Abstract

Korean Industry in 2019

Value Chain Analysis for the LNG Carrier and Biopharmaceuticals

Domestic manufacturing industry, which is heavily influenced by overseas markets, is slowing production and exports due to strengthened protectionism. This slowdown is largely attributable to the slowdown in overseas demand, but there is a growing need to examine its competitiveness not only in the final product but also in the value chain of each product. In particular, as export regulations on specific items in Japan began in July of this year, the necessity of analyzing the detailed value chain structure and procurement system of major manufacturing products is increasing. In this research, LNG carriers in the shipbuilding industry and biopharmaceuticals in the new industry are targeted. The reasons for the analysis of these two items are that the representativeness of each sector, the distinction in the value chain type, and the promising time are clearly distinguished. The purpose of this study is to analyze the value chains of LNG carriers and biopharmaceuticals and to diagnose their competitiveness, to derive structural improvement and constitution improvement methods and to suggest industrial policy directions.

The global value chain, which has been rapidly spreading in the global market until the 2000s, is showing a slight weakening trend as the protection trade trend emerged after the 2008 global financial crisis. After 2012, the shift to China's domestic central structure and reshoring, which has increased with the adoption of new technologies of the 4th Industrial Revolution in the production process, were also major factors.

One of the objectives of this study is to identify market players in

each segment of manufacturing processes, and analyze those firms' competitiveness in each stage of the global value chain of the commodity. In line with our objective, we introduce Hernandez and Pederson (2017)'s research framework for identifying properties and components of the global value chain. Moreover, we apply a snake-type GVC model to biopharmaceuticals with a spider-type GVC model ~~on~~(to) LNG carrier according to the results of Baldwin and Venables (2013).

Based on the manufacturing process analysis for final products of the LNG carrier and biopharmaceuticals, we extend analysis scope not only to forward parts such as Research and Design (R&D), engineering, and procurement, but to backward parts (marketing, logistics, and Customer Relationship Management (CRM)) of both industries. Those results will be used as underlying analyzing tools for identifying competent firms, analyzing competitive advantage, and mapping the global value chain.

In addition, this analysis presents a general framework for analyzing the sources of competitive advantage, prioritizes the importance or coreity of each major industry by source, and compares the competitive advantage sources of major companies in the value chain with global companies. The diagnosis of competitive advantage by industry and company applied the methodology of the KIET (2018) using the analysis framework of Bruce Greenwald and Jude Khan (2005). The analytical method considers the source of competitive advantage as to whether it can maintain competitive advantage in the current competitive structure and in the future.

The LNG carriers to be examined in this study are the most expensive ships among the cargo ships and high value-added ships requiring high construction technology. In the market structure of LNG carriers, consumers are the ship owners who order ships at shipyards, and the most ordered vessel is Maran Gas Maritime, a Greek shipping company. Indirect demanders of LNG carriers consist of gas companies and gas operators in each country. Representative direct suppliers of LNG

carriers are mainly represented by three large domestic companies(HHI, DSME, SHI), accounting for about 85.7% of the global market backlog based on the end of September, 2019. The value chain of LNG carriers can be divided into stages such as R&D and design/engineering, materials, parts, LNG carriers construction, LNG shipping companies, after-sales service and maintenance.

LNG Carrier's main equipments are consisted of cargo containment system, cargo handling system, machinery equipment, electrical-electronic equipment, and outfitting equipment. Because LNG Carriers handles LNG cargo, they have specialized cargo handling systems and machinery-electric equipments including DF(dual fuel) engine, DF generator, vapor gas process unit, etc. In this study, domestic and foreign suppliers are classified into 44 detailed materials/components under big five categories.

The combined competitiveness of domestic companies in R&D/Design/Production value chain of LNG carriers is higher or equal to that of global top companies. However, the demand sector and A/S is a lower than that of global companies. In materials and components/equipments, there are many insufficient parts compared to global companies in the areas of cargo handling system and electrical-electronic equipment. This is because some materials, cargo handling devices and parts of electrical-electronic equipment are all imported.

The direction of change in the value chain structure of LNG carriers is expected to be internalized in the value chain through localization of equipment. In addition, the value chain is expected to be upgraded and the value chain expanded.

The very first phase of government's shipbuilding industry policies had been mainly focused on backing its manufacturing process, shipbuilding. Moving forwards, since 1986 onwards, government's economic development plans had expanded its scope by encompassing a broader range of the shipbuilding industry's value chains. In more

details, it embarked projects devised to raise the parts localization ratio in vessels.

Since 1990s, the government instead let market principles shape the whole market ecosystem and public interventions had been subdued henceforth. It believed technological innovation is the key to bolster the industry's overall competitiveness and increased its budget share for R&D support.

However, financial crisis in 2008 and a sharp drop of oil prices in 2014 had dampened the entire Shipbuilding and Offshore industry and government announced a series of plans to revitalize the industries. It encompasses plans to support small and medium-sized companies for technological transitions to smart/automated shipbuilding and help them get ahead in terms of market readiness in response to the IMO's tightened environmental regulations.

Upon Japan's export controls in 2019, government announced its plan to fortify material, component and equipments industries' competitiveness, which is expected to boost shipbuilding industry's self-sufficiency as well that is currently as low as 50% when it comes to LNG carriers. The move will equip domestic shipbuilding companies to take more controls in the realm of shipbuilding GVCs and enrich the overall domestic shipbuilding ecosystem.

The biopharmaceutical industry in Korea is striving to strengthen the competitiveness of R&D stage in the industry value chain. Also, the global competitiveness of the Korean biopharmaceutical industry is secured in the manufacturing stage by virtue of some large companies such as Celltrion and Samsung Biologics. Still, the ecosystem of the Korean biopharmaceutical industry seems in a early stage of development, and the competitiveness of the downstream industry supporting biopharmaceutical industry is evaluated very weak.

The Korean biopharmaceutical industry is expected to grow at an CAGR of 7% by 2030, while the domestic and global demands for biopharmaceutical is rapidly increasing. Of course, this growth will be possible based on the premise that the competitiveness of the system, including legal and institutional infrastructure surrounding the

ecosystem of the local biopharmaceutical industry, will be strengthened.

Strengthening the competitiveness of the biopharmaceutical industry in Korea should pursue a balanced competitiveness in each value chain stage. In addition to promoting disruptive innovation in the R&D stage, the added economic value of the biopharmaceutical industry would be created by improving the systematic competitiveness of the ecosystem, such as capacity building at the manufacturing stage and social acceptability for disruptive innovation in the biopharmaceutical industry.

In the manufacturing industry, LNG carriers, which are currently at the top of the global market, and biopharmaceuticals with high promising futures, will secure vitality for growth and development through value chain enhancement and value chain expansion. For the advancement of each value chain, R & D will promote technology differentiation and R & D in promising areas, and in the parts and equipment sector, systemize and package to enhance added value and technical power. At the same time, the company will proceed with localization by reviewing the efficiency of both supply and demand, and secure a track record to target the narrow (small market) and deep (high professional) market such as LNG carriers. As a policy, it is necessary to select localized items, support related technology development, certification for highly specialized SMEs, and lay the foundation for commercialization through KR consultation.