crisis and an overview of the problematic period 1973-87.

orderbooks, the production capacity of the world’s yards had increased tremendously in the late 1960s and early 1970s. Ironically, when the production capacity had reached a historically high volume, the market collapsed.

Problems in the shipping industry rapidly spill over to the shipbuilding sector. As a result of the strong growth of the fleet before the freight market breakdown, from 1974 onwards new orders were virtually absent and large amounts of tonnage on order was cancelled. Chart 1 shows the fluctuations in the tonnage completed in the period 1969-1990, as well as South Korea’s increasing market share. The more than ten year glut and the South Korean shipyards’ massive expansion during this period are evident from the data.

Chart 1. Tonnage completed (million grt) and South Korea’s share (per cent), 1969-1989



The basis for South Korea’s growth in the international shipbuilding market should be sought in a combination of international and domestic elements. Although these two factors are closely intertwined, the rest of this paper is organised by looking at the two factors separately. However, we initially indicate why we think it is necessary to take both aspects into account, and why we have taken a “two-stage” approach in our analysis, where we look at international factors before we consider the domestic dimension.

Few sectors are as “international” in their character as the shipping industry. However, this does not automatically imply that the market for ships has the same international properties. There are some examples, with the United States as the most noteworthy, of strong protectionist links between the domestic shipping and shipbuilding industries. However, the majority of shipowners sell their services in a global market, where the nationality of the service provider for all practical purposes is irrelevant. Furthermore, most shipowners purchase their ships in an international market as well, either as second-hand ships or as newbuildings. While there are some links between shipping and shipbuilding at the national level, this is far more important with regard to for instance warshipbuilding, than with regard to merchant shipping.

The fact that the shipyards’ customer base is international does not imply that this is a market where the influence of national governments is unimportant. On the contrary, governments

in all major shipbuilding nations have interfered with the market mechanism, providing direct subsidies, easy financing, preferential orders, etc.⁶ Thus, while the state of the market at the international level is undoubtedly important, the domestic dimension has to be considered in order to fully understand the rise and fall of shipbuilding nations. Conditions in the international market determine the room to manoeuvre, but domestic policies and possibilities determine the actual movement.

Table 1 is a schematic presentation of the factors underlying the ascendancy of the three nations that have been leaders within world shipbuilding. This table is a testament to the relative strength of the dominant shipbuilding nations across time. Since the second half of the 19th century there have only been three market leaders in peace-time: Great Britain, Japan and South Korea.⁷ However, the factors on which their position was based varied along several dimensions. The table presents the elements that were of particular importance during the periods in which the countries gained large market shares. As the shipbuilding industry matured, other factors gained prominence.

Table 1. Perceived advantages of leading shipbuilders during their initial period of growth

	1850s-1880s Great Britain	1950s-1970s Japan	1970s onwards South Korea
Demand factors			
Shipping market	Booming	Booming	Volatile
Shipbuilding market	Increasing	Increasing	Declining (temporarily)
Market focus	Domestic	Initially domestic	Export market
Supply factors			
Relative labour costs	High	Low	Low
Labour unions	Limited	Repressed	Repressed
Technology	Domestic	Foreign	Foreign
Resources	Iron and coal	Steel	Steel
State support	Limited (indirect)	Yes	Yes

Considering the demand factors, both Great Britain and Japan established their positions in periods where the demand for shipping services and ships was growing rapidly, while the South Korean progress occurred under more difficult demand conditions. Moreover, while British yards had the advantage of a large home market and Japan used domestic owners as a base for subsequent export orders, the South Koreans relied on foreign demand.

The differences are evident when we look at the supply factors as well, although here the two Asian nations share the same properties, though with different timing. Great Britain’s supremacy was built on bespoke production, entailing relatively high labour costs, but initially

⁶ Stråth (1987:14) refers to the wealth of government efforts to secure shipbuilding activity as “the ‘obscure jungle’ of subsidies”.

⁷ The role of US shipbuilding during periods of war, and their immediate aftermath, should of course be mentioned. However, when we consider only periods of uninterrupted market conditions, the triumvirate above have an impressive pedigree. The UK was the world’s main shipbuilder from the mid 19th century until the late 1950s, before Japan established the dominant position that it held until it was eclipsed by South Korea around the turn of the millennium. Exactly when South Korea overtook Japan, depends on the measure used; gross tonnage, compensated gross tonnage, tonnage launched, tonnage completed or the size of the orderbook.

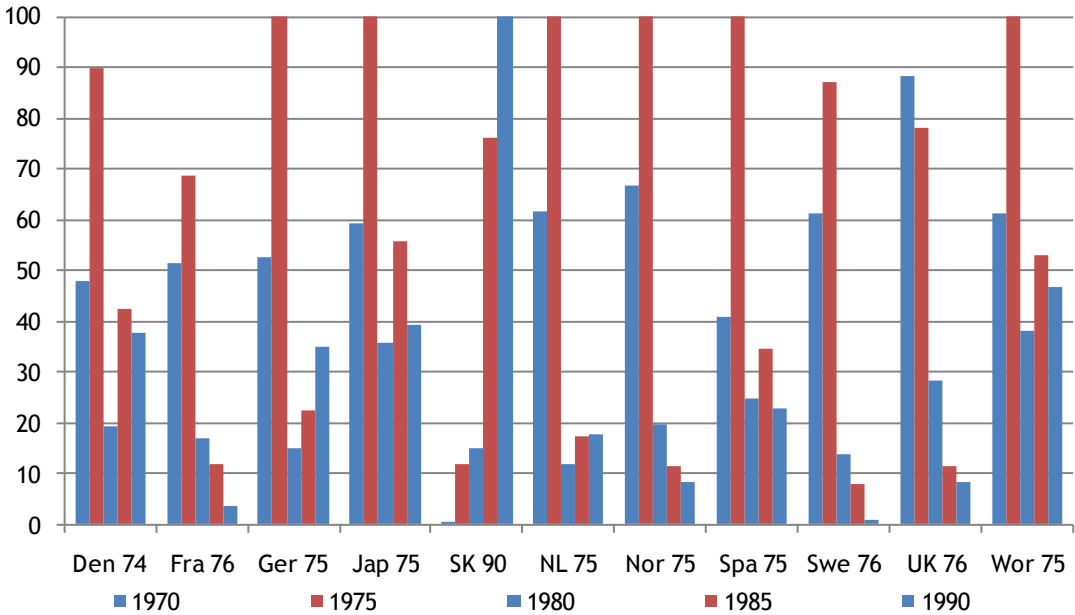
occurred in a period where labour unionism was limited. Great Britain’s dominance within shipbuilding technology and marine engineering gave an advantage that was enhanced by abundant supply of iron and coal. The direct state support was very limited, compared with the postwar period, but there is no doubt that the role of the Empire, and the country’s position in international trade had important indirect effects. Moreover, postal subventions and Admiralty support also helped British shipbuilding (Johnman & Murphy, 2002:1).

The initial phases of Japanese and South Korean shipbuilding growth were characterised by relatively low wages and repressed labour unions. Moreover, production technology was “imported” from abroad - and only subsequently refined - while the role of the state was substantial. In both countries the authorities had detailed plans for the expansion of the industry, working closely with major business interests to ensure that the goals were met.

2. The international development

Chart 1 painted a gloomy picture of the amount of tonnage completed, and showed the massive increase of South Korean market shares over the period 1969-1989. The world shipbuilding glut weighed down the industry, affecting all major shipbuilding nations adversely. Chart 2 shows the development of output in the most important shipbuilding countries.⁸ The chart presents the production at five year intervals. The output is measured as a percentage of production during the best year of the period, which is indicated next to the legend for each country.

Chart 2. Tonnage completed, per cent of year with highest production⁹



⁸ All nations that at some time during the period 1970-1990 completed more than one million grt within a year are included in the data. The exception is the United States, the shipbuilding industry of which is more or less detached from the global market.

⁹ As the dates for the peak production shows, there was a lag from the breakdown of the shipping market (1973-74) to the drop in shipbuilding production, as a result of the substantial amount of newbuildings ordered before the market collapsed.

Chart 2 illustrates the varying fortunes of shipbuilding in the European countries. Some countries - France, Norway, Sweden and the UK - reached a peak in the mid 1970s, after which shipbuilding fell by 90 per cent or more.¹⁰ The Netherlands and Spain experienced lower, but still substantial, decline. Only Denmark, Germany and Japan saw acceptable production figures, at least in relative terms, though even here output in 1990 amounted to as little as 35 to 40 per cent of the peak production. The odd one out is, of course, South Korea, which had very limited shipbuilding activity in 1970, but continued to expand the capacity and production.

The massive decline of shipbuilding happened in spite of substantial efforts at maintaining production in all shipbuilding countries. A huge arsenal of support was employed; financial credits and direct transfers to yards and shipowners, tax concessions, new equity from state funds, large naval and other public orders, etc. Nevertheless, the forces of the market were so strong, and the overcapacity so large, that a downscaling of the industry had to take place. Intuitively, this makes South Korea's performance even more remarkable. However, as we will argue later, South Korea might have had some benefits from entering a sector in which the market mechanism was strangled and a return to "normalcy" appeared impossible.

Table 2 gives an overview of some of the support measures put in place to secure employment at the yards in the major shipbuilding countries. In addition to the nation-specific measures mentioned below, a conspicuous element in all Western European countries and Japan was the closure of several yards, capacity reduction in others and massive lay-offs all around. More than a hundred yards were closed, and employment was halved in Western Europe and Japan between 1975 and 1987.¹¹ In 1975 more than 325,000 people had been employed at shipyards in Western Europe. By 1983 the figure was down to around 155,000.¹² There was a substantial reduction of employment in Japan as well, from 150,000 in 1975 to 85,000 in 1983.¹³

¹⁰ The apparently consistent decline of the UK output in the chart is misleading; in 1976 the country completed more tonnage than in 1970.

¹¹ Stopford (2004).

¹² Data from Institute of Shipping Economics (1984a:47). Considering shipbuilding only, and excluding ship repair and conversion, employment in the EU countries declined from 209,000 in 1975 to 65,700 in 1991; see Glen (2006:5).

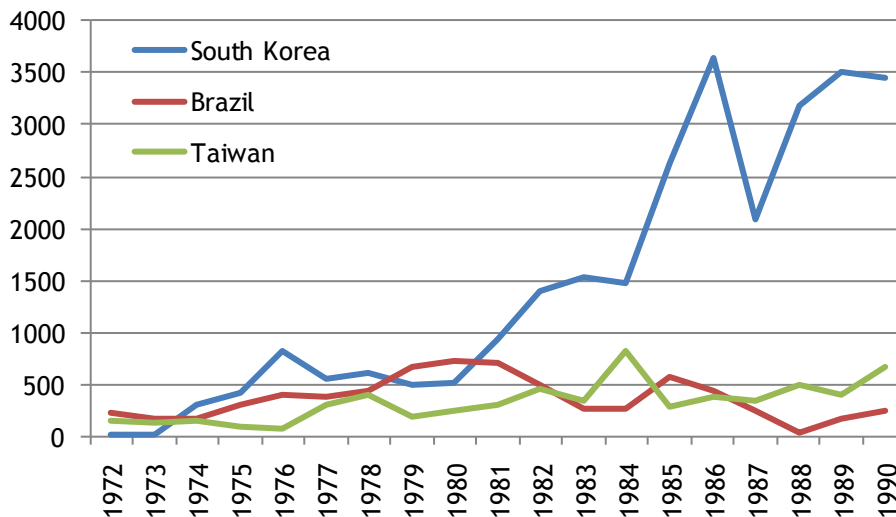
¹³ The Japanese data refer to the members of the Shipbuilding Association of Japan, which includes the 23 leading shipbuilding companies.

Table 2. Production 1975 and 1990 (thousand grt) and strategic support measures¹⁴

	1975	1990	Change	Strategic measures
Denmark	969	407	-58%	Tax concessions, owners' orders
France	1,149	63	-95%	Massive subsidies, bankruptcies, specialization
Germany	2,499	874	-65%	Restructuring, mergers, state owners, naval orders
The Netherlands	1,028	184	-82%	Massive subsidies, the RSV-scandal
Norway	1,052	88	-92%	Offshore focus, subsidies, specialization
Spain	1,593	367	-76%	Restructuring, nationalization, naval orders
Sweden	2,188	27	-99%	Subsidies, nationalization, full withdrawal
United Kingdom	1,169	127	-89%	Nationalization, privatization, naval orders
Japan	16,991	6,661	-61%	Rationalization, cross-subsidization
South Korea	410	3,440	+740%	Capacity increase, state support
World	34,203	15,995	-53%	

Most of the support measures were futile and only contributed to prolonging the decline of European shipbuilding. The fundamental problem, lack of competitiveness, was not properly addressed. European costs, in particular wages, were too high, and the strategic measures did not lead to a sufficiently large improvement in productivity and production costs. The by far most persistent competitor was South Korea, but it was not the only developing country making a specific effort at expanding their shipbuilding activities; Brazil and Taiwan also tried to break into the market. In 1979 and 1980, the output of Brazilian shipyards even exceeded that of South Korea.

Chart 3. New competitors: tonnage completed in Brazil, South Korea and Taiwan, 1970-90



The Brazilian drive, primarily based on a system of direct intervention in shipbuilding contracts and guaranteed domestic orders that led to a substantial increase in output during the 1970s, imploded

¹⁴ For a concise introduction to strategic measures in various European countries, see for instance Oakes (1986). For development in individual countries, see Poulsen & Sornn-Friese (2010) for Denmark, de Voogd (2007) for Germany and The Netherlands and Johnman & Murphy (2002) for the UK.

in the first half of the 1980s: “The shipbuilding industry is now almost totally idle”.¹⁵ Taiwan turned out to be a more viable competitor, though never managed to get the kind of market shares that the South Korean yards gained. The basis for the emergence of the three developing country producers was more or less the same; an initial focus on price competitiveness, helped by strong governmental support. However, South Korean shipbuilders appear to have succeeded better in the second phase of the shipbuilding drive, when low wages could no longer be the only means of competition.

The competitive costs of South Korean and Taiwanese yards, and the low productivity of Brazilian shipyards, are evident from Table 3. The table is based on data on production, measured as *compensated gross tonnage* (cgt), which take into account variations in the amount of labour necessary to construct different kinds of vessels. The table, which is based on data for production and employment for the years 1979-81, coupled with the compensation per worker in 1982, shows the dramatic differences in productivity among the countries competing in the market for new ships. For instance, the average shipyard worker in the United Kingdom produced only marginally more than the average South Korean, but received more than three times as much in compensation.

Table 3. Productivity - annual output and compensation, 1982¹⁶

	Output cgt	Workforce	Output/worker	Comp./worker	Comp./ cgrt
Northern Ireland	47,625	5,769	8.26	11,451	1387
Belgium	119,917	5,904	20.31	21,860	1076
Brazil	398,333	30,000	13.28	12,800	964
Great Britain	355,414	20,982	16.94	14,039	829
Portugal	62,808	9,233	6.80	5,524	812
Italy	239,370	14,483	16.53	13,313	805
Germany	719,334	24,819	28.98	20,079	693
Denmark	279,836	10,127	27.63	18,577	672
AWES	4,427,142	194,697	22.74	15,130	665
France	434,709	17,067	25.47	16,543	649
Spain	557,082	33,507	16.63	10,665	641
Norway	436,318	14,480	30.13	18,548	616
Finland	464,739	16,600	28.00	14,860	531
Sweden	409,708	12,300	33.31	17,478	525
Netherlands	300,282	9,426	31.86	16,384	514
Taiwan	148,924	12,000	12.41	5,185	418
Japan	4,461,282	115,598	38.59	15,209	394
Poland	405,688	43,650	9.29	3,190	343
South Korea	469,200	31,053	15.11	4,600	304

¹⁵ Pires (2001:157).

¹⁶ AWES refers to the member countries of the Association of West-European Shipbuilders. Data from Netherlands Economisch Instituut reprinted in Institute of Shipping Economics (1984b), 47.

There is no doubt that South Korea’s position as a low cost provider of new tonnage was crucial to the country’s growing share of the world market for ships. According to Graham Day, CEO of British Shipbuilders: “if for example you or I were an independent shipowner, and we had communication from, say, a Japanese shipbuilder that said the price was 10, all you would have to do is produce that to a South Korean yard and they will bid 9 without looking at the specification or anything else.”¹⁷

By the mid 1980s, South Korea had become the most important competitor to the Japanese in the high-volume shipbuilding market. Some European yards had chosen to focus on more advanced purpose-built vessels, but in aggregate the European shipbuilding capacity had been dramatically reduced. For the largest vessels, it was now more or less a two-horse race between Japan and South Korea. In the mid 1980s the currency development improved South Korea’s competitiveness even further. As a result of the appreciation of the *yen*, the advantages related to higher productivity in Japanese yards were eroded; “the price differential with the [South] Koreans this time a year ago was between 5-10%. Now, though, since the *won* is linked to the dollar, the gap is anything up to 50%”¹⁸

In the last part of the 1980s, however, the South Korean expansion lost some steam. Rising labour costs, labour conflicts and uncertainty in connection with the transition to democracy all affected the country’s shipbuilding sector negatively.¹⁹ Nevertheless, there is no doubt that South Korea by the beginning of the 1980s had come a long way from the meagre starting point at the beginning of the 1970s. During that decade, South Korean shipbuilding developed from a sheltered, domestically oriented industry to an important challenger in the world market. Table 4 shows the transition of the country’s shipbuilding industry from 1971 to 1981.

Table 4. Shipbuilding capacity, South Korea 1971 and 1981²⁰

	1971	1981
Shipbuilding capacity (grt)	190,000	4,000,000
Domestic demand (grt)	43,000	193,000
Export demand (grt)	-	880,000
Shipbuilding companies	131	153

Table 4 indicates that by 1981 there was substantial surplus capacity in the South Korean shipbuilding industry. During the 1980s, as a result of demand for new ships recovering, the overcapacity was substantially reduced, even though production capacity was further increased. This enabled South Korea to develop from an important challenger to the world’s second largest shipbuilding nation. Table 5 shows that Hyundai, the first company to properly enter the world market, had been followed by several other yards, most of which had an impressive orderbook based primarily on foreign demand.

¹⁷ Johnman & Murphy (2002:231).
¹⁸ Bartlett & Asami (1986:133).
¹⁹ *Lloyd’s Shipping Economist* (1988:14).
²⁰ Institute of Shipping Economics (1981:52).

Table 5. Orderbook by shipyard, end of 1990²¹

	Domestic #	Domestic grt	Export #	Export grt	Export share	Avg. Size
Hyundai	0	0	45	3003.5	100	66,744
Daewoo	2	72	21	2753.9	97.45	122,865
Hanjin	4	155	4	208.9	57.41	45,488
Samsung	0	0	14	802.6	100	57,329
Tacoma	1	0.4	1	0.1	20	250
Donghae	1	5.7	6	18.9	76.83	3,514
Dae Dong	2	2.5	3	7.5	75	2,000
Daesun	6	8.4	2	0.8	8.70	1,150
Shin-A	4	5.4	0	0	0	1,350
Halla	0	0	8	216	100	27,000
Others	0	0	20	3.6	100	180
Sum	20	249.4	124	7015.8	96.6	50,453

South Korea's position at the end of the 1980s was vastly different from only ten years earlier. The country's international market share had increased further, but the competitive position had been changed as well. In the late 1980s currency developments worked against the South Korean yards, and labour costs increased in tandem with rising living standards. Indeed, by 1989 the competitive position of the country's shipbuilding industry had changed: "South Korea has now entered the ranks of the high quality-high cost shipbuilding nations, competing on direct terms with Japan."²²

In the last part of the paper we will discuss to which extent the problematic conditions in the world shipbuilding industry might have been beneficial for South Korea. However, before that, it is necessary to look more closely at the domestic factors that made the massive inroads into the international market possible.

3. The domestic development

The presentation of the international development has shown South Korea's rapid ascent towards the top of the world's shipbuilders. To explain this ascendancy, domestic developments are important. Specifically, we deal with two aspects of South Korean shipbuilding: the role of industrial policy and the improvement of skills through technological learning. First, however, we will give a brief introduction to some of the important development trends in South Korean shipbuilding in the period 1970-1990 and the government's motives for promoting the shipbuilding industry.

South Korea's starting point was, as we saw from the previous section, meagre. Although the country had more than a hundred shipyards in the 1960s, only nine of these were producing steel vessels.²³ In 1970 the country had one major yard, the Korea Shipbuilding and Engineering Corporation (KSEC). The yard received orders for six tankers in the 20-30,000 ton range from Gulf

²¹ Data from Institute of Shipping Economics (1991:75). Tonnage refers to 1000 grt.

²² *Lloyd's Shipping Economist* (1989:12).

²³ Our presentation of the early shipbuilding industry in South Korea draws heavily upon Jonsson (1995).

Oil in 1970 and 1971.²⁴ Although KSEC through these orders were responsible for South Korea's first stab at the international market for ships, the real expansion was to come elsewhere. Rather than the state-owned KSEC, Hyundai, one of the leading *chaebol* (business conglomerates) would become the vehicle for South Korea's expansion.

Hyundai was instrumental in the ascendancy of South Korea's shipbuilding, but at the same time dependent on state support. Hyundai Construction Company (HCC) applied for a licence to construct ships in June 1970 and the government subsequently approved it in September the same year.²⁵ The construction of Hyundai's huge shipyard at Ulsan commenced in March 1972 and was completed in June 1974.²⁶ HCC established the shipbuilding company Hyundai Heavy Industries (HHI) on March the 23rd 1972.²⁷ The establishment and early operations of HHI depended upon state support, the full extent of which we will elaborate on below. In brief, the state supported HHI by (i) giving access to domestic and foreign funds with preferential interest rates; (ii) helping in obtaining and providing financial guarantees for the first order; (iii) making complementary investments in facilities and complementary industries, such as steel through the Pohang Iron and Steel Company (POSCO); and (iv) providing support for acquiring new technologies. HHI became the major shipbuilder in South Korea in the 1970s and became the world's leading shipbuilder in 1983, a position it still holds today.

State support was vital for Hyundai's foray into shipbuilding, as well as for their followers Daewoo and Samsung. In December 1978 the Daewoo group took over a shipyard at Okp'o which was originally built by KSEC with a planned capacity of 1.2 million grt. KSEC had to delay the building of the shipyard because of depressed market conditions and the shipyard was delayed until October 1978. The Okp'o shipyard was only 25 % completed in December 1978, and following complementary investments by Daewoo the shipyard was finally finished in January 1981 (Jonsson, 1995:82). Samsung entered the shipbuilding market in similar fashion, acquiring Geoje Shipyard through the purchase of Koryô Shipbuilding. The latter company was originally founded in March 1974 and started the construction of a planned 150.000 grt shipyard in December the same year. Koryô Shipbuilding was struggling to get a foothold in the market and in April 1977 Samsung purchased the company, with operations at the Geoje shipyard starting in September 1979.

Table 6 shows the production of the four big shipyards from 1973 to 1986. There is a large Hyundai dominance in the 1970s, while Daewoo and Samsung increase their market shares in the 1980s. In the crucial years from 1979-85 production increased more than five-fold from 555,639 tons in 1979 to 2,813,920 tons in 1985, marking South Korea's transition from being a developing shipbuilder to being a large market player, as seen in chart 3. South Korean shipyards, especially the big four, were in a favourable position to exploit the short-lived international boom in 1979-80 to fill their orderbooks.

²⁴ Nam (2009:201).

²⁵ Jonsson (1995:79).

²⁶ South Korea's total production capacity measured in grt increased from 187,000 ton in 1970 to 250,000 ton in 1973; which was followed by huge leaps to 1,100,000 ton in 1974 and 2,390,000 ton in 1975 (Jonsson 1995:78).

²⁷ According to HHI home page; http://english.hhi.co.kr/company/at_a_glance.asp. However, according to HHI's annual report in 2009 it was established in 1973.

Table 6. Principal shipbuilders' production (grt) 1973-1986.²⁸

Year	Hyundai	KSEC	Daewoo	Samsung	Big four (BF)	Total	BF/Total
1973	126,000	2,980	0	0	128,980	163,474	78.9 %
1974	451,700	2,980	0	0	454,680	561,870	80.9 %
1975	512,000	75,400	0	0	587,400	612,460	95.9 %
1976	573,500	52,450	0	0	625,950	683,973	91.5 %
1977	505,568	76,322	0	0	581,890	648,523	89.7 %
1978	614,790	116,694	0	0	731,484	775,800	94.3 %
1979	383,763	103,060	0	0	486,823	555,639	87.6 %
1980	518,565	60,448	0	13,858	592,871	684,931	86.6 %
1981	907,040	137,655	21,500	52,000	1,118,195	1,219,932	91.7 %
1982	861,206	186,988	148,329	126,000	1,322,523	1,479,367	89.4 %
1983	864,782	129,573	128,270	73,400	1,196,025	1,328,246	90.0 %
1984	1,320,904	152,781	571,800	123,974	2,169,459	2,313,565	93.8 %
1985	1,423,378	124,484	929,600	273,074	2,750,536	2,813,920	97.7 %
1986	1,262,478	186,535	722,101	378,100	2,549,214	2,730,147	93.4 %

The fact that the government was crucial in promoting the South Korean shipbuilding sector is well recognized; but what motivated the government to do this? Two main motivations have been mentioned in the literature, one economic and one political.²⁹ The economic argument was that light manufactures exports could not be sustained in the long run and that South Korea had to gain a competitive edge in more heavy manufactures, such as shipbuilding, in order to maintain economic growth. The reason for South Korea's reduced competitive advantage within labour-intensive production was increasing labour costs. Moreover, there was increased competition from exporters that did have lower labour costs such as Malaysia and Thailand. In addition there were increasing trade restrictions on textiles to the US, for instance the Voluntary Export Restraints (VER) in October 1971.³⁰ This economic motivation originated with the government and President Park in particular. His desire to promote heavy manufactures was met by scepticism by the Economic Planning Board and international institutions such as the World Bank.

The political motive behind the promotion of heavy industries was national security. The 1969 Nixon doctrine stated that the US would become less directly involved in potential future armed conflicts in Asia.³¹ In 1971 Nixon withdrew one third of all US troops from South Korea, and this was seen as the start of a full troop withdrawal. Five years later, the newly elected Carter administration announced that US troops would be fully withdrawn from South Korea.³² Park saw the promotion of South Korea's defence industry as a necessary step in maintaining national security.

²⁸ Jonsson (1995:83).

²⁹ Another motive mentioned by Lee (1991:438) was the confidence that the government got from successful planning in the 1960s. A vital element was Park's (1970) high regard of the Japanese model of development which was seen as a rough blueprint for how to develop South Korea.

³⁰ See McClenahan (1991:189) and Lee (1991:438).

³¹ Lee (1991:437).

³² Carter's policy was eventually suspended in July 1979; see Nicksch (1981) for a summary of Carter's South Korean troop policy. Despite the suspension, Park still felt vulnerable and continued his drive towards military security.

South Korea's proximity to both Mao's China and a military superior North Korea would make an evaluation of the promotion of heavy industries on pure economic grounds unfair. Park's dogged promotion of the heavy industries at the end of the 1970s, when the economy was overheated and there were clear signs of overcapacity, indicates that political concerns might have dominated the economic ones.

In the 1980s, under the Chun and Woo regimes, state support continued. However, the support was less extensive than in the 1970s. State support could be easily defended, as long as shipbuilding was expanding, towards the middle of the 1980s. However, towards the end of the 1980s, several shipbuilding companies started to struggle and the state provided bailouts on the grounds that they believed the crisis was temporary. The arguments by the state also indicated that shipbuilding had become a sensitive sector, just like in the other shipbuilding countries with a high capital stock and high employment, and was simply too big to fail.

Having briefly reviewed the actual development and the government motivations, we will more extensively analyse the roles of industrial policy and technological learning. The industrial policy consists both of macro level policies aimed at the shipbuilding sector (and other heavy industries) and of micro level state intervention at the company level. Given that this paper looks at the ascendancy of South Korean shipbuilding, more attention is given to Hyundai Heavy Industries than the other companies, given that HHI was first and came to dominate the industry. The technological learning was vital for the adoption of shipbuilding technologies, the subsequent increase in innovation and the production of higher value-added ships.

3.1 Industrial policy

Strong state support has become an important feature of the shipbuilding industry. The sector is dependent on the state for at least three reasons. First, the high fixed costs make the establishment of shipbuilding capacity virtually impossible without government support, in part because competitors from other countries are also relying on government subsidies. Second, shipbuilding companies, once established, are often too big to fail and hold positions as important employers in regions where job opportunities are limited. Thus, the government is pressured to support unprofitable shipbuilding companies. If shipbuilding is a declining domestic industry, restructuring is costly as employment is substantial and sector specific capital stock, which has few alternative purposes, is high. Finally, related to the other two arguments, the shipbuilding sector is sensitive partly because of national security. Therefore, national companies are sometimes forced to choose more expensive nationally built ships over cheaper vessels of higher quality to maintain the country's shipbuilding industry. It is surely the case that a major successful component in establishing and maintaining a viable shipbuilding industry is a supportive government.³³

South Korea had attempted to promote the shipbuilding sector before the 1970s. Under the Rhee regime, the Shipbuilding Promotion Law from 1958 was a first attempt to stimulate the sector.³⁴ Park took power in 1961, and wanted to promote shipbuilding as early as in the Second Five Year Development Plan (1967-71), but the EPB persuaded him otherwise. As a compromise, in

³³ For a good introduction to this topic, see Cho and Porter (1986).

³⁴ The Shipbuilding Promotion Law from 1958 included subsidies of 40 % of construction costs, and allowed for generous loan repayments. The real problem was the availability of public funds, and the shipbuilding output only grew from 4,525 grt in 1959 to 4,674 grt in 1961 (Jonsson 1995:70).

1967 the Shipbuilding Promotion Law was introduced which increased the scope of the 1958 law.³⁵ The main vehicle of promotion had been the then state-owned Korea Shipbuilding and Engineering Corporation (KSEC). But the progress had been slow. A number of events triggered a more aggressive promotion. First, the already mentioned Nixon doctrine in 1969 and the withdrawal of one-third of US troops in 1971. Second, the Yushin constitution in 1972, which suspended democracy, gave Park more direct power and allowed the president to override the EPB, thus making a more aggressive promotion policy possible.³⁶

The first detailed reference to the future expansion of the heavy and chemical industries (HCIs) was in the Third Five Year Development Plan (1972-76).³⁷ The planned output of shipbuilding would be 1.3 million grt by 1976 (Jonsson, 1995:79). But the real promotion of the HCI sectors came with the announcement of the HCI plan in January 1973 and its implementation in June the same year. As a part of that, the Shipbuilding Development Plan was announced in March 1973 by the Ministry of Trade and Industry (MTI). The plan had several objectives. First, South Korea would be self-sufficient in vessels by 1980. Second, shipbuilding exports should reach 1 billion USD by 1980 (3.2 million grt) and 2 billion USD (6.2 million grt) by 1985. Third, nine shipyards should be constructed by 1980 and a further five by 1985. The main means of production would be Hyundai Heavy Industries (HHI), even though Daewoo and Samsung would also come to enter the shipbuilding market towards the end of the 1970s.³⁸ The Third Five Year Development Plan's objective of 1.3 million grt was eventually not met as production in 1976 was 1,172,000 grt, even though the overall shipbuilding capacity was 2.6 million grt.

The Fourth Five Year Development Plan (1977-81) included a number of objectives for the shipbuilding sector. One of these was the commencement of the production of shipping components domestically. Another was the development of the Planned Shipbuilding Program, which gave guidelines to the shipbuilding sector. Much of the finance of the shipbuilding sector would come from the National Investment Fund and foreign loans. Also, government procurement would be used to overcome depressed international shipping markets. There was also an increased focus on replacing the imports of ships with South Korean-built ships, as there were problems with reaching the objective of self-sufficiency by 1980. In fact, the goal would not be reached as about 80 % of the additions to South Korea's fleet in the early 1980s were imported (Amsden, 1989:271).³⁹ The Fourth Five Year Development Plan also made the first major revisions in the shipbuilding targets because of the global shipping crisis, as the number of planned shipyards was reduced from nine to two.

The HCI drive provided shipbuilding and other preferred sectors with (i) capital incentives, (ii) complementary investments, (iii) trade incentives, and (iv) tax holidays. The capital incentives

³⁵ The Shipbuilding Promotion Law from 1967 was to establish an inquiry commission and set up a basic plan to develop shipbuilding by providing capital and implementing government-aid projects. However, previous subsidies were abolished, the repayment period of loans shortened and interest rates increased. Because of the latter, Hyundai did not regard the law as an improvement (Jonsson 1995:74).

³⁶ Park was also less dependent foreign aid than in the 1960s because of the economic growth the preceding decade. The increased economic power allowed for more independence from not only international institutions, but more importantly the US.

³⁷ An overview of the HCI policies is provided by Lee (1991:431-471).

³⁸ Park's close ties with Hyundai's owner Chun probably played a part when Hyundai became the instrument of promotion of the shipbuilding industry.

³⁹ The question was why this policy was not enforced with greater vigour; it would have been easy for the state to force South Korean shipping companies to buy domestically built vessels. However, this would most likely have stifled the growth of shipping companies, which for the most part were better served by acquiring more reasonably priced second-hand ships.

included preferential rates from state-owned banks with low nominal rates with the high inflation making the real interest rate negative for most of the 1970s.⁴⁰ A related method for securing access to capital was government guarantees for foreign loans. The Foreign Capital Inducement Law states that the South Korean government would repay the loans to foreigners if the loans defaulted, for examples of such foreign loans for shipbuilding, see table 7. The second category of incentives was the government complementary investments which included large infrastructure programmes for new facilities. The government invested in industrial complexes for shipbuilding at Ulsan, Okp'o and Chukdo (Kang, 2001:353). Also of great importance was the promotion of the steel industry through the state-owned Pohang Iron and Steel Corporation (POSCO). The shipbuilding industry gave POSCO increased economies of scale and POSCO gave the shipbuilding industry steel as a vital input at comparatively low prices.

Table 7. Major commercial loan projects, shipbuilding, 1971-85⁴¹

Loan Recipient	Projects	Country Providing Loan	Contract Value (Million)	Year of Contract Validation
Hyundai Heavy Industry	Ulsan Shipyard construction	UK, Ger., Spain, France & Sweden	50 USD	1971-72
Daewoo Shipbuilding & Heavy Machinery	Okp'o Shipyard construction and machine purchase	UK, Sweden, Den. & Fin.	30 USD; 3 SEK	1978
Daewoo Shipbuilding & Heavy Machinery	Okp'o Shipyard construction and machine purchase	Hong Kong	30 USD	1980
KSEC	Construction of export ships	Hong Kong	31 USD	1981

Following the assassination of Park in October 1979 and the ascendancy of the Chun regime in May 1980, the economic policy changed. The selective targeting of industries was replaced with a more functional industrial policy, with support given to research and development (R&D) and training. For instance, policy loans for R&D first became the main means for financing private R&D in the beginning of the 1980s. The policy loans for R&D in the 1970s had one of the highest interest rates, indicating the lower preference for R&D by the government, which resulted in relatively low private R&D during the 1970s (Kang, 2001:359). Also, the protection of shipbuilding was reduced, but did not disappear. In 1986, the Industry Development Law replaced the Shipbuilding Promotion Law from 1967.⁴²

State support in the shipbuilding sector was often targeted at the company level. The government played a large role in the establishment of Hyundai Heavy Industries, although the true

⁴⁰ See table in appendix 1.

⁴¹ Based on data from Jonsson (1995:80) and Hattori (1997:460-463).

⁴² The Industry Development Law of 1986 called for a 'balanced development' with promotion of technological development, increased productivity, the efficient allocation of resources, training of the labour force and the expansion of a self-reliance basis as the main focus. This was partly because of foreign pressure regarding the nature of state support for South Korean shipbuilding. It meant that shipbuilding would follow OECD guidelines for deferred export payments. Also, it fixed loan ratios at 8 %, interest rates at 8 % and repayment periods for loans was extended to 8,5 years to reduce the extent of direct state support.

extent of this support is not entirely known.⁴³ One area of importance was the government's guarantees for the foreign loans for the construction of the first shipyard at Ulsan. The construction of the Ulsan shipyard required a budgeted 67 million USD, with 40 million supplied through foreign loans. Foreign lenders were sceptical, but the South Korean government was able to raise 50 million USD in foreign loans based on two factors. First, HCC had a proven ability in construction with projects completed both domestically and abroad. Second, Hyundai had already managed to get a first customer in Greek shipowner George Livanos, and was able to start production as soon as the facilities were constructed.

Government support with orders was also vital. The government support was important in winning its first order from Livanos in 1971 as it provided Hyundai with large financial guarantees. The order was for two very large crude carriers (VLCCs) of 259,000 dead weight tons (dwt) each. Livanos purchased the ships for a price 16 per cent below the world market price and demanded they would be exact replica of a ship that had been built at the Scott Lithgow shipyard in Scotland. The learning-by-doing and the implementation of foreign technology were undoubtedly useful, but there were problems in production which delayed the delivery of the ships. Livanos, as well as Japanese and Hong Kong shipowners cancelled orders, which led to government help in finding new buyers for the ships. Eventually, the government assisted the establishment of the Hyundai Merchant Marine Company in 1976.

As mentioned, the state did still intervene directly in the 1980s when Daewoo and KSEC had severe losses and were threatened by bankruptcies. It showed that Daewoo was simply too big to fail as the government arguments for supporting the company rested on protecting jobs and communities. Also, the government argued that the problems were short-term. KSEC was eventually bought by the conglomerate Hanjin in May 1989 and renamed Hanjin Heavy Industries in 1990. The intervention was based on the government's expectancy that the recession in the world shipbuilding market would be short-term. The government, as it turned out, were right and shipbuilding markets started to recover in the 1990s.

3.2 Technology

The South Korean shipbuilding sector was technology-dependent in the 1970s, but did manage to learn quickly and over time became market leading within technology as well. The technological development of South Korean shipbuilding is a key component in explaining the country's importance in the world's shipbuilding market, not only in terms of production, but also in terms of technology.⁴⁴ Hassink and Shin (2005) looked at the transition from foreign technology-dependency to innovator and identified that the development of a domestic/local supply base and the growing importance of research and development (R&D) and innovations were the main causes. We will emphasise three major aspects of the technological development. The first is the technological learning and adoption, in particular HHI's learning at an early stage. The second is the development of human capital, which is of special significance for the shipbuilding industry. The nature of technological development in shipbuilding is different from for instance steel. In steel, most of the

⁴³ Amsden (1989:275).

⁴⁴ According to Kim (1997:31-32), the HCI drive came earlier than was initially intended as the technological capabilities were not yet in place to support the HCI sectors. Within shipbuilding, however, this argument does not constitute an argument against the state support shipbuilding received because of the time it took to increase technological learning and production capacity. As Amsden (1989:269-290) emphasised, Hyundai Heavy Industries (HHI) had a large learning benefits from the 1970s in terms of designs, manpower and market positioning which did help position HHI when the market started to expand. South Korea was able to exploit the short-term boom in the world shipping market 1979-80, which would have been impossible without the increase in shipping capacity during the 1970s.

technology is embedded in the capital goods, while in shipbuilding more technology is embedded in labour. The third is the building of networks, both in terms of better vertical integration with suppliers, but also in terms of sharing technology with other shipbuilders.

First, South Korean shipbuilding in the 1970s lacked the technological know-how to be competitive in international markets and therefore technological assistance from abroad was sought.⁴⁵ Foreign assistance for the Hyundai plant at Ulsan was sought from Britain rather than Japan, following the Akazawa Report.⁴⁶ HHI got four types of technological assistance (Amsden, 1989:276); (i) dockyard designs from the English company, A&P Appledore; (ii) ship designs and operating instructions from Scott Lithgow; (iii) expatriates, European shipbuilders, working for HHI the first three years of operations; and (iv) production know-how from Kawasaki Shipbuilding. Hyundai had to pay 1.7 million USD to Appledore and Scott Lithgow for the technology acquired by them. The link between the South Koreans and Scott Lithgow went back to a previous order of South Korean ships at the yard, “so we [Scott Lithgow] were the logical choice when Hyundai and their consultants looked around for help. They bought the plans of our current quarter-million-tonner and signed a contract to train their key men[.]”⁴⁷

At HHI, production know-how improved relatively fast, while design technology, the ability to design ships, took longer to master. The production know-how increased through learning-by-doing in producing multiple types of ships. As mentioned before, the first order was for two VLCCs. However, the market for VLCCs collapsed in 1974 and HHI started to take orders for medium and small sized vessels and the company managed to accumulate production know-how in the building of crude oil tankers, Roll on-Roll off ships, multi-purpose cargo vessels, bulk carriers and container ships. Regarding design technology, HHI was dependent on foreign ship designs for most of the 1970s even though the company started to acquire basic design abilities from as early as 1974.⁴⁸ Gradually, HHI started to experiment with shipping designs and in 1978 a Basic Design Department was set up within the company. HHI’s first self-designed ship was a 25,000 dwt bulk carrier ordered by Hyundai Merchant Marine in 1979. In the period 1978 to 1983, Hyundai was actively purchasing ship designs from other companies to increase their design technology; see table 8.

⁴⁵ According to Bae (2002:137-138), Hyundai initially wanted to establish a joint-venture with Mitsubishi in January 1969, but could not agree on the terms. Mitsubishi was sceptical to reveal too much to what could be a future competitor. Hyundai also sought joint-ventures with the Aker group from Norway and Pan Maritime from Israel in October 1969, but these efforts eventually failed.

⁴⁶ The Akazawa Report from 1969 was made by a Japanese delegation examining the feasibility of constructing heavy industries in South Korea. The conclusion was that a large shipyard was unthinkable and that capacity should be expanded gradually. This conclusion did not please the South Korean government and they sought to build the shipbuilding sector with less Japanese assistance than originally planned.

⁴⁷ Scott Lithgow company magazine, No. 10 (1972:18).

⁴⁸ Bae (2002:144-145).

Table 8. Hyundai's purchased design technology from abroad⁴⁹

Design technology	Purchased from	Time of purchase	Price
80,000 DWT tanker	Naiereorm (Ger.)	February 1979	281,000 DM
40,000 DWT bulk carrier and 130,800 DWT bulk carrier	B&W (Den.)	March 1982	11,110,000 USD
45,000 DWT OBO	B&W (Den.)	October 1982	51,000 USD
170,000 DWT bulk carrier and 80,000 DWT bulk carrier	BWS (Den.)	November 1983	100,000 USD
Multipurpose cargo carrier	NVLaskey (Can.)	November 1983	60,000 USD

As one company representative pointed out, "Hyundai Heavy Industries has made strenuous efforts to develop specific expertise and technology for the construction of gas carriers, and since 1978 has made license agreements with consultant companies to enhance its technological capability in cargo tank systems."⁵⁰ Other South Korean shipbuilders also choose to use licences as a mean for acquiring technology, see table 9 for the case of Samsung. In all 159 licences were purchased by South Korean shipbuilders in the period from 1962 to 1987, paying a total of 117 million USD.⁵¹

Table 9. Samsung's purchased technology licences from abroad⁵²

Technology/Areas	Partner	Period	Details
Managing shipyards	B&W (Den.)	3/78-12/84	Management
Managing shipyards	B&W (Den.)	3/81-12/87	Techno. Consulting/ Design Contract
Managing shipyards	IEC (Jap.)	9/87-11/90	Management of Production Process
Design/ Manufacturing	AUTOKON (Nor.)	10/82-11/90	Computer Programmes for Design
Design/ Manufacturing	MARCON (Ger.)	4/83-8/89	Design Technology
Design/ Manufacturing	MONNECKE (Jap.)	4/83-1/92	Design Technology
Design/ Manufacturing	IHI (Jap.)	6/86-6/89	Consulting Production Technology
Design/ Manufacturing	Sanoyath (Jap.)	12/86-12/96	Technological Training

The internal organisation of HHI also evolved over time. The Department of Quality Control was established in 1973, with J.B. Park as its first manager. An indicator that the quality of ships improved was that the success rate in vessel inspection increased.⁵³ In 1983 HHI had managed to get three quality assurance certificates; from Lloyd's Register of Shipping, Det Norske Veritas and the American Bureau of Shipping. Internationally, only four shipyards were approved by Lloyd's and only two shipyards were approved by Veritas at the time. This indicated that the quality standard reached by HHI had reached an internationally accepted level. The internal organisation of HHI

⁴⁹ HHI (1992:549-550); paraphrased from Bae (2002:145).

⁵⁰ Lee (1989:20).

⁵¹ Gomes-Casseres and Lee (1989:18).

⁵² Hassink and Shin (2005:145).

⁵³ Bae (2002:143-144), citing figures from HHI (1992), points out that vessel inspection increased from 38.1 % in 1973; to 52.6 % in 1974; to 69.7 % in 1975 and 84.1 % in 1976. Amsden (1989:283) also cited similar figures, but it is uncertain whether these are comparable as there was a re-organisation of HHI's quality department in 1978-79. According to Amsden's figures the inspection acceptance ratio increased steadily from 87.1 % in 1978 to 96.1 % in 1985.

changed to accommodate the increase in technology-intensity as HHI started to produce higher value-added ships in the 1980s. In November 1983 the Hyundai Welding Research Institute was set up to improve production technology. Another 1983 establishment was the Hyundai Industrial Research Institute (HIRI) which aimed at improving productivity and quality and conducted research on for instance welding, material processing and protective coatings. In February 1984 a tank experiment station was set up to allow for in-house testing, rather than being dependent on other companies. In October 1984 Hyundai Merchant Research Institute was set up to research core technologies, for instance ship resistance, propulsion and manoeuvring; engine combustion, performance and durability; and hull form.

The second element crucial to technological development is the development of human capital. The increase in the number of engineers is considered vital for the technological catching-up with leading shipbuilders. As Amsden and Jonsson show, the number of shipbuilding engineers had been growing since the 1950s, but many of these were not employed in shipbuilding. Despite having sufficient unskilled workers in the 1970s, there was a shortage of skilled workers. HHI did have the advantage of being able to recruit shipbuilding engineers from KSEC; getting skilled labour from similar position from Hyundai Construction Company and Hyundai Motors; and being able to find shipbuilding engineers that were 'under-employed' elsewhere. This was, however, not enough to meet HHI's demand.

There were three main sources for the increase in human capital. First were the expatriates, such as the European engineers who were at HHI in the first three years of operation. This included the Dane Kurt J. Schau from Odense shipyard, who became the first president of the Ulsan shipyard. At Odense he had been responsible for technology and had long experience in constructing VLCCs, and he was also responsible for bringing along many engineers to Ulsan. In addition to numerous European engineers there were also more than thirty Japanese engineers from Kawasaki Heavy Industries.⁵⁴

The second way to increase human capital was to send personnel abroad to train at foreign shipyards. In accordance with the deal signed with Appledore and Scott Lithgow, 60 engineers and administrative staff would receive overseas training in shipbuilding technology and management abilities.⁵⁵ This was especially useful as the Livanos order was built on the basis of a Scott Lithgow blueprint.⁵⁶ In addition HHI dispatched personnel to train in design at the Sakaiide Shipyard and shipyard construction technology at Kashima Construction in Japan. Given that Japan had the 'state-of-the-art' technology on shipyard construction this meant that HHI could leapfrog and learn some of the latest technologies of the day, allowing them to acquire global competitiveness quickly.

The final way to increase human capital was by training personnel at HHI itself. This strategy had both short-term and long-term orientation. In the short-term, engineers from various backgrounds came to the yard and brought with them their own standards and procedures. A small training centre was set up at the start of HHI's production and foremen were sent there for one to three months to increase uniformity.⁵⁷ In the long-term, HHI wanted to increase the number of in-house trained manpower. In September 1972 the company opened up a training centre and Robert L. Wilson from Appledore became the director. Upon opening, HHI trained 324 people in various six months courses in for instance cutting, plumbing, sheet metal, electricity, machinery work, drawing

⁵⁴ HHI (1992), 344; paraphrased from Bae (2002:150).

⁵⁵ Bae (2002:151).

⁵⁶ Scott Lithgow company magazine, No. 10 (1972:18).

⁵⁷ Amsden (1989:281).

and management. By the end of 1975 a total of 3,636 personnel had been trained, and by 1990 the total was 35,234.⁵⁸

Another example of human capital development was at Daewoo Shipbuilding and Heavy Machinery (DSHM), which was struggling heavily in 1987 because of falling demand and substantial labour unrest. Heavy losses in 1988 and 1989 led to the need for government assistance. However, the effects of the 1987 labour dispute, in hindsight, might have speeded up technological development. New labour measures were implemented which increased technological learning, increased cohesion and increased management-worker relationships.⁵⁹ Small groups of 10-15 workers went through training programmes and were sent to Japanese manufactures to learn more efficient production know-how. Another beneficial element was the re-organising of labour schedules that allowed increased flexibility, which again led to increased efficiency. DSHM also re-organised the dry docks allowing more efficient use of labour by smoothing out workload distribution. A number of improvements in production followed, for instance changes that allowed a parallel propeller installation, which was more common, and often delayed delivery time. The parallel propeller installation allowed for the saving of lead time and allowed for better coordination with other operations.

Finally, the building of linkages was manifested in at least two ways. The first was the development of domestic suppliers. Companies could either create their own backward linkages or they could use subcontractors. In the 1970s and in the beginning of the 1980s, most key components were being imported; towards the end of the 1990s between 70 and 80 per cent of the supply was purchased domestically.⁶⁰ One example was the Hyundai Engine and Heavy Machinery Manufacturing Company (HEMCO) which was established in 1978 to make engines and other components for ships.⁶¹ As with HHI, HEMCO's learned through foreign technical assistance, overseas training and licences. Another example is that most shipbuilding companies have to buy their ship electronics and ship navigation systems in the market. Samsung, however, with a strong electronics division was able to purchase these components within the group.

The second linkages were primarily improved technology linkages. From the outset, there were linkages with foreign shipbuilders to acquire new technology. In the 1980s, private R&D increased, as mentioned before, both through increased policy loans and changes in the internal organisation of shipbuilding companies. This also led to increased technological cooperation between South Korean shipbuilders, universities, other research institutions and suppliers. While these exchanges were started in the 1980s, they evolved into the 1990s to a large network.⁶² Also, South Korean shipbuilders have a lot of lobby power through co-operation. The Korea Shipbuilders' Association (KOSHIBA) was founded on July 19, 1977 and functioned as an organised lobby group to promote shipbuilders interests.

⁵⁸ Boa (2002:152).

⁵⁹ Upton and Kim (1994).

⁶⁰ Hassink and Shin (2005:146-148).

⁶¹ Amsden (1989:279-280).

⁶² Hassink and Shin (2005:148-151).

4. Rising in a sunset industry

What was the basis for the success of the South Korean shipbuilding industry? Three important points emerge from the analysis of the international and domestic dimensions above. First, South Korea managed to acquire a large share of the world shipbuilding market, expanding rapidly in a period when capacity was being reduced in all major shipbuilding nations. Second, the influence of the South Korean authorities was substantial, with the industry placed prominently in the governments' plans for long-term economic development. Third, South Korea managed to continuously develop and upgrade its production processes, sustaining its initial cost advantages through rationalization and innovation. We might combine these elements to discuss to which extent the shipping glut and the plight of the yards in traditional shipbuilding nations might have been beneficial for the South Korean shipbuilding industry. Was it easier for South Korean yards to establish themselves in a declining, rather than a booming, market?

There are four elements; all of which are related to the shipping and shipbuilding crises, which are likely to have affected the ascendancy of South Korean shipbuilding in a beneficial manner. First, the shipping crisis led to an increased emphasis on the price of new ships. Second, the shipping crisis, and the concomitant economic difficulties of shipping companies, enabled South Korean owners to gain market shares by offering novel financing solutions. Third, the large amount of subsidies in Western Europe probably strained the willingness of the authorities in traditional shipbuilding countries to compete with the newcomers. Finally, the crisis is likely to have improved the South Korean yards' access to technology and know-how.

First, the subdued rates in the shipping market made shipowners preoccupied with the question of costs. The problematic conditions in the shipping sector may have helped South Korea's entry through two mechanisms; market penetration and cost focus. With regard to market penetration, the crisis may have made it easier for the yards to acquire customers within the relatively tight networks of the shipping world. When freight rates are high and the shipping market is booming, the market for ships is a sellers' market, where shipowners are willing to pay a premium to get ships delivered rapidly and maintain existing customer relationships with preferred yards. During a shipping depression, however, the market for ships becomes a buyers' market. The low freight rates implied that shipping companies could not justify paying extra for tonnage from old business relations. This is linked to the cost focus. During the crisis, price was the one factor that determined where shipowners ordered vessels, an element that is likely to have helped South Korean yards. In a similar vein, uncertainty regarding the yards' ability to deliver the ships on time is something that shipowners are willing to pay a lot to avoid during booms. In a depressed market, delays are much less costly for shipowners, thus again having an adverse effect on the owners' willingness to pay extra to order at established yards.

Second, the difficult financial situation of many shipping companies made novel financing solutions a necessity. In this respect, a number of owners were able to acquire new tonnage by entering into a bareboat charter with a South Korean yard (the legal owner of the vessel), and combine this with a purchase option. Thus, the owners' need for financing was limited, but they would get control of the tonnage and be able to purchase it "properly" when the market and the financial situation had improved.⁶³ An added bonus for the shipowners was the fact that the ships could utilise low-cost foreign labour, which would have been impossible in a number of European

⁶³ Thowsen & Tenold (2006:447-448).

countries with strict manning requirements. Table 11 shows that such arrangements were fairly common for a number of vessel types.

Table 11. Vessels on bareboat charter with purchase options, 1984⁶⁴

	General cargo	Container ships	Log carriers	Bulk carriers	Chemical tankers	Oil tankers	Sum
Number	21	6	4	20	4	4	59
Grt	176,882	80,420	14,819	359,436	6,163	364,607	1,002,327

Third, the financial resources transferred to the yards from the authorities in Western European countries at the earlier stages of the crisis were enormous. This element is important for three reasons. First, the support stifled efficiency improvements and enabled European yards to maintain their relatively low productivity. Second, the expensive subsidies paid out in the period before the market improved occurred against a backdrop of reduced activity, and cash-strapped European governments were unlikely to provide even more financial support to the sector. Finally, the extensive use of subsidies by the governments in traditional shipbuilding nations implies that the criticism of the government support in South Korea was much more muted than would otherwise have been the case. Moreover, the crisis may have hindered South Korean costs from escalating, as the low price of newbuildings led to a clear focus on productivity.⁶⁵

Finally, the availability of technology and competence may have been improved as a result of the crisis. European yards, unable to build ships at a profit, were able - and willing - to sell their services. As such, the technology transfer from traditional yards might be considered a reflection of the fact that although they were unable to secure orders for new ships, at least they had something - knowledge - to sell.

The length of the shipping crisis was a blessing in disguise for South Korea’s shipbuilders. Had the crisis been shorter, the reduction of production capacity in Europe, and the amount of support paid out to European yards, would have been lower. If this were the case, it is likely that South Korean yards would have faced much more fierce competition, both during the temporary improvement of newbuilding orders in 1979-80, and in the second half of the 1980s.

5. Conclusion

The aim of this paper has been to look more closely into the factors that enabled South Korea to grasp substantial market shares in the shipbuilding industry in the 1970s and 1980s. There is no doubt that the role of the South Korean government in supporting the venture was crucial, but we have also emphasised that it is likely that the scale and the length of the shipping and shipbuilding crisis was beneficial. The traditional shipbuilders in Western Europe were plagued by high wages, relative to productivity, which sounded the death-knell of most of the European shipbuilding. Consequently, European shipowners’ shift of focus from Europe to Asia was encouraged by lower prices, better delivery times and more beneficial financial terms.

⁶⁴ Institute of Shipping Economics (1984a).

⁶⁵ There is of course also the possibility that by investing heavily in new capacity and accepting losses through aggressive pricing, the Asian yards were able to see off their European competitors.

Today, it seems likely that the shipbuilding sector again is suffering from substantial overcapacity. The development has been much the same as that of the 1970s - rapid growth of shipyard capacity, linked to a boom in the shipping market - followed by a collapse of shipbuilding orders amongst historically high orderbooks. This time around, however, the low labour cost, government-sponsored challenger is China, while South Korea's position is similar to that of the established builders - Japan and Europe - in the 1970s.

Bibliography

- Amsden, Alice, "Asia's Next Giant: South Korea and Late Industrialization", New York: Oxford University Press, 1989
- Bae, Yong-Ho (2002), "Shipbuilding Technology Development in Hyundai Heavy Industries Co., Ltd. (HHI)", Chapter 6 in Bae, Yong-Ho; Song, Sungsoo; Um, Mi-Jung; Lee, Dae-Hee; and Hobday, Michael (2002), "Case Study on Technological Innovation of Korean Firms", Science and Technology Policy Institute (STEPI), 132-155
- Bartlett, Paul & Hiroko Asami, "Japanese report," *Seatrade*, July/ August 1986, 117-143
- Blumenthal, Tuvia, "The Japanese Shipbuilding Industry," in Patrick, Hugh T. & Larry Meisner, *Japanese Industrialization and its social consequences*, Berkeley: University of California Press, 1976
- Bradshaw, York W., Young-Jeong Kim & Bruce London, transnational Economic Linkages, the State, and Dependent Development in South Korea, 1966-1988: A Time-Series Analysis," *Social Forces*, Vol. 73 (1993), No. 2, 315-345.
- Cho, Dong Sung & Michael E. Porter, "Changing global Industry Leadership: The Case of Shipbuilding," in Porter, Michael E., *Competition in Global Industries*, Boston: Harvard Business School Press, 1986
- Chou, Chia-Chan & Chang Pao-Long, "Core competence and competitive strategy of the Taiwan shipbuilding industry: a resource-based approach," *Maritime Policy & Management*, Vol. 31 (2004), No. 2, 125-137
- Chida, Tomohei & Peter N. Davies, *The Japanese Shipbuilding and Shipbuilding Industries: A History of Their Modern Growth*, London: Athlone, 1990
- Gomes-Casseres, Benjamin and Lee, Seung-Joo (1989), "Korea's Technological Strategy", Harvard Business School Case Study 9-388-137, Boston
- deVoogd, Cees, "Shipbuilding in West Germany and the Netherlands, 1960-1980," *International Journal of Maritime History*, Vol. XIX (2007), No. 1, 63-86
- Ferraz, Joao Carlos, "Determinants and consequences of rapid growth in the Brazilian shipbuilding industry," *Maritime Policy & Management*, Vol. 13 (1986), No. 4, 291-306
- Glen, David, "Shipbuilding disputes: the WTO panel rulings and the elimination of operating subsidy from shipbuilding," , " *Maritime Policy & Management*, Vol. 33 (2006), No. 1, 1-21
- Graham, Edward Montgomery, *Reforming Korea's industrial conglomerates*, Washington: Institute for International Economics, 2003
- Hassink, Robert & Dong-Ho Shin, "South Korea's Shipbuilding Industry: From a Couple of Cathedrals in the desert to an Innovative Cluster," *Asian Journal of Technology Innovation*, Vol. 13 (2005), No. 2, 133-155
- Hattori, Tamio, "Chaebol-style enterprise development in Korea," *The Developing Economies*, Volume XXXV (1997), No. 4, 458-477

Institute of Shipping Economics, *Shipping Statistics*, Volume 25, No. 10, October (1981a)

Institute of Shipping Economics, *Shipping Statistics*, Volume 28, No. 5, May (1984a)

Institute of Shipping Economics, *Shipping Statistics*, Volume 28, No. 8, September (1984b)

Institute of Shipping Economics, *Shipping Statistics*, Volume 35, No. 7/8, July/ August (1991)

Jang, Sung Moon, "Korean Success Story," *Shipbuilding Technology International*, Vol. 2 (1987), No. 1, 251

Johnman, Lewis & Hugh Murphy, *British Shipbuilding and the State since 1918*, Exeter: Exeter University Press, 2002

Jonsson, Gabriel, "Shipbuilding in South Korea: A Comparative Study", *Stockholm East Asian Monographs*, Stockholm: Stockholm University, 1995

Kang, Hojin, "The Development Experience of South Korea - The Role of Public Policy", Chapter 8 in Wong, Poh-Kam and Ng Chee-Yuen, *Industrial Policy, Innovation and Economic Growth: The Experience of Japan and the Asian NIEs*, Singapore University Press, 2001

Kim, Linsu, *Imitation to Innovation - The Dynamics of Korea's Technological Learning*, Boston: Harvard Business School Press, 1997

Hyundai Heavy Industries, "Annual Report 2009", Ulsan, 2009

Hyundai Heavy Industries, "Hyundai at a glance", webpage
http://english.hhi.co.kr/company/at_a_glance.asp accessed 12.07.2010

Lee, C H, "Advanced gas tankers," *Shipbuilding Technology International*, Vol. 4 (1989), No. 1, 20-21

Lee, Suk Chae, "The Heavy and Chemical Industries Promotion Plan (1973-79)", Chapter 17 in Cho, Lee-Jay and Kim, Yoon Hyung, *Economic Development in the Republic of Korea - A Policy Perspective*, University of Hawaii Press, 1991.

Lim, Youngil, "Government Policy and Private Enterprise: Korean Experience in Industrialization", *Korean Research Monographs*, Berkeley: Berkeley Center for Korean Studies, 1981

Lloyd's Shipping Economist, "Strength and weaknesses," *Lloyd's Shipping Economist*, January 1988, 14

Lloyd's Shipping Economist, "Changing role," *Lloyd's Shipping Economist*, August 1989, 12

McClenahan, William, "The Growth of Voluntary Export Restraints and American Foreign Economic Policy, 1956-1969", *Business and Economic History*, Second Series, Vol. 20 (1991), 180-190.

Niksich, Larry A., "U.S. Troop Withdrawal from South Korea: Past Shortcomings and Future Prospects", *Asian Survey*, Vol. 21 (1981), No.3, 325-341.

Oakes, John, "Shipbuilding in W. Europe," *Seatrade*, July/ August 1986, 19-24

Park, Chung-Hee, "The Country, The Revolution and I", Seoul: Hollym Corporation, 1970

Pires, Floranio M. Jr., "Shipbuilding and shipping industries: net economic benefit cross-transfers," *Maritime Policy & Management*, Vol. 28 (2001), No. 2, 157-174

Poulsen, René Taudal & Henrik Sornn-Friese, "Downfall delayed - ownership structures and maritime deindustrialisation in Danish shipbuilding, 1975-2009," unpublished manuscript, Esbjerg: University of Southern Denmark, 2009

Rhee, Jong-Chan, "The Limits of state-led and chemical industrialization", chapter 3 in "The State and Industry in South Korea", London: Routledge, 1994.

Sohal, Arthur S. & Bill Ferme, "An analysis of the South Korean automotive, shipbuilding and steel industries," *Benchmarking for Quality Management & Technology*, Vol. 3 (1996), No. 2, 15-30

Sohn, Eunhee, Sung Yong Chang & Jaeyong Song, "Technological Catching-up and Latecomer Strategy: A Case Study of the Asian Shipbuilding Industry," *Seoul Journal of Business*, Vol. 15 (2009), No. 2, 25-57

Song, Byung-Nak, *The Rise of the Korean Economy*, ? : Oxford University Press, 2003.

Stopford, Martin, "World Shipbuilding 2004," *Shipbuilding Overview 2004*, London: Clarkson, 2004

Stråth, Bo, *The Politics of De-Industrialisation: The Contraction of the West-European Shipbuilding Industry*, Beckenham: Croom Helm, 1987

Tenold, Stig, "Tankers in Trouble - Norwegian shipping and the crisis of the 1970s and 1980s," *Research in Maritime History* No. 32, St. Johns, Newfoundland: International Maritime Economic History Association, 2006

Thowsen, Atle & Stig Tenold, *Odfjell - The history of a shipping company*, Bergen: Odfjell ASA, 2006.

Todd, Daniel & Michael Lindberg, *Navies and shipbuilding industries: the strained symbiosis*, Westport: Praeger, 1996

Upton, David; and Kim, Bowon (1994), "Daewoo Shipbuilding and Heavy Machinery", Harvard Business School Case Study 695001, Boston

Zhang, Jie, "China's Potential and Global Strategy in the Shipbuilding industry," unpublished thesis, Massachusetts Institute of Technology, 1994

Appendix 1

Nominal versus real interest rates, per cent, 1963-1999⁶⁶

	Nominal interest rate		Rate of inflation	Real interest rate		Household Savings Ratio
	Bank (A)	Kerb Market (B)	C	(A-C)	(B-C)	
1963-69	22,5	56,4	18,1	4,4	38,3	4,0
1970-79	16,5	41,7	19,2	-2,7	22,4	10,5
1980-89	11,2	28,0	7,8	3,4	20,2	15,3
1990-99	9,8	21,2	6,0	3,8	15,2	16,0

⁶⁶ Data from Song (2003:190-191).