



Séminaire du CIRRELT Seminar

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## PORT ADAPTATION TO CLIMATE CHANGE AND CAPACITY INVESTMENTS UNDER UNCERTAINTY

ZOOM : <https://ulaval.zoom.us/j/63275404880?pwd=RkdJSWxmQVhVTVhJZ3oyaHoxTDN1dz09>

ID de réunion : 632 7540 4880 / Code secret : 898239

**Abstract:** Seaports are crucial linkages in supply chains and account for over 80 per cent of global trade by volume and 70 per cent by value. They are also vulnerable to extreme weather events and sea level rise driven by climate change. Choosing the timing and scale of adaptation measures is challenging due to uncertainty about the rate of climate change, the frequency of disasters, and the irreversibility of investment in physical infrastructure. In addition to adaptation to climate change, ports must invest in throughput capacity to accommodate rising traffic volumes, reduce congestion, and maintain their long-term competitiveness. Ports also face uncertainty about shipping demand, which fluctuates with the business cycle, trade relations between countries, and other events. With this as background, we investigate the optimal timing and amount of port protection and capacity investments, as well as port charges, given uncertainty about climate-change-related threats and demand. The port gains better information over time, and thus has an option value to waiting. We show that the port charge is a decreasing function of capacity and an increasing function of protection. Capacity and protection are supermodular: a higher capacity warrants more protection, and better protection justifies higher capacity. If the disaster frequency rises, the port reduces its capacity and traffic volume but may increase or decrease protection investment. It prefers to postpone capacity investment if the disaster frequency can fall, but prefers to invest in advance if the climate is likely to get worse. It prefers to postpone protection investment if the disaster frequency changes a lot, or if the disaster frequency is currently low. The port also holds back on capacity and protection if future demand is highly uncertain. The results are largely the same for a landlord port, a service port, and a fully privatized port.

**Bio:** Wenyi Xia is an assistant professor at the Department of Logistics and Operations Management, HEC Montréal. She obtained her PhD in Transportation and Logistics from Sauder School of Business, University of British Columbia in 2020. Her core expertise lies at the intersection of data analytics and transportation operations. She is interested in developing cutting-edge methods to study passenger choice behaviors using empirical methods and data-driven techniques. With a better understanding of passenger behaviors, she derives prescriptive solutions to practical transportation problems and designs transportation policies and systems for better outcomes. She is also interested in studying how to enhance the resilience and adaptability of the vulnerable transportation infrastructure to climate change, while minimizing costs. In addition, she studies the interactions among different transportation modes and provides insights on managing intermodal transportation systems. She leverages the methodologies including discrete choice modeling, empirical estimation, data-driven optimization, and game theory in her research. Wenyi Xia has published in several peer-reviewed journals. Her papers have received more than 400 citations according to Google Scholar.

MARDI / TUESDAY

10 mai 2022, 10h30  
May 10<sup>th</sup>, 2022, 10:30

Salle / Room 5441  
Pavillon André-Aisenstadt  
Université de Montréal  
ou/or Lien Zoom

Ouvert à tous / Open to all

Responsable / Organizer  
Jacques Renaud