

Factor Decomposition Analysis of Changes in CO2 Emissions from Container Shipping

Topic: Input-output and the network theory I (Chair: Keisuke Nansai, National Institute for Environmental Studies of Japan)

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CO2 emissions from international shipping were estimated as 1056 million tonnes-CO2, accounting for 3% of the global anthropogenic CO2 emissions and there is an urgent need to decarbonize the sector. To the best of our knowledge, there are few previous studies that attempted to estimate the CO2 emissions from the maritime sector of countries and regions. Based on the microdata of IHS Markit, this study estimated CO2 emissions from container ships owned by major seven operating companies (Maersk, Mediterranean Shipping Company, COSCO SHIPPING, CMA CGM, Hapag-Lloyd, Ocean Network Express, Evergreen) that occupy a large portion of fuel consumptions in maritime transport. Based on the CO2 emissions at company level, we develop a new factor decomposition framework to identify driving forces of the changes in the CO2 emissions from container ships. The results show that (1) CO2 emissions of each company increased by 3.5% on the company average from 2018 to 2019, however Maersk, Mediterranean Shipping Company, Hapag-Lloyd, and Ocean Network Express reduced CO2 emissions during the COVID-19 period (2019-2020); (2) the main reason for this reduction in CO2 emissions of the companies during the COVID-19 period was port calls (i.e., demand-side change factor); (3) the change in CO2 emission intensities in ton-CO2 per ton-miles of container ships (i.e., supply-side change factor) was marginal for all the companies. The environmental and business strategy shown in the sustainability reports provided by the companies has not yet been fully reflected in the major change factors identified in this study. Looking at the marginal contribution of the supply-side factors to CO2 mitigation, the operating companies should put more efforts on improving supply-side factors of size and speed of their vessels to reduce carbon intensity.