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TWO ASPECTS OF ENERGY TRANSITION IN SHIPPING: CARRYING AND USING FUELS

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- This study concerns promoting energy transition on Panamax bulk carriers (hereafter “Panamax”) with which mainly coal is traded.
- Ownership of Panamax is highly distributed among many owners. Therefore, targeting the reputations of market leaders, who don’t control much market share, may not be effective. Instead, incentives targeted to all owners may play an important role.
- The age structure of the Panamax fleet is uneven, with 40% of the fleet set to be replaced in the early 2030s. If zero-emission fuels are not adopted for these replacement vessels to some extent, an infrastructure to support subsequent adoption will be delayed.
- Including a prohibition of coal shipments as an incentive would be helpful for public acceptance. However, coal will still account for over 40% of the Panamax trade in the early 2030s. Therefore, such an incentive condition would likely not be accepted by many and thus would significantly reduce the adoption of zero-emission fuel.

- The shipping industry is responsible for energy transition from two aspects: (1) as a transporter of fossil fuel, and (2) as a consumer of fossil fuel.
- These two aspects are related to each other in terms of shipowners' business decisions.
- If one aspect of transition is pursued without proper consideration, the other aspect may be hindered.

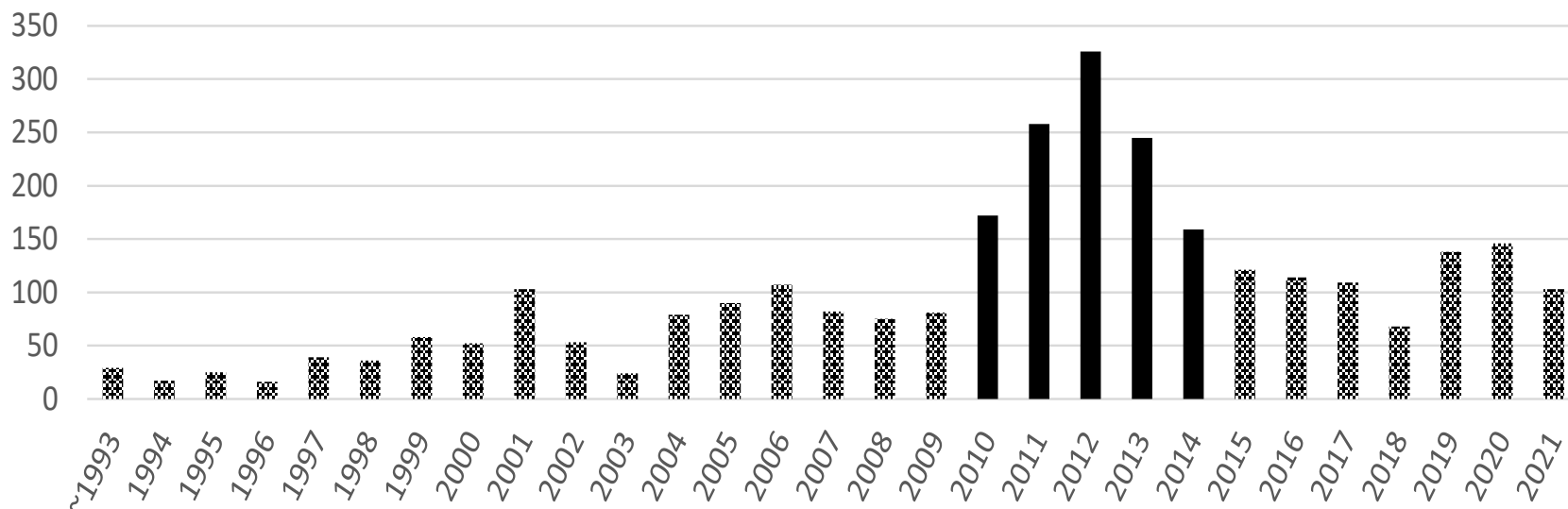
- A type of bulk carrier that is used to carry coal.
- However, this type of ship also carries grain. In fact, the share of coal to grain shipments is about 1:1.
- Panamax makes calls at many types of ports. Thus, the fuel supply chain infrastructure is an important consideration.



- The concentration of Panamax ownership is very low.
 - The share of the biggest owner is 1.7% and that of the top 10 owners is 12.9%.
 - The Herfindahl–Hirschman Index (HHI) is 41. In general, an HHI below 100 is regarded as a highly competitive industry.
- This means that there are no leading owners with a major market share of Panamax. Therefore, a strategy of targeting the reputations of market leaders to encourage change may not be effective.
- Instead, incentives targeted to all owners will play an important role.

Age Structure of Panamax Fleet

- The age structure of the Panamax fleet is heavily skewed.
- Ships delivered in 2010–2014 account for 41% of the entire Panamax fleet.
- A Panamax is usually scrapped when it is around 20 years old. As a result, mass replacement will occur in the early 2030s.



- Two fuel options are available for ships to be delivered in the early 2030s: (1) current diesel fuel and (2) zero-emission fuels such as ammonia.
- In the future, diesel fuel needs to be replaced by bio- or synthetic fuels to meet zero-emission targets.
- However, it is uncertain whether that replacement will occur in a timely manner. Mass production of such fuels may be difficult, and these fuels may be preferentially supplied to other industries, such as airlines.
- Therefore, for efficient energy transition, Panamax should employ zero-emission fuels as much as possible.

- The development of a zero-emission fuel supply chain depends on how many Panamax vessels will adopt zero-emission fuel.
- If the adoption of zero-emission fuel for Panamax will not proceed in the early 2030s, the disadvantage will last for a subsequent 20 years.
- However, the zero-emission engine will not be competitive in the early 2030s. As a result, incentives will play a key role in accelerated adoption.

- In 2022, the share of coal in the entire Panamax trade is 57%.
- The share of coal will remain high in 2030. Based on IEA WEO 2021, the share will be 49% in the most conservative STEPS scenario, 45% in the APS scenario, and 40% in the SDS scenario.
- It is almost impossible for most Panamax owners to give up the coal trade in the early 2030s.

Dilemma about Two Targets

- From the viewpoint of public acceptance, a prohibition of coal shipments as a condition of incentive receipt would be helpful for the adoption of zero-emission fuel.
- However, if this condition is required for receipt of the incentive, most owners would simply choose not to adopt zero-emission fuel and continue to carry coal.

- Quantify the conditions involved.
 - The share of zero-emission Panamax required to maintain momentum to deploy the fuel supply chain in the early 2030s.
 - The amount of incentive required to adopt zero-emission fuel for Panamax in the early 2030s.
- Design long-term policies to accelerate both the adoption of zero-emission fuel and an exit from coal transportation.



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