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Does quality pay? The case of the dry bulk market

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Abstract

Following important changes in the safety regulation of tankers, the dry bulk sector is coming under the spotlight in a safety and quality perspective. Nominal freight differentiation between 'quality' and 'other' tonnage has been observed occasionally and much lip service has been paid to promoting the need for younger and safer ships. Whether or not these signals actually manifest in a *market* initiative for the enhancement of the standards of the world bulk carrier fleet is debatable. This paper investigates the possible existence of a two-tier spot freight market for medium and large bulk carriers of differing age. Known voyage fixtures are investigated for four representative years since the end of the 1980s, during which contrasting freight market conditions prevailed. In all but very few cases, there was no statistically significant difference between rates paid to older and younger tonnage. In those few cases where such differences were statistically significant, they never exceeded 10%.

Keywords: Shipping economics; Dry-bulk markets; Two-tier freight markets

1. Introduction

Environmental disasters and increasing safety awareness have intensified pressures on the shipping sector to improve the quality and reliability of vessels. Developments in environmental legislation have exercised pressure primarily on the tanker sector. Casualties in the dry bulk sector tend to attract less media attention, nonetheless the dry bulk sector is gradually finding itself under the spotlight in a safety/quality perspective. Some of the most notable casualties in the last two decades have involved large bulk carriers of the Capesize class, a size range often targeted as an accident-prone segment of the dry bulk fleet due to the deterioration of its quality (Timmerman

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and McConville, 1996). However, despite the increasing focus of regulatory bodies on marine safety and quality issues there has been no systematic analysis of whether higher returns for quality tonnage exist in order to sustain a *market* initiative for the enhancement of the standards of the world bulk carrier fleet. The aim of this paper is to test the hypothesis of the existence of a two-tier voyage freight market in two dry bulk segments: Panamax and Capesize.

Section 2 offers a summary overview of the role of quality in shipping, especially in relation to the way quality may be reflected in spot freight markets. Section 3 looks at the methodology and data chosen for the statistical comparisons and the problems that may arise from the way the term 'quality' is defined. Section 4 discusses the results from the statistical comparisons and their interpretation, and section 5 draws conclusions and suggests areas for further research.

2. Quality and the bulk markets in the 1990s

Safety in the bulk markets is of growing importance. Starting from the rather hastily implemented and extensively contested US Oil Pollution Act (OPA 90), environmental legislation gained momentum through new regulations on construction designs and standards for new and existing tankers. The cost implications of the new requirements are estimated on an average at an extra 15% for construction costs alone. Combined with the prevailing relative scarcity of new tanker units, [1] the intensifying focus on quality and more stringent port state controls, the consequent cost increase would be expected to prompt the emergence of a two-tier market in tankers. However, an effort to measure the impact of such measures on the main tanker segment, that of crude oil carriers, produced mixed results (Tamvakis, 1995). Whatever freight rate premia were found seemed more related to the willingness of the ship owners to assume the risk of unlimited pollution liability for US-bound voyages than to the charterers' desire to seek modern, more reliable, units. A year after the publication of these results INTERTANKO was venting the owner's concerns about the poor-to-negative returns over 1994–1996 of modern units facing high capital repayments compared to significantly better returns for older units; tanker owners were also expressing their concerns about the implied lack of strong rate differentiation between new and old tankers (INTERTANKO, 1996).

The first wave of new safety and pollution regulations concluded for tankers in the mid 1990s with the introduction of Certificates of Financial Responsibility (COFRs) for trading in the US. Soon after, and a little before the expected date for the coming into force of the International Safety Management Code of the IMO in mid-1998 (affecting the operation of both dry and liquid bulk shipping) the focus shifted to the dry bulk market. The larger segments of this market had long been candidates for such attention with a number of dramatic losses, some at such speed that they remained mysteries pointing to catastrophic structural failure. Despite the improvement in accident rates since the end of the 1980s (INTERCARGO, 1996) the perception, especially of old large units, of dry bulk carriers as accidents waiting to happen has been reinforced. In 1997, the IMO passed for the first time retroactive legislation on dry bulk carriers with a view to improve their safety standards, adding a new Chapter XII to the SOLAS convention. The structural

[1] At the time almost 50% of the tanker fleet was over 15 yr old (*data*: OECD, 1991).

modifications required by the amendment, following similar standards introduced by the main classification societies in late 1996, add to the enhanced special surveys introduced in 1993. [2]

With the quality concept having definitely won over regulators and classification societies, it is of critical importance to ascertain whether or not the market itself has showed any willingness to remunerate quality tonnage through higher freight rates. If the assessment was to be based on market reports of nominal differences only, the quality concept would seem to have already been embraced by the market. In the rising markets of late 1994, differences between Capesize trip charter rates per day (pd) for modern and older units in the 15–20 year age bracket, were reported to have exceeded $3,000 for a rate range of $20–25,000 pd (Drewry, 1995).

However, the emergence of a two-tier market cannot be established automatically on the basis of sporadic observations alone. When turning to other market information besides freight rates, to confirm the trend, the picture that emerges is more confusing than it is elucidating. On the one hand, there have been consistent and continuous protests of dry bulk owners that the quality of tonnage remains largely unredeemed by market rates. On the other, prime bulk charterers have been adopting stringent criteria of tonnage selection often resulting in confrontations with brokers unwilling to assume what the latter regarded as bureaucratic tasks. The fact that the main short-term dry bulk charter indices are still not differentiated by age seems to suggest that whatever the trend currently emerging, if any, it is still forming and its momentum and extent depend on a number of pressures both inside and outside the freight markets.

3. Methodology and data

In a market characterised by considerable volatility [3] (see Fig. 1), the first issue to arise was the possible change of behaviour by charterers under different market conditions; thus fixtures from years representative of more than one state of the freight markets are used. The period considered is 10 years following the 1987 final recovery of dry bulk shipping from its worst recession in 30 years. The fixtures selected are those for the years 1989 and 1995 and for the years 1992 and 1996, the two sets of years representing peak and trough market conditions, respectively, for both the dry bulk segments under investigation. Fig. 2 shows the age composition of the fleet appearing in the sample used, while Fig. 3 shows that the age composition of our sample approximates the age composition of the world dry bulk carrier fleet. Although the evolution of freight rates in the Panamax and the Capesize bulk markets is not identical, our correlation coefficient of representative Panamax and Capesize time-charter rates over 1988–1996 was 0.94, while for voyage rates the coefficient was 0.86. When rates for larger vessels are used as representative of the Capesize market, both coefficients decrease, but not drastically. [4]

Two databases have been created for a statistical analysis of the Panamax and the Capesize dry bulk markets. The first includes details of all the individual voyage fixtures recorded for the

[2] Interestingly, however, enhanced surveys had in the case of some accidents preceded total vessel loss only by a year or so.

[3] For a recent formal detailed analysis of dry bulk market volatility, see Kavussanos (1996) and Kavussanos (1997).

[4] It has to be noted in this context that correlation coefficients for the routes included in both the SSY Capesize indices – Atlantic and Pacific – are high by any standard (Glen and Rogers, 1997), so rates for different routes covered by fixtures in the selected years were deemed to follow similar cyclical paths.

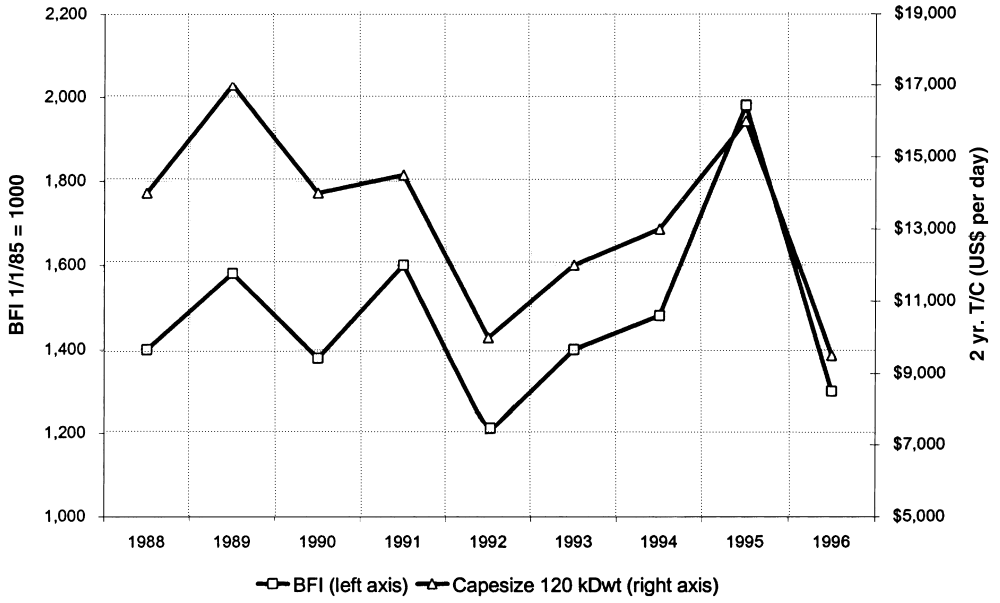

Fig. 1. Dry bulk freight market: 1988–1996. (*Source*: OECD, Maritime Transport, various dates for 1989–1995; calculated on the basis of daily BFI data published in Drewry Monthly, various dates for 1996. For T/C rates: Clarkson Research, Shipping Intelligence Weekly)

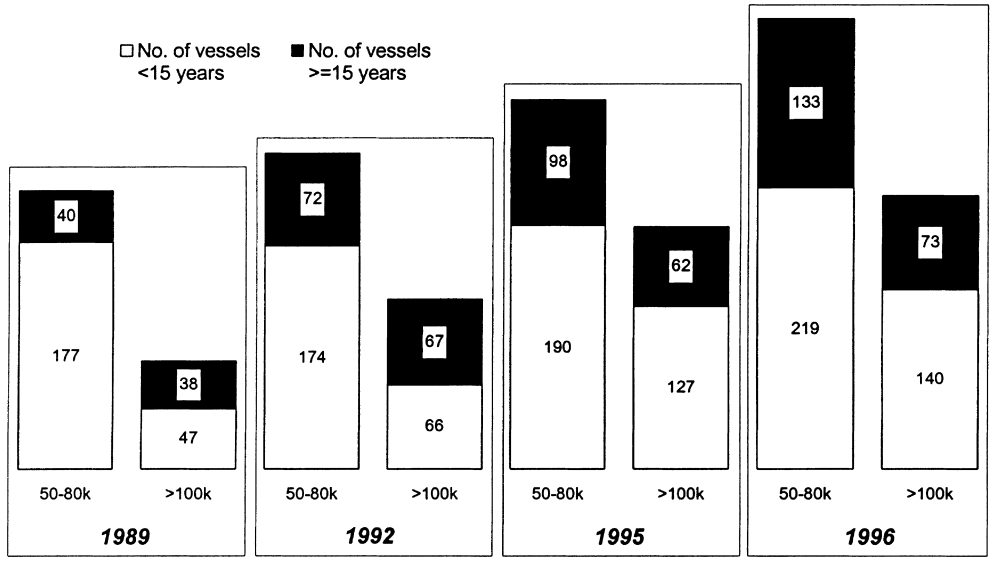

Fig. 2. Age composition of fleet appearing in voyage fixture samples. (*Source*: authors' databanks)

aforementioned markets, as published monthly by Drewry in the market report section of Shipping Statistics and Economics. The fixture data include name of the vessel, cargo, charterer, freight/ton in US$ and route (loading/discharging ports) for all the four years for which statistical tests are performed. This has resulted in the inclusion and processing of a total of approximately

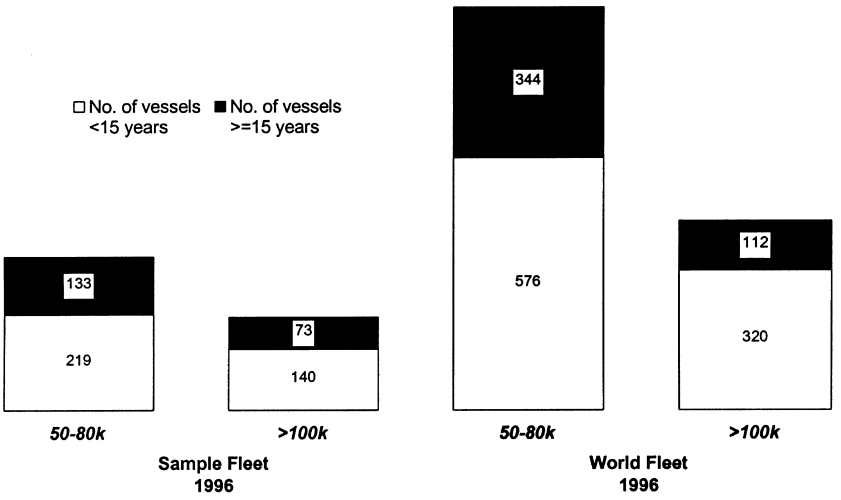

Fig. 3. Age composition of sample and world dry bulk carrier fleet 1996. (*Source*: SSY and authors' databanks)

4000 fixtures. The second database includes vessel details from the Lloyd's Register of Shipping databank including present and former names of vessels, dead-weight tonnage, flag, owning company and classification society. [5] The construction and combination of the two databases created some methodological problems.

The first major problem is the selection of a working definition of "quality" tonnage. There are at least three angles from which this problem may be viewed, namely the owner's, the charterer's and the academic's. The number of vessel characteristics that can be implicated is substantial. In order to defend older tonnage, owners will always argue that maintenance and management are the most critical factors. On the demand side, whenever there is a conscious effort to secure quality tonnage, age seems to be mentioned first by charterers. Market reports of fixtures relating the age of the vessel with prevailing rates or the individual rate achieved are self-revealing of the importance of this vessel characteristic.

In a number of interviews with large brokers and in-house brokers of dry bulk carrier tonnage conducted by the authors in 1997, age is rated from "quite significant" to "extremely significant" among the criteria used by charterers when evaluating vessel quality, classification society rating as the second most important. The significance of characteristics such as the flag or management is reported to be less prominent. Crew characteristics emerge as either entirely or almost entirely insignificant and are reported to be rarely included in charterer questionnaires that brokers and owners often complete in the context of negotiated fixtures. From an academic point of view, standard references for marine accident investigation (e.g., Giziakis, 1982) continue to point at the high correlation of age and accident rates in all incident categories where vessel quality can be directly involved. In view of the above, age plays the most prominent role in our analysis. However, we also include flag as an additional variable that could be regarded as a proxy for quality. [6]

[5] An indication of the vessels covered in our database of fixtures, in comparison to the total dry bulk fleet, is given in Fig. 1, for 1996.

[6] Flag was the next best available proxy in the absence of any data on vessel classification.

An additional issue related to age is the choice of the right cut-off point for distinguishing between 'young' and 'old' tonnage. Evidence from market practitioners [7] and academic research [8] pointed to the use of 15 years [9] as the cut-off point. [10] Reinforcing this choice was the fact that in recent years the average age of dry bulk vessels lost at sea dropped below 15 only once, in 1995, when it was down to 14 years (data: Clarkson Research Studies, 1998).

The second data problem is with relation to vessel sizes and types of fixtures to be included in the regressions. The focus on the Panamax and Capesize markets was decided well before the design of the databases: recent reports (The Baltic, 1996) on – at least nominal – freight differentiation for short-term charters in these two dry bulk markets prompted the research. Voyage rates seem the most adequate basis for comparisons between old and modern unit earnings; they proved to be the appropriate choice for researching into tanker freight rates (Tamvakis, 1995) [11]. Using time-charter rates is perhaps easier, yet it can give rise to complications as details for a large part of deals of this type are not reported or are only partially reported. This is especially true in the upper segment of the Capesize sector, where large volumes of tonnage are under cargo guarantees. [12] Selecting trip charters would have been the other alternative; the large number of trip fixtures would have provided adequate numbers of observations for the 1990s. However, information regarding fixtures of this type becomes scarcer in earlier years, especially for larger bulk carriers, and creates further problems for the validity of the statistical tests due to the lack of an adequate number of observations.

A third data problem is matching the observed fixtures with the actual vessels (and their specifications) on the Lloyd's database. Through a process of removing duplicate entries and unusable fixtures, approximately 10% of the observations initially obtained are eliminated.

[7] On the choice of 15 yrs as the cut-off point, a quote from Lloyd's List's Michael Gray (20/5/99) lends further support: "Speaking at the BIMCO general meeting ISM Code workshop in Lisbon, Richard Schiferli, secretary-general of the Paris memorandum on Port-State control, said that the first six months' experience of the situation after the ISM code came into effect last July indicated that younger ships revealed significantly fewer non-conformities than vessels of more than 15 yr in age.

[8] See, for example, Strandenes (1999).

[9] For the statistical analysis in this paper, we used both 10 and 15 yr as the switching point for age. Results for 15 yr are reported only. Results using 10 yr were insignificant, do not change any conclusions and are available on request.

[10] It would be interesting, however, to explore the opinion expressed by some of the brokers interviewed that, due to the awareness of the shorter life-expectancy of modern tonnage built after 1980 with a significant percentage of high tensile steel (Timmerman and McConville, 1996), one of the markets investigated is actually further segmented. According to this view, the Capesize market, dealing with high density cargoes which put additional pressure on the vessel's structure, had eventually broken into "three-tiers" comprising of (i) newbuildings up to 6 yr old (ii) vessels between 6–15 yr of age and (iii) overage vessels more than 15 yr.

[11] In the case of tankers, potential problems arising from the way fixtures are reported can be overcome by using voyage rates, Worldscale providing a suitable basis for identifying eventual rate differentials between the two age segments of the tanker fleet. Unlike tankers, however, the dry bulk carrier market does not possess such a convenient tool for inter-market voyage comparisons as Worldscale, and thus the amount of comparison allowed between sub-markets is more limited.

[12] In 1993, near the middle of the period over which this research spans, out of a total of 123 dry bulk vessels over 150,000 dwt, more than one third of them, i.e., 42 vessels, were falling into this category on the basis of *known* guarantees only (Thanopoulou and Theotokas, 1997).

Table 1
Average vessel size in the original samples (in tonnes Dwt)

	Panamax (<15 yr)	Panamax (⩾15 yr)	Capesize (<15 yr)	Capesize (⩾15 yr)
1989	64,724	65,911	140,385	124,384
1992	65,512	66,354	139,675	124,769
1995	66,696	63,831	147,547	123,761
1996	67,875	63,637	152,134	125,565

A fourth data problem may arise from changes of the average size of vessels in recent years. This problem is significant in the Capesize class (see Table 1), despite removing combined carriers from the databases. As a result all regressions for Capesize vessels were run on more tightly defined samples: 120–170,000 Dwt for 1989; 130–170,000 Dwt for 1992 and 1995; and 130–150,000 Dwt for 1996.

A final and equally important problem is that of choosing a sound statistical methodology to establish whether or not different freight rates are indeed paid to younger and older vessels. We discussed earlier that age is an appropriate proxy for quality of tonnage. There may, however, exist additional parameters which it would be unwise to omit from the analysis. [13] One such factor is flag, which may also affect the charterers' opinion of the quality of the vessel, especially since a number of flags have been associated with sub-standard tonnage.

Multiple regressions are run for each individual year in this study (1989, 1992, 1995 and 1996), both for Panamax and Capesize vessels. The vessel's age was used as a dummy variable, with '1' assigned to vessels over 15 years and '0' otherwise. The flag was also represented by a dummy variable which takes the value of '1' for flags of convenience [14] and '0' otherwise.

4. Results and interpretation

All multiple regression results are summarised in Tables 2 and 3, for both Panamax and Capesize vessels. Common to all regressions are the very low values for adjusted R^2, which is not unusual for large data sets with a lot of unexplained variation in the freight rates. Looking closer at the coefficients [15] of the dummy variables we observe the following:

- For Panamax vessels (Table 2), the age coefficients are significant for two of the four years (1995 and 1996), while all flag coefficients are insignificant. In addition, the age dummy consistently has the right sign (negative) for all years, whereas the flag dummy has the right sign (negative) twice (1992 and 1996) and the wrong sign otherwise. Deadweight coefficients are significant for three of the four years and all have a negative sign, implying that smaller cargo sizes receive higher rates per ton freight. The result is consistent with the existence of economies of scale in bulk shipping. In addition, consignments closer to the lower end of the range tend to

[13] The authors acknowledge the comments made by the editor and anonymous referees on this point.

[14] Flags of convenience (as classified in OECD's Review of Maritime Transport) are: Antigua and Barbuda, Bahamas, Bermuda, Cayman Islands, Cyprus, Gibraltar, Honduras, Lebanon, Liberia, Malta, Mauritius, Oman, Panama, Saint Vincent and Vanuatu.

[15] All regressions are performed at the 95% level of significance.

Table 2
Multiple regression results for Panamax freight rates (size range: 50–80 kDwt)[a]

Year	Intercept	Dwt	Age[b]	Flag (dummy)	Sample size	Adjusted R^2
1989	34.81	−0.0002	−0.69	0.19	299	0.037
	(*4.79*)	(*−3.58*)	(*−0.71*)	(*0.23*)		
1992	29.73	−0.0002	−1.32	−0.58	345	0.023
	(*5.90*)	(*−2.72*)	(*−1.50*)	(*−0.70*)		
1995	35.14	−0.0002	−2.35	0.72	393	0.007
	(*5.30*)	(*−1.70*)	(*−2.06*)	(*0.70*)		
1996	30.00	−0.0002	−2.09	−0.56	505	0.023
	(*6.46*)	(*−2.61*)	(*−2.70*)	(*−0.79*)		

[a] Figures in brackets and italics are *t*-statistic calculated values. The critical value at the 95% significance level is 1.96.
[b] It is a dummy variable with '1' assigned to vessels of 15 yr and above.

Table 3
Multiple regression results for Capesize freight rates[a]

Year (size range)	Intercept	Dwt	Age[b]	Flag (dummy)	Sample size	Adjusted R^2
1989	3.15	0.00004	−0.34	0.60	81	−0.017
(*120–170* kDwt)	(*0.58*)	(*1.22*)	(*−0.34*)	(*0.56*)		
1992	8.20	−0.00001	−0.69	0.28	125	−0.007
(*130–170* kDwt)	(*2.03*)	(*−0.38*)	(*−1.28*)	(*0.58*)		
1995	0.32	0.00006	−1.16	0.40	223	0.031
(*130–170* kDwt)	(*0.08*)	(*2.43*)	(*−1.78*)	(*0.83*)		
1996	11.99	−0.00004	−0.52	−0.25	174	−0.010
(*130–150* kDwt)	(*1.78*)	(*−0.79*)	(*−0.89*)	(*−0.53*)		

[a] Figures in brackets and italics are *t*-statistic calculated values. The critical value at the 95% significance level is 1.96.
[b] It is a dummy variable with '1' assigned to vessels of 15 yr and above.

be grains and cereals, as opposed to larger consignments which tend to be minerals (e.g., coal). In conclusion, the results are suggestive of a possible freight differentiation due to age, but are only statistically confirmed in 1995 and 1996.

- For Capesize vessels (Table 3) both the age and the flag dummies are insignificant. The age dummy has the right sign in all cases, whereas the flag dummy has the right sign only once (in 1996). Deadweight coefficients are not significant, except for 1995, when the coefficient is positive. A possible explanation for this could be the fact that during the exceptionally good market conditions in 1995, larger Capesize units (which tend to be tied to long-term charters) were in short supply and, hence, may have commanded higher rates. In conclusion, the results, although suggestive towards freight differentiation, offer no statistically significant evidence that would confirm this tendency.

5. Conclusions and further research

The results of the research suggest that there are still no clear indications of strong pecuniary incentives to owners for increasing fleet quality and improving safety in the dry bulk carrier market through vessel replacement, despite existing indications of a geographical redistribution of larger

quality/non-quality dry bulk units (Timmermann and McConville, 1996). Owners of older tonnage might be developing what could be designated as a "detention/claim/loss of earnings" risk aversion. It is unlikely, however, that shipowners will be prompted at the current stage of existing rate differentiation to massively upgrade their fleets, especially in the dry bulk market conditions prevailing since the end of 1995. Leaving aside the question of the timing of the investment, for a replacement to be justified it must be viewed as a profitable alternative to the continued exploitation of an older vessel. While there have been some indications of increasing differences between modern and old vessel rates in depressed market conditions, it is unlikely that even these will be enough to compensate for increased capital costs of newbuildings; nor can their level be deemed sufficient to compensate for a greater risk of cash-flow pressures arising from new investment in fickle markets. Charterers still need to provide more clear signs of preference for quality, before any drastic (market-initiated) removal of old units at accelerated rates is to take place.

In the case of tankers, the existence of a handful of prime charterers who may want to endorse quality and pay more for it might lead eventually to a sustainable quality segmented market. This may also be due to the high media profile of tanker accidents and the associated marketing and public image repercussions. However, the case of the dry bulk market is different. Dry bulk charterers certainly seek tonnage with a minimum of quality specifications; after all, they do not want to risk the valuable cargoes they move around the world. However, brand names among dry bulk charterers are much less prominent and, thus, less easily identifiable by final consumers. Few lay people ever remember large dry bulk carrier disasters, or the companies chartering the vessels when the disasters occurred. There is no incentive to demonstrate more than the minimum required sensitivity to safety issues, or need to offer pecuniary compensation for it in the form of freight rate premia.

As measures at both the international and the national level (e.g., the Brazilian stringent rules for older tonnage carrying iron ore and minerals) proliferate, the spectre of increased regulation taking the place of market forces emerges clearly. Whether charterers will finally actively endorse quality differentiation in the form of a second, better-remunerated, tier for quality tonnage, remains to be seen.

The findings of this paper do not, however, suggest that such an outcome is likely in the near future, drastic regulatory measures notwithstanding. Any indications towards freight rate differentiation depending on quality are still too sporadic to revolutionise our current perception of the dry bulk carrier market. Nonetheless further research is called for including an investigation into the rates for other vessel class sizes while testing the main hypothesis should be extended to include a larger number of years in order to assess the origins of any such trend, its extent and its momentum. [16]

[16] Extending the tests will also allow the authors to relate fixtures in year n to vessel details in year $n+1$. This technique will eliminate the possibility of including extremely low freight rates for voyages of older vessels undertaking their last voyage to scrapyards. The research in this paper was not affected by this problem; however, due to the vessel data available to the authors an inverse bias might have been introduced to some degree in the case of earlier observations. With the overall good to booming markets since 1988–1995, however, the number of lost observations is deemed rather small and the calculations of the age mean in the samples have not confirmed that a systematic bias was introduced.

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