

Monitoring, Reporting, and Verification of CO₂ Emissions in Shipping

Identification and comparison of available methods

Abstract

Although maritime shipping is by far the most carbon-efficient transport mode, the industry has recently announced its ambitious strategy on reduced carbon emissions. The monitoring of CO₂ emissions is the first step in pursuing this strategy. Two major initiatives have been launched in this respect: The Monitoring Reporting and Verification scheme of the EU, and the Data Collection System of the IMO. Despite sharing the ultimate aim of improving the sector's carbon footprint, the two initiatives differ in the approach they follow and the tools they use. A number of additional metrics have also been proposed for monitoring the fuel efficiency of ships.

In the framework of the research project MASSHIP, funded by the Orients Fund of Denmark, the present thesis uses data on fuel consumption and CO₂ emissions from leading Danish companies to compare the alternative EU and IMO approaches, assess the effectiveness of the proposed performance indices and draw policy and R&D recommendations on this subject. Data on the voyages performed in 2018 by a fleet of 1,332 ships in total consisting of dry bulk carriers, tankers, containerships and Ro-Ro ships are analyzed (Figure 1). The role of factors such as speed and capacity utilization on variations among sister ships or even among the voyages of a single ship is investigated (Figure 2).

The results show that none of the indicators examined is robust enough to provide reliable information on the fuel efficiency of ships, while the geographic restrictions of the EU scheme introduce additional exogenous bias (Figure 3).

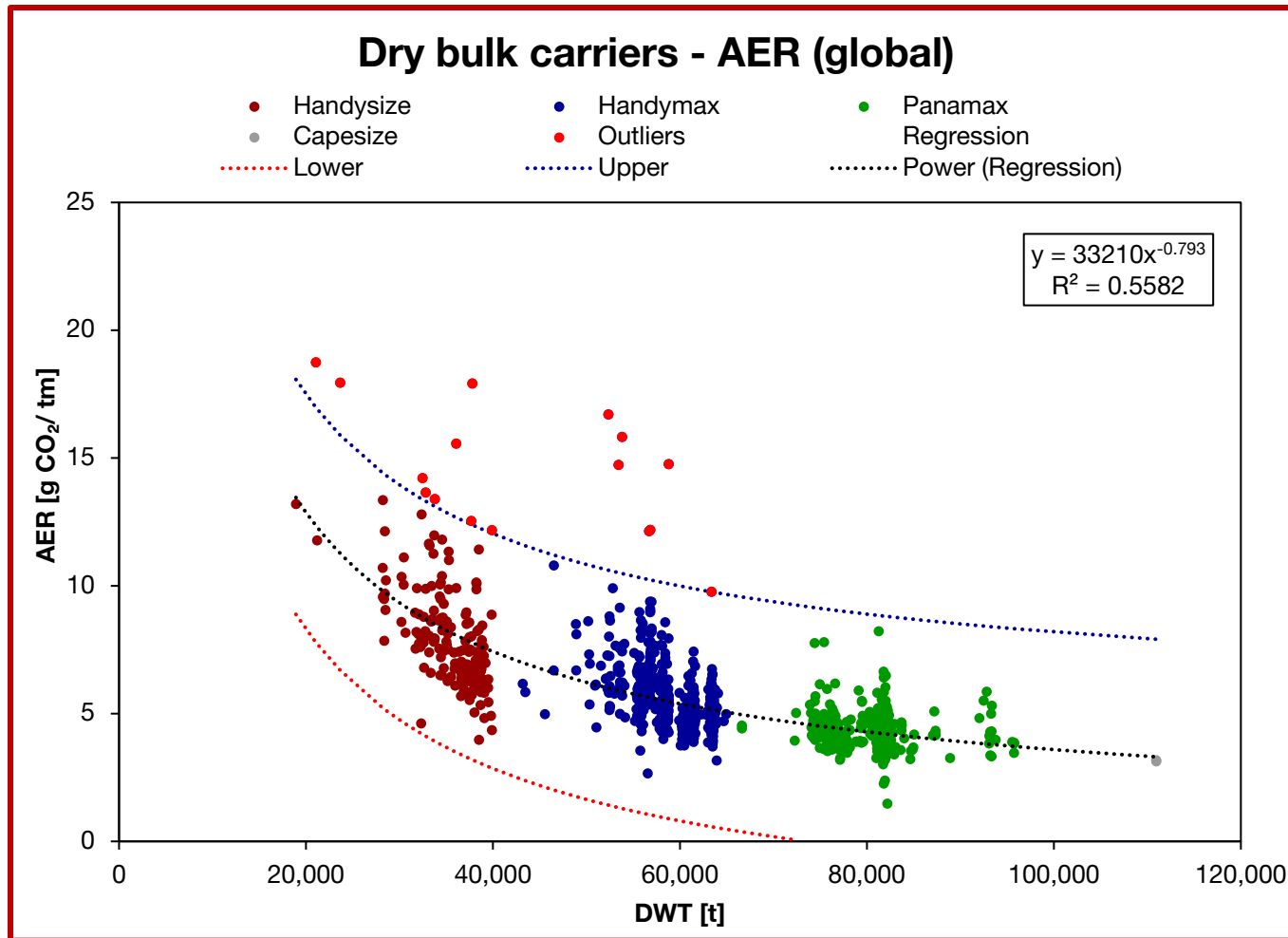


Figure 1. The Annual Efficiency Ratio of the dry bulk fleet by size (2018).

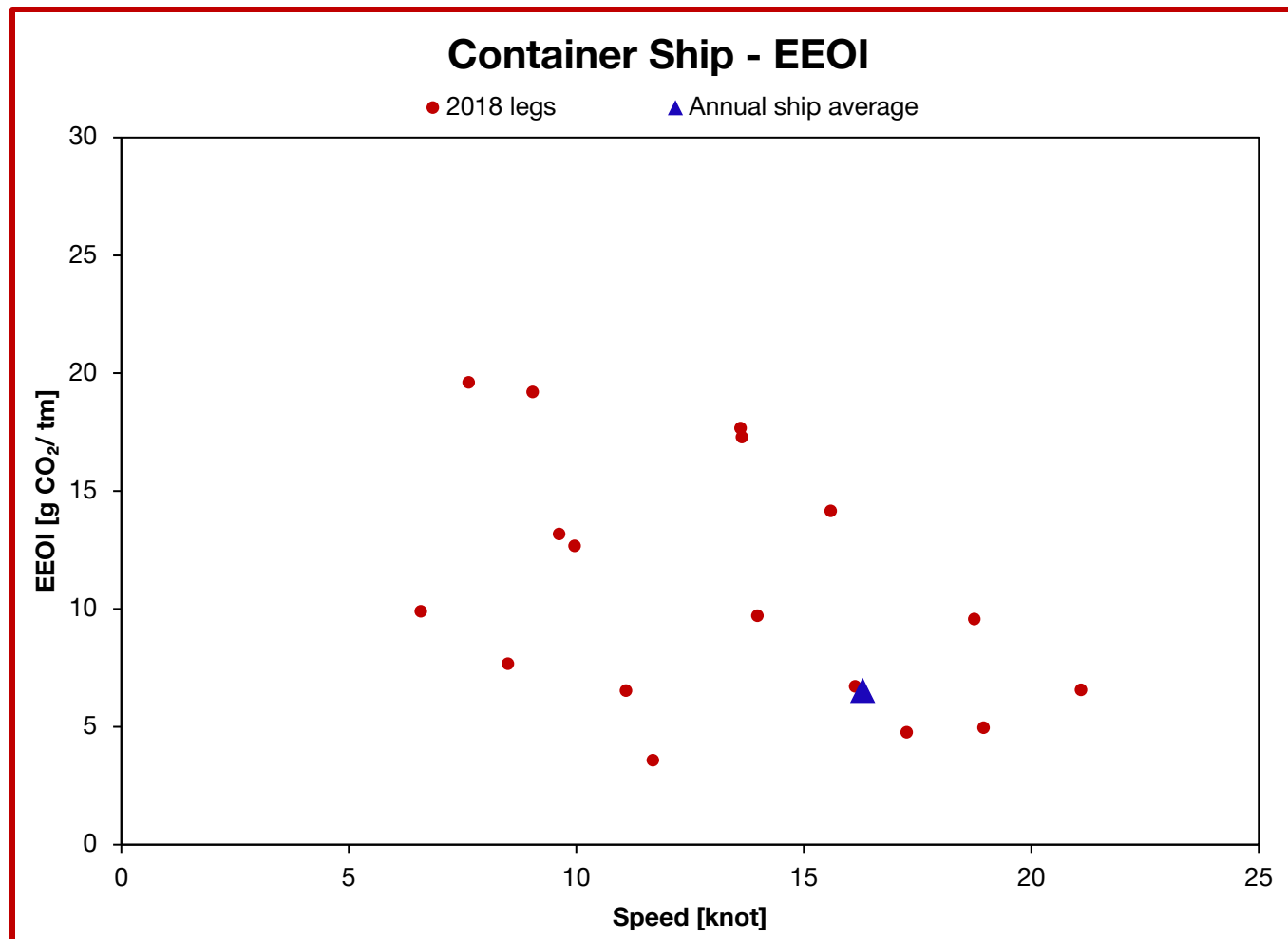


Figure 2. The Energy Efficiency Operational Indicator for the voyages performed by a single ship in 2018 (by speed) and the corresponding annual ship value.

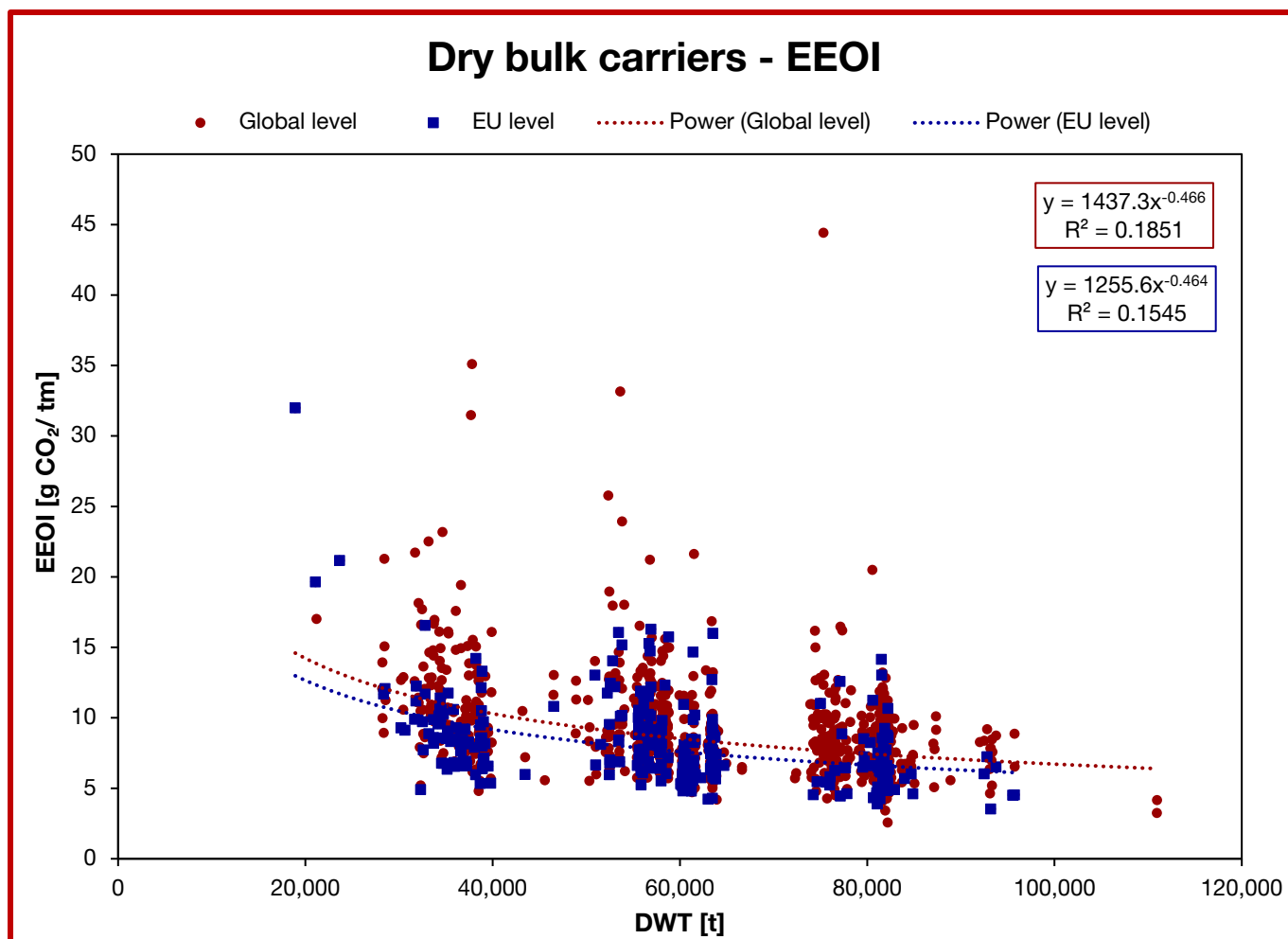


Figure 3. The effect of geographical coverage on the EEOI values of the dry bulk fleet (2018).