# Lead times in the Asian coal supply chain

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## Overview

This paper investigates the cross-sectional and time-varying properties of lead times for the procurement of ocean freight for coal cargoes in the Asian market. The lead time is defined as the time lag between the initial enquiry for ocean transportation and the intended shipment date of the bulk cargo. Using a unique new data set of nearly 40,000 drybulk cargo enquiries obtained from automated textual analysis of global shipbroker email flows in 1H 2015 we evaluate a number of hypotheses. Firstly, lead times should be positively related to the state of the freight market, with high freight rates being an indication of relatively fewer ships being available (i.e. possible "stockout" of transportation). Secondly, lead times should be positively related to cargo size, in part due to the shorter trading distances for smaller vessels and in part due to the greater total fleet size for smaller vessels, both leading to expected better transport availability. Thirdly, ports and countries with better export infrastructure (lower congestion, lower variability of port handling times) should have lower lead times associated with their lower risk of unexpected delays. Finally, there may be seasonal effects due to regional weather patterns (typhoons, hurricanes). The data and empirical results represent a key building block in the future development of optimization models for the matching of ships and cargoes in a stochastic framework.

The paper is organised as follows: After the introduction the second section gives a brief overview of the relevant maritime economic and supply chain theory and develops our hypotheses. The third section gives an overview of the data and its statistical properties. The fourth section presents our empirical results and the fifth section concludes.

## Methods

Panel data analysis

## Results

First, we do not find a significant relationship between the state of the freight market and lead times for freight procurement, presumably due to our relative short sample and low variation in freight rates.

Second, we find some evidence of country effects, with lead times for Indonesian coal exports being longer than those for Australia, when controlling for other variables (sailing distances and ship sizes).

Third, we find evidence of a significant relationship between cargo size and lead time, as suggested by theory.

## Conclusions

We find that shippers' are generally willing to 'pay' for securing ocean transportation in terms of longer lead times when there is a greater risk of delays in the physical supply chain.