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The Ship Scrapping Industry in Southern Asia: Future Development and Economic Impact

By

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Abstract

Lots of paper started analysing the ship scrapping and recycling industry in the past decades since the demolition market has moved to the southern Asia and produced a lot of pollution to jeopardise the health of the local population and the environment. Besides, the ship scrapping and recycling industry play a critical role in balancing the demand and supply in the shipping market. However, a lot of challenges, such as a new tax regime, unpredictable freight rate, EU and ship demolition policies, are likely to bring uncertainties for the future of demolition market. Therefore, understanding the demolition market in the next three years is not only relevant to the shipping market, but also to the southern Asian countries.

This paper shall employ the logistic and linear regression model to predict how many ships in the current world fleet (71934 ships) will be scrapped in the next three years for the sake of providing insight into the dynamics of the demolition market in the near future. Accordingly, stepping into the qualitative content analysis of defining the economic predictors is dedicated to identifying what economic contribution comes from referring to the presence of the ship scrapping industry.

There is an expectation of promising outlook for the ship dismantling and recycling market in the future since a mess of ships in the current fleet will reach the age where they need to be dismantled regardless the EU demolition regulation and the new tax rate of the SBI. Among those three uncertainties which demonstrate the different effects towards the possibility of scrapping, the freight rate as the most influenced factor has proven in this paper should be aware. Moreover, the ship scrapping and recycling industry make a great contribution to the southern Asian countries' economy, that contribution has been discussed in terms of jobs, business revenue, and tax revenue in this paper. Governments of southern Asia countries should be acquainted with the prominent characteristic of the SBI by its market share and economic contribution.

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CHAPTER 1: The Introduction

1.1 Background: Literature Review

As the shipbuilding industry started flourishing in the 1970s, as illustrated in figure 1, the ship breaking and recycling industry subsequently has become a vital player since 1983, participating in the shipping supply chain for the sake of removing ships away from the market. Because of this, a variety of topics about the ship breaking industry (SBI) have been discussed in the previous literatures.

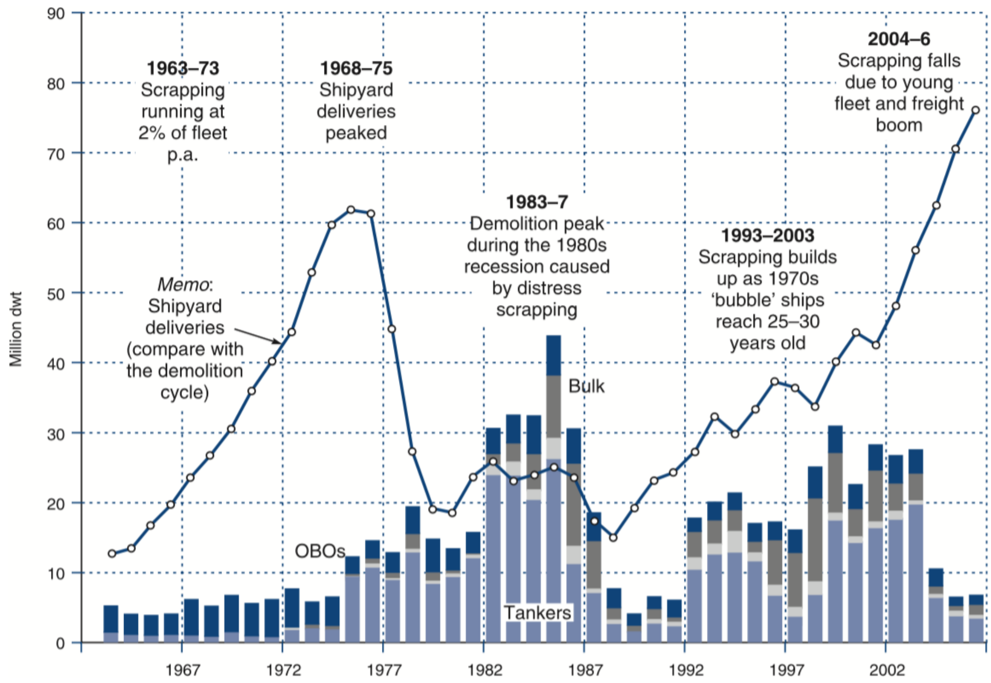


Figure 1: World ship scrapping industry by type 1963-2006 (Stopford, 2013).

Ship breaking or ship demolition was initially active in developed countries such as the United States and the United Kingdom before 1950 (Sujauddin et al., 2015) but later it took off in Spain, Italy, and Croatia (Khan et al., 2012) before 1970 (Misra, 2009). Nevertheless, these activities gradually switched to China and Taiwan from the latter half of 1980. The ship breaking activities in Taiwan had dramatically dropped to 2 ships in 1990 from 7822 ships in 1985 (Khan et al., 2012). Thanks to Lower labour costs and less stringent environmental regulations in the developing countries, the operational locations for scrap started shifting to the Bangladesh, India, Turkey, and Pakistan (Mikelis, 2007; Abdullah et al., 2010). Beginning in the early 1980s, ship owners sent their vessels to the scrap yards of southern Asian countries (India, China, Pakistan, and Bangladesh) for the sake of their interests of higher income (Hossain et al., 2016). By 2016, almost 77% of worldwide ship breaking activity have taken place in southern Asian countries (NGO Shipbreaking Platform, 2016: 6). Sujauddin et al., also stressed the flourishing development of SBI in the southern Asian countries in the light of government support, entrepreneurial restructuring, positive societal changes, and the favourable economics of supply and demand of the scrap materials and reusable items (2015).

The SBI was a labor intensive industry (Kusumaningdyah, Eunike, and Yuniarti, 2013; Basu and Rahman, 2016) and the absence of binding legal power in the South Asia (Sujauddin et al., 2015), and the change in the practice of ship breaking started concentrating in South Asia countries led easily to disposal of hazardous materials to South Asia, as a result, several studies have been conducted in attempt to analyze the social and environmental impact of the SBI on the South Asia countries and the sustainability of ship breaking activities in those countries (Islam and Hossain, 1986; Tewari et al., 2001; Reddy et al., 2003; Greenpeace, 2005; Hossain and Islam, 2006; Neşer et al., 2008, 2012; Hossain and Rahman, 2010; Abdullah et al., 2012; Pasha et al., 2012; Zakaria et al., 2012). The degree of to which the hazardous wastes from scrap ship impact the occupational health, safety and environment at the country level has been analyzed respectively in terms of different categories of pollution such as oil, asbestos, chemical, physiochemical parameters, disposable metals, persistent organic pollutants and so on (Tewari et al., 2001; Ahmed et al., 2002; Reddy et al., 2003; Hossain and Islam, 2006; Siddiquee., 2009; Demaria, 2010; Talukder, 2011; Hossain et al., 2016) or different measurements of contamination such as air, soil (Islam and Hossain, 1986) or various types of ship (Hiremath, Pandey, and Asolekar, 2016). On the other hand, some of the research papers about the influence and effectiveness of the ship breaking regulations (Nele, 2010; Ormond, 2012; Engels, 2013; Galley, 2014). There are some papers measuring the impact based on the country level (Legaspi, 2000; Taylan, 2013; Beins, 2014; Sarraf et al., 2010) either focusing on the social impact or environmental impact.

Without fully describing the impact of the SBI on the countries in a systematic descriptive approach, readers were unfeasible to understand the whole scope of impacts the SBI may bring and the connections between those impacts relating to the SBI. Kusumaningdyah, Eunike, and Yuniarti came up a system dynamics approach which had greatly represented the tradeoff between loss and benefit of ship breaking industry among the economic, social, and environmental impacts (2013). Ko and Gantner had quantified this imbalance between the value added from the lifetime of a ship in the economic perspective and harm to the environment through emissions at the environmental point of view (2016). Similarly, a cost–benefit analysis and an environmental life cycle assessment were combined to differentiate the "trade off" benefit among two different scrap method- Standard recycling methods and substandard recycling methods (Choi et al., 2015).

Also, ship scrap price as a payment paid to the owner of the end-of-ship was a non-negligible factor for a ship to be scrapped (Knapp, Kumar, and Remijn, 2008) and proved that it had been influenced positively by currency exchange rates (Karlis, and Polemis, 2016). Later on, Nikos, Andreas & Anna built upon on the previous research to identify the main factors between international steel-scrap prices, ship-demolition prices for tanker vessels, crude oil prices, and the exchange rate between Indian rupee and US dollar (INR/USD) would lead to a ship to scrap (2016).

Furthermore, several papers endeavoured to explain in variables which were the most significant to determine the decision to scrap the ship and the scrap market. In the earlier papers, the technical and economic obsolescences were meant to represent the cause to dismantle the ship and strong influence on the freight market levels (Buxton, 1991). A more sophisticated econometric model built by Knapp, Kumar and Remijn (2008) was to indicate that ship's age is significant and positive towards its probability of being scrapped and smaller ships are most likely to be scrapped in Turkey. The general cargo vessels are easily sent to the Turkey for scrapping, tankers to India and passenger ships to Bangladesh. Sujauddin et al., (2014) added the local demand for steel to influencing variable to scrap in Bangladesh.

1.2 Research Question

Most of the previous researches on ship breaking are either confined to environmental and social concerns or focusing on the impacts on countries in south Asia without proper measurements, and the model for predicting the scale of the scrap market remains largely unexplored in quantitative manner as well as the economic benefits from SBI to the southern Asian countries and its relevant industries are not defined yet. Our study is a move to overcome those gaps.

Our research questions are "what does shipping-breaking Industry would like in the next three years with those uncertainties the SBI will face in a few years? And what is the economic contribution of ship breaking industry to Southern Asian countries?"

1.3 Relevance of the Topic

Until recent years trans boundary relocation of the SBI from developed countries to the southern Asian countries has changed the scrapping market dramatically, it also led to some economic opportunities, challenges, and environmental problems for those scrapping countries. The paper tries to help policy makers who are seeking answers about how does the current policy decision can impact the SBI and the economy in the Southern Asian Countries. Moreover, it outlines the current context and characteristics of the shipbreaking industry in Southern Asia.

1.4 Objective

This paper, with an overview of the impact of the SBI on the southern Asian countries, it outlines two of the most important impacts -the economic impact by the SBI and current uncertainty impacts of the SBI on the south Asia countries. The SBI plays a major role in developing the economy of south Asia countries, but the general public largely neglects the economic contribution of the SBI. Thus, the economic contribution of the SBI has been focused on in this paper. Accordingly, with regards to the recent uncertainties posted to the SBI being the primary underlying factors to decide to send for scrapping, it depicts the impact of the ship scrapping on the southern Asian countries through identifying the market scale of the SBI in the southern Asian countries in next three years. Moreover, through the identification of the primary factors to determine the scrapping market, it gives a board view of what are the factors to impact the scrapping decision and their significance to the scrapping decision.

In order to understand and solve those two impacts, it is necessary to find out the implications of recent new scrapping legislation posed by the EU, the new tax regime in the SBI and volatility freight rate on the southern Asian countries and how does the economy of the southern Asian countries be affected by the ship demolition activity.

To find the answers to those questions, it will be possible to split the questions into the following sub-questions:

1. "What are the uncertainties of SBI in the southern Asian countries?"
2. "How many variables affect the scrapping market in the southern Asian countries except the uncertainties the SBI will face?"
3. "What is economic activity generated from SBI in southern Asia?"
4. "What is the economic contribution from and associated with the SBI for the southern Asian countries?"
5. "What is a conceptual framework applied to capture all the key factors and concepts in the theoretical framework of the SBI market analysis and of the SBI's economic contribution in the south Asia?"
6. "What are the methodologies used to analyze the market scale and economic contribution of the SBI in the southern Asian countries?"
7. "Which types of the data should be used?"

1.5 Structure of the Paper

The uncertainties the SBI will meet in the next few years have been addressed in chapter 2. The three most important aspects of uncertainties, including the EU ship demolition regulation, the new tax regime for the SBI issued by the southern Asian countries, and the unexpected freight rate, are introduced and described with a profound understanding of how those uncertainties affect the SBI.

In the following chapter 3, it is dedicated to constructing a theoretical framework to assess the economic contribution from the SBI in the southern Asian countries. It envisions an economic assessment of a project or industry for the purposes of realizing where financial contributions come from as a comparable parameter to identify the economic cycles brought by the SBI.

Consequently, with the help of existing theories and papers, the theoretical framework of scrapping market endeavours to figure out the fundamental variables or indicators which may influence the scrapping decision. Or even, decisions can extend their influence to give changes to the scale of the scrapping market in further. To clarify the theoretical framework of scrapping market and economic contribution, it attributes to calling into being the conceptual framework which is a visual or written chart linking all the variables in the respective frameworks with leverages determining the SBI and the measures of economic impacts.

An appropriate methodology and data were used to specify and describe the design regarding finding the impact of uncertainties in southern Asia countries in chapter 5.

Presenting the analysis and findings of the study and summarising the outcome of the impacts of uncertainties and economic contribution are in chapter 6.

The final chapter 7 is the conclusion, limitations and areas for further research.

1.6 Research Design and Methodology

This thesis employs the qualitative method to define the measures of economic contribution of the SBI to the southern Asian countries and relevant industries of the SBI; moreover, it also uses the quantitative analysis in order to deal with the impact of those uncertainties on the SBI and to measure the market scale of the SBI in the southern Asian countries in next three years.

- Qualitative approach

The qualitative approach will focus on the economic contribution coming from all the scrapping activities that are involved in dismantling and converting imported scrapped vessels through using labour, land, infrastructure, machinery, various utilities, financial services and resources into scraps and other reusable commodities. The research of the economic contribution of the SBI is primarily based on the previous researches, and the main economic benefit can be presented in three categories which are employment impact, government revenue (Taxation), and business revenue.

- Quantitative analysis

According to such uncertainties and the recognition of the ship breaking market in the next three years, we chose to employ a linear and logistics model to select of ships which will be scrapped in next three years and endeavored to paint the decision making with respect to the amount of estimated scrap ship sent to southern Asian countries.

Chapter 2: The Overview of the Ship Breaking Industry and Its Uncertainties in Next three Years

In combination with the flourish of SBI in south Asia countries, the SBI still faces some uncertainties that the ship demolition market has become slowing down at the beginning of 2017 after the recycling market has increased in the past three years (Clarksons research, 2017). Since the onset of the financial crisis and subsequent drop in vessel earnings attributing to the overcapacity in the shipping industry, it has forced the ship owner to send the different types of ships to the scrapping yards after 2008 (illustrated in Fig.2). The trend of the demolition market was bound with the world economy and fluctuating with respect to different periods of the economic cycle; I,e., whether the global economy had faced a recession or prosperity. The overwhelming supply in the shipping market created overcapacity, which eventually forced the ship owners to send their vessels to be dismantled to balance out the supply and demand. When the economy began to boom, the less redundant ships were sent to the scrapping yards because container operators hesitated to bring the ship to scrapping yards (Lun, Lai and Cheng, 2010). As a result, demolition played an important buffer role in adjusting the demand and supply in the shipping freight market (Stopford, 2013).

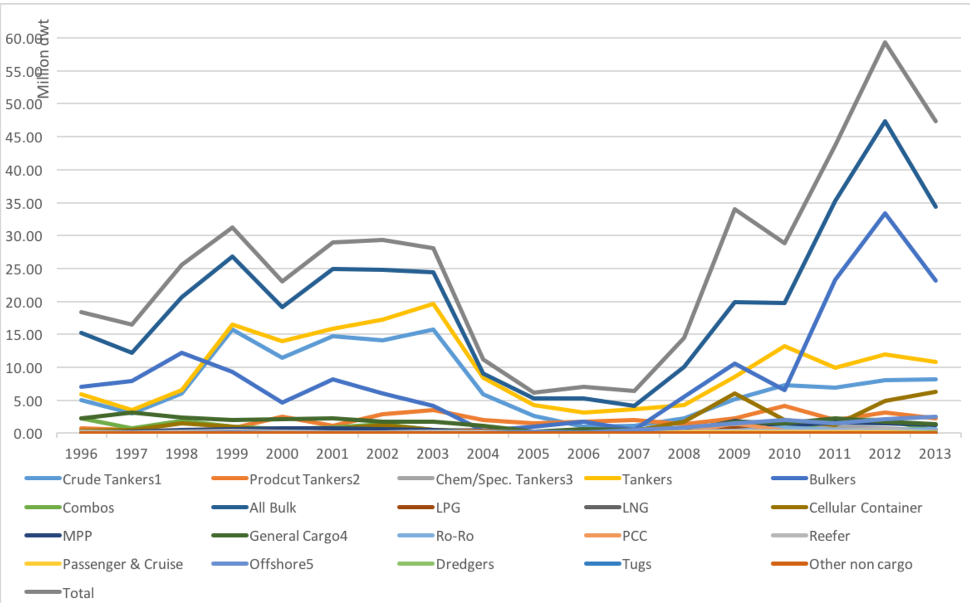


Figure 2: Global demolition volumes DWT (in tons) between 1996 and 2013 (Data for the Clarksons database, 2016).

The regulation change stimulates technical obstacles for the existing vessels as well as the level of freight market and scrap ships. Thus, it would affect the decision to scrap the vessel (Karlis, Polemis and Georgakis, 2016: 54). The advent of those uncertainties primarily stems from those recent changes in terms of the regulation, tax, and the precarious freight market will affect not only the all the relevant industries of the SBI in the Southern Asia, but also the ship owners, shipping freight market. To be explicit, the effects of those uncertainties create an acceleration of erratic ship breaking market that no ship is sent for demolition because the ship scrapping operators are paying less and less to the ship owners to preserve their margins in the context of rising costs of those uncertainties. Although those uncertainties remain obscure in significance for real impacts on the SBI, especially for the SBI in the south Asia countries- Bangladesh, India, and Pakistan, whose economy to a great extent are supported by the SBI in the form of taxes support, job opportunity and steel production. The economic contribution of the SBI for the southern Asia countries should be stressed or well discussed as much popular as other topics in relation to the SBI, such as environmental impact of SBI. In this chapter, a separate discussion of several uncertainties the SBI faces has emphasised on the impact of SBI, specifically for the impact on the SBI in the south Asia countries.

2.1 EU Policy & Environment Policy

The toxic and containment materials, such as asbestos, heavy metals, PCBs, oil residues and organic waste are released from end-of-life ships through the ship scrapping process. These pollutants contribute to the bad image of the SBI globally considering the terrible environmental effects and the poor occupational health and safety conditions for workers (Ignacio Alcaide, Rodríguez-Díaz, and Piniella, 2017). These pollutants have been widely exposed on the beaches of Southern Asian countries where the most scrap ships sent, and they jeopardize the environment because a beaching method accumulates pollutants in makeshift work areas which can wash out to sea as tides retreat (Yujuico, 2014). Apart from the hazardous waste, the scrapping affects people who either directly work for conducting the dismantling process without adequate equipment and infrastructure, or who live in the intertidal zone which is contaminated by these materials.

Accordingly, international policies which seek to set up a balance between economies of reusability and recycling from the SBI and environmental protection and regulatory fulfillment are configured to improve demolition methods used in less developed states, making them more sustainable. Several legal frameworks to counteract the sub-standard recycling practices used in Southern Asia are already being drafted, and some of them have already come into force. The two important international regulations coming into force in the next few years are the Hong Kong Convention (HKC) and the European Union (EU) Ship Recycling Regulation.

The HKC for the Safe and Environmentally Sound Recycling of Ships was adopted by the International Maritime Organization (IMO) at a diplomatic conference in Hong Kong in May 2009. It provides general legal provisions and working mechanisms, as well as an Annex with the practical technical requirements for the design, construction and operation of ships, for the operation of ship recycling facilities, and for reporting and enforcement mechanisms (Ormond, 2012: 4). Recently the approval of the Hong Kong Convention by the Turkish government on March 31, 2017, brought a bit closer to the ratification of the HKC where one of two main criteria must be met. The first one that least 15 countries must ratify it before it can enter into force has met as the Turkey became the sixth nation to sign this agreement. Another criterion that the combined merchant marine fleets of these countries should constitute at least 40 percent of the world's gross tonnage is completed half of its 40 percent requirement (Papachristou, 2017). By 2016, 17 ship breaking yards in the Alang had been certified as meeting the HKC Statement of Compliance (SOC) standards by the HKC, and 26 were expected to be approved (Mikelis, 2016); In the meantime, the Bangladesh was collaborating with the international regulatory organization and seeking financial support to establish a green and sustainable SBI, and Pakistan has been pressing the SBI in the area of Gadani to implement HKC guidelines after a devastating explosion occurred (Boonzaier, 2017).

With an increasingly aggregate market share of world gross tonnage in the EU from 29% to 34% since 2010 (Bray, 2017), thus there is a certain liability for the EU thinking about the guidance of how to alleviate the society and the environmental impact of the end-of-life stages of European owned ships in the Southern Asian countries where the majority of recycling facilities are located. In March 2012, EU Ship Recycling Regulation was proposed by the European Commission focusing on the establishment of a system of survey, certification, and authorization for large commercial seagoing vessels flying an EU Member State flag (Ormond, 2012: 6). Also, it had much more rigorous requirements than the HKC. *This Regulation will enter into force 6 months after the date that the combined maximum annual ship recycling output of the ship recycling facilities included in the European List constitutes not less than 2.5 million light displacement tonnage (LDT) and in any case latest by 31 December 2018(Regulation (Eu) No 1257/2013 Of The European Parliament and of The Council).*

The EU checked every applied scrap yards and initially formed a list of approved ship recycling facilities which only comprised European scrap shipyards. Moreover, owing to several reasons that the EU has not ratified the HKC, one of the most important criteria is that the European Commission bans on beach recycling for scrapping the vessels, but it is allowed in the HKC. Inevitably, to be exclusive rather than complementary to each other and different standards between the HKC and EU ship recycling regulation will bring uncertainties and troubles to the SBI in building a two-tier standards and unfair demolition market where switching registration of a vessel to a non-EU flag would help the EU ship owners to be circumvented from being paid more for choosing the green scraping method. Furthermore, it is not meant for 17 ship breaking yards in the Alang which will not be ratified by EU ship recycling regulation, but rather a bleak prospect for all SBI in south Asia losing the incentive to comply with the regulations. It is no double that the cooperation and ratification of HKC would be beneficial to all the parties involved in the SBI and that cooperation has solved the insufficient capacity to demolish the European fleet under the current scrap yards in the “EU list”.

Moreover, the other environmental protection regulations also impact the SBI. On 13th February 2004, International Maritime Organization (IMO) implemented the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention) which was held in London, the IMO headquarters. This convention has resulted from all vessels registered in IMO states member to execute the ballast water management, and the sediments plan with carrying the Ballast Water Record Book as well as Ballast Water and apply the standard given (International Maritime Organization, 2017). On 8 September 2017, BWM Convention will step into the force and require ships to manage ballast water to prevent the spread of aquatic organisms and pathogens which will attempt to motivate the ship owner for not spending the money on fitting ballast water management system but sending some ships to the scrap yards (Kritz, 2016).

2.2 The New Tax Regime

Both the Pakistani and Bangladeshi budgets in 2017 have revealed increases in duties where Pakistan aimed at a rise in the specific tax on ships imported for dismantling and Bangladesh planned to come up with 15% value added tax (VAT) and 5% duty on revenue on the operation of demolition. The consequence of such announcements was represented by a falling demolition price where the $50 per ldt dropped from peak price in the previous quarter in Bangladeshi while a potential fall of $10-$15 per ldt from recent rates in Pakistani expected to happen shortly after the announcement (Wainwright, 2017). The 9% decrease from average demolition price $350 per ldt for bulk carriers in Bangladesh (LIOYD'S) has driven low interest and pessimism towards the SBI in Bangladesh through the ship owners who hesitated to send their ship to the scrap yards in Bangladesh rather temporarily halted the plan for scrapping the ship or looked at other alternatives yards in the south Asia. It is worth noting that the SBI is far more complicated and hard to manage is because the owner of the end-of-life vessel is typically price-taker, they are looking at the earning much money at the end of vessel's life with less interest in environmental protection. The new tax regime as one of the main factors besides currency exchange rate and domestic steel price, to influence the demolition price is imperatively treated like an uncertainty for the SBI in southern Asia. Furthermore, the effectiveness of the new tax regime will undoubtedly exacerbate the tough time of the shipping industry in the short-term due to the increased cost input, which will give the shipping market more uncertainties.

The Bangladesh Ship Breakers Association (BSBA) attempted to intervene the introduction of the new tax regime as they successfully did last time when the government tried to impose the VAT on the demolition and called a meeting with the government to respond to the new tax regime. As a result, the BSBA has finally succeeded in persuading the Bangladesh government to get these duties overturned supposed at least two years (Corbett, 2017). Accordingly, the demolition price rebounded by at least USD 20/LDT from the floor to show the internal demand emerging from Bangladesh. There was ongoing confusion all cross the SBI after announcing uncertainty budget despite the fact that the government was committed to postponing adopting the new tax regime.

It is a broad acceptance that implementation of taxes and duties on the SBI is inevitable, if not today, and it will be in the near future. To strive to drive the tax collection from SBI by the government is not only raising the government revenue when the scrapping business starts to prosper, but also giving a foundation of equal competition and same level of the field of the steel producers who are melting the steel in order to get the finished steel as same as steel re-rolling mills (SRRM) directly coming from the SBI. In addition, regulating the standard sizes of SRRM by the government has endeavoured to create equality between different steel origins. The important question would be what are the impacts of that time when the tax and duty levy.

2.3 The Freight Rate

The shipping industry has a dynamic development of shipping freight rate. Even though the freight rates for distinct types or sizes of vessels are different from each other shown in figure 3, they have been surprisingly strongly correlated over time (Randers and Göluke, 2007: 253). One of the synergetic reasons is that carriers and investors in the shipping industry participate in all shipping sectors when there is an imbalance between supply and demand in one segment, it will encourage them to enter into other segments of shipping sectors (Tsouknidis, 2016). In particular, the freight rate could easily be characterized as extraordinarily volatile, seasonal, and asymmetric. (Wessam and John Pettit, 2014: 215), thus the freight rate of shipping industry was normally unpredictable and could change into some far more dangerous uncertainties to all the parties involved.

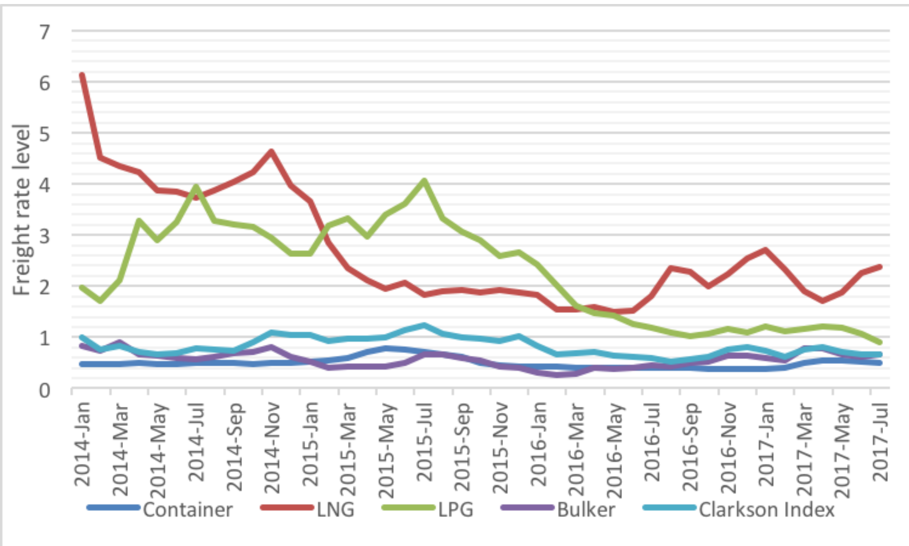


Figure 3: The freight rate for different types of vessels (Data for the Clarksons database, 2017)

Traditionally, the shipping freight rate was the outcome of bargaining process happened between the supplier (carrier) and buyer (cargo owner or shipper). However, it became more complicated due to the massive fleet expansion and upward movement in ship size in the shipping industry in recent years. The supply (shipping service) in the shipping industry is seemingly homogeneous (Karakitsos and Varnavides, 2014: 12) leading to a perfect elastic to the customer's demand, in other word supplier loses the barging power with operation on the verge of a breakeven point when supply exceeds demand in the shipping industry. Also, the demand and supply in the shipping causing the freight rate momentum are exposed to a macro environment of which shipyards capacity, world economic situation, and technology innovation are all affected, thus predicting the demand and supply are harder to accomplish than scholars can do.

The result of the volatility of the shipping freight market and second-hand markets are to influence the ship owners' decision fundamental on whether to send the ships for scrap (Buxton, 1991). In general, a ship owner can choose either sending the ship to scrap or selling the ship as a second hand vessel to next buyer when he does not want to use that ship, however, it is an option for the big player in the shipping market since over capacity has dragged down the freight rate severally. By selling the vessel to others, it results in a new competitor who is willing to offer the low price of the old ship.

On the other hand, an owner of a ship can either obtain cash inflow from the freight market or the scrapping market (Vedeler, 2006). But in the sluggish economy where the freight rates were low, and ship owners did not have high cash flow, they had to sell the old and obsolete vessels to scrap dealers for turning into available cash to the business (Stopford, 2013). That was a theoretical economic explanation in Stopford's book, whereas, in the shipping mechanism, a ship owner is usually resolved to scrap a ship by weighing the advantages of holding the vessel against selling it as scrap (Puthucherril, 2010: 101). To be more explicit, high earnings driven by high freight levels would put a temporary halt to scrapping activity as regards bringing a destructive impact on the demolition market by the ship owner's decision that ship owner does not care about the old, obsolete, and inefficient ships served in as long as the ship is profitable.

Figure 4 indicates the high freight rates in the shipping market vs a very limited number of scrap ships during seven years from 2002 to 2009 and is best demonstrated that the demotivate ship owner was reluctant to sell the ships for scrapping when the freight rate was at the highest level. Contrary to the periods before 2009, the dramatic low freight rate boomed the ship scrapping market after 2009. Therefore, the demolition activity is primarily driven by the freight market conditions (Karlis and Polemis, 2016) and inconsistent with the status of the freight market conditions. More importantly, the freight rate of the shipping industry is nearly unpredictable, which will be uncertainty in the both shipping market and ship breaking industry.

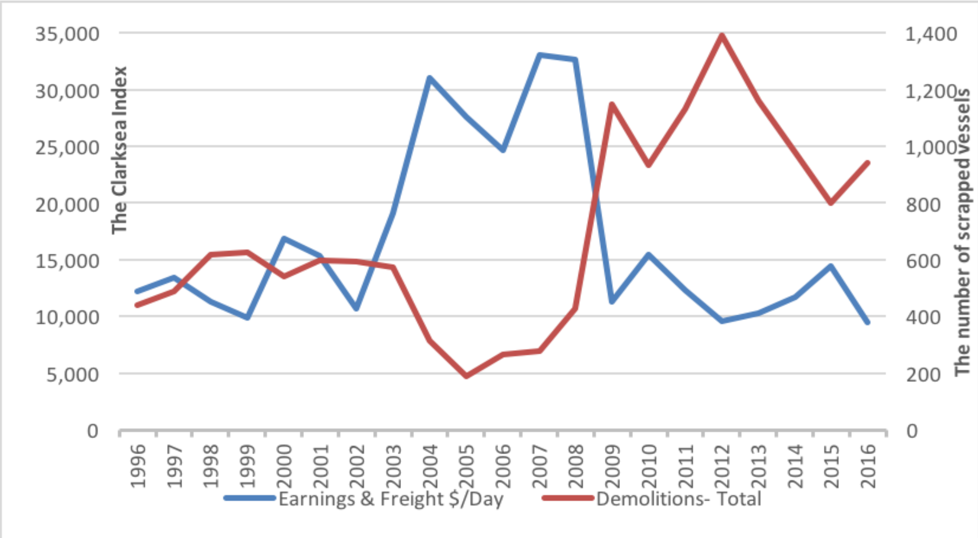


Figure 4: The average freight rate and total numbers of demolitions from 1996 and 2016 (Data for the Clarksons database, 2017).

An expectation for a global increase in cargo demand unveiled by a study where 81% of the respondents' ships have been all used in service compared with only 70% of respondents' one year before, moreover, approximately 60% of ship owners are looking forward to an increase in revenue in the next 12 months (Craig, 2017).

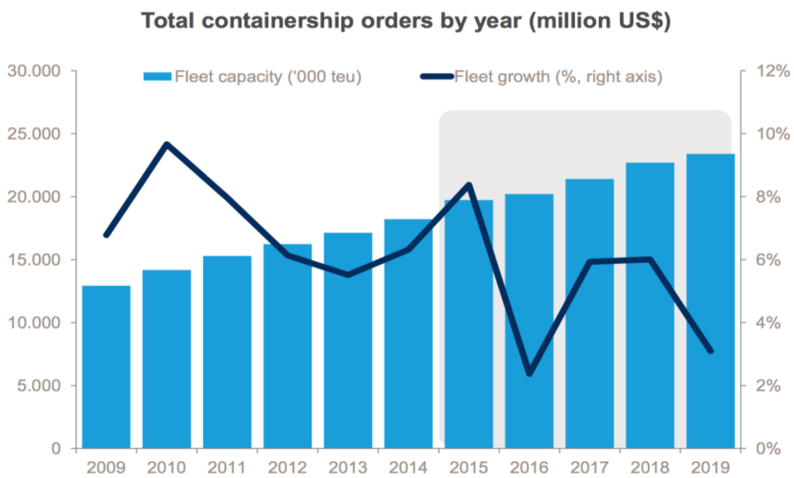


Figure 5: The fleet capacity and orders in the container shipping industry from 2009 to 2019 (Davidson, 2017).

It fits the increased demand in the container market analysed by the Drewry Maritime Research, as illustrated in Figure 5 that the overall container shipping market outlook will be better after the sharply descending number of new orders in 2016.

Nevertheless, capacity dilemma seems to plague chemical tanker companies all the way to the coming years. The depression of chemical shipping industry is visible in 2016 when 9% slump in the chemical freight rate on both main trade lanes- American to Transatlantic eastbound and the US Gulf to Asia trade (Kelley, 2017) and it's about to continue, especially for the large-sized chemical tankers as volume growth has not kept in line with supply growth in the chemical industry (Qing, 2017 cited in Kelley, 2017). It also should be noticed that the shipping market is not completely isolated from other factors besides the ship capacity, the future of shipping market is not merely same as many ship owners' expectations that the shipping freight rate should be firmer in next few years. Nevertheless, the implication of optimisation of future shipping freight rate is inspiring the ship owners holding the ship not for scrap without a doubt.

In conclusion, we have focused on those uncertainties in which the SBI is expected to meet in the next few years and discussed the characters and impacts of those uncertainties to the SBI. The EU ship recycling regulation will be enforced in the next year to form a tight legal framework to counteract the EU flag ships which will be sent to the substandard recycling yards and to guide the right practices for conducting ship demolition. In addition, the expectation of higher freight rate and imposing a new tax on the SBI in the next few years would likely bring the negative externalities to the SBI. No doubt, there will be a challenge for the SBI and south Asian countries whose economy has relied on the SBI in large part.

CHAPTER 3: Theoretical Framework of Economic Contribution of the SBI on Southern Asian Countries

The ship breaking activity makes a considerable contribution to the national economy, as it generates the economic benefits throughout the breaking process from converting demolished vessels to scrap including steel mills, re-rolling mills, steel plate re-manufacturing, cable and asbestos re-manufacturing, and other reusable commodities, such as furniture, paint, electrical equipment, and lubricants (Kusumaningdyah, Eunike and Yuniarti, 2013). In more detail, the most positive economic aspect of SBI has shown in table 1 that almost the entire products or materials separated from demolition ship can be reused, recycled and resold (Sarraf et al., 2010).

S. No	Materials/Machineries	Uses/Re-uses
a	Steel	1. Raw material for re-rolling mills. 2. Steel plate, frame, girder, stiffener, longitudinal, etc. are used for construction of inland vessels
b	Electric cable and cable sheathings	1. House hold and industry 2. Cable sheathing is used in rubber industry 3. Inland Shipbuilding industry
c	Navigational instrument such as compass, navigation light, life boat and buoy, life raft, fog horns, battery, various maps, firefighting equipment, etc.	1. Inland Shipbuilding industry 2. Other Industry
d	Marine engine,	1. Re-exported 2. Inland Shipbuilding industry
e	Generator	1. Used in industries and some are exported 2. Inland Shipbuilding industry 3. Household use
f	Motor, Light, Fans, Fridge, Switch, Switchboard, Various Electrical & Electronic Materials	1. Household use 2. Inland Shipbuilding industry 3. Used in industries and some are exported
g	Anchor, Cable, Chain, Block, Pulley, Wear rope, Bollard, Fairlead, Deck-eye, Hatch, Hatch coaming, Various fittings & fixture, etc.	1. Inland Shipbuilding industry 2. Other industries
h	Furniture, utensils, bedding materials, bathroom fittings, refrigerator, washing machine, etc.	1. Household use 2. Inland Shipbuilding industry 3. Used in other industries and some are exported
j	Pumps, Compressors, Steering Gear, Capstans, Windlass, Crane, David, Derik, Other Mechanical Equipment's & Machineries	1. Household use 2. Inland Shipbuilding industry 3. Other industries and some are exported
k	Fuel and lube oil	1. Transport industry 2. Inland Vessels
l	Burnt oil and oil sludge	1. Brick field
m	Coolants	1. Refrigerant Industry
n	Dye	1. Dying industry
p	Heavy metals like copper, zinc, mercury, brass, alloy metal	1. Recycled in metal industries 2. Other Industry 3. Export

Table 1: The materials from scrap ship to the end of a new recycled product (Hossain, 2015).

Nevertheless, few types of research recognise the economic contribution brought by the SBI. This chapter tries to build up a theoretical or empirical basis of what the economic consequence of the SBI would be. In order to estimate the economic contribution of the SBI, the key economic indicators should be addressed concerning all the activities associated with the SBI. The economic indicators distinguish all the expenditures in the form of intermediate inputs or to value added component required by the SBI into the labour, taxes, the capital. Those expenditures do not have to only spend on the SBI, but also on the other industries for the sake of satisfying the needs from the SBI. This measurement aims to find the relation of the

SBI with other industries on the economic aspect and circulation of economic through the activities of SBI.

3.1 Theoretical Framework of Economic Contribution

1. Different industries associated with the activity of the SBI

In general, the SBI proves to be a high degree of interconnection with other industries in the economic activity. More importantly, it had a profound implication as a considerable driving force to boom in the economy, attributable to an increased net economic activity in other industries or more jobs created for workers in the southern Asian countries in which those would not have existed if there was not the SBI. Thus, accurate identification of industries which are impacted by the SBI is important to define the spread effects and economic contribution in relation to the SBI. For example, the change in the demand of the maritime industry, latter may change in ports, shipping industry, and business service related to the maritime industry. Thus, ports, shipping industry, and business service are the industries linking to the SBI. Recognizing the spill over effect of the SBI and targeting the specific industries which experience the changes to meet the change of the SBI are aggregating all the impacts across those industries for estimating the total economic contribution of the SBI. Furthermore, besides those industries, the economic indicators as measures of economic activity need to be identified as well.

2. Economic indicators

The different terms of measurements used to generate estimates of economic benefit resulting from the industry or project are economic indicators, indicators comprise the great interest in typical aspect of the economy under broad topics which include economic growth, household income and expenditure, business profits and investment, labour, inflation and deflation, production, housing, finance, government, international, cyclical indicators and forecasting, economic well-being, and psychology (Frumkin, 2006). Although there are many economic indicators explained by the Frumkin, several indicators are the most important factors which have to be included in the contribution of a project or industry. PWC has used GDP, employment and tax revenues as the three most critical economic predictors measure the capital and operating expenditure to confine the economic contribution by the mining industry (Plumstead, 2012).

In our case, the economic measurement of SBI in Southern Asian countries can be categorized by several assessments as the distinct influences from different economic aspects. They are viewed in terms of

- Employment impact
- Government revenue (Taxation)

- Business revenue

The employment impact reflects the number of jobs directly hired by the SBI and indirectly hired by the relevant industries. Compared to the large, abstract dollar figures, the number of jobs is much straightforward, so that it is the most popular measure along with other indicators (Weisbrod, G., and Weisbrod, B.1997). The SBI like the shipbuilding industry is project-based that employees start working when there is a ship waiting for scrapping, however, whether the dismantling or building is the unexpected event, the yards do not only hire many full-time workers; conversely, they hire a lot of part-time employees during the peak of workload. Thus, the estimation of the workers in the SBI should include both of them. Income describes a status of the local economic structure as well as affect workers live in that area, it is imperative to evaluate the personal income of a large variety of workers from the SBI.

Government revenue in the form of corporate taxes, and income tax from the SBI and the relevant industries are generated by the SBI. The SBI and its relevant industries were sustaining financial support to the local government from paying the taxes which is the certain percentage of their revenue. The taxation collected by SBI is used in the distribution of national income to ensure that the government exercises its public functions, the implementation of public policy and the provision of public services, capital needs. Thus, it is an important source of income for the local government.

The business revenue earned from those projects and its relevant industries is substantial and is much relevant to the economic contribution, especially for the SBI in the southern Asia in which the most scrap ships around the world have sent to for scrapping, thus the highly concentrated SBI on the southern Asia is inevitable generating a great deal of economic impact.   Direct and indirect, induced impacts

The three types of impact which are direct, indirect, induced impact, through the different economic predictors in aggregate provide the economic contribution.

- Direct impact- the impact from direct activity(s) of the project or industry. It is rather being applied for the employment and output of the business.
- Indirect impact- the impact for suppliers to the directly-affected business.
- Induced impact- further impacts of spending by those direct workers

Those three aspects of measurements are crucial to evaluate the economic contribution of a project or industry and construct the theoretical framework for measuring the economic contribution of SBI. A more elaborate discussion of economic contribution based on this framework will be explained in chapter 5. Before moving the analysis, the prior researches about the SBI's economic impact on the southern Asian countries define the limitations and help to understand the scope of economic impact.

3.2 Prior Research about Economic Impact of SBI on the Southern Asian countries

In 2013, Kusumaningdyah, Eunike and Yuniarti in their research were measuring the impacts of SBI on the developing countries by constructing the system dynamic approach methodology where economics, environmental and social issue had been considered to build relationship map among those three variables and exhibited the variable behaviour that affects each other.

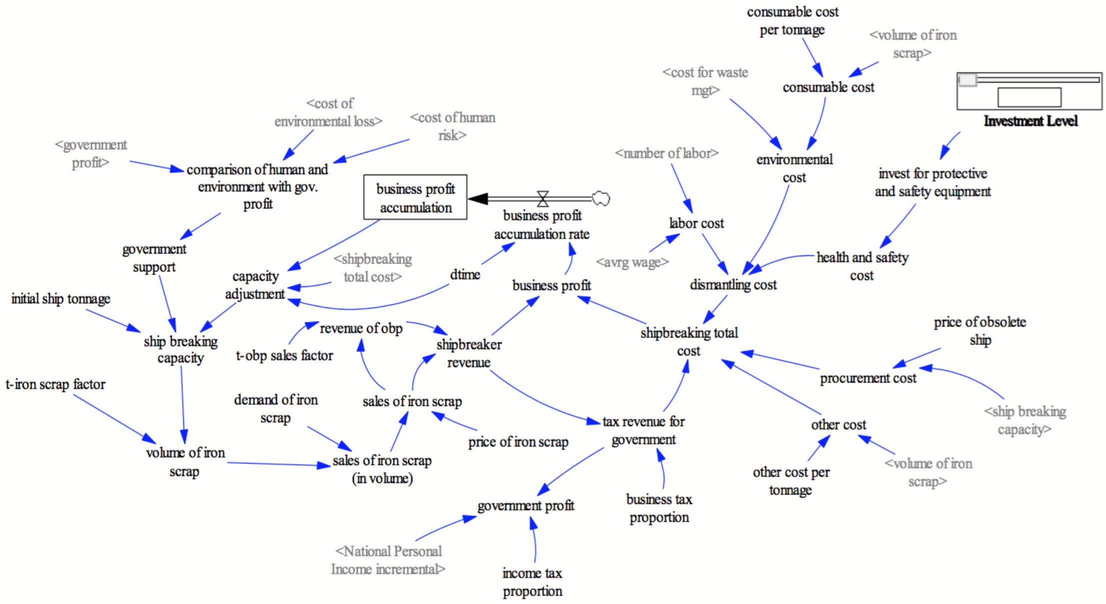


Figure 6: Flow diagram of economic aspect (Kusumaningdyah, Eunike and Yuniarti, 2013).

Figure 6 has drawn a sophisticated SBI's economic impact map involving in different variables which were relevant to both cost and benefit aspects and represented how did SBI impact the economy. Nevertheless, it did not use the quantitative approach to calculate the degree of the economic impacts of SBI in Southern Asian countries instead of developing countries.

The SBI could bring economic benefit which can be reflected in the number of jobs created by SBI in the developing countries (Legaspi, 2000: 23). Moreover, the significance of the known factors which influence the average economic life cycle of a ship had been pointed out as age, prevailing market condition and new regulations in this paper. (Legaspi, 2000: 23). In addition, such variables had been extensively analysed for effect toward the SBI in the following years.

To reflect the SBI's economic contribution of the Southern Asian countries, the table 2 in the research computed by The World Bank depicted the SBI's business benefit doing nothing more than using a Panamax oil tanker of 14,800 LDT as a single ship to calculate the profit for scrapping a ship in Bangladesh and Pakistan. More importantly, it found revenues and cost structure for scrapping business and tried to assume the approximate amount of money for each cost and revenue item. The result showed that the Bangladesh gained more profit than Pakistan. However, it was not entirely credible because the all the data were not from justified sources.

	Bangladesh		Pakistan*	
Revenues	5,613,600		5,505,500	
Total costs	4,692,200		5,340,900	
- Purchase of ship		3,848,000		3,848,000
- Labor costs		92,700		233,400
- Consumables		302,200		230,000*
- Financial costs		147,900		265,700
- Taxes, tariffs, and duties		263,000		693,600
- Other costs (including rents, investment costs, etc.)		38,400		70,200
Profit	921,400		164,600	

*As information on use of consumables in Pakistan was unavailable, it was estimated based on data available from India.

Table 2: Overview of cost and benefit structure of a sample ship in Bangladesh and Pakistan, mid-2009 in dollars (Sarraf et al., 2010：20).

A more detailed study on a socioeconomic analysis of the SBI in the Pakistani attached the SBI's social impact of the SBI's economic contribution at the country level, giving a board view of how the current socioeconomic situation was respecting to numerous laborers who were working at the SBI at Gadani Beach (Beins, 2014). The analysis was based on the primary and secondary literature about SBI and a standardized survey whose were filled up by the employee in NCMPR (National Centre for Maritime Policy Research) who were the expertise for dealing with maritime-related topics.

Admittedly, there was an insufficient number of SBI's research papers with regard to the measurement of the economic contribution of the Southern Asian countries. The main reasons were that the breaking yards had different size and management structure and were not strictly regulated by either SBI or government, and that lack of or inadequate date to do the research. Until to the IMO NORAD SENSREC Project, Ahammad and Sujauddin tried to develop an economic assessment upon evaluation of economic catalyst in the ship recycling industry of Bangladesh. In this paper, the different categories of taxes paid by SBI had been listed on a yearly basis from 2010 to 2014, other fees and business revenue from scrapping business also had been considered, and the number of jobs was estimated. Indirect contribution in terms of materials coming from scrap ship, indirect employment- employment in the relevant industry to the SBI, and social and human health issue, of SBI to the economy, was explained but did not delve into a detailed study on the calculation of all those factors.

In comparison to SBI's economic analyses the previous papers had done (table 3), we have selectively taken the variables mentioned in the prior research into consideration in our model to build a more reliable conceptual methodology framework.

Prior research	Year	Athor(s)	Depend variable(s)	Independent Variable(s)	Methodology	Outcome
Modeling Tradeoff in Ship Breaking Industry Considering Sustainability Aspects: A System Dynamics Approach	2013	Kusumaningdyah, Eunike and Yuniarti	Economics, environmental and social impact brought by SBI	All the SBI's variables affect to economy, society and environment	System dynamics approach	The profit of SBI will not much effect by the participation of process of hazardous materials. Environment and human risk will be significant lower if the the SBI is willing to present the pollution from the business.
Ship recycling : analysis of the shipbreaking countries in Asia	2000	Rolando D. Legaspi	The Economic benefit for the demolition area	Employee employed in the shipbreaking industry	Qualitative method	The shipbreaking industry has become an important source of income for the leading shipbreakers in developing countries.
Ship Breaking Yards At Gadani Beach: An analysis of the socio-economic dimension of the Pakistani ship breaking industry and the embedding in the global shipping market cycle	2014	Lars Bomhauer-Beins	The socio-economic analysis of the SBI in the Pakistani	labour, health, and safety conditions	The primary and secondary literature review, expert interview, survey	About 850,000 labourers and their families are directly and indirectly involved in this branch. But for who works in the SBI has poor labour conditions and that may not be solved in recent years.
Contributions of Ship Recycling in Bangladesh: An Economic Assessment	2017	Helal Ahammad and Mohammad Sujauddin	The Economic Contributions of the Ship Recycling Industry of Bangladesh	Government taxes and duties, business revenue, number of jobs, and indirect contribution in terms of materials coming from scrap ship	NIL	It is estimated that for every Taka 1,000 of value-added generated by the ship breaking industry on the yards, there is an additional value-added of worth about Taka 1,300 generated indirectly through various downstream processing

Table 3: The summary of previous papers.

The most prior researchers do not define the relevant industries which are an important aspect to take into account when determining the economic cycle by the SBI. Furthermore, the assumption of one type of scrap ship to measure the economic impact resulted in an unpractical and inaccurate result. Except for the models the papers used, the data for the tax, the price of a ship, used in the model were also highly inconsistent with each other. Therefore, the clarification of the economic impact on the southern Asian countries still needs to be investigated further.

To sum up, the objective of this chapter is to provide the theoretical economic framework that would elaborate the economic contribution of the SBI and to summarise the previous researches about the economic impact of the SBI in order to understand the critical scope of this study they were not included.

Chapter 4: Theoretical and Conceptual Framework

In chapter 2, the uncertainties of the SBI over the next few years was discussed. Those uncertainties actually will not directly impact the Southern Asian countries but be thought to affect the market for the ship breaking industry and then influence the Southern Asian countries. However, the SBI is a complex industry, and those described uncertainties from chapter 2 are not solely to determine the shipping market as far as the impact of them goes. In order to successfully measure the market scale of the SBI, a theoretical framework as the existing theories has developed the indications to assess the SBI's market scale combines with uncertainties mentioned in chapter 2 to determine the main factors driving the decision of scrapping the ships by ship owners. The basis of analysis of the theoretical framework is the identification of the fundamental factors of the ship that are considered to be particularly influential in the scrap decision. With respect to all those variables, the conceptual framework can be established; eventually, the market scale of the SBI can be estimated.

4.1 The primary factors to influence the scrap decision

Apart from those uncertainties in Chapter 2, the demolition market is also vulnerable to factors, such as the types and ages of the ships, current earnings and market expectations, present and anticipated regulations (Knapp, Kumar and Remijn, 2008), operating costs of the vessels and the size of the current fleet (Vedeler, 2006). The age of the ship is the most critical factor which determines the decision to scrap it (Stopford, 2013). Furthermore, the ship's age is a significant factor and positively towards its probability of being scrapped, as has been proven in Knapp, Kumar and Remijns' research paper by using the Econometric analysis (2008). In general, the result of increased maintenance costs when ocean-going ships deteriorate as they grow older may be usually sent the ships for dismantling after serving the global shipping fleet from 20 to 30 years (Chang, Wang, and Durak, 2010). According to the database provided by the NGO Shipbreaking Platform, 862 vessels were dismantled in 2016. As shown in Appendix 1, by the Pivot table in the Excel, the average age of demolition ship was 25.8 years; however, it was not identical with a total number of demolition ships in the Clarksons database which showed 994 demolition ships in 2016. If the two databases are compared, Clarkson's proved to be more comprehensive regarding a total number of ships than that of the NGO Shipbreaking Platform. Through analyzing all the 994 demolition ships dismantled in 2016, the result revealed that the average age for a demolition ship was 26.4 years (table 4) but the difference in age varied from one type of redundant ships to another, 246 containers had only an average 20.6 years, in contrast to the 416 bulk vessels that had an average of 23.7 years.

The average scrapping age of redundant vessels in 2016	
Row Labels	Average of Age
AHTS	34
Bulk	23.70432692
C,U & FP Lay	38
Container	20.69105691
GCargo	36.93548387
Icebreaker	39
L.N.G.	39
L.P.G.	30.75
PSV	35.5
Reefer	31
Ro-Ro	30.33333333
Suct. Dredger	52
Tanker	24.33333333
Utility	31.58823529
Costed Tanker	28.46666667
Support	33
Offshore	40.89285714
Salvage	39.77777778
Products Tanker	28.70588235
Pure Car Carrier	28.62068966
Rescue & Salvage Vessels	48.66666667
Survey	33.92307692
Other Specialised Tankers	39
RORO Passenger	34.78571429
Grand Total	26.35252525

Table 4: (Data for Clarksons Research 2016).

The average scrapping age of redundant vessels between 2013 to 2016	
Row Labels	Average of Age
Other Specialised Tankers	38
AHTS	34.09090909
Bulk	24.88877756
C,U & FP Lay	34.5
Chemical Tanker	27.08333333
Coated Tanker	30
Combined Tanker	33
Container	22.69166667
Costed Tanker	28.46666667
GCargo	33.54411765
Icebreaker	39
L.N.G.	39
L.P.G.	29.55769231
Marine Research	49
Offshore	38.9516129
Products Tanker	29.3015873
PSV	35.5
Pure Car Carrier	28.95555556
Reefer	31.6
Rescue & Salvage Vessels	40.25
Ro-Ro	30.33333333
RORO Passenger	35.08064516
Salvage	39.77777778
Suct. Dredger	52
Supply	37.6
Support	33
Survey	34.17857143
Tanker	25.20338983
Training Ship	60
Trans. Shipment Vess	56
Tug	35.4
Ulitity Support	35
Utility	31.58823529
(blank)	
Grand Total	27.37252369

Table 5: (Data for Clarksons Research 2016).

To verify the accuracy of the average age of the different types of vessel, further extensive data about all the ships dismantled in last three-year were extracted from the Clarksons database was to make a comparison with the result from Table 5. It was apparent that almost all the average ages of the different types of vessel in the table simultaneously were raised when the database was enlarged from 994 demolition ships in 2016 to 2322 demolition ships dismantled between 2013 and 2016. The older ships were preferred to serve in the market rather than being sent to be scrapped in the past.

Thanks to the facts that the older the vessels are, the more the cost of routine repairs and maintenance of the vessel have to be paid, thus the ship owners normally send the vessel to scrap at the age of 25 when the older vessels need more time off hire for maintenance and are in the face of a high frequency of maintenance. Even though the vessels have an average 25 years old, different types and sizes of ships perform dissimilarly to the time when they should retire and dismantle.

The various sizes and types of vessel played in the different level activities in the ship demolition market since the wide variations in freight rate for different type vessels bring about different fluctuations in the course of operating of vessels. Figure 7 shows a significant distinction in demolition market correspondence with various kinds of vessels. In the past four years, bulker accounts for the largest share of tonnage scrapped following by the container and tanker.

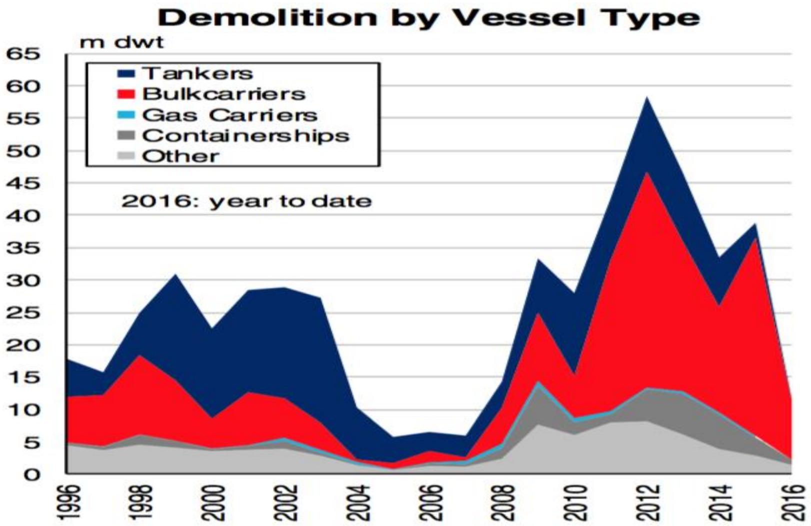


Figure 7 (Data for Clarksons Research 2016).

Consequently, the different sizes and types of the vessel have concluded differently to the scrapping decision and scrapping place. Small tonnage has proven its positive effect towards Turkey by Knapp, Kumar, and Remijn (2008), it represents that smaller ships attend to be scrapped in Turkey. It highlights an aspect of ship owner's interests very different from the conventional decision that the most ships are sent to the south Asia countries; it is because fuel cost for transporting small ship to breaker's yard in southern Asia is fairly higher than the earnings from selling the scrap ship. In essence, the little ship with its low steel content pretends to an inhibitive factor to send for scrapping but to sink at the quayside.

Profitability as a great importance decision factor attributes to making the demolition decision by ship owner leans to the size and type of vessel (Karlis, and Polemis, 2016); in other words, the size and type of a ship determine the Light Displacement Tonnage (LDT) of which scrapping companies or operators pay the seller of end-of–life vessel on the basis. LDT is roughly equivalent to the steel weight of a ship (Karlis and Polemis, 2016) giving a good estimate of the quantities of useful material after the demolition. Since different types and size of ships have varied steel component-some vessels have approximately 90% of steel content (Sundelin, 2008: 11), each type of vessel has its price per LDT. Furthermore, it represents a sense of the economic benefit for the ship owner in the end of the lifecycle of the ship. In general, the larger and higher steel content a ship has, the more chance the ship owner sends her to the scrap yards based on the high LDT price recovered from selling that ship.

Banning the ship demolition activity for certain type of ship due to the safety concerns in the specific country would also change the demolition decision. There was a string of fatal accidents happened in the scrapping yards of Pakistan and India when dismantling oil and LPG tankers, it caused a lot of death from the incident. Therefore, the ban was imposed by both two local governments. Such ban is positive for Bangladeshi breakers in favor of attracting more tankers to be scrapped in Bangladeshi which has a diverse pattern in the type of ships scrapped there, by far all types of ship from liquefied gas tankers, chemical carriers, pure car carriers, to very large crude carriers has already been sent to Bangladesh's breaking yards, but it dismantled the bulk carriers and oil tankers which have higher steel content most than other ship's categories, in terms of weight and number (Sujauddin et al., 2013).

Unlike the SBI, the ship building industry is assembly activities related to the cutting, shaping, outfitting, and installation of components to form a ship. Moreover, it requires high technologies and high-skilled employees to accomplish the production and is a highly competitive market that several yards in different countries around the world combat furiously for its market share. Acknowledging that producing ship was essentially different from yards in different countries, the European shipyards has mainly focused on producing densely outfit, complex ship types to avoid the competition with large Asian shipyards which expertise on building simple, cargo ship (Rose and Coenen, 2016 cited in Sea Europe, 2012). Such distinguishes in the type and technology of the ship that shipyards in different countries have produced are prone to have different effects on the ship reflected by the time the ship can use. Although there is not enough proof in the previous paper to conclude the effect between when the decision was made to scrap the ship and where the ship builds, somehow the relationship should be either positive or negative.

The different beneficial owners driven by the same context of freight market and field of ship players may easily come out the same decision on scrapping the ship, but more often than not, the same scrapped decision on a place to scrap the ship has been influenced by favourable scrapping incentives towards the same beneficial owners. It has proven that the EU is thus the single largest market sending end-of-life ships to the south Asian countries where they still use the polluting and dangerous practices to dismantle the ships (NGO platform, 2015). In conclusion with above, a place to dismantle can potentially be affected by a specified type of ship owner. Thus, same preference by the same type of ship owner considers bringing the same ultimate result for the same place to dismantle the ship and should be differentiated to any analysis.

In the theoretical part, the primary factors (age, type, owner ship, and builder) affecting the decision of ship demolition on the southern Asian countries have been analysed. It has been demonstrated that the average age of each vessel is around 27, thus increasing the age is fairly easy to enhance the scrapping probability for a ship entering into demolition; while the different types, builders, and ownerships of the ship also have distinctive tendencies towards the probability of demolition.

4.2 The Conceptual Framework

Constructing a conceptual framework after finishing the theoretical framework was to connect all the variables among the concepts we had discussed in the theoretical framework with regards to deeply understanding the relationship between the variables and the SBI. The structure of conceptual framework in the paper has been divided into two segments correspondingly to answer the research question that the impacts the SBI in the south Asian countries. First, it is the economic impact of the SBI.

The theoretical discussion about several contributions coming from SBI has been expounded on the basis of the economic aspect in chapter 3. All of economic contributions from those three Asia countries which had different situations and policies toward the SBI were differentiated and listed from country to country in chapter 3 in order to have knowledge of the economic contribution of the SBI to the southern Asian countries and to fulfill the gap of doing the research about the significant distinct outcome of assessments of economic contributions which was not given by different previous researchers, of SBI. In the conceptual framework, it situates the connection to all important aspects of the economic contribution brought by the SBI and helps to advance the study of economic contribution by building the "bridge" across those contributions.

Subsequently, we have attempted to estimate what the impacts of those uncertainties on the SBI are. The shift of market of the SBI in the Southern Asian countries as the most significant indicator is to evaluate those uncertainties mentioned in chapter 2 in terms of the number of vessels ship owners deciding to dismantle in the Southern Asian countries in next three years. It was not sufficient to measure the scale of breaking industry in Southern Asian countries in next three years if only taking into consideration those uncertainties, revealed a number of factors, such as the scrapping age, size and type of a ship and ship's flag and owner ship, treated in the theoretical framework as other fundamental factors are also used to build the model for the sake of determining the number of scrap vessels in Southern Asian countries.

There are two different scenarios built for two different freight rate levels in this conceptual framework; one is the basic scenario which is normal freight rate accordance with the public expectation, another one is the optimal scenario and it is estimated the freight market level by twice much as the basic scenario does. A relevant conceptual framework with a view to fundamental factors and destabilizing elements in chapter 2 provided an unambiguous map for analyzing the market scale of the SBI.

The conceptual framework of this paper is built on a combination of two theoretical frameworks which include the leverages determining the SBI and measurements of economic contribution, as shown in figure 8.

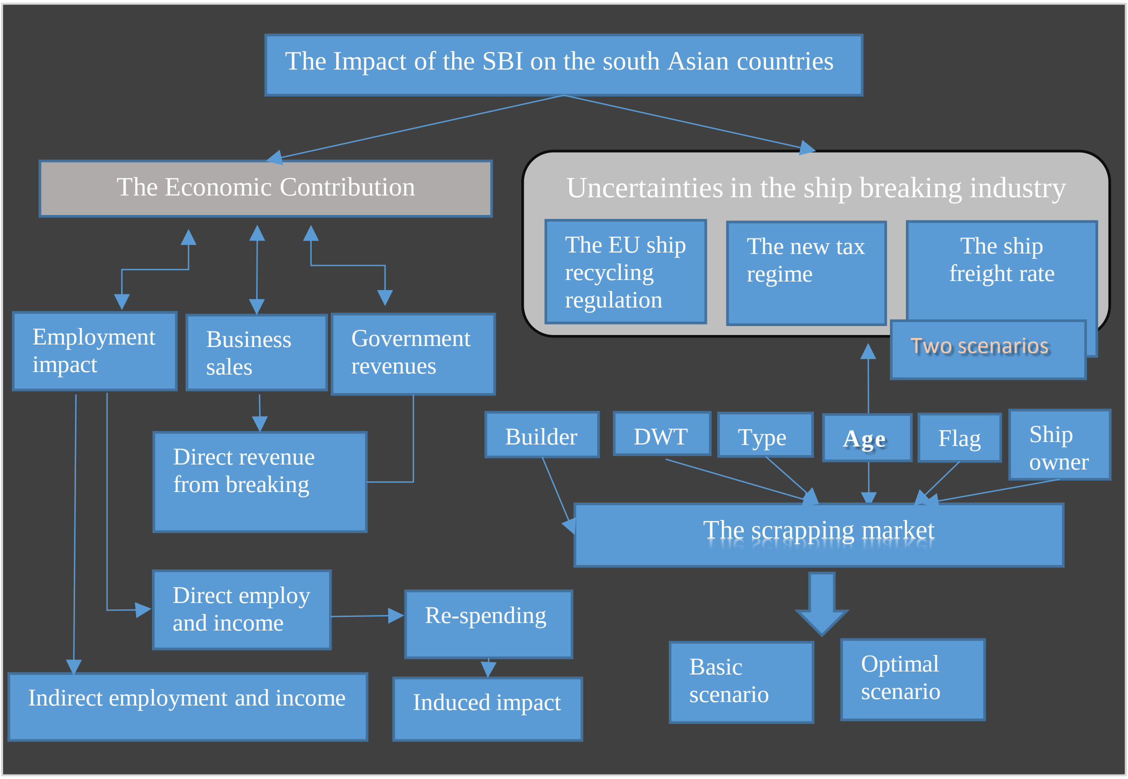


Figure 8: The conceptual framework of economic contribution of the SBI

Based on previous chapters presented an extensive literature review on the factors which influence the demolition decision and the economic contribution of the SBI, the conceptual framework of the SBI market is mapping them together.

CHAPTER 5: Methodology

The methodology devised to cope with the conceptual framework to come out the right answers of the research question is divided into two main parts. In the first part, it describes an appropriate econometric model in order to answer the research questions raised in this thesis. Furthermore, the data and data sources used are stated, and approaches of data into the model are also explained. The second part is dedicated to presenting a qualitative content analysis to analyse the economic contribution of the SBI.

5.1 Quantitative Analysis

5.1.1 The Econometric Analysis of Market of Ship Demolition Market

In order to quantify the size of the demolition market in next three years, the econometric modelling, which is used to develop a mathematical statement between the object variable and several other variables, should be employed. In the previous research, Knapp, Kumar, and Remijn used econometric modelling on a dataset to analysis the dynamic demolition market and its trends (2008). In that paper, the binary logistic regression model is built upon whether the probability of a ship being scrapped in India, Bangladesh, China, Turkey, and Pakistan, is pertinent to 25 other variables, including ship type, double hull, vessel age and size, classification and times for inspection by PSC. Although our research aims at identifying the number of scrap ships in the future rather than exploring the relationship between the variables of scrap ship, there is a strong confidence that several variables we have discussed before, having a high correlation to determining the number of scrap ships gives help to build a prediction equation in which the main factor- age of each vessel is the paramount factors to assess its lifespan and appraisals the time would describe the amount of scrap ships in the future.

Equation 1: $\mathbf{y = \beta_0 + \beta_1 DWT_{\mathit{i}} + \beta_2 FR_i + \beta_4 Type_i + \beta_5 Flag_i + \beta_6 Builder_i + \beta_7 SO_i + \varepsilon}$

Table 6:The list of all the independent variables				
Variable	*i*	Independent Variables	Type of IDV	Total N_i
DWT	1	Dead weight of each ship	C	1
BY	2	Build Year	C	1
FR	3	Average freight rate per day	C	1
Type	4	Ship type	D	29
Flag	5	Ship flag	D	48
Builder	6	Ship builder country groups	D	13
SO	7	Ship owner territorial groups	D	8
US$/Ldt	8	Scrap Price on individual ship	C	1

Where y is the dependent variable (age of vessel), $Type_i$, DWT_i, $Flag_i$, $Builder_i$, FR_i, and SO_i (ship owner) are independent variables, and β_1, β_2, ... β_6 are the coefficient of each variable. β_0 and ε are the y intercept and error variable respectively.
The dead weight and freight rate are continuous variables; the rest of the variables are the dummy of categorical variables. When the age in the equation as a predictive variable y for each scrap vessel of the multiple linear regression model is known, the predicted life span for each vessel in the world can be estimated based on the equation stringed from the multiple linear regression model. Based on the equation 2, the remaining life the ship has can be derived.

Equation 2: $\boldsymbol{Yleft_i = Y\rho_i - Yage_i}$

$Y\mathit{left}_i$ is how many years each ship has left to send to the demolition.
Yp_i is the prediction age for each ship
$Yage_i$ is the age each ship has until 2017

To test what the decision should be made to ship, whether it should be dismantled in the south Asia countries can be extended to a binary choice- dismantle in the south Asia countries or dismantle in the rest of the world. The logistic model concerning the case that the outcome is discrete and describing the relationship between a response variable and one or more explanatory variables (Menard, 2002 :5) is applicable to solve this kind of problem. The binary outcome of the logistic model demonstrates that 1 represents the ship dismantled in southern Asian countries, whereas, 0 represents the ship dismantled in the other countries. To simplify the formulation, $\pi_{(x)} = E(Y \text{ I } x)$ normally represent the condition mean of Y given X.

Equation 3: Testifying the place to dismantle
When the logistic model is used, the specific form we used is:

$$\boldsymbol{\pi_{(x)} = \frac{e^{\beta_0+\beta_1 x}}{1+e^{\beta_0+\beta_1 x}}}$$ (Hosmer, Lemeshow and Sturdivant, 2013).

Definition of term **$\beta_0 + \beta_i x_i$ in equation 3**

$$\boldsymbol{\beta_0 + \beta_i x_i = \beta_0 + \beta_1 \mathrm{In}(\mathrm{Dwt}_i) + \beta_2 \mathrm{In}(\mathrm{BY}_i) + \beta_3 \mathrm{In}(\mathrm{FR}_i) + \sum_{k=1}^{n_4-1} \beta_4 Type_{k,i} + \sum_{k=1}^{n_5-1} \beta_5 Flag_{k,i} + \sum_{k=1}^{n_6-1} \beta_6 Builder_{k,i} + \sum_{k=1}^{n_7-1} \beta_7 SO_{k,i} + \beta_8 \mathrm{In}(US\$/Ldt_i)}$$

Predictor variables X includes all the dummy and continuous variables which appear in the table 6, moreover, adding up an extra variable build $year_i$ and $US\$/Ldt_i$ as indicators represent the ship's build year and scrap price in this model. The regression coefficients βi for each predictor are unknown and will be estimated by the software.

Based on the function of a wide range of different vessels, the type of vessel in our research has been divided into 16 main categories, which are

- Multipurpose,
- AHTS,
- Bulker: Handysize 10,001-40,000, Handymax 40,001-60,000, Panamax 60,001-90,000, Capesize Over 90,001)
- Tanker: (Other Specialised Tankers, Tanker Small (<5K dwt), Small Tanker (5-10K dwt), Tanker Handysize (10,000- 55,000), Panamax (55,000-85,000), Tanker Aframax (85,000-125,000), Tanker Suezmax (125,000-300,000)
- Containership: Feeder (100-3000 TEU), Intermediate (3k-6k TEU), Intermediate (6k-8k TEU).
- General Cargo and General Cargo Small Bulk carrier
- L.N.G.
- L.P.G.
- Offshore
- Utility Support
- Pure Car Carrier
- Reefer
- Rescue & Salvage Vessels
- RORO Freight
- RORO Passenger
- Survey Units

Due to the different size of ships classified into the bulker, tanker, container, and general ships' categories having much distinction in terms of the freight rate, purpose of use, and restriction, they have been classified into different groups using different names under those 4 categories; otherwise, putting all ships in a short list will lead to the inaccuracy to the result from this model and to the continuous research. A number of vessels owned by different owners or built in the different countries are grouped according to its owners or builders' territory range, however several countries are not being grouped in the region they belong to on account of a high portion of the number of ships owned by themselves over the rest of the world or it associates with the specific research orientation.

The volatility in freight rate level and its connection to the ship demolition are explained in chapter 2, the freight rate as one of the independent variables is going to be used in an innovative way by adopting two scenarios analysing its impact on the future scrapping market in this chapter. The basic scenario is a normal situation where the freight rate level in 2010 was consistent with the analyses or predictions by Drewry or Clarksons shipping intelligence firms for the future shipping market is more realistic to the real situation in 2010, but because of unpredictability in the freight rate level, the optimal assumption as an optimal scenario has twice much growth rate than the basic scenario will be adopted to distinguish the difference between two scenarios and to measure what the maximum impact would be like if the freight rate steadily grow from 2017 at a high speed.

The table 7 illustrates that the different five sectors respectively adapt into two scenarios with different average growth rates. With respect to the huge variation in the type of ship, earnings, preferred payment in terms of obtaining and analyzing all kinds of ships are hardly accomplished, the five sectors include the Clarksea index that drafts average index of earnings for the main vessel types fulfilling the gap and being using to analyze for the rest types of vessels. For the Bulker, LNG, LPG, and Container sectors, the ideal measurement is average earnings per day per sector, which generally views as a more accurate measure and is convince to compare with the Clarksea index. The data have been used for the prediction in table 7 as same as the data used for the figure 3 in chapter 2 come from the Clarksons research.

Type of vessel	The Basic Scenario	Average freight rate rate	The freight rate increase to
Container	2.00%	0.75086882	10573.94812
LNG	3.00%	4.290634581	60421.93553
LPG	0.40%	0.982789011	13839.91415
General Ship/Clarksea Index	1.00%	0.804963863	11335.72988
Bulker	0.50%	0.723853821	10193.51521
Type of vessel	The optimal Scenario	Average freight rate rate	The freight rate increase to
Container	5.00%	1.424711869	20063.19743
LNG	6.00%	8.312647775	117061.0683
LPG	1.00%	1.102240385	15522.06235
General Ship/Clarksea Index	3.00%	1.205831559	16980.8627
Bulker	1%	0.796634394	11218.43193

Table 7: The two different scenarios
(Notes: The benchmark for all those figure is based on the ClarkSea Index of January 2014)

The flag of the ship has been categorised in 48 nations whose ships are much more than other excluded countries. Moreover, the exhaustive flag nation’s collections are attentive to doing the research about the EU legal restrictions towards the SBI. The two scenarios are built in the different situations where the EU has ratified the HKC that will not change much to the SBI and where the EU has not ratified the HKC that the EU flag ships need to reflag to other countries avoiding being restricted in scrapping in the scrapping yards designated by the EU commission.

5.1.2 Model Validation- The Logistic Regression Model

Because the complexity of the decision to be made to scrap the ship, the age will not entirely and accurately explain the demolition market in next three years, reflecting on the result of the ANOVA table. In practice, the ship will not be immediately sent for scrapping when their life is over up to the equation's result, sometimes it has been dismantled earlier or later than we expected. Therefore, the model validation is the set of processes and activities intended to adjust and verify the results before using them in the practical situation. To verify the result is to assess whether the number of scrap ships out of the world fleet in the next three years coming from the previous model send to dismantle or not. Thus, the logistic regression model that the fitness and parsimonious interpretation concluded in this model construe the relationship between the dependent variable and independent variables (Hosmer, Lemeshow, and Sturdivant, 2013), is different from the linear regression model in regard to the binary outcome in the logistic model which approaches every single ship from our first linear model either it should be 1 "scrap" or 0 "no scrap".

Equation 4:

$\boldsymbol{\pi}_{(x)} = \frac{e^{\beta_0+\beta_1 x}}{1+e^{\beta_0+\beta_1 x}}$ (Hosmer, Lemeshow and Sturdivant, 2013).

Definition of term $\boldsymbol{\beta_0 + \beta_i x_i}$ **in equation 4**

$$\boldsymbol{\beta_0 + \beta_i x_i = \beta_0 + \beta_1 \mathrm{In}(\mathrm{Dwt}_i) + \beta_2 \mathrm{In}(\mathrm{BY}_i) + \beta_3 \mathrm{In}(\mathrm{FR}_i) +}$$
$$\boldsymbol{\sum_{k=1}^{n_4-1} \beta_4\, Type_{k,i} + \sum_{k=1}^{n_5-1} \beta_5\, Flag_{k,i} + \sum_{k=1}^{n_6-1} \beta_6\, Builder_{k,i} + \sum_{k=1}^{n_7-1} \beta_7\, SO_{k,i}}$$

Each predictor is same as described in the table 6.

5.1.3 Data

The meticulous dataset collection and clarification are of great importance to deliver a creditable result and should be processed fairly and lawfully. However, obtaining the accurate information regarding the scrapping yards in the south Asia countries remains undisclosed and the data about every variable used in the equation for all numbers of ships in the world are highly incomprehensive from Clarksons, a massive manually searching has been made by checking up the information on the website like FleetMon, Maritime Database, and World Shipping Register.

There are 71934 vessels in the world categorized into different types by the Clarksons and 2781 scrapped vessels dismantled between July 2014 to June 2017. The classification of different types of ships is primarily based on the ship's design function as reported by ship owners, class societies or other sources (Clarksons 2016). The detailed information on how to classify each type of vessel is attached in appendix 3.

On account of no container ship in size of the Neo- Panamax (8,000 TEU to 12,000 TEU) or even a large one scrapped in past three years, the container ship which has over 8000 TEU has been excluded in our dataset. At the same time, Non-propelled vessels, Inland waterway vessels, Fishing vessels, Military Vessels, Yachts, Fixed and mobile platforms and barges primarily used for drilling and production in the offshore energy sector (with the exception of FPSO & Drillships) which are excluded from the Clarksons database has not been contained as well. Clarksons has strict rules for keeping the vessel account where the order vessel counts unless it confirms a contract. Moreover, unconfirmed contracts and rumours are not taken into consideration when measuring the terms of a contract. There are 13350 ship owners who have less than three ships, among the total 18225 ship owners of the 67816 vessels which exclude the large size of container ships. It is hard to manually review every single ship owner’s country out of all of those 18225 ship’s ownership. Therefore, only the top 4000 ship owners have been classified into four continents which are Europe, Asia, Africa, North American, South American, and Australia and Oceania, and the remaining ship owners belong to the unknown category.

Granted the presence of scrap ship’s flag sometimes is not same as the flag the ship has in the last business journal. After the intermediate agent buys the vessel from the ship owner, he gives her a new name, flag and insurance to cover for the voyage to the recycling yard. Therefore, the ship’s flag should be justified to the flag in which she supposed to end with when the last owner decides to dismantle or sell the ship, before it turns to a validated data in our model; or else it will lead to the misinterpretation of the reflag countries attentive to be easy to dismantle the ship. Manually check every single ship’s flag history is necessary to resist the conclusion in the inaccurate impact of flag towards to the scrap ship.

Furthermore, the ship which has old age and the status of laid up in large part will not go back to the market if the freight market will not recover from the downside in next few years. Thus, the consequence of those ships which either need to be scrapped or sink at quayside is different from the ordinary ships and the number of those ships to be scrapped do not evaluate the built model but rely on the presumption from the different freight markets in next three years. When in the normal freight market over 30% of the laid-off ship will dismantle in next three years, while in the optimal freight market scenario 10% of those ships will not back to the shipping market.

5.2 Qualitative Content Analysis for the Economic Contribution

In chapter 3, the economic theoretical framework which has been constructed primarily on the previous papers is to identify the economic predictors and other factors for the sake of defining the economic contribution of the SBI. In addition, the conceptual framework presents the structure of its theoretical framework clearly. The qualitative content analysis is used to testify and support the conceptual framework that the business revenue, government revenue, and job of the SBI and relevant industry in the conceptual framework can bring the significant economic contribution to the southern Asian countries. This paper is moving to the first step to identify and analyse what the economic contribution of the SBI may bring to the south Asia countries rather than give the conclusion without perceiving the consistencies of the economic impact of the SBI. Thus, the qualitative analysis is more applicable for such analysis concerning its attention of defining the economic contribution of the SBI. The following discussion about the economic contribution of the SBI is concentrated on the qualitative content analysis.

The qualitative content analysis extends to be an interpretative analysis which helps to gain a preliminary understanding of the phenomenon under investigation and its context, and discerning the essential features of the text (Severinsson 2003). Furthermore, it also interprets and analyses the qualitative data, while focusing on the differences, and context of the study (Graneheim and Lundman, 2004). With the use of qualitative content analysis doing the research about defining the economic contribution, it offers opportunities to analyse the statistics of the economic contribution of the SBI on the southern Asian countries with different aspects of business revenue, government revenue, and job. The qualitative data from the previous research papers underlying meaning of economic contribution corresponds to the great contribution by the SBI and to support the economic conceptual framework of the SBI.

The papers and data used in analyzing the economic contribution of the SBI collected from the research papers regarding the economic impact of the SBI on the southern Asian countries, the report from associations such as world steel, NGO Shipbreaking Platform, transcribing of the international conference on the ship recycling, websites, and a lot of master theses from World Maritime University. Here is the information retrieval regarding the main sources used in the qualitative content analysis

Research Orientation	Title	Year	Author(s)	Methodology	The useful information
Relevant industry of the SBI STEEL industry in India	The Environmental Trade-offs of Ship Recycling: The Case of India: Ship Recycling & Steel Industry	2013	Vally Athana-sopoulou	Flow diagram analysis	Ship scrap as a source to the steel industry, and it becomes more important as the increased steel consumption in India
STEEL industry in India	Ship Breaking and the Steel Industry in	2017	Sujauddin, M., Koide, R.,	A Material Flow analysis	Bangladesh consumed more steel relative to its

	Bangladesh: A Material Flow Perspective		Komatsu, T., Hossain, M. M., Tokoro, C. and Murakami, S.		GDP thanks to the abundant supply of steel from SBI
Relevant industry of the SBI Financial industry	The role of the ship breaking industry in Bangladesh and its future with special emphasis on capacity building through education and training	2012	Kazi A.B.M Shameem		The SBI provide the business both local and international opportunities to the different sectors
Relevant industry of the SBI Other businesses	The Economic Importance of the U.S. Shipbuilding and Repairing Industry	2015	Maritime Administration	Input-output (I-O) model	There are several sectors can be impacted by the ship building industry
Employment contribution	Contributions of Ship Recycling in Bangladesh: An Economic Assessment	2017	Ahammad and Sujauddin	Qualitative method	The number of workers in the SBI
Employment contribution	NGO Shipbreaking Platform	2015	NGO	Qualitative method	Salary of workers in the SBI
Government revenue Tax rate	IBFD Tax Research Platform Bloomberg	2017	IBFD Bloomberg	Website	Tax rate in the SBI
Tax revenue	Contributions of Ship Recycling in Bangladesh: An Economic Assessment	2017	Ahammad and Sujauddin	Qualitative method	The SBI's tax revenue collect by Bangladesh
Business revenue	Ship Recycling Markets And The Impact Of The	2013	Mikelis, N,	Qualitative method	A very large amount of steel scrapped by the scrapping yards

	Hong Kong Convention. In: *International Conference On Ship Recycling*				in the southern Asian countries

Table 8: Summary of selective sources in qualitative content analysis

Chapter 6 Analysis and Interpretation of the Data

This chapter comprises of 5 sections. In the first section, the descriptive statistics giving the summaries of what the datasets scrap ship data and current world fleet statistics shows, to combine with simple graphics analysis generated by the SPSS software by using the data from datasets to form the exclusive quantitative analysis of data. The Second section contains the result and analysis of the linear regression model introduced in chapter 4. Furthermore, the prediction of the number of scrap ships, validation, demolition country prediction under basic scenario and optimal scenario are given in the third section and fourth section respectively. The last one is the summary table, including all the results from two scenarios.

6.1 Descriptive Statistics of the Main Dataset

Looking at the descriptive statistics (Appendix 4) for the scrap ship in past 3 years, the total 2780 scrapped vessels with a wide age range from 1 to 75 are, on average, 27.5 years old, and the standard deviation of age is 8.8 years which is relatively higher than the mean age 27.5, meaning all scrap ships are dismantled roughly between 19 to 46. The ship flies the Panama flag, or belongs to bulker ship, or is built in the Asia, or owned by the Asian or European ship owner has more chance to be scrapped compared to others. The transaction information relating to the LDT of scrap ship and price per LDT is undisclosed for many of scrap ships. Thus, only 877 of LDT transaction information exhibits at the descriptive statistics table.

The descriptive table does not perform an explicit relationship between the age and type of ship, but illustrates that even though the average age of all the ships is 27.5, the various types of ships have reached up to the retirement and demolition at different age, in part, bulkers sent to scrap at least are used 17 years which has a longer service period than the 10 years of a container ship.

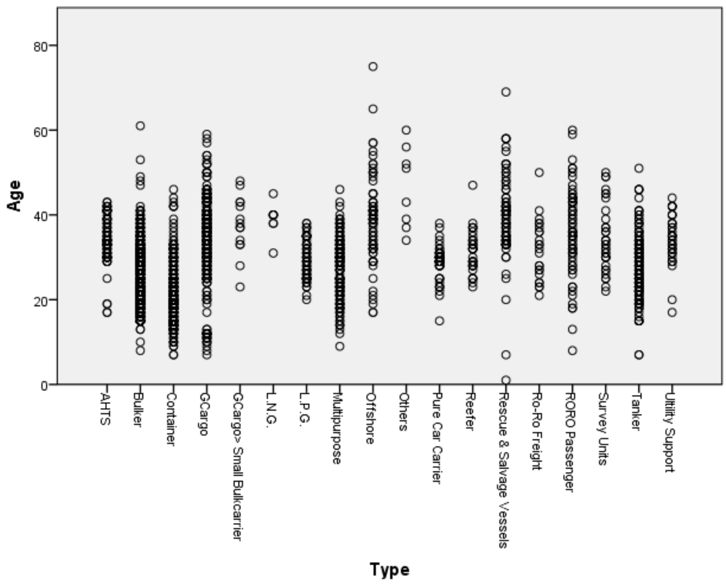


Figure 9: The scatter chart for the type and age of scrap ship.

Nevertheless, the age does not show much difference in the distinctive size of the ship (figure 9), the ships between 19 to 46 are sent to scrap regardless of their size. It is surprising that the large size ship would not scrap in the older age, but has rough scrap age as the small ship has. According to the figure 9 and 10, it is obvious that to a large extent, the scrap age has commonly explained by the variables in our model.

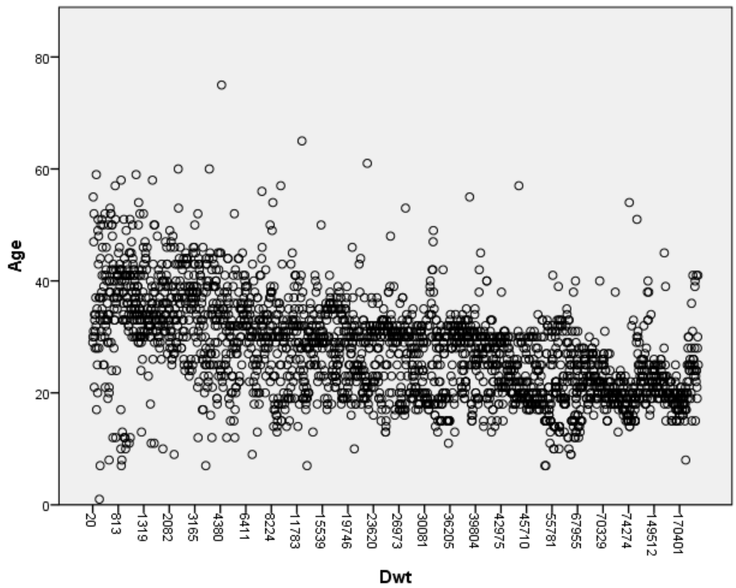


Figure 10: The scatter chart for the Dwt and age of scrap ship.

The descriptive statistics for world fleet has been attached to the appendix 5. Figure 11 presents the structure of current world fleet by the different types of ship based on the proportion of their dead weight. The bulk carrier has accounted for more than one-third dwt of the world merchant over the container carrier, general cargo carrier, L.P.G carrier, tanker carrier.

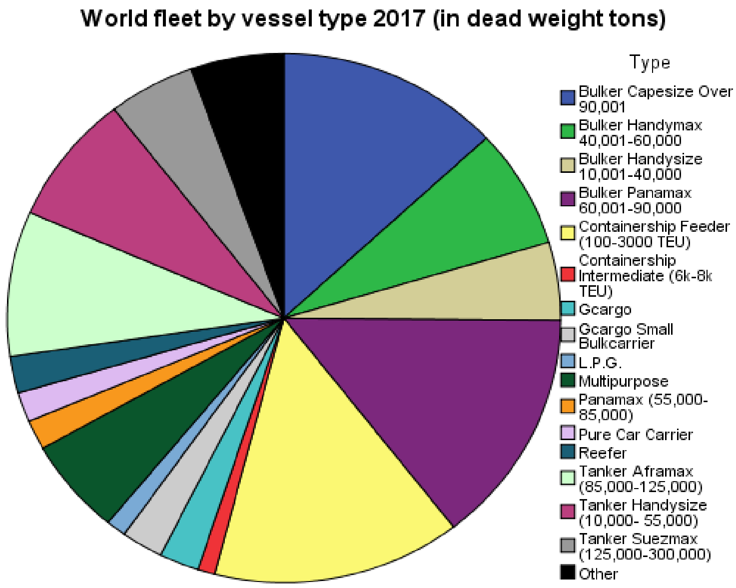


Figure 11

In comparison to the age of the scrapped fleet, the age of current world fleet shows a general trend of outnumbers in the age range of different kinds of ships. Interestingly, the ship with older age in the current world fleet should be scrapped and represented in the scrapped fleet as which the younger ship considering a low maintained cost has recognised an irony to demolition. Probably, the scrapping decision is a pretty much random behaviour or based on several factors far more over than displayed here, thus a wide range of the age the ship should be scrapped need to be considered.

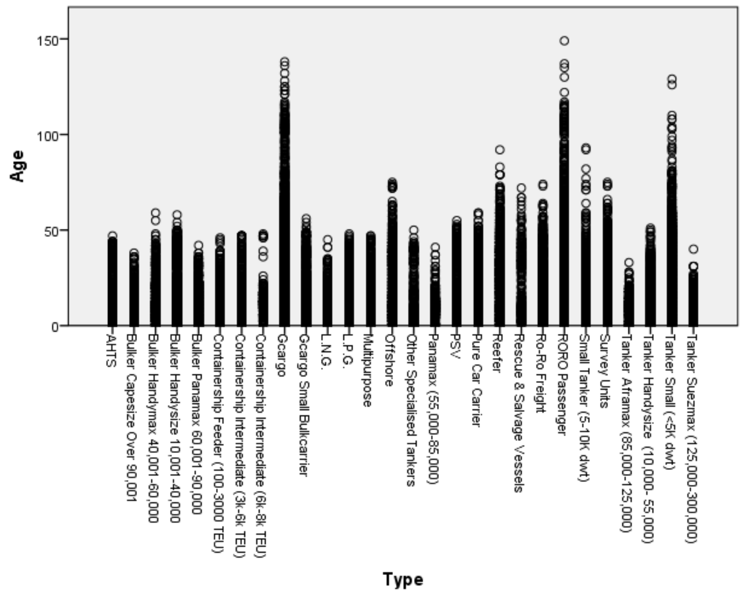


Figure 12: The scatter chart for the Dwt and the age of world fleet

6.2 The Quantitative Results and Analysis

The results of linear regression model shown in table 9, 10, and appendix 5 prove that the age of scrap ship can be explained by the other independent variables and that the model is statistically significant for scrapped age. In common literature, a 5 % confidence level is prudent for all sorts of regression models in this paper.

Model Summaryb

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.771a	.594	.580	5.635	.594	40.759	96	2671	.000

Table 9: Test result of model summary for the linear regression

The coefficient of determination R2 in the F-test tells the proportion of variance in age explained by the independent variable variances- dead weight, freight rate, type, flag, builder and ship owners of the ship. Given approximately 60% of the interpretive variance in ship's scrapped age exhibits that this model has a relatively good prediction power for the scrap ship's age with respect to dead weight, freight rate, type, flag, and builder and ship owners of the ship. However, the choice of scrapping the ship is a normal human behaviour which is mostly hard to predict. Thus the 40% of the variance of age cannot be found out using those independent variables. Consequently, the standard error 5.6 is giving the idea of the variances are on each side of linear regression.

ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	124235.454	96	1294.119	40.759	.000b
	Residual	84804.870	2671	31.750		
	Total	209040.324	2767			

Table 10: Test results of ANOVA table for linear regression test

The F 40.759 and p-value 0.000 in the analysis of variance (ANOVA) in table 10 shows that the model has some degree of correlation between scrapped age and the dead weight, freight rate, type, flag, and builder and ship owners of the ship.

Note that the p-value for Dwt, freight rate, the Other Specialized Tankers, Indonesia Flag, Saint Kitts and Nevis Flag, Saint Vincent and The Grenadines Flag, Togo Flag, Greece Flag, Russia Flag, Norway Flag, Sierra Leone Flag, Bangladesh Flag, Palau Flag, United States of America Flag, Turkey Flag, Germany Flag, Bermuda Flag, Tuvalu Flag, Moldova Flag, Tanzania Flag, Cook Islands Flag, Mongolia Flag, Philippines Flag, Taiwan Flag, EU Builder, OCEANIA Builder, South America Builder, African Builder, Russia Builder, North of American owner, Europe owner, Asia owner, and Oceania owner has less than 0.05, thus they do not obtain the predictive ability for dependent variable- scrapped age in this linear regression. The positive coefficients of the influential variables- Germany and northern American builders and southern American and Africa owners imply that ships possessing those characters pretend to have a positive effect on the scrap ship's age. Furthermore, the linear equation for forecasting all the ships' age can be figured out using the coefficient of each variable and the constant from the coefficients table.

The figure 13 reveals the associations between depended variable and independent variables in the scatter plot. There is 60% of variation in age have been accounted for this multiple linear regression, as a result, it shows a dense spot area in the middle of the graph

Figure 13: Test results of linear regression showed in the scatterplot

6.3 The Prediction of Number of Scrap ship in Next Three Years under the Basic Scenario

For the purpose of depicting the demolition market in next three years under the normal freight rate in our expectation, the linear regression equation as well as equation 2, in combination with the basic freight rate assumption applied to all the existing ships are helping to confine the range of target ships by measuring how many years left to send to scrap for all the ships.

Row Labels	Number of ships	% Number of ships
(blank)	0.00%	
-112.59--102.59	0.00%	1
-102.59--92.59	0.01%	6
-92.59--82.59	0.02%	13
-82.59--72.59	0.05%	35
-72.59--62.59	0.13%	87
-62.59--52.59	0.09%	58
-52.59--42.59	0.12%	81
-42.59--32.59	0.35%	236
-32.59--22.59	1.05%	715
-22.59--12.59	3.98%	2699
-12.59--2.59	10.83%	7343
-2.59-7.41	22.44%	15219
7.41-17.41	31.88%	21618
17.41-27.41	21.46%	14550
27.41-37.41	6.23%	4228
37.41-47.41	1.31%	889
47.41-57.41	0.06%	38
Grand Total	**100.00%**	**67816**

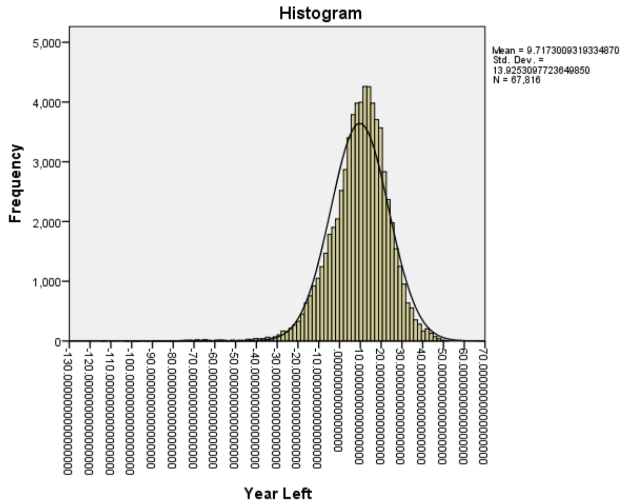


Figure & table 1: The frequency table for all the ships with respect to their remaining life span

The prediction age and standard error based on its expectation (around 0 to 3) were given and the frequency table for all the ships with respect to their remaining life span was demonstrated in the figure & table 1. In total, 67816 vessels have mean (9.7) and standard deviation (13.92) years waiting for recycling or retirement. Surprisingly, 16.62% (11274) of the ship having less than -2.59 life span, and 22.44% (15219) is between -2.59 to 7.41. Thus, a lot of ships which in theoretical should be scrapped in the past are still in the service now. However, the tendency of the remaining life span curve envisions vanishment for those ships on the verge of life curve in a short term. Taking the standard error as a consideration, age indicating less than -2.49 in the result approximately should be dismantled according to our model, while the ship has a life between -2.59 to 7.41 entering to the group which has a high probability to be scrapped in next three years. In the following validation model, those two groups of a ship will be verified whether they should scrap in the next three years as we expect in this model.

As far as it is concerned, the time plots in the graph fit the standard normal distribution, a branch of old ships should phase out the shipping market in or after nine years where the majority of ships' remaining life locate at. Owing to the overcapacity the current ship market faces, a limited replacement of current old fleets will lead a short of supply in the next decade to an inevitable impact on both the shipping market and ship building industry. Will the shipbuilding industry be prosperous through this short capacity? Or can the ship owner adapt to use the old ship with a high maintained cost?

6.3.1 Validation Process for the Basic Scenario

Pooling all the ships where the scrap ship in the past three years show the 1 as the status of scrapped and world fleet ship show 0 in the logistic model is used to estimate the probability of a binary response (scrap or not scrap) based on the 7 predictor variables and to acquire the coefficients of each variables which will be used to assess not only the correlation between the decision to demolition and other independent variables, but also the result of number of ships from previous prediction model.

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	15065.281[a]	.111	.385

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Table 11: Test results of model summary for the validation process (basic scenario)

Although the model summary for the validation result indicates that only 38% of variability in the demolition decision accounts for the logistic model, the highly significant (chi-square=8090, df=101, p<.000) chi-square means model is still significantly better. It has reason to believe that the relatively small sample size of scrap ships comparable to the large number of existing world fleet in the database causes the deviation showing a median prediction capability to the outcome. The sensitive of sample size towards to the chi-square test used in this model has been faulted for this deviation, however, in a very limited time for doing this research, we are unable to enlarge our scrap ship dataset to the 5 or even 7 years. We believe that the logistic model can give a more precise prediction if the scrap ship dataset can be expanded.

Classification Table[a]

			Predicted		
			Status		Percentage Correct
	Observed		0	1	
Step 1	Status	0	65103	242	99.6
		1	2247	504	18.3
	Overall Percentage				96.3

a. The cut value is .500

Table 12: Test results of classification table for the validation process (basic scenario)

The classification table also manages to give an idea of how the accuracy of the forecast this model can give. Though the overall accuracy rate is 96.3% regarding the precise forecast of demolition decision, 2247 are not determined by the model, but actually do determine in real and only 504 out of 2751 determinations for demolition can be successful and correctly classified. Therefore, an overwhelming decision on “not scrap” subjected to an insufficient amount of scrap ship in the data set will result in a less number of scrap ships during the validation process. In order to adjust this error, whatever is low the 75% of predicted probability in the decision of “no scrap” will alter to the scrap decision for this case.

The most prominent result table for the logistic regression model is the variables in the equation. It can conclude that every independent variable is significant to the decision to scrap the ship, and that impact would like to bring to the decision. In the case, the most independent variables have a significant impact on the demolition decision making except for 4 types of ship (other special and small tankers, Utility support, Ro-Ro passenger), 9 flag countries (Saint Kitts and Nevis, Korea, Comoros, Russian, Norway, Turkey, Netherlands, Philippine and Japan), 4 builders (Oceania, North American, Middle East, African) and 4 territorial ship owners (North of American owner, South American owner, Oceania owner and Africa owner).

In the critical independent variables, DWT has zero for exponential beta and one for the beta coefficient; it represents that the demolition decision will not change as one unit has increased or decreased in the dead weight. Since a large amount of data indicate “no scrap”, any sample falling in those variables are unlike to send the ship to scrap. Thus, all the dummy variables have a negative B coefficient. However, the explanation of exponential beta for the continuous variables has the different interpretation from explaining the dummy variable, and a negative exponential beta can be expressed that an increase in those independent variables decreases a likelihood of the case falling into the target group. For instance, two continuous variables- the build year and freight rate have negative B -.092 and -3.874 respectively, it means the increase in the build year and freight rate that will decrease the probability to scrap. Moreover, the exp(b)s 0.912 and 0.12 for the build year, and freight rate indicate that a unit increase in those two predictors decreases the probability to scrap by a factor of 0.912 and 0.12 separately; in other words, a good shipping market and a young age of the ship are likely to decrease the scrapping probability. Furthermore, the odds of demolition decision is lower for the predictors which have a negative exponential beta.

Taking the coefficients of each variable from the previous “variables in the equation” table in the logistic equation, then applying it to the different optimal freight rates to the desired ships are able to find out the decision on each ship whether it will be scrapped in the next three years and the decision’s predicted probability. The results of the validation process will include the summary in the result table at the end of this chapter. Accordingly, the places where those ships should be scrapped in need to identify.

6.3.2 The Number of Scrap Ships Sent to Southern Asian countries

The following analysis is to classify the contribution of each independent variable to the demolition decision on the scrapping country and to forecast the number of ships in the previous results to be dismantled in the south Asia countries.

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	2054.809[a]	.436	.596

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Table 13: Test results of model summary for the scrapped countries (basic scenario)

Overall, the logistic model proves to be fitted in this estimation of scrapping place in the light of approximately 0.6 of Nagelkerke R and has a very good predictive ability that overall predictive rate in the classification table illustrates 83.7%, in particular, 90% of ships scrapped in southern Asian can be correctly predicted.

Classification Table[a]

	Observed		Predicted		
			Location		Percentage Correct
			0	1	
Step 1	Location	0	736	283	72.2
		1	169	1580	90.3
	Overall Percentage				83.7

a. The cut value is .500

Table 14: Test results of classification table for the scrapped countries (basic scenario)

Age, freight rate, type of ship (other specialized, small, Aframax, Suezmax tankers; general cargo, small bulk carrier; AHTS; Container ship median size; L.N.G.; Utility support; salvage; Ro-Ro passenger; and survey units), flag (Togo, United Kingdom, Singapore, Greece, Thailand, Cyprus, Cambodia, Russia, Sierra Leone, Bangladesh, Antigua &amp, United States of America, Germany, Italy, Barbados, Vanuatu, Brazil, Moldova, Netherlands, CookIslands, Mongolia, Isle of man, and Taiwan), Builder (Oceania, Asia, South America, and African), and Oceania ship owner do not have a strong enough relationship to influence the demolition in the southern Asian. The negative coefficient for the independent variables indicates that the demolition is less likely to conduct in the southern Asian countries for ships having those coefficients. In order to know if the ships from validation need to be dismantled in the southern Asian, the coefficients of each variable in Appendix eight applying to equation three help to identify the scrapped place for each of predicted scrap ship. The result shows that 65% of 1242 predicted vessels will be scrapped in the southern Asian countries without considering the laid-off vessels. With all the 1033 ships which will be scrapped in the southern Asian countries, only 6.4% of vessels have EU Flag versus 93.6% of vessels having Non-EU Flag.

6.3.3 The Tax Effect on the SBI in the Southern Asian Countries

Since not all the scrap prices recorded for each scrap ship, the scrap price does not fit for testifying the scrap location. However, the tax influence which has indirectly impacted on the scrap price, of the SBI in southern Asian countries needs to be addressed on the probability of scrapping in southern Asian countries. To add one more predictor-scrap price in the previous location validation logistic model, the result of the omnibus test of model coefficients has shown that this model was statistically significant as well. With the absence of a lot of scrap price from sample, it differs some of the results from remarkably important to irrelevant to the decision to place to scrap, for example, the freight rate has changed in this model.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	210.522	88	.000
	Block	210.522	88	.000
	Model	210.522	88	.000

Table 15: Omnibus test of model coefficients for tax effect model

Accordingly, the scrap price has proven its significantly positive impacts on decision of scrapping on the southern Asian countries, but the low exp (B) 1.024 demonstrates that an additional unit in scrap price, the odds of scrapping in southern Asia is higher by 0.024. In the case of decreasing of the scrap price because of the new tax regime is likewise to inverse the representations of 0 to “scrap” and of 1 to “no scrap”. Thus, $OR' = e^{-\beta} = \frac{1}{e^{\beta}} = \frac{1}{1.024} = 0.976563, e^{\beta} = 0.976563, \beta = 0.0237$. It means that decreasing of the scrap price of a unit, the odds of scrapping in southern Asia is lower by 0.0237.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Dwt	.000	.000	.014	1	.907	1.000	1.000	1.000
	Built	.001	.058	.000	1	.993	1.001	.893	1.121
	Freight rate	-4.909	1.819	7.284	1	.007	.007	.000	.261
	US$/Ldt	.024	.006	15.479	1	.000	1.024	1.012	1.036
	Type_Multipurpose(1)	-30.597	42291.130	.000	1	.999	.000	.000	.
	Type_Bulker Handysize 10,001-40,000(1)	4.068	41553.341	.000	1	1.000	58.435	.000	.
	Type_Bulker Handymax 40,001-60,000(1)	4.621	41553.341	.000	1	1.000	101.563	.000	.
	Type_Bulker Panamax 60,001-90,000(1)	3.969	41553.341	.000	1	1.000	52.947	.000	.
	Type_Bulker Capesize Over 90,001(1)	2.211	41553.341	.000	1	1.000	9.125	.000	.
	Type_Tanker Small (< 5K dwt)(1)	5.429	41553.341	.000	1	1.000	228.002	.000	.
	Type_Tanker Handysize (10,000- 55,000)(1)	3.541	41553.341	.000	1	1.000	34.496	.000	.
	Type_Panamax (55,000-85,000)(1)	3.240	41553.341	.000	1	1.000	25.540	.000	.
	Type_Tanker Aframax (85,000-125,000)(1)	7.353	41553.341	.000	1	1.000	1560.880	.000	.

Table 16: Test results of tax effect on the southern Asian countries

6.4 The Optimal Scenario

When the freight rate has ascended in the next three years twice as much as the basic scenario is, the age expectation for every existing ship has prolonged to a certain degree. The histogram from figure and table 2 illustrates that the mean for the remaining life span of all the ships has risen to 9.815 compared with 9.7 in the basic scenarios. Therefore, all ships will have a longer life span in the optimal scenario, it also reflects the number of vessels estimated to be scrapped in next three years. In the optimal model, there are 11193 vessels whose remaining life span are less than -2.59, and 15122 vessels' remaining life span are between -2.59 to 7.41.

Row Labels	Number of ships 9	Number of ships
<-114.5 or (blank)	0.00%	
-114.5--100.5	0.00%	2
-100.5--86.5	0.02%	11
-86.5--72.5	0.06%	42
-72.5--58.5	0.15%	105
-58.5--44.5	0.13%	89
-44.5--30.5	0.48%	328
-30.5--16.5	2.64%	1792
-16.5--2.5	13.12%	8898
-2.5-11.5	34.98%	23719
11.5-25.5	37.98%	25754
25.5-39.5	9.50%	6443
39.5-53.5	0.93%	633
Grand Total	**100.00%**	**67816**

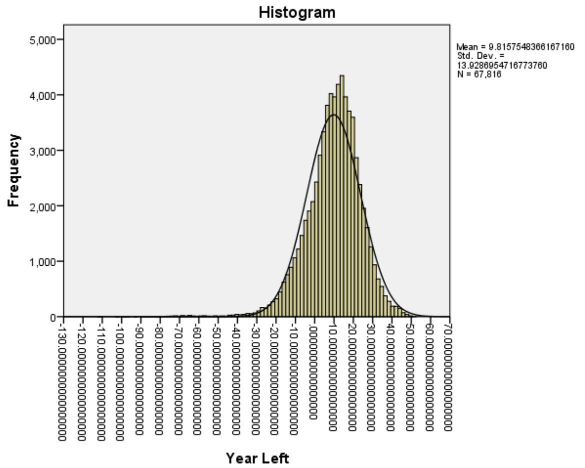


Figure & table 2: the frequency table for all the ships with respect to their remaining life span in the optimal solution

6.4.1 Validation Process for the Optimal Scenario

It is easy to get the verified result from duplicating the same way used in the basic scenario, but changing the basic freight rates to the optimal rates. The result demonstrates a tremendous difference from the basic scenario by just doubling the freight rate level, nearly 42% decrease in the total number of demolition ships in the next three years shown as the result of the validation process. The conclusion of the explicit numbers of scrap ship displays in the result of figure & table 2 to make a comparison with the basic scenario.

6.4.2 The Number of Scrap Ships Sent to Southern Asian countries in next 3 years.

Assuredly, 716 of scrap ships send to the southern Asian countries based on the optimal scenario is less than the number of ships in the basic scenario, but the higher percentage (77%) in terms of number of ship scrapped in southern Asian countries indicate that when the freight rate market left up dramatically in next three years, the amount of scrap ships will decrease but the motivation to demolition in the southern Asian countries is much higher than the time stays in the normal freight rate level.

6.5 The Results for Both Scenarios

Result for the Basic scenario		
Before the validation process	11274 of ship should be dismantled in next 3 years	15219 of ships have high possible to be dismantled
After the validation	674 ship should be scrapped in next 3 years	568 have a high possible to be scrapped
Under basic scenario, there are **974** laid-up ships estimating to be scrapped		
The number of ships scrapped in south Asia countries	801 vessels	232 Laid-up vessels
EU policy impact	EU has ratified the HKC No impact	EU hasn't ratified the HKC 6.4% impact on south Asia countries
Result for the Optimal scenario		
Before the validation process	11193 of ship should be dismantled in next 3 years	15122 of ships have high possible to be dismantled
After the validation	291 ship should be scrapped in next 3 years	425 have a high possible to be scrapped
Under Optimal scenario, there are **325** laid-up ships estimating to be scrapped		
The number of ships scrapped in south Asia countries	553 vessels	81 Laid-up vessels
EU policy impact	EU has ratified the HKC No impact	EU hasn't ratified the HKC 8.1% impact on south Asia countries

Table 17: The results for both scenarios

6.6 The Qualitative Results of Economic Contribution

A long-held view is that scrap is not oversimplified benefits coming at a business revenue, instead of a central place in the national development strategy of Bangladesh- due to the no iron ore sources or mines in the Bangladesh. Derived the scrap from scrapping industry reduce the need for conserving energy from mining and ore (Puthucherril, 2010) and are widely used in the construction of the transportation industry, building, energy, agriculture, and infrastructure. Thus, the result of SBI - 75% to 85% of the tonnage of scrap vessel is steel (Mikelis, 2013), gives a high contribution to accelerating country's socioeconomic development as steel consumption and modernisation are the most crucial criteria to measure of that (IBM, 2012). The table 18 illustrates that the total aggregate domestic steel consumption of Bangladesh has dramatically increased approximately 455% in the last decade; in contrast, the apparent steel use in India only gradually grew from the year 2006 (4.9 million) to 2015 (8.9 million), and total aggregate domestic steel consumption of Pakistan remains the upward trend from 2010 to 2015 after the severe fall in 2008.

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bangladesh	925.00	905.00	817.00	1726.00	1916.00	2064.00	2390.00	2533.00	2798.00	4209.00
China	393400.00	435 860	465480.00	574 420	612060.00	667930.00	687610.00	765750.00	740380.00	700350.00
India	49100.00	55491.00	56209.00	64360.00	69082.00	73154.00	77436.00	80655.00	86704.00	89353.00
Indonesia	7494.00	8694.00	10587.00	8908.00	10744.00	13148.00	15006.00	15237.00	15483.00	13656.00
Japan	83300.00	85900.00	83200.00	56000.00	67400.00	69600.00	68800.00	70900.00	72900.00	67800.00
Pakistan	3216.00	3249.00	2396.00	2621.00	2173.00	3189.00	3788.00	4210.00	5239.00	7087.00
Singapore	3000.00	3800.00	4226.00	3540.00	3350.00	4900.00	4750.00	5400.00	4800.00	5100.00

Table 18: Apparent Steel Used (mn Thousands of Tons) (Data for World Steel Association 2016).

Therefore, the ship demolition as a resource for producing steel makes ship scrapping is the inevitably prominent source of relentless providing of steel to fill in the gap between the steel need and supply in the domestic market (Sujauddin et al., 2017). Moreover, steel generated by the domestic steel production has been recognised as much important as the most vital industry to affect the economy of Southern Asian countries when the steel demand has steadily increased in those countries. Moreover, recapturing the value of a component of the ship which is mainly made of steel and materials from demolition ship, is promising a considerable profit for the players of the scrapping business and provide tax revenue for the government.

The local supporting industry would also benefit from indirect effect or subsequently acquire the business profit from the increasing spends of SBI in the local businesses. For instance, on account of that the most of the ship breaking operators are unable to purchase the vessel with "once for all cash" payment method proposed by almost all the owners of end- of –life vessel, the banks as the intermediate units need to lend money to the ship breaking operators to earn the interest constantly for borrowing the loan to SBI. In this case, the SBI provides the business opportunities to the financial institutes, such as banks (Shameem, 2012). In addition, suppliers selling the necessary equipment to the SBI are also considered a part of the beneficial party in the business with the SBI. The indirect influence of business revenue also identified as the indirect benefit from the recovery of steel after sold by scrapping operation generates the benefit to the location steel business.

Similar to the financial service, the SBI has facilitated in other industries, such as agriculture, utilities, construction, manufacture, wholesale and retail, transportation, technology support and others. The impact of those industries largely depended on the number of people hired by the SBI or the needs from the SBI. Every impact on those industries can be identified into employment, government revenue and business revenue stem from the SBI.

Since ship breaking is a process required by labour intensive and largely manual (Basu and Rahman, 2016), it directly or indirectly provides two million of working opportunities for workers (Hossain, 2015: 2 cited in Hossain, Iqbal and Zakaria, 2010). It is critical when coming to think about importance of the labour market, especially in Southern Asian countries whose population density are much higher than Turkey and USA (Table 19), and fast population growth rate, and fast urbanization develop rate (about 3% to 4%) are likely to create a great pressure on the society or government in the course of national development when there are a limited number of jobs on the market and to deliver a high degree of competition to the employees to find the job, especially for low skill labour.

Country	Bangladesh	India	Pakistan	China	Turkey	USA
Density of population in World Ranking	***12 (1101/ sq. km)***	*31 (362/ sq. km)*	*51 (235/ sq. km)*	76 (139/ sq. km)	**97 (100.5/ sq. km**	**173 (32/ sq. km)**

Table 19: The population density between Southern Asian countries and OECD countries in 2011 (Data for CIA world fact book, 2011)

Ship scrapping industry fills the gap of unemployment rate, hires the most skill-lacked or no education workers, and brings the incremental net gain in income to unemployed workers, hence it has given rise to an enormous economic benefit to Southern Asian countries where there is a much higher unemployment than contributions in a region of full employment where the employees have no alternative option to do other jobs except for working in the SBI. The high participation rate in the number of people as increasing labor force for conducting the scrapping process provides economic catalysts for those nations, but large group of workers migrating from poorer, less industrialized areas to work in the breaking yards is unprotected in context of low strict law enforcement by those three countries that workers under lack of personal protective equipment have the wage lower than the living wage and no payment for working extra hours.

6.6.1 Employment impact

With respect to the Employment impact, the economy of those three countries is impacted in the presence of ship scrapping industry by creating the jobs and attracting workers from outside the scrapping region to fill a labour shortage. Moreover, employment and income are analysed through not only generating by the whole ship scrapping industry, but also from the procurement of supplies and services, materials, and equipment as a result of “spin off” effects on the SBI. Consequently, employment impact can be decomposed into three types of job impacts, which are indirect, direct, and induced jobs (Port of Brownsville, 2015). The definition of those jobs is given in the below:

Direct job: all the direct job opportunities that are generated or recreated by the SBI. They are dependent on the SBI. Otherwise, they would apparently suffer dislocation if the SBI is ceased. They are associated with the jobs in the ship breaking yards and can be classified as different forms of job (management, administration or technical), the character of the job (Managers, Supervisors, Foremen, Cutters, Fitters, platters, Wire and hammer experts, and divers), the expertise of job (skilled, semi-skilled, and unskilled jobs), and tenure on the job (permanent and temporary) (Ahammad and Sujauddin, 2017). To estimate, the SBI provides approximately between 25,000 and 40,000 full-time equivalent jobs in Bangladesh 2015 (Ahammad and Sujauddin, 2017), employs 40,000 workers at the largest breaking coast-Alang in India (Athanasopoulou, 2013) and 5,000 workers in Pakistan (Euroconsult Mott MacDonald and WWF-India, 2011).

Indirect job: generated by the SBI upstream and downstream supply chain as a result of the necessary procurements from conducting scrapping process and merchandise of scraped materials to the other parties. The upstream indirect job can be classified into jobs related to transport services; electricity and other utilities; oxygen plants; machinery, banking, insurance and regulatory services; while upstream indirect jobs are the added jobs in the marine equipment industry, equipment maintenance, repair services, and steel production manufacture thanks to of the existence of SBI. To estimate, there are 24,041,000 workers hired by the SBI’s linkage industries in the Bangladesh (Shameem, 2012).

Induced jobs: jobs created locally and throughout the regional economy with regard to the expenditure of goods and services, such as food, housing, and clothing, by ship recycling workers. Regarding the low salary earned by the direct workers, the induced jobs are insignificant amount compared with the direct and indirect jobs.

Personal Income impact: is the measurement of earning for the direct employees working in the SBI, and of re-spending of those workers for purchases of goods and services. The wage for the workers also varies from one country to another. Despite the labour cost is only a small fraction of the total cost, it will eventually be added up to the total cost which is a critical parameter to determine the place to dismantle the ship. The wage of labours is largely dependant on the skills of labour and working hours. Overtime is a common practice in the SBI for almost all the workers although the long working hours are not permitted by the statutes of the country. However, in order to earn much more money to support their family, 63.4% of workers in a Pakistan breaking yards have to choose work seven days in a week (Beins, 2014).

The overtime wage for each worker is calculated based on the experience of that worker and extra working hours. The wage depends on types and skill of employed labour from Taka 200 to Taka 500 (on average €3.75) per day in the Bangladesh (Ahammad and Sujauddin, 2017: 48), the workers are required to work five days per week and take shift runs for 8 hours per day. In India, the skilled workers can earn €4 per day, twice much than €2 earned by unskilled workers (NGO Shipbreaking Platform, 2015:7) and the workers from Pakistan earn slightly higher between € 2.70 to € 6.00 per day (NGO Shipbreaking Platform, 2015: 9). The re-spending effect would differ from one worker to another and different from one region to another. However, the wage for the normal workers does not have much difference among those three scrapping countries, and low salary would prevent them from spending money out of scrapping nations or over spending the money.

6.6.2 Government Revenue

With the growth of SBI in the Southern Asian countries starting in the last decade, the tax revenue from ship demolition in terms of customs or import duty, value added tax (VAT), income and other taxes, has constituted the substantial government income to the national economies with respect to the proportion of sum of tax revenue to the government. Thus, the economic contribution of the SBI towards to the different state government revenues is represented by the tax revenue paid by the SBI. In general, SBI needs to pay customs or import duty, value added tax (VAT), income and other taxes to the government (Ahammad and Sujauddin, 2017: 39), but actual tax payment by the SBI is determined by the different tax policies enforced by different countries.

In Pakistan, the ship-breaking industry has to pay about Rs12 billion (approximately $114 million) in taxes annually (Hasan, 2017). According to the Pakistan Income Tax Ordinance 2001 shown in the IBFD Tax Research Platform, the government of Pakistan has imposed an import tax rate at 4.5%, or 6.5% if the tax payer is non filer on the ship demolition business. The tax collection should be done at the time the ship breakers import the end-of-life ship (ITO section 148 (8)). Furthermore, referring to the ITO clause 9AA, part IV, the tax exemption of rest types of corporate taxation after finishing the payment of import tax applies to all the ship breaking import tax payers only if the taxpayers do not conduct other business. If the taxpayer is conducting other businesses, for instance, having composite units of re-rolling or steel melting, clause 9AA will not be applicable anymore. It is no doubts that the SBI has been recognised as an important role plays in boosting the Pakistan economy, hence it had received government support in the form of tax reduction or exemption.

In comparison with 4% to 6% tax levied on the ship breaking industry in the Pakistan, the India has levied 15% customs duty and 16% excise duty respectively on the ship breaking industry (UNESCO, 2004). With a doubt of high taxation on the ship breaking industry while finding nothing about the taxation of the SBI on the Income-tax Act of India, the tax actually paid by the shipbreaking firm in India would be a good evidence showing the tax payable in accordance with relevant provisions of income tax and the tax regulations. The one of the largest ship breaking firms in India, namely, Hariyana Ship Breakers Ltd (India) indicates 31% effective tax rate levied in the firm by 2017. The high amount of taxation under the current tax regulatory and compliance framework of India is less competitive and low attraction to the ship owner compared with lower tax payment in Bangladesh and Pakistan. Despite imposing higher tax rate on the SBI, the India also issued some motivated regulation regarding alleviating the burden on the SBI in the India.

> *The interest payable by an industrial undertaking in India on money borrowed, or debt incurred before 1 June 2001, by it in a foreign country in respect of the purchase outside India of raw materials, components or capital plant and machinery, subject to a maximum at the rate approved by the central government for this purpose. This exemption extends to interest paid for the purchase of plant... and to usance interest paid by an Indian ship-breaker for the purchase of a ship outside India. (*Income-tax Act, section 10(15) (iv)(c))

The SBI's operator can appeal an exemption to against the interest from money borrowed from the bank for the purpose of buying the scrap ship outside India. Thus, the usance interest would be exempted from the SBI's operator.

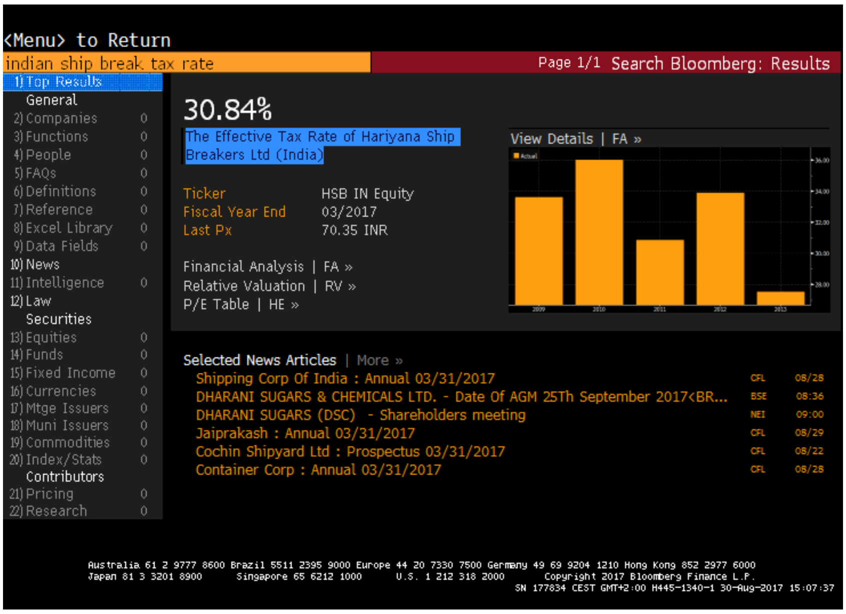


Figure 13: The effective tax rate of Hariyana Ship Breakers Ltd in India (Bloomberg, 2017)

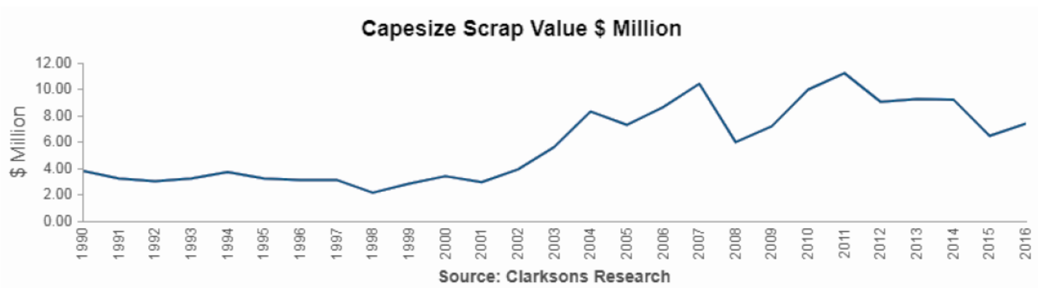
By imposing customs duties, income and value-added taxes on the SBI, the government of Bangladesh earns annually Taka 5 billion ($68 million) on average 5 years from 2010 to 2014 (Ahammad and Sujauddin, 2017), the tax earnings are roughly an estimation by Ahammad and Sujauddin, based on the data from the National Board of Revenue. The estimated result (table 20) lists the separate categories of tax paid by the SBI in Bangladesh and their annual taxation collection between 2010 to 2014 and number in the bracket are measured million US$ equivalents by using the yearly exchange rates. The estimated result reveals that the Bangladesh taxation collection from the SBI equals to 2.5% of total GDP in 2015. Hence, the SBI plays a major role in the government of Bangladesh owing to the substantial amount of fees and tax contribution under the current tax regime.

Fiscal year	Customs duty	Income tax	Value-added tax
2010-11	1.1 (15)	Not available	Not available
2011-12	2.4 (30)	2.7 (34)	0.02 (0.2)
2012-13	3.3 (41)	2.2 (28)	0.7 (9.2)@
2013-14	2.4 (31)	1.6 (21)	0.5 (7.0)@
2014-15	3.2 (42)	1.7 (22)	0.6 (7.5)@

Table 20: The taxation paid by the SBI in Bangladesh in billion Taka. (Ahammad and Sujauddin, 2017)

6.6.3 Business revenue

Although the scrapping price for a different size of the ship was apparently volatile and fluctuating in the market dynamics all the way along, the scrapping price for all sizes of ship has increased that the owner of the ship got paid $8.0m for selling the Capesize vessel and $5.0 m for selling Aframax vessel in 2016, while they only had $4.0m and $3.0m in 2000 (Figure 14, Clarksons Research 2016), due to inflation of asset value.



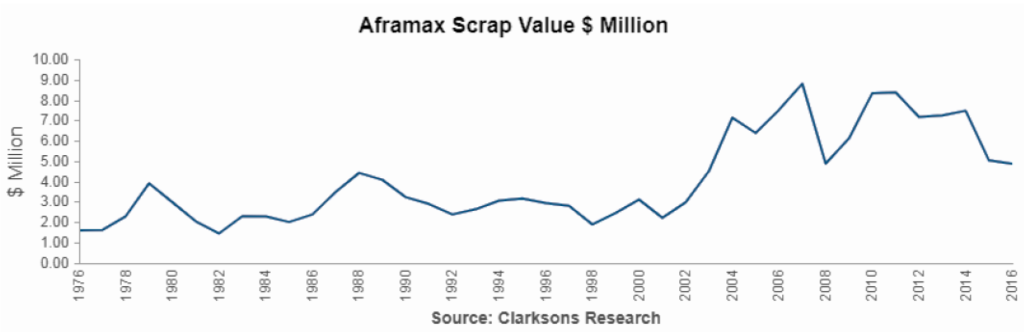


Figure 14 (Data for Clarksons Research, 2016)

The SBI benefits from selling the recovery of steel derived from the demolition ship process and such benefits are also to be affected by the cost of per LDT paid to the ship-owner and scrap steel price. The scrapping operators separate and sell the recovery of steel in two categories with regard to its form and shape, around 60% of a ship's LDT is steel re-rolling mills (Mikelis, 2013), which can directly be reused in construction or road building and rest of steel are used as raw material by melting into electric furnace plants in order to produce crude steel (Athanasopoulou, 2013:18).

The business revenue is directly dependent upon the scrapping service provided by the firms, normally referred to as the scrapping operators. The scrapping operators have accumulatively produced about 44 million tons LDT scrap steel from 2007 to 2012 in the south Asia countries (Mikelis, 2013, see Appendix 2 for further details); as a result, it generates a significant amount of revenue from selling the recovery of steel with a respective steel price of per LDT. The business revenue from scrapping operators is largely relying on the steel price, to be specific it depends on the unit selling price for re-rolling mills steel and melting steel, though south Asia countries are not likely to each other with respect to the both distinct scrap steel prices. The existence of the slight difference in the scrap prices is because it confronts with the uneven competition of the scrapping business among the southern Asian countries, but also reflects the different demands of steel and situation in each southern Asian country.

Overall, the SBI has given a great economic contribution to the southern Asian countries in terms of

I. Relevant industry: the financial service institution, agriculture, utilities, construction, manufacture, wholesale and retail, transportation, technology support and suppliers of the SBI.
II. Employment impact: There are about 25,000 and 40,000 full-time equivalent jobs, and 40,000 jobs in the Alang yards and 5,000 workers which are indirectly created by the SBI in Bangladesh, India, and Pakistan respectively. In addition, a few million people are indirectly hired by the SBI.
III. Government revenue: the SBI provides a substantial government revenue with

respect to the tax imposed on them. The 4% to 6% tax levied on the ship breaking industry in the Pakistan and Bangladesh, while India has levied 15% customs duty and 16% excise duty respectively on the SBI.

IV. Business revenue: there are 44 million tons LDT scrap steel created by the SBI from 2007 to 2012 in the southern Asia. Considering the recent thriving scrapping market share in the southern Asia, a large variety of companies have earned a lot of money from the scrapping process in the past few years.

Chapter 7 Conclusion and Areas for Further Research

7.1 Conclusion

A lot of models in the paper built on the basis of testing the impact of different variables or predictors on the decision of scrapping or of place to scrap give an important evaluation in the market scale of the SBI in next three years, but also draw an extraordinary conclusion on the connections between the scrapping decision and the flag, weight, age, place to build, owner ship, and type of ship, freight rate, and scrap price. Overall, the impacts of those uncertainties on the SBI should be answered respectively.

- What is the impact of EU ship recycling regulation on the SBI in southern Asia?

Unfortunately, due to the inaccuracy caused by the relatively small sample size of scrap ships and time pressure on finishing the thesis, the validation process does not improve as far as it can give us a very precise result on the number of scrap ships in southern Asian countries in next three years. Rather, it gives a principle of scrap decision and a rough image of the market size of the SBI in next three years. For the basic scenario which is more suitable to the market trend in next three years, the 2216 ships, including 974 laid-off vessels will be scrapped, within those ships, 1033 ships will be scrapped in the southern Asian countries. More importantly, only 6.4% of the 1033 ships are an EU flag vessel, in other words, the EU demolition regulation won't bring too much effect on the South Asian countries in terms of a small fraction of scrap ships having an EU flag and reflagging the ship by the most EU ship owners to avoid the EU regulation.

- What is the impact of unexpected freight rate on the SBI in southern Asia?

As we have mentioned before, the ship demolition decision and place to scrap had significantly leverage on different variables- different types of ship, flag, ship owner, and ship builder. Moreover, the decision of ship scrapping is also associated with ship's dead weight, age, and market freight rate level. The age of a ship does not have statistically significant for the place to scrap whereas the ship dead weight and market freight rate level has the relationship to the decision of where is the place to scrap. Particularly, two different scenarios have proven that ship owners hesitate to send the ship to scrap when there will be the substantial potential earnings for that ship. The high market freight rate would maximally decrease 42% of the ship demolition market in next three years. In essence, the ship resembles a real estate like a house or land by the ship owners who are rather paying the money for lading up the vessel until the market recovered, but do not want to earn money from scrapping the vessel that has diminished the future value of the ship.

- What is the impact of the new tax regime on the SBI in southern Asia?

Lifting up the taxation on the SBI in the southern Asian countries has been called off because no scrap ship sent to the southern Asian countries after scrap price dropped severely with the response of the new tax regime. Therefore, a negotiation between the representative of the SBI and governments has postponed the effectiveness of implementation date to alleviate its negative effect. However, the existing tax rate on the SBI is too much lower for both Pakistan and Bangladesh compared with the SBI's tax regime in India. Thus, it has the reason believes that new tax regime is about come into effect in near future. Our model indicates that the scrap price has its significance to determine to scrap the ship in southern Asian countries but it does not have many impacts as the freight rate does. Ghosh et al. has concluded same result that *potential earnings are more important in the decision than the scrapping price* in their book- Nature, economy, and society (2015). Inevitably, the new tax regime will bring some panic sentiment in the short term, but the scrapping market will not change much in the long term as the mechanism of the SBI will adjust the variations.

The future outlook for the SBI shows the results from the linear regression, a lot of ships (11274) should be scrapped and 15219 of ships are expected to be scrapped in next three years according to the space of ship demolition the world fleet has right now. The distribution of further demolition market shows in table 21, the 11274 assured scrap ships in the next three years will contribute total 65548652 tons of dead weight tonnage. The general cargo ship accounts for the largest portion of the demolition market in next three years, then followed by the Ro-Ro passenger ship and small tanker; by contrast, only one LNG ship is predicted to be scrapped in next three years.

Row Labels	The Number of	Sum of Dwt	Average of Built
AHTS	56	83840	1977.714286
Bulker Capesize Over 90,001	87	13829181	1990.954023
Bulker Handymax 40,001-60,000	161	3026446	1984.714286
Bulker Handysize 10,001-40,000	256	1033945	1976.375
Bulker Panamax 60,001-90,000	126	6559810	1990
Containership Feeder (100-3000 TEU)	92	2903295	1988.369565
Containership Intermediate (3k-6k TEU)	246	1706576	1991.353659
Containership Intermediate (6k-8k TEU)	33	1447637	1990.606061
Gcargo	4114	6992899	1968.825474
Gcargo Small Bulkcarrier	61	533988	1972.704918
L.N.G.	1	11836	1972
L.P.G.	104	731556	1980.519231
Multipurpose	158	1241369	1982.398734
Offshore	124	351056	1966.064516
Other Specialised Tankers	12	97170	1975.25
Panamax (55,000-85,000)	12	344174	1989.333333
PSV	27	20182	1967.592593
Pure Car Carrier	264	12626278	1977.825758
Reefer	698	3406379	1974.91404
Rescue & Salvage Vessels	54	28246	1968.537037
Ro-Ro Freight	273	839265	1974.564103
RORO Passenger	1944	575145	1965.540123
Small Tanker (5-10K dwt)	142	818625	1975.232394
Survey Units	352	135995	1971.457386
Tanker Aframax (85,000-125,000)	11	1031966	1994.454545
Tanker Handysize (10,000- 55,000)	105	2106108	1982.52381
Tanker Small (<5K dwt)	1754	2373137	1971.030787
Tanker Suezmax (125,000-300,000)	7	692548	1987.142857
Grand Total	**11274**	**65548652**	**1971.533617**

Table 21: The scrapping market in next three years

It is apparent from the table that those ships which should be scrapped in the next three years are not being fully scrapped if the scrap rates do not rapidly rise. Moreover, the worldwide scrap yards do not have insufficient capacity to demolish such amount of ships. To be worse, the number of aged ships will steadily growth in the next few years and peak at 2025 where a complicated situation that the high freight rate and large demand prevent the ship owners from scrapping the ship, but relative uneconomic fleet allocation with high maintained cost regarding the older age of fleet reduce the margin of the shipping company, makes the scrapping decision more hard.

- What is the economic contribution of the SBI on the Southern Asian countries?

The results of the economic contribution of the SBI are mainly explained in a qualitative way. Given the theoretical framework of economic contribution in chapter 3, the main economic predictors such as a number of workers, the tax rate, and the business revenue have been verified that the SBI has given a distinctive contribution to the southern Asian countries' economy in terms of those predictors.

In addition, the other industries which act with consideration of satisfying the needs of the SBI or of having the need of the scraps described as the outcome of the scrapping process are commonly recognized by the relevant industries of the SBI. They participate in the economic cycle of the SBI providing the sustainable economic contribution to the southern Asia countries only if the market shares of SBI in the Southern Asia maintain a high percentage.

Thus, the southern Asian governments give a high priority to the SBI in regard to its significant economic contribution. According to our result that the ship breaking market will prosper in the following years, the India, Bangladesh, and Pakistan in sum up having the largest market share of the SBI by in favour of those ship owners should be the largest beneficial countries on the economic aspect, on the other hand, the environment of those countries will be challenged and the regulations and environmental protection organization still need to against the substantial pollution from the SBI. As long as the policymakers understand the economic contribution of the SBI, they know how to implement the regulation regarding adjusting the pollution method of scrapping the ships and adopt a new tax policy on the SBI to increase the government revenue.

Furthermore, the detailed tax rate and average employee revenue for each southern Asian country were given to conduct a further quantitative measurement which is more visible rather than qualitative measurement of the economic impact of the SBI on the Southern Asian countries. Although lots of efforts have been made by writing this thesis, there are still some limitations on this thesis.

7.2 Limitations

The data is critical to come out the accurate result. The obstacle in writing this thesis is finding the data regarding the scrap ship, for instance, the number of scrap ships in the past ten years, the number of accidents on those ships, and other variables of a ship which may help the ship owner to decide to send the ship for scrapping. In addition, the direct and indirect economic impact in terms of government and business revenues and the jobs for the relevant industries of the SBI have not been concluded in the result due to the lack of credible data. Nevertheless, it should be comprised as the result of economic contribution.

Secondly, the economic contribution of the SBI in the southern Asia depends on the number of ships scrapped in the southern Asia, in other words, the economic contribution replies on the market size of the SBI which is the part of our result. However, we did not build the connection between the potential market size of the SBI and economic contribution of the SBI on account of incomplete and unsophisticated economic model and inaccessible data source.

7.3 Areas for further research

In the further research, the more specific indirect, direct, and induced economic impact on the SBI, steel industry, agriculture, utilities, construction, manufacture, wholesale and retail, transportation, and technology support will need to analyze. Moreover, inspired by the analysis results of prior researchers, the economic contribution of the SBI normally overlooks the intangible impact- the socioeconomic cost that trade off between economic benefit and cost of human risk and environmental loss also needs to be stressed when appraising the economic benefit of SBI. With the pressure of EU legislation and of public opinion, the scrapping yards suffer the economic costs in favour of a cleaner environment when paying some money for preventing the pollution from the scrapping process. Despite the ship breaking yards pay some money for the certain types of equipment in accordance with the fitness of requirement by HK Conventions or EU regulatory law, the economic loss has only been found in the cost of buying the equipment by the scrapping yards, not from the governments which are traditionally responsible for protecting the environment and workers spend a lot of money on recovery of the environmental damage caused by the SBI. Moreover, the government funds spent on bailing the scrapping yards out in the interests of constructing the proper working place, asbestos removal facilities, and waste storage and systems to manage hazardous wastes should also be taken into consideration as the economic loss for the economic contribution of the SBI.

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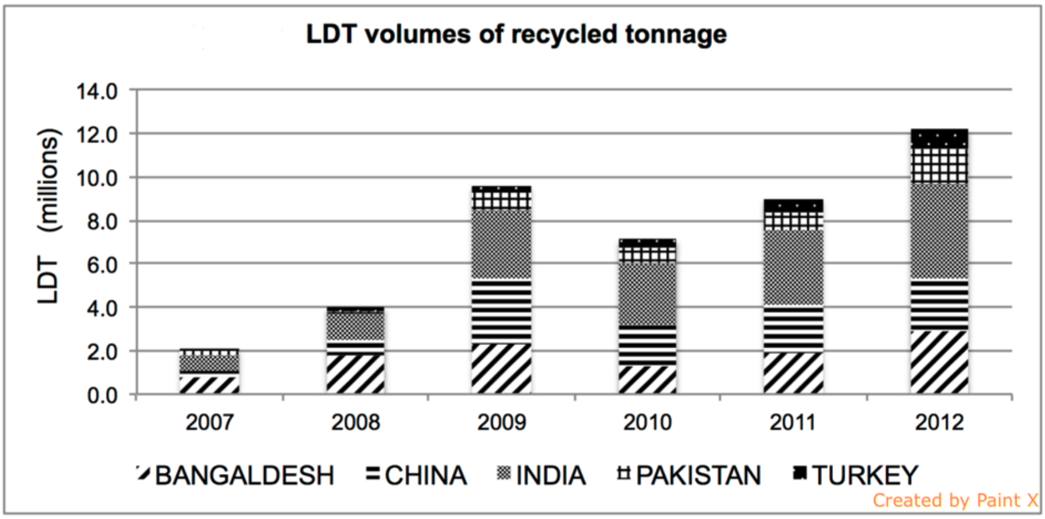
Appendices

Appendix1: The average scrapping age of redundant vessels in 2016 (*NGO Shipbreaking Platform* 2016).

	Average of BUIL	Average of AGE
Barge	1982	34
Dredger	1964	52
Fishing	1982	34
Livesstock	1964	52
Livestock	1987	29
Maintainance	1983	33
Pontoon	1951	65
Reefer	1986.625	29.375
Research	1983.333333	32.6666667
Supply	1980.333333	35.6666667
Support	1983.666667	32.3333333
Tanker	1985	30.3333333
Trawler	1975.5	40.5
Tug	1979.666667	36.3333333
Tug/Icebreaker	1982	34
Tug/Supply	1979.857143	36.1428571
Yacht	2008	8
GeneralCargo	1980.893617	35.0638298
CombinedChemicalAndOilTanker	1986.555556	29.4444444
BulkCarrierWithContainerCapacity	1985.75	30.25
ProductTanker	1990.142857	25.8571429
BulkCarrier	1992.596685	23.3839779
DivingSupport	1977.5	38.5
GeneralCargoWithContainerCapacity	1985.691176	30.2941176
FullyCellularContainership	1996.766467	19.2335329
LiquidNaturalGasCarrier	1978	38
TrailingSuctionHopperDredger	1969	47
DrillShip	1977.25	38.75
BulkOreCarrier	1991.888889	24.1111111
PassengerRo/Ro	1981.9	33.9
Wood-ChipCarrier	1992	24
HopperDredger	1975	41
CombinedBulkAndOilCarrier	1994	22
LiquefiedPetroleumGasCarrier	1984.625	31.375
DrillPlatform	1983.5	32.5
AnchorHandlingTug/Supply	1982	34
RollOnRollOff	1989	27
VehicleCarrier	1987.190476	28.8095238
LiquidPetroleumGasCarrier	1986.6	29.4
CrudeOilTanker	1991.25	24.75
StandbySafetyVessel	1980.5	35.5
Research/SupplyShip	1974	42
FloatingStorageTanker	1989	27
FloatingProductionTanker	1980	36
RollOnRollOffWithContainerCapacity	1984	32
PipeLayer	1977	39
Semi-SubPontoon	1975	41
BlukCarrier	1986	30
CraneShip	1978	38
ChemicalTanker	1986	30
BulkCementCarrier	1977.333333	38.3333333
SeismographicResearch	1986	30
GenearlCargo	1986	30
FishFactory	1971	45
AnchorHandlingFireFightingTug/Supp	1989	27
NavalAuxiliaryTanker	1976	40
SludgeCarrier	1977	39
OffshoreSafety	1972.5	43.5
Grand Total	1990.139211	25.8433875

Appendix 2 (Mikelis, 2013).



Appendix 3: The definition of different types of ships (Clarksons 2016).

1. Tankers
Crude oil and product carriers over 5,000 deadweight tonnes; all other tankers and combination carriers are included over 10,000 metric tonnes.

2. Bulkcarriers
Includes single deck dry cargo vessels in excess of 10,000 deadweight tonnes.

3. Container
These are ships designed to carry cellular cargo with a cellular capacity greater than 100.

3a. Multi-Purpose General Cargo
A Multi-Purpose Vessel is defined as a Non-Cellular container capable vessel (excluding Barge Carriers and Conbulkers) meeting the following criteria:-

- Any vessel built 1970 onwards with a total TEU capacity of 500 or above; or
- Any vessel built 1970 onwards with a TEU capacity of 100 or above and a Deadweight to TEU ratio of 45 or less.
- Non-Cellular means the ship is not equipped with fixed cell guides for containers in all the cargo holds. There may be partial coverage and/or portable guides, or none.

3b. Ro-Ro
These are ships intended for wheeled or tracked cargo, such as trucks, unaccompanied trailers, and forest products on bogies. The cargo is driven to and from the ship via a ramp. The deck area is usually covered. Passenger capacity does not exceed 50. Vessels over 1,000 deadweight tonnes.

3c. General Cargo
General Cargo Tramp & Liner vessels, Barge carriers, Heavy Lift cargo vessels and Livestock carriers all above 5,000 deadweight tonnes.

4. Gas
LNG Carrier, LPG Carrier, Ethylene Carrier or a combination of these with a capacity greater than 100 cubic metres.

5. Chemical Tankers
This covers chemical parcel tankers and chemical bulk tankers, defined as follows: Parcel tankers are defined as tankers where over 75% of the tanks are segregated with an average tank size less than 3,000 cbm and / or stainless steel tanks. Chemical bulk tankers are vessels with a lower level of segregations to tanks (below 75%) and an average tank size below 3,000 cbm and not stainless. In addition this category also includes all other tankers below 30,000 dwt with IMO grade 2.

5a. Specialised Tankers
Specialised tankers designed to carry liquid bulk cargoes other than oil or chemicals, e.g. fruit juice carriers & wine.

6. Reefer
Refrigerated Carrier, Reefer Fish Carrier & Reefer/Pallets Carrier above 10,000 cubic feet refrigerated capacity.

Descriptive Statistics

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Dwt	2768	20	322941	112760434	40737.15	48429.038
Built	2780	1941	2013	5526699	1988.02	8.900
Freight rate	2780	.2581825172	4.235818507	1875.324927	.6745773119	.3781915036
Ldt	1536	346	66128	17111310	11140.18	7169.493
US$/Ldt	877	87.00	856.00	289079.75	329.6234	80.41960
Age	2780	1	75	76458	27.50	8.816
Type_Multipurpose	2780	0	1	171	.06	.240
Type_Other Specialised Tankers	2780	0	1	2	.00	.027
Type_AHTS	2780	0	1	97	.03	.184
Type_Bulker Handysize 10,001-40,000	2780	0	1	401	.14	.351
Type_Bulker Handymax 40,001-60,000	2780	0	1	248	.09	.285
Type_Bulker Panamax 60,001-90,000	2780	0	1	264	.09	.293
Type_Bulker Capesize Over 90,001	2780	0	1	205	.07	.261
Type_Tanker Small (< 5K dwt)	2780	0	1	36	.01	.113
Tanker > Small Tanker (5-10K dwt)	2780	0	1	12	.00	.066
Type_Tanker Handysize (10,000- 55,000)	2780	0	1	92	.03	.179
Type_Panamax (55,000-85,000)	2780	0	1	19	.01	.082
Type_Tanker Aframax (85,000-125,000)	2780	0	1	27	.01	.098
Type_Tanker Suezmax (125,000-300,000)	2780	0	1	14	.01	.071
Type_Containership Feeder (100-3000 TEU)	2780	0	1	248	.09	.285
Type_Containership Intermediate (3k-6k TEU)	2780	0	1	167	.06	.238
Type_Containership Intermediate (6k-8k TEU)	2780	0	1	13	.00	.068
Type_GCargo	2780	0	1	256	.09	.289
Type_Gcargo Small Bulkcarrier	2780	0	1	14	.01	.071
Type_L.N.G.	2780	0	1	8	.00	.054
Type_L.P.G.	2780	0	1	66	.02	.152
Type_Offshore	2780	0	1	76	.03	.163
Type_Ultility Support	2780	0	1	37	.01	.115
Type_Pure Car Carrier	2780	0	1	59	.02	.144
Type_Reefer	2780	0	1	33	.01	.108
Type_Rescue & Salvage Vessels	2780	0	1	78	.03	.165
Type_Ro-Ro Freight	2780	0	1	23	.01	.091
Type_RORO Passenger	2780	0	1	72	.03	.159
Type_Survey Units	2780	0	1	34	.01	.110
Flag_Panama	2780	0	1	522	.19	.391
Flag_Liberia	2780	0	1	265	.10	.294
Flag_China	2780	0	1	249	.09	.286
Flag_Hong Kong	2780	0	1	106	.04	.192
Flag_Marshall Islands	2780	0	1	87	.03	.174
Flag_Korea (South)	2780	0	1	75	.03	.162
Flag_India	2780	0	1	68	.02	.155
Flag_Indonesia	2780	0	1	65	.02	.151
Flag_Malta	2780	0	1	65	.02	.151
Flag_Saint Kitts and Nevis	2780	0	1	50	.02	.133
Flag_Comoros	2780	0	1	46	.02	.128
Flag_Saint Vincent and The Grenadines	2780	0	1	46	.02	.128
Flag_Togo	2780	0	1	55	.02	.139
Flag_United Kingdom	2780	0	1	46	.02	.128
Flag_Vietnam	2780	0	1	39	.01	.118
Flag_Singapore	2780	0	1	53	.02	.137
Flag_Greece	2780	0	1	41	.01	.121
Flag_Bahamas	2780	0	1	63	.02	.149
Flag_Belize	2780	0	1	38	.01	.116
Flag_Thailand	2780	0	1	36	.01	.113
Flag_Cyprus	2780	0	1	36	.01	.113
Flag_Cambodia	2780	0	1	36	.01	.113
Flag_Russia	2780	0	1	39	.01	.118
Flag_Norway	2780	0	1	32	.01	.107
Flag_Sierra Leone	2780	0	1	34	.01	.110
Flag_Bangladesh	2780	0	1	25	.01	.094
Flag_Antigua & Barbuda	2780	0	1	29	.01	.102
Flag_Palau	2780	0	1	26	.01	.096
Flag_United States of America	2780	0	1	23	.01	.091
Flag_Turkey	2780	0	1	22	.01	.089
Flag_Germany	2780	0	1	20	.01	.085
Flag_Bermuda	2780	0	1	17	.01	.078
Flag_Italy	2780	0	1	16	.01	.076
Flag_Tuvalu	2780	0	1	14	.01	.071
Flag_Barbados	2780	0	1	14	.01	.071
Flag_Canada	2780	0	1	15	.01	.073
Flag_Vanuatu	2780	0	1	14	.01	.071
Flag_Brazil	2780	0	1	16	.01	.076
Flag_Moldova	2780	0	1	19	.01	.082
Flag_Denmark	2780	0	1	13	.00	.068
Flag_Tanzania	2780	0	1	30	.01	.103
Flag_Netherlands	2780	0	1	11	.00	.063
Flag_Cook Islands	2780	0	1	14	.01	.071
Flag_Mongolia	2780	0	1	11	.00	.063
Flag_Isle of Man	2780	0	1	9	.00	.057
Flag_Philippines	2780	0	1	10	.00	.060
Flag_Taiwan	2780	0	1	9	.00	.057
Flag_Japan	2780	0	1	9	.00	.057
Builder_EU	2780	0	1	504	.18	.385
Builder_Germany & Netherlands	2780	0	1	279	.10	.301
Builder_OCEANIA	2780	0	1	2	.00	.027
Builder_Northern America	2780	0	1	53	.02	.137
Builder_Asia	2780	0	1	138	.05	.217
Builder_South America	2780	0	1	27	.01	.098
Builder_Unknow	2780	0	1	91	.03	.178
Builder_Korea	2780	0	1	397	.14	.350
Builder_Japan	2780	0	1	994	.36	.479
Builder_China	2780	0	1	250	.09	.286
Builder_MIDDLE EAST	2780	0	0	0	.00	.000
Builder_African	2780	0	1	2	.00	.027
Builder_Russia	2780	0	1	43	.02	.123
North of American owner	2780	.0	1.0	104.0	.037	.1898
Europe owner	2780	0	1	795	.29	.452
Asia owner	2780	0	1	1136	.41	.492
South American owner	2780	0	1	30	.01	.103
Oceania owner	2780	0	1	8	.00	.054
Africa owner	2780	0	1	41	.01	.121
SSS	2780	0	1	577	.21	.406
Unknow	2780	0	0	0	.00	.000
Valid N (listwise)	826					

Appendix 4: The descriptive statistics for the scrap ship

Appendix 5: The descriptive statistics for world fleet

Descriptive Statistics

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Dwt	65842	0	499125	1585051272	24073.56	41520.098
Built	67816	1868	2017	135454236	1997.38	15.885
Age	67816	0	149	1330636	19.62	15.885
Type_Multipurpose	67816	0	1	3160	.05	.211
Type_Other Specialised Tankers	67816	0	1	354	.01	.072
Type_AHTS	67816	0	1	1455	.02	.145
Type_Bulker Handysize 10,001-40,000	67816	0	1	2878	.04	.202
Type_Bulker Handymax 40,001-60,000	67816	0	1	2775	.04	.198
Type_Bulker Panamax 60,001-90,000	67816	0	1	3238	.05	.213
Type_Bulker Capesize Over 90,001	67816	0	1	1677	.02	.155
Type_Tanker Small (< 5K dwt)	67816	0	1	5950	.09	.283
Tanker > Small Tanker (5-10K dwt)	67816	0	1	1819	.03	.162
Type_Tanker Handysize (10,000- 55,000)	67816	0	1	3815	.06	.230
Type_Panamax (55,000-85,000)	67816	0	1	446	.01	.081
Type_Tanker Aframax (85,000-125,000)	67816	0	1	1309	.02	.138
Type_Tanker Suezmax (125,000-300,000)	67816	0	1	538	.01	.089
Type_Containership Feeder (100-3000 TEU)	67816	0	1	2866	.04	.201
Type_Containership Intermediate (3k-6k TEU)	67816	0	1	1069	.02	.125
Type_Containership Intermediate (6k-8k TEU)	67816	0	1	272	.00	.063
Type_GCargo	67816	0	1	13718	.20	.402
Type_Gcargo Small Bulkcarrier	67816	0	1	1140	.02	.129
Type_L.N.G.	67816	0	1	465	.01	.083
Type_L.P.G.	67816	0	1	1420	.02	.143
Type_Offshore	67816	0	1	1491	.02	.147
Type_PSV	67816	0	1	1690	.02	.156
Type_Ultility Support	67816	0	0	0	.00	.000
Type_Pure Car Carrier	67816	0	1	714	.01	.102
Type_Reefer	67816	0	1	2850	.04	.201
Type_Rescue & Salvage Vessels	67816	0	1	353	.01	.072
Type_Ro-Ro Freight	67816	0	1	1303	.02	.137
Type_RORO Passenger	67816	0	1	7082	.10	.306
Type_Survey Units	67816	0	1	1969	.03	.168
Flag_Panama	67816	0	1	6922	.10	.303
Flag_Liberia	67816	0	1	3056	.05	.207
Flag_China	67816	0	1	3648	.05	.226
Flag_Hong Kong	67816	0	1	2301	.03	.181
Flag_Marshall Islands	67816	0	1	3204	.05	.212
Flag_Korea (South)	67816	0	0	0	.00	.000
Flag_India	67816	0	1	1106	.02	.127
Flag_Indonesia	67816	0	1	4048	.06	.237
Flag_Malta	67816	0	1	2033	.03	.171
Flag_Saint Kitts and Nevis	67816	0	0	0	.00	.000
Flag_Comoros	67816	0	0	0	.00	.000
Flag_Saint Vincent and The Grenadines	67816	0	1	513	.01	.087
Flag_Togo	67816	0	1	292	.00	.065
Flag_United Kingdom	67816	0	1	680	.01	.100
Flag_Vietnam	67816	0	1	1627	.02	.153
Flag_Singapore	67816	0	1	2735	.04	.197
Flag_Greece	67816	0	1	1169	.02	.130
Flag_Bahamas	67816	0	1	1363	.02	.140
Flag_Belize	67816	0	1	629	.01	.096
Flag_Thailand	67816	0	1	639	.01	.097
Flag_Cyprus	67816	0	1	923	.01	.116
Flag_Cambodia	67816	0	1	342	.01	.071
Flag_Russia	67816	0	1	1889	.03	.165
Flag_Norway	67816	0	1	1370	.02	.141
Flag_Sierra Leone	67816	0	1	419	.01	.078
Flag_Bangladesh	67816	0	1	286	.00	.065
Flag_Antigua & Barbuda	67816	0	1	877	.01	.113
Flag_Palau	67816	0	1	132	.00	.044
Flag_United States of America	67816	0	1	757	.01	.105
Flag_Turkey	67816	0	1	1008	.01	.121
Flag_Germany	67816	0	1	365	.01	.073
Flag_Bermuda	67816	0	1	155	.00	.048
Flag_Italy	67816	0	1	1018	.02	.122
Flag_Tuvalu	67816	0	1	168	.00	.050
Flag_Barbados	67816	0	1	111	.00	.040
Flag_Canada	67816	0	1	332	.00	.070
Flag_Vanuatu	67816	0	1	310	.00	.067
Flag_Brazil	67816	0	1	352	.01	.072
Flag_Moldova	67816	0	1	145	.00	.046
Flag_Denmark	67816	0	1	139	.00	.045
Flag_Tanzania	67816	0	1	267	.00	.063
Flag_Netherlands	67816	0	1	910	.01	.115
Flag_Cook Islands	67816	0	1	171	.00	.050
Flag_Mongolia	67816	0	1	222	.00	.057
Flag_Isle of Man	67816	0	1	382	.01	.075
Flag_Philippines	67816	0	1	1415	.02	.143
Flag_Taiwan	67816	0	1	212	.00	.056
Flag_Japan	67816	0	1	4109	.06	.239
Builder_EU	67816	0	1	9892	.15	.353
Builder_Germany & Netherlands	67816	0	1	5032	.07	.262
Builder_OCEANIA	67816	0	1	480	.01	.084
Builder_Northern America	67816	0	1	1408	.02	.143
Builder_Asia	67816	0	1	6790	.10	.300
Builder_South America	67816	0	1	412	.01	.078
Builder_Unknow	67816	0	1	5464	.08	.272
Builder_Korea	67816	0	1	6722	.10	.299
Builder_Japan	67816	0	1	17985	.27	.441
Builder_China	67816	0	1	12828	.19	.392
Builder_MIDDLE EAST	67816	0	1	525	.01	.088
Builder_African	67816	0	1	153	.00	.047
Builder_Russia	67816	0	1	1397	.02	.142
North of American owner	67816	0	1	3315	.05	.216
Europe owner	67816	0	1	18336	.27	.444
Asia owner	67816	0	1	25740	.38	.485
South American owner	67816	0	1	771	.01	.106
Oceania owner	67816	0	1	476	.01	.083
Africa owner	67816	0	1	905	.01	.115
SSS	67816	0	1	15855	.23	.423
Unknow	67816	0	1	9	.00	.012
Valid N (listwise)	65842					

Appendix 6: Results table for linear regression model

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	45.539	2.220		20.509	.000	41.185	49.893
	Dwt	-7.871E-6	.000	-.044	-1.337	.181	.000	.000
	Freight rate	.253	.489	.011	.517	.605	-.707	1.213
	Type_Multipurpose	-16.918	2.083	-.469	-8.124	.000	-21.002	-12.834
	Type_Other Specialised Tankers	-5.685	4.583	-.018	-1.240	.215	-14.671	3.302
	Type_AHTS	-10.971	2.121	-.231	-5.172	.000	-15.131	-6.812
	Type_Bulker Handysize 10,001-40,000	-14.552	2.070	-.589	-7.031	.000	-18.611	-10.494
	Type_Bulker Handymax 40,001-60,000	-18.824	2.096	-.619	-8.982	.000	-22.934	-14.715
	Type_Bulker Panamax 60,001-90,000	-19.423	2.117	-.656	-9.173	.000	-23.574	-15.271
	Type_Bulker Capesize Over 90,001	-19.224	2.299	-.579	-8.361	.000	-23.732	-14.715
	Type_Tanker Small (<5K dwt)	-11.027	2.255	-.144	-4.890	.000	-15.449	-6.606
	Tanker > Small Tanker (5-10K dwt)	-13.755	2.620	-.104	-5.249	.000	-18.893	-8.617
	Type_Tanker Handysize (10,000-55,000)	-17.378	2.127	-.358	-8.171	.000	-21.548	-13.207
	Type_Panamax (55,000-85,000)	-19.430	2.458	-.185	-7.905	.000	-24.249	-14.611
	Type_Tanker Aframax (85,000-125,000)	-19.329	2.387	-.219	-8.098	.000	-24.009	-14.649
	Type_Tanker Suezmax (125,000-300,000)	-18.520	2.816	-.151	-6.577	.000	-24.042	-12.998
	Type_Containership Feeder (100-3000 TEU)	-20.398	2.082	-.670	-9.799	.000	-24.480	-16.316

Type_Containership Intermediate (3k-6k TEU)	-23.920	2.129	-.655	-11.238	.000	-28.094	-19.746
Type_Containership Intermediate (6k-8k TEU)	-24.786	2.634	-.195	-9.409	.000	-29.951	-19.620
Type_GCargo	-10.700	2.072	-.357	-5.165	.000	-14.762	-6.638
Type_Gcargo Small Bulkcarrier	-6.790	2.557	-.055	-2.655	.008	-11.805	-1.776
Type_L.N.G.	-6.833	3.052	-.042	-2.239	.025	-12.817	-.848
Type_L.P.G.	-14.629	2.259	-.257	-6.475	.000	-19.059	-10.199
Type_Offshore	-4.213	2.158	-.079	-1.952	.051	-8.445	.019
Type_Ultility Support	-11.030	2.270	-.146	-4.859	.000	-15.482	-6.579
Type_Pure Car Carrier	-15.257	2.184	-.254	-6.986	.000	-19.540	-10.974
Type_Reefer	-13.682	2.275	-.171	-6.015	.000	-18.142	-9.221
Type_Rescue & Salvage Vessels	-6.689	2.155	-.121	-3.104	.002	-10.915	-2.463
Type_Ro-Ro Freight	-14.005	2.361	-.146	-5.932	.000	-18.635	-9.376
Type_RORO Passenger	-9.753	2.149	-.179	-4.538	.000	-13.967	-5.539
Type_Survey Units	-11.304	2.278	-.139	-4.963	.000	-15.770	-6.837
Flag_Panama	-1.926	.508	-.087	-3.793	.000	-2.921	-.930
Flag_Liberia	-4.255	.577	-.144	-7.376	.000	-5.386	-3.124
Flag_China	-1.375	.611	-.045	-2.252	.024	-2.573	-.178
Flag_Hong Kong	-5.852	.730	-.129	-8.021	.000	-7.282	-4.421
Flag_Marshall Islands	-5.479	.755	-.110	-7.260	.000	-6.959	-3.999
Flag_Korea (South)	-2.468	.823	-.046	-2.999	.003	-4.082	-.854
Flag_India	-1.644	.861	-.029	-1.910	.056	-3.332	.044
Flag_Indonesia	-.393	.840	-.007	-.468	.640	-2.040	1.254
Flag_Malta	-4.781	.834	-.083	-5.735	.000	-6.415	-3.146
Flag_Saint Kitts and Nevis	-1.673	.916	-.026	-1.826	.068	-3.470	.124
Flag_Comoros	-1.853	.944	-.027	-1.962	.050	-3.705	-.001
Flag_Saint Vincent and The Grenadines	-1.072	.949	-.016	-1.129	.259	-2.934	.790
Flag_Togo	.183	.885	.003	.206	.837	-1.554	1.919
Flag_United Kingdom	-4.617	1.016	-.066	-4.546	.000	-6.608	-2.625
Flag_Vietnam	-12.410	1.077	-.168	-11.521	.000	-14.522	-10.298

Flag_Singapore	-3.749	.904	-.059	-4.148	.000	-5.521	-1.977
Flag_Greece	-.137	1.005	-.002	-.137	.891	-2.107	1.833
Flag_Bahamas	-2.218	.854	-.038	-2.597	.009	-3.893	-.543
Flag_Belize	-1.398	1.020	-.019	-1.370	.171	-3.399	.603
Flag_Thailand	-3.784	1.081	-.049	-3.501	.000	-5.903	-1.665
Flag_Cyprus	-2.795	1.053	-.036	-2.655	.008	-4.860	-.731
Flag_Cambodia	2.599	1.055	.034	2.463	.014	.530	4.667
Flag_Russia	.644	1.055	.009	.610	.542	-1.426	2.713
Flag_Norway	1.371	1.132	.017	1.211	.226	-.849	3.592
Flag_Sierra Leone	.567	1.070	.007	.530	.596	-1.530	2.665
Flag_Bangladesh	1.106	1.232	.012	.897	.370	-1.311	3.522
Flag_Antigua & Barbuda	-8.164	1.170	-.096	-6.979	.000	-10.457	-5.870
Flag_Palau	-.818	1.194	-.009	-.685	.493	-3.158	1.523
Flag_United States of America	1.814	1.323	.019	1.371	.170	-.780	4.408
Flag_Turkey	-.577	1.291	-.006	-.447	.655	-3.109	1.955
Flag_Germany	-.634	1.361	-.006	-.466	.641	-3.303	2.034
Flag_Bermuda	-1.864	1.471	-.017	-1.267	.205	-4.748	1.020
Flag_Italy	-3.679	1.508	-.032	-2.439	.015	-6.636	-.721
Flag_Tuvalu	-2.840	1.608	-.023	-1.766	.077	-5.993	.313
Flag_Barbados	-4.331	1.608	-.035	-2.694	.007	-7.483	-1.179
Flag_Canada	4.141	1.603	.035	2.583	.010	.998	7.284
Flag_Vanuatu	-3.011	1.633	-.025	-1.844	.065	-6.212	.190
Flag_Brazil	-4.323	1.603	-.038	-2.697	.007	-7.467	-1.180
Flag_Moldova	2.568	1.386	.024	1.853	.064	-.149	5.285
Flag_Denmark	-3.463	1.640	-.027	-2.111	.035	-6.680	-.247
Flag_Tanzania	-.006	1.135	.000	-.005	.996	-2.232	2.220
Flag_Netherlands	-11.798	1.882	-.081	-6.268	.000	-15.490	-8.107
Flag_Cook Islands	-1.187	1.608	-.010	-.738	.460	-4.340	1.966
Flag_Mongolia	-.907	1.774	-.007	-.512	.609	-4.385	2.570
Flag_Isle of Man	-5.762	1.960	-.038	-2.940	.003	-9.605	-1.919
Flag_Philippines	-2.181	1.859	-.015	-1.173	.241	-5.825	1.464
Flag_Taiwan	-2.961	1.976	-.019	-1.498	.134	-6.836	.915
Flag_Japan	-6.797	1.965	-.045	-3.459	.001	-10.650	-2.943
Builder_EU	.014	.354	.001	.039	.969	-.681	.709

Builder_Germany & Netherlands	2.807	.440	.097	6.373	.000	1.943	3.670
Builder_OCEANIA	-.045	4.202	.000	-.011	.992	-8.284	8.195
Builder_Northern America	2.630	.959	.041	2.741	.006	.749	4.511
Builder_Asia	-3.122	.572	-.078	-5.459	.000	-4.243	-2.001
Builder_South America	.340	1.195	.004	.285	.776	-2.003	2.684
Builder_Unknow	1.488	.675	.030	2.206	.027	.166	2.811
Builder_Korea	-1.505	.382	-.061	-3.942	.000	-2.254	-.756
Builder_China	-5.781	.431	-.190	-13.416	.000	-6.626	-4.936
Builder_African	-.131	4.102	.000	-.032	.975	-8.174	7.912
Builder_Russia	.370	.981	.005	.377	.706	-1.553	2.293
North of American owner	.870	.891	.019	.977	.329	-.877	2.617
Europe owner	.405	.677	.021	.598	.550	-.922	1.732
Asia owner	.349	.675	.020	.518	.605	-.974	1.673
South American owner	3.236	1.258	.039	2.573	.010	.770	5.702
Oceania owner	.611	2.253	.004	.271	.786	-3.808	5.029
Africa owner	2.577	1.116	.036	2.310	.021	.389	4.764
SSS	1.582	.678	.074	2.335	.020	.253	2.911

a. Dependent Variable: Age

Appendix 7: Results table for validation process (basic scenario)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	Dwt	.000	.000	46.056	1	.000	1.000	1.000	1.000
	Built	-.092	.002	1910.578	1	.000	.912	.909	.916
	Freightrate	-3.874	.282	188.935	1	.000	.021	.012	.036
	Type_Multipurpose(1)	-4.194	.423	98.144	1	.000	.015	.007	.035
	Type_OtherSpecialisedTankers(1)	-1.667	.841	3.932	1	.047	.189	.036	.981
	Type_AHTS(1)	-4.455	.430	107.340	1	.000	.012	.005	.027
	Type_BulkerHandysize1000140000(1)	-3.955	.428	85.252	1	.000	.019	.008	.044
	Type_BulkerHandymax4000160000(1)	-3.708	.431	74.032	1	.000	.025	.011	.057
	Type_BulkerPanamax6000190000(1)	-3.464	.432	64.328	1	.000	.031	.013	.073
	Type_BulkerCapesizeOver90001(1)	-3.531	.441	64.060	1	.000	.029	.012	.070
	Type_TankerSmalllt5Kdwt(1)	-.380	.457	.692	1	.405	.684	.279	1.674
	TankergtSmallTanker510Kdwt(1)	-1.972	.507	15.123	1	.000	.139	.052	.376
	Type_TankerHandysize1000055000(1)	-3.482	.429	65.846	1	.000	.031	.013	.071
	Type_Panamax5500085000(1)	-4.064	.484	70.416	1	.000	.017	.007	.044
	Type_TankerAframax85000125000(1)	-3.127	.470	44.339	1	.000	.044	.017	.110
	Type_TankerSuezmax125000300000(1)	-2.962	.517	32.765	1	.000	.052	.019	.143
	Type_ContainershipFeeder1003000TEU(1)	-3.345	.433	59.699	1	.000	.035	.015	.082
	Type_ContainershipIntermediate3k6kTEU(1)	-3.925	.436	80.854	1	.000	.020	.008	.046
	Type_ContainershipIntermediate6k8kTEU(1)	-2.436	.517	22.177	1	.000	.088	.032	.241
	Type_GCargo(1)	-1.415	.421	11.299	1	.001	.243	.107	.554
	Type_GcargoSmallBulkcarrier(1)	-1.804	.509	12.569	1	.000	.165	.061	.446
	Type_L.N.G(1)	-9.017	.704	163.888	1	.000	.000	.000	.000
	Type_L.P.G(1)	-8.440	.573	217.275	1	.000	.000	.000	.001
	Type_Offshore(1)	-4.012	.443	81.947	1	.000	.018	.008	.043
	Type_UltilitySupport(1)	-27.454	5922.717	.000	1	.996	.000	.000	.
	Type_PureCarCarrier(1)	-3.758	.439	73.393	1	.000	.023	.010	.055
	Type_Reefer(1)	-1.711	.452	14.309	1	.000	.181	.075	.439
	Type_RescueampSalvageVessels(1)	-4.332	.447	93.749	1	.000	.013	.005	.032
	Type_RoRoFreight(1)	-2.219	.467	22.548	1	.000	.109	.044	.272
	Type_ROROPassenger(1)	-.425	.441	.930	1	.335	.653	.275	1.552
	Type_SurveyUnits(1)	-2.266	.445	25.961	1	.000	.104	.043	.248
	Flag_Panama(1)	-1.599	.104	235.457	1	.000	.202	.165	.248
	Flag_Liberia(1)	-1.769	.119	222.704	1	.000	.171	.135	.215
	Flag_China(1)	-2.185	.124	312.196	1	.000	.112	.088	.143
	Flag_HongKong(1)	-1.500	.143	109.700	1	.000	.223	.168	.295
	Flag_MarshallIslands(1)	-1.011	.150	45.582	1	.000	.364	.271	.488
	Flag_KoreaSouth(1)	-26.038	3918.877	.000	1	.995	.000	.000	.
	Flag_India(1)	-1.944	.184	111.726	1	.000	.143	.100	.205
	Flag_Indonesia(1)	-.572	.163	12.367	1	.000	.565	.411	.776
	Flag_Malta(1)	-1.085	.164	43.997	1	.000	.338	.245	.466
	Flag_SaintKittsandNevis(1)	-26.460	4687.652	.000	1	.995	.000	.000	.
	Flag_Comoros(1)	-26.378	4557.519	.000	1	.995	.000	.000	.
	Flag_SaintVincentandTheGrenadines(1)	-1.577	.196	64.620	1	.000	.207	.141	.303
	Flag_Togo(1)	-2.781	.193	207.245	1	.000	.062	.042	.090
	Flag_UnitedKingdom(1)	-1.551	.211	53.812	1	.000	.212	.140	.321
	Flag_Vietnam(1)	-1.898	.213	79.316	1	.000	.150	.099	.228
	Flag_Singapore(1)	-.853	.173	24.203	1	.000	.426	.303	.599
	Flag_Greece(1)	-1.173	.200	34.489	1	.000	.310	.209	.458
	Flag_Bahamas(1)	-1.354	.170	63.484	1	.000	.258	.185	.360
	Flag_Belize(1)	-1.598	.215	55.031	1	.000	.202	.133	.309
	Flag_Thailand(1)	-2.196	.219	100.516	1	.000	.111	.072	.171
	Flag_Cyprus(1)	-1.122	.202	30.960	1	.000	.326	.219	.484
	Flag_Cambodia(1)	-2.924	.225	168.619	1	.000	.054	.035	.084
	Flag_Russia(1)	-.248	.211	1.379	1	.240	.780	.516	1.181
	Flag_Norway(1)	.362	.261	1.924	1	.165	1.436	.861	2.393
	Flag_SierraLeone(1)	-1.922	.226	72.110	1	.000	.146	.094	.228
	Flag_Bangladesh(1)	-2.072	.266	60.809	1	.000	.126	.075	.212
	Flag_AntiguaampBarbuda(1)	-1.204	.222	29.332	1	.000	.300	.194	.464
	Flag_Palau(1)	-2.138	.268	63.616	1	.000	.118	.070	.199
	Flag_UnitedStatesofAmerica(1)	-2.469	.308	64.143	1	.000	.085	.046	.155
	Flag_Turkey(1)	-.085	.280	.093	1	.761	.918	.530	1.591
	Flag_Germany(1)	-.717	.306	5.481	1	.019	.488	.268	.890
	Flag_Bermuda(1)	-2.203	.331	44.283	1	.000	.110	.058	.211
	Flag_Italy(1)	-.481	.293	2.691	1	.101	.618	.348	1.098
	Flag_Tuvalu(1)	-2.033	.330	38.023	1	.000	.131	.069	.250
	Flag_Barbados(1)	-2.489	.330	56.943	1	.000	.083	.043	.158
	Flag_Canada(1)	-1.163	.324	12.928	1	.000	.312	.166	.589
	Flag_Vanuatu(1)	-.889	.373	5.693	1	.017	.411	.198	.853
	Flag_Brazil(1)	-1.198	.344	12.156	1	.000	.302	.154	.592
	Flag_Moldova(1)	-2.038	.286	50.724	1	.000	.130	.074	.228
	Flag_Denmark(1)	-1.821	.389	21.927	1	.000	.162	.076	.347
	Flag_Tanzania(1)	-2.037	.245	69.074	1	.000	.130	.081	.211
	Flag_Netherlands(1)	.278	.364	.582	1	.446	1.320	.647	2.696
	Flag_CookIslands(1)	-1.469	.318	21.353	1	.000	.230	.123	.429
	Flag_Mongolia(1)	-1.792	.387	21.390	1	.000	.167	.078	.356
	Flag_IsleofMan(1)	-.806	.369	4.774	1	.029	.447	.217	.920
	Flag_Philippines(1)	.144	.340	.180	1	.671	1.155	.593	2.251
	Flag_Taiwan(1)	-1.297	.373	12.089	1	.001	.273	.132	.568
	Flag_Japan(1)	-.040	.354	.013	1	.911	.961	.480	1.925
	Builder_EU(1)	-1.599	.146	120.299	1	.000	.202	.152	.269
	Builder_GermanyampNetherlands(1)	-1.096	.154	50.938	1	.000	.334	.247	.452
	Builder_OCEANIA(1)	-.035	1.050	.001	1	.974	.966	.123	7.567
	Builder_NorthernAmerica(1)	-.025	.234	.012	1	.914	.975	.617	1.542
	Builder_Asia(1)	-.975	.174	31.384	1	.000	.377	.268	.530
	Builder_SouthAmerica(1)	-2.066	.311	44.164	1	.000	.127	.069	.233
	Builder_Korea(1)	-1.499	.160	88.291	1	.000	.223	.163	.305
	Builder_Japan(1)	-1.359	.149	83.675	1	.000	.257	.192	.344
	Builder_China(1)	-.359	.163	4.815	1	.028	.699	.507	.962
	Builder_MIDDLEEAST(1)	15.110	1481.506	.000	1	.992	3648763.902	.000	.
	Builder_African(1)	-1.165	.752	2.399	1	.121	.312	.071	1.363
	Builder_Russia(1)	-1.292	.239	29.160	1	.000	.275	.172	.439
	NorthofAmericanowner(1)	-.145	.196	.551	1	.458	.865	.589	1.269
	Europeowner(1)	-.606	.157	14.883	1	.000	.545	.401	.742
	Asiaowner(1)	-.397	.156	6.504	1	.011	.672	.495	.912
	SouthAmericanowner(1)	-.226	.279	.660	1	.416	.797	.462	1.377
	Oceaniaowner(1)	-.249	.406	.375	1	.540	.780	.352	1.729
	Africaowner(1)	-.337	.239	1.988	1	.159	.714	.447	1.140
	SSS(1)	-.209	.153	1.862	1	.172	.812	.602	1.095
	Constant	433.728	9766.014	.002	1	.965	2.321E+188		

a. Variables in the Equation

Appendix 8: Results table for place validation (basic scenario)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	Dwt	.000	.000	7.104	1	.008	1.000	1.000	1.000
	Age	.011	.010	1.228	1	.268	1.011	.992	1.030
	Freightrate	-.399	.231	2.999	1	.083	.671	.427	1.054
	Type_Multipurpose(1)	-3.800	1.341	8.035	1	.005	.022	.002	.310
	Type_OtherSpecialisedTankers(1)	-1.119	2.539	.194	1	.660	.327	.002	47.370
	Type_AHTS(1)	-2.559	1.341	3.642	1	.056	.077	.006	1.072
	Type_BulkerHandysize1000140000(1)	-4.111	1.339	9.427	1	.002	.016	.001	.226
	Type_BulkerHandymax4000160000(1)	-3.409	1.355	6.332	1	.012	.033	.002	.471
	Type_BulkerPanamax6000190000(1)	-3.774	1.374	7.543	1	.006	.023	.002	.339
	Type_BulkerCapesizeOver90001(1)	-3.949	1.491	7.010	1	.008	.019	.001	.359
	Type_TankerSmalllt5Kdwt(1)	-2.555	1.387	3.394	1	.065	.078	.005	1.177
	TankergtSmallTanker510Kdwt(1)	-1.324	1.621	.667	1	.414	.266	.011	6.386
	Type_TankerHandysize1000055000(1)	-4.214	1.369	9.481	1	.002	.015	.001	.216
	Type_Panamax5500085000(1)	-3.841	1.541	6.214	1	.013	.021	.001	.440
	Type_TankerAframax85000125000(1)	-2.614	1.472	3.154	1	.076	.073	.004	1.311
	Type_TankerSuezmax125000300000(1)	-2.219	1.675	1.754	1	.185	.109	.004	2.899
	Type_ContainershipFeeder1003000TEU(1)	-4.168	1.354	9.481	1	.002	.015	.001	.220
	Type_ContainershipIntermediate3k6kTEU(1)	-4.938	1.401	12.427	1	.000	.007	.000	.112
	Type_ContainershipIntermediate6k8kTEU(1)	-22.345	10779.172	.000	1	.998	.000	.000	.
	Type_GCargo(1)	-1.770	1.330	1.770	1	.183	.170	.013	2.311
	Type_GcargoSmallBulkcarrier(1)	-.985	1.466	.451	1	.502	.374	.021	6.613
	Type_L.N.G(1)	-1.469	1.783	.679	1	.410	.230	.007	7.581
	Type_L.P.G(1)	-4.128	1.393	8.788	1	.003	.016	.001	.247
	Type_Offshore(1)	-2.639	1.345	3.850	1	.050	.071	.005	.997
	Type_UltilitySupport(1)	-1.933	1.413	1.872	1	.171	.145	.009	2.307
	Type_PureCarCarrier(1)	-2.666	1.358	3.854	1	.050	.070	.005	.996
	Type_Reefer(1)	-3.186	1.390	5.255	1	.022	.041	.003	.630
	Type_RescueampSalvageVessels(1)	-.846	1.362	.386	1	.534	.429	.030	6.191
	Type_RoRoFreight(1)	-2.870	1.409	4.150	1	.042	.057	.004	.897
	Type_ROROPassenger(1)	-2.256	1.347	2.806	1	.094	.105	.007	1.467
	Type_SurveyUnits(1)	-.740	1.451	.260	1	.610	.477	.028	8.201
	Flag_Panama(1)	-.599	.226	7.019	1	.008	.549	.353	.856
	Flag_Liberia(1)	-1.430	.318	20.190	1	.000	.239	.128	.447
	Flag_China(1)	3.888	.380	104.821	1	.000	48.806	23.187	102.732
	Flag_HongKong(1)	1.194	.312	14.695	1	.000	3.302	1.793	6.081
	Flag_MarshallIslands(1)	-1.142	.402	8.061	1	.005	.319	.145	.702
	Flag_KoreaSouth(1)	-.881	.414	4.528	1	.033	.414	.184	.933
	Flag_India(1)	-4.095	.632	42.017	1	.000	.017	.005	.057
	Flag_Indonesia(1)	-.965	.374	6.677	1	.010	.381	.183	.792
	Flag_Malta(1)	-1.388	.455	9.293	1	.002	.250	.102	.609
	Flag_SaintKittsandNevis(1)	-2.057	.513	16.085	1	.000	.128	.047	.349
	Flag_Comoros(1)	-1.818	.604	9.073	1	.003	.162	.050	.530
	Flag_SaintVincentandTheGrenadines(1)	-1.325	.462	8.236	1	.004	.266	.108	.657
	Flag_Togo(1)	-.544	.378	2.070	1	.150	.580	.276	1.218
	Flag_UnitedKingdom(1)	.057	.487	.014	1	.907	1.059	.408	2.750
	Flag_Vietnam(1)	1.702	.694	6.014	1	.014	5.485	1.407	21.379
	Flag_Singapore(1)	.030	.410	.005	1	.942	1.031	.462	2.300
	Flag_Greece(1)	.394	.455	.748	1	.387	1.483	.607	3.618
	Flag_Bahamas(1)	-.916	.409	5.011	1	.025	.400	.179	.892
	Flag_Belize(1)	-1.397	.502	7.732	1	.005	.247	.092	.662
	Flag_Thailand(1)	-21.263	6324.736	.000	1	.997	.000	.000	.
	Flag_Cyprus(1)	-.513	.510	1.013	1	.314	.599	.220	1.626
	Flag_Cambodia(1)	-.522	.456	1.315	1	.252	.593	.243	1.449
	Flag_Russia(1)	-.175	.462	.143	1	.705	.840	.340	2.076
	Flag_Norway(1)	1.432	.496	8.347	1	.004	4.186	1.585	11.057
	Flag_SierraLeone(1)	-.489	.479	1.042	1	.307	.613	.240	1.569
	Flag_Bangladesh(1)	-21.048	7590.427	.000	1	.998	.000	.000	.
	Flag_AntiguaampBarbuda(1)	-.427	.568	.565	1	.452	.652	.214	1.986
	Flag_Palau(1)	-2.607	1.090	5.720	1	.017	.074	.009	.625
	Flag_UnitedStatesofAmerica(1)	.048	.673	.005	1	.943	1.049	.281	3.923
	Flag_Turkey(1)	1.662	.725	5.260	1	.022	5.269	1.273	21.803
	Flag_Germany(1)	-.260	.750	.120	1	.729	.771	.177	3.354
	Flag_Bermuda(1)	1.654	.629	6.910	1	.009	5.230	1.523	17.957
	Flag_Italy(1)	.413	.631	.428	1	.513	1.511	.439	5.208
	Flag_Tuvalu(1)	-2.417	1.195	4.093	1	.043	.089	.009	.927
	Flag_Barbados(1)	-.652	.766	.723	1	.395	.521	.116	2.340
	Flag_Canada(1)	3.059	1.132	7.299	1	.007	21.307	2.316	196.023
	Flag_Vanuatu(1)	-.141	.818	.030	1	.863	.869	.175	4.315
	Flag_Brazil(1)	-.716	.706	1.027	1	.311	.489	.122	1.951
	Flag_Moldova(1)	.366	.611	.357	1	.550	1.441	.435	4.777
	Flag_Denmark(1)	3.515	1.171	9.008	1	.003	33.608	3.385	333.635
	Flag_Tanzania(1)	-1.948	.495	15.457	1	.000	.143	.054	.376
	Flag_Netherlands(1)	1.382	.917	2.274	1	.132	3.983	.661	24.013
	Flag_CookIslands(1)	-.487	.811	.360	1	.548	.614	.125	3.014
	Flag_Mongolia(1)	-.076	.737	.011	1	.918	.927	.219	3.932
	Flag_IsleofMan(1)	-19.484	12630.753	.000	1	.999	.000	.000	.
	Flag_Philippines(1)	-2.291	1.113	4.237	1	.040	.101	.011	.896
	Flag_Taiwan(1)	-.501	1.113	.203	1	.653	.606	.068	5.372
	Flag_Japan(1)	2.948	1.188	6.157	1	.013	19.067	1.858	195.687
	Builder_EU(1)	-1.757	.488	12.969	1	.000	.173	.066	.449
	Builder_GermanyampNetherlands(1)	-1.404	.500	7.900	1	.005	.246	.092	.654
	Builder_OCEANIA(1)	-20.130	27368.233	.000	1	.999	.000	.000	.
	Builder_NorthernAmerica(1)	-.740	.691	1.146	1	.284	.477	.123	1.849
	Builder_Asia(1)	-1.896	.559	11.488	1	.001	.150	.050	.450
	Builder_SouthAmerica(1)	-1.294	.746	3.007	1	.083	.274	.064	1.184
	Builder_Unknow(1)	-1.240	.564	4.831	1	.028	.289	.096	.874
	Builder_Korea(1)	-2.015	.525	14.756	1	.000	.133	.048	.373
	Builder_Japan(1)	-2.107	.496	18.040	1	.000	.122	.046	.322
	Builder_China(1)	-1.278	.534	5.725	1	.017	.278	.098	.794
	Builder_African(1)	-21.447	28165.591	.000	1	.999	.000	.000	.
	NorthofAmericanowner(1)	1.810	.464	15.184	1	.000	6.110	2.458	15.184
	Europeowner(1)	.931	.385	5.857	1	.016	2.538	1.194	5.395
	Asiaowner(1)	1.305	.385	11.467	1	.001	3.687	1.732	7.845
	SouthAmericanowner(1)	1.600	.605	6.989	1	.008	4.952	1.512	16.211
	Oceaniaowner(1)	-1.300	.988	1.732	1	.188	.273	.039	1.890
	Africaowner(1)	1.526	.552	7.644	1	.006	4.600	1.559	13.568
	SSS(1)	.969	.383	6.413	1	.011	2.636	1.245	5.580
	Constant	211.709	43768.783	.000	1	.996	8.795E+91		

a. Variable in the Equation

Appendix 9: Results table for tax effect (basic scenario)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	95% C.I.for EXP(B) Upper
Step 1[a]	Dwt	.000	.000	.014	1	.907	1.000	1.000	1.000
	Built	.001	.058	.000	1	.993	1.001	.893	1.121
	Freight rate	-4.909	1.819	7.284	1	.007	.007	.000	.261
	US$/Ldt	.024	.006	15.479	1	.000	1.024	1.012	1.036
	Type_Multipurpose(1)	-30.597	42291.130	.000	1	.999	.000	.000	.
	Type_Bulker Handysize 10,001-40,000(1)	4.068	41553.341	.000	1	1.000	58.435	.000	.
	Type_Bulker Handymax 40,001-60,000(1)	4.621	41553.341	.000	1	1.000	101.563	.000	.
	Type_Bulker Panamax 60,001-90,000(1)	3.969	41553.341	.000	1	1.000	52.947	.000	.
	Type_Bulker Capesize Over 90,001(1)	2.211	41553.341	.000	1	1.000	9.125	.000	.
	Type_Tanker Small (< 5K dwt)(1)	5.429	41553.341	.000	1	1.000	228.002	.000	.
	Type_Tanker Handysize (10,000- 55,000)(1)	3.541	41553.341	.000	1	1.000	34.496	.000	.
	Type_Panamax (55,000-85,000)(1)	3.240	41553.341	.000	1	1.000	25.540	.000	.
	Type_Tanker Aframax (85,000-125,000)(1)	7.353	41553.341	.000	1	1.000	1560.880	.000	.
	Type_Tanker Suezmax (125,000-300,000)(1)	6.915	41553.341	.000	1	1.000	1007.037	.000	.
	Type_Containership Feeder (100-3000 TEU) (1)	4.142	41553.341	.000	1	1.000	62.904	.000	.
	Type_Containership Intermediate (3k-6k TEU) (1)	-13.840	41680.411	.000	1	1.000	.000	.000	.
	Type_Containership Intermediate (6k-8k TEU) (1)	-12.650	43268.409	.000	1	1.000	.000	.000	.
	Type_GCargo(1)	-34.830	43013.233	.000	1	.999	.000	.000	.
	Type_Gcargo Small Bulkcarrier(1)	-13.140	57811.501	.000	1	1.000	.000	.000	.
	Type_L.N.G.(1)	-1.285	41553.341	.000	1	1.000	.277	.000	.
	Type_L.P.G.(1)	-9.756	41553.341	.000	1	1.000	.000	.000	.
	Type_Offshore(1)	7.263	41553.341	.000	1	1.000	1426.092	.000	.
	Type_Pure Car Carrier(1)	4.691	41553.341	.000	1	1.000	108.924	.000	.
	Type_Reefer(1)	-28.234	43305.899	.000	1	.999	.000	.000	.
	Type_RORO Passenger (1)	3.038	41553.341	.000	1	1.000	20.865	.000	.
	Flag_Panama(1)	.360	1.111	.105	1	.746	1.433	.162	12.643
	Flag_Liberia(1)	-1.549	1.156	1.795	1	.180	.213	.022	2.048
	Flag_China(1)	2.351	1.538	2.335	1	.127	10.494	.515	214.033
	Flag_Hong Kong(1)	1.268	1.611	.619	1	.431	3.553	.151	83.541
	Flag_Marshall Islands(1)	-17.578	5073.173	.000	1	.997	.000	.000	.
	Flag_Korea (South)(1)	-.549	1.835	.089	1	.765	.578	.016	21.090
	Flag_India(1)	.950	1.682	.319	1	.572	2.585	.096	69.855
	Flag_Indonesia(1)	-20.459	7080.604	.000	1	.998	.000	.000	.
	Flag_Malta(1)	-.293	1.527	.037	1	.848	.746	.037	14.872
	Flag_Saint Kitts and Nevis(1)	.524	2.269	.053	1	.817	1.689	.020	144.362
	Flag_Comoros(1)	-17.948	9091.622	.000	1	.998	.000	.000	.
	Flag_Saint Vincent and The Grenadines(1)	-17.021	7321.664	.000	1	.998	.000	.000	.
	Flag_Togo(1)	-16.128	13570.811	.000	1	.999	.000	.000	.
	Flag_United Kingdom(1)	-19.817	15271.039	.000	1	.999	.000	.000	.
	Flag_Vietnam(1)	-18.880	40191.550	.000	1	1.000	.000	.000	.
	Flag_Singapore(1)	-18.269	6422.244	.000	1	.998	.000	.000	.
	Flag_Greece(1)	.274	1.709	.026	1	.872	1.316	.046	37.451
	Flag_Bahamas(1)	-2.934	2.610	1.264	1	.261	.053	.000	8.856
	Flag_Belize(1)	-18.051	8664.246	.000	1	.998	.000	.000	.
	Flag_Thailand(1)	-18.312	10913.617	.000	1	.999	.000	.000	.
	Flag_Cyprus(1)	-18.365	7785.969	.000	1	.998	.000	.000	.
	Flag_Cambodia(1)	-13.275	23087.966	.000	1	1.000	.000	.000	.
	Flag_Russia(1)	20.462	5575.763	.000	1	.997	770004836.0	.000	.
	Flag_Norway(1)	.174	1.722	.010	1	.920	1.190	.041	34.773
	Flag_Sierra Leone(1)	-22.185	24420.609	.000	1	.999	.000	.000	.
	Flag_Bangladesh(1)	-13.396	40192.761	.000	1	1.000	.000	.000	.
	Flag_Antigua & Barbuda(1)	2.343	1.597	2.153	1	.142	10.415	.455	238.244
	Flag_Palau(1)	-20.237	12875.155	.000	1	.999	.000	.000	.
	Flag_United States of America(1)	-16.992	15115.542	.000	1	.999	.000	.000	.
	Flag_Turkey(1)	-17.167	28368.480	.000	1	1.000	.000	.000	.
	Flag_Germany(1)	-17.634	9233.537	.000	1	.998	.000	.000	.
	Flag_Bermuda(1)	2.679	1.663	2.597	1	.107	14.575	.560	379.182
	Flag_Italy(1)	6.095	3.023	4.065	1	.044	443.544	1.185	166042.785
	Flag_Tuvalu(1)	-18.647	12892.916	.000	1	.999	.000	.000	.
	Flag_Barbados(1)	-13.772	19015.207	.000	1	.999	.000	.000	.
	Flag_Canada(1)	.450	40323.449	.000	1	1.000	1.568	.000	.
	Flag_Vanuatu(1)	-13.225	18178.267	.000	1	.999	.000	.000	.
	Flag_Brazil(1)	.676	2.324	.085	1	.771	1.966	.021	186.994
	Flag_Moldova(1)	24.035	7927.719	.000	1	.998	2.744E+10	.000	.
	Flag_Tanzania(1)	-17.246	22544.921	.000	1	.999	.000	.000	.
	Flag_Netherlands(1)	-4.193	40191.954	.000	1	1.000	.015	.000	.
	Flag_Cook Islands(1)	-17.443	18625.589	.000	1	.999	.000	.000	.
	Flag_Mongolia(1)	-13.135	27584.873	.000	1	1.000	.000	.000	.
	Flag_Isle of Man(1)	-15.794	11120.666	.000	1	.999	.000	.000	.
	Flag_Philippines(1)	22.099	41700.551	.000	1	1.000	3958200170	.000	.
	Flag_Taiwan(1)	-.356	1.872	.036	1	.849	.701	.018	27.471
	Builder_EU(1)	-41.650	43722.825	.000	1	.999	.000	.000	.
	Builder_Germany & Netherlands(1)	-38.599	43722.825	.000	1	.999	.000	.000	.
	Builder_Northern America(1)	-40.180	61285.574	.000	1	.999	.000	.000	.
	Builder_Asia(1)	-35.885	43722.825	.000	1	.999	.000	.000	.
	Builder_South America(1)	-37.590	43722.825	.000	1	.999	.000	.000	.
	Builder_Unknow(1)	-56.478	44961.126	.000	1	.999	.000	.000	.
	Builder_Korea(1)	-38.331	43722.825	.000	1	.999	.000	.000	.
	Builder_Japan(1)	-37.727	43722.825	.000	1	.999	.000	.000	.
	Builder_China(1)	-36.111	43722.825	.000	1	.999	.000	.000	.
	Builder_African(1)	-18.533	58866.839	.000	1	1.000	.000	.000	.
	North of American owner (1)	19.736	9779.076	.000	1	.998	372764652.2	.000	.
	Europe owner(1)	19.352	9779.075	.000	1	.998	253819394.8	.000	.
	Asia owner(1)	18.063	9779.075	.000	1	.999	69949277.05	.000	.
	South American owner(1)	19.191	9779.076	.000	1	.998	215946411.3	.000	.
	Oceania owner(1)	21.566	43322.615	.000	1	1.000	2323105985	.000	.
	Africa owner(1)	22.748	9779.076	.000	1	.998	7570469598	.000	.
	SSS(1)	17.450	9779.075	.000	1	.999	37870324.75	.000	.
	Constant	665.397	937004.489	.000	1	.999	9.508E+288		

a. Variable(s) entered on step 1: Dwt, Built, Freight rate, US$/Ldt, Type_Multipurpose, Type_Bulker Handysize 10,001-40,000, Type_Bulker Handymax 40,001-60,000, Type_Bulker Panamax 60,001-90,000, Type_Bulker Capesize Over 90,001, Type_Tanker Small (<5K dwt), Type_Tanker Handysize (10,000- 55,000), Type_Panamax (55,000-85,000), Type_Tanker Aframax (85,000-125,000), Type_Tanker Suezmax (125,000-300,000), Type_Containership Feeder (100-3000 TEU), Type_Containership Intermediate (3k-6k TEU), Type_Containership Intermediate (6k-8k TEU), Type_GCargo, Type_Gcargo Small Bulkcarrier, Type_L.N.G., Type_L.P.G., Type_Offshore, Type_Pure Car Carrier, Type_Reefer, Type_RORO Passenger, Flag_Panama, Flag_Liberia, Flag_China, Flag_Hong Kong, Flag_Marshall Islands, Flag_Korea (South), Flag_India, Flag_Indonesia, Flag_Malta, Flag_Saint Kitts and Nevis, Flag_Comoros, Flag_Saint Vincent and The Grenadines, Flag_Togo, Flag_United Kingdom, Flag_Vietnam, Flag_Singapore, Flag_Greece, Flag_Bahamas, Flag_Belize, Flag_Thailand, Flag_Cyprus, Flag_Cambodia, Flag_Russia, Flag_Norway, Flag_Sierra Leone, Flag_Bangladesh, Flag_Antigua & Barbuda, Flag_Palau, Flag_United States of America, Flag_Turkey, Flag_Germany, Flag_Bermuda, Flag_Italy, Flag_Tuvalu, Flag_Barbados, Flag_Canada, Flag_Vanuatu, Flag_Brazil, Flag_Moldova, Flag_Tanzania, Flag_Netherlands, Flag_Cook Islands, Flag_Mongolia, Flag_Isle of Man, Flag_Philippines, Flag_Taiwan, Builder_EU, Builder_Germany & Netherlands, Builder_Northern America, Builder_Asia, Builder_South America, Builder_Unknow, Builder_Korea, Builder_Japan, Builder_China, Builder_African, North of American owner, Europe owner, Asia owner, South American owner, Oceania owner, Africa owner, SSS.