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The Impact of Truck Arrival Information on System Efficiency at Container Terminals

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Research Motivation

The transportation system inefficiencies within drayage truck/container terminal interface

- Truck idling at terminal
- Unproductive container re- handling operation

Research Motivation

- Identify a mechanism for improvement aligned with terminal's and trucker's incentives.

- Possibility to coordinate terminal and drayage truck operation through sharing information
  - Gate Appointment System
  - Installation of GPS on trucks

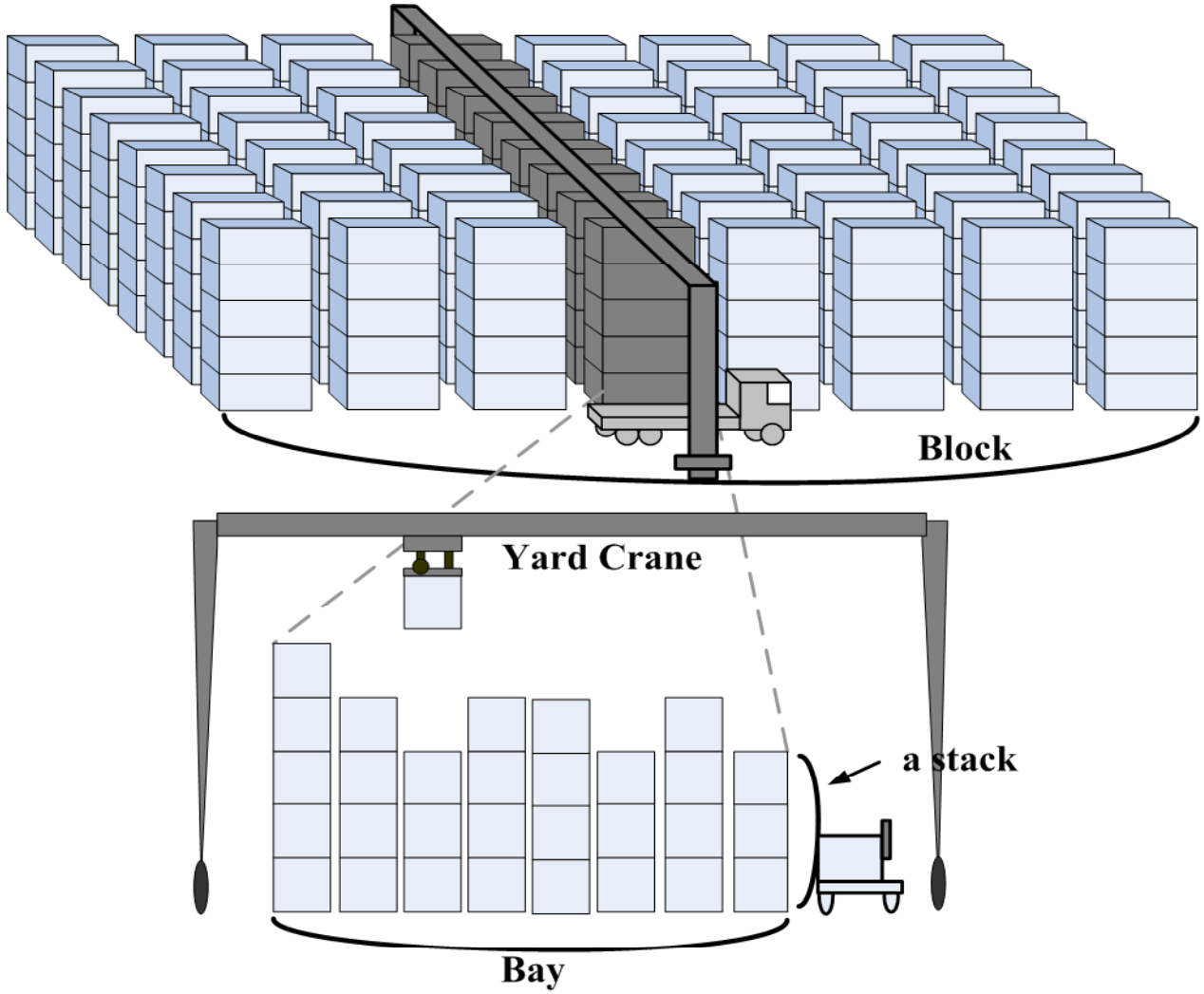
Research Problem

- How and whether truck arrival information can be used to improve the truck/terminal interface?

Research Objective

- Identify information need for system improvement
- Evaluate impact of system configuration on information effectiveness

Research Scope

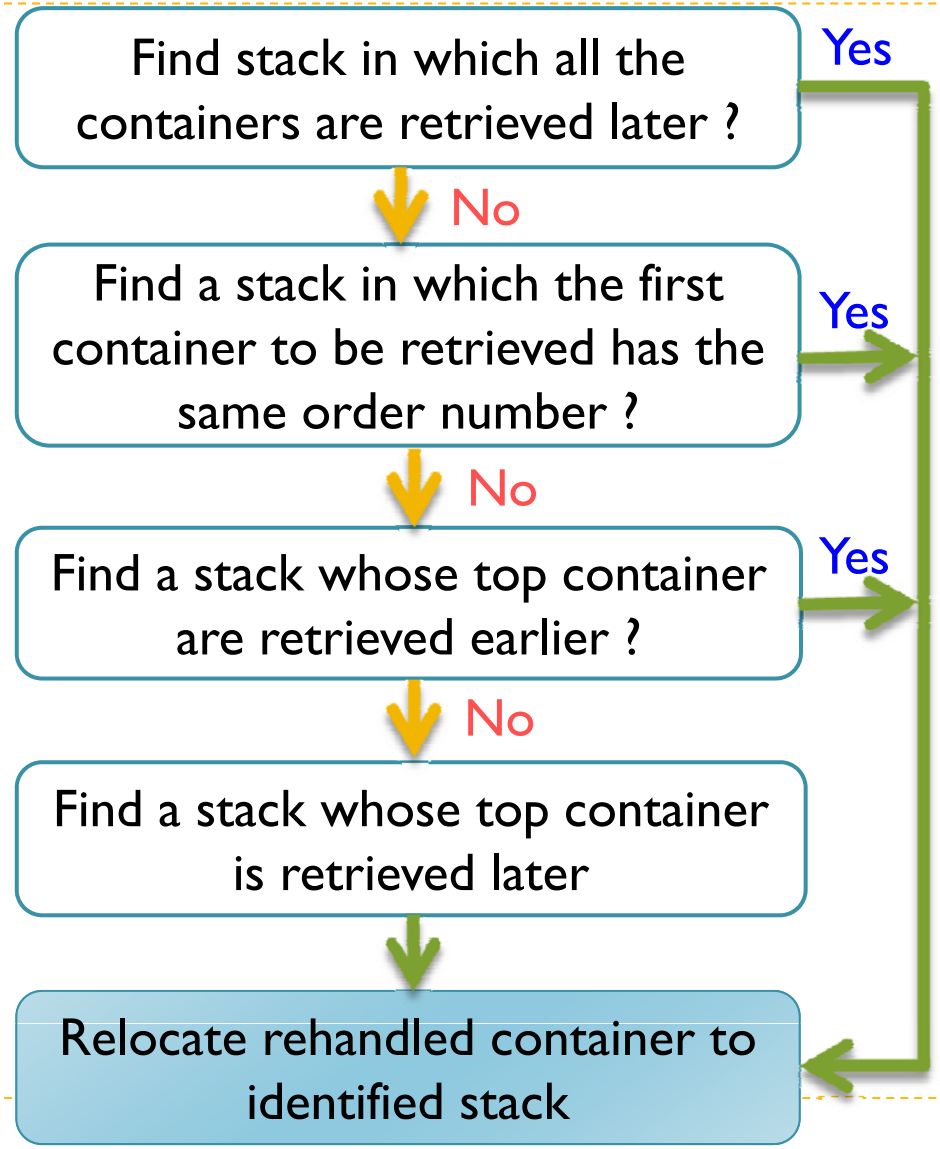


Research Assumptions

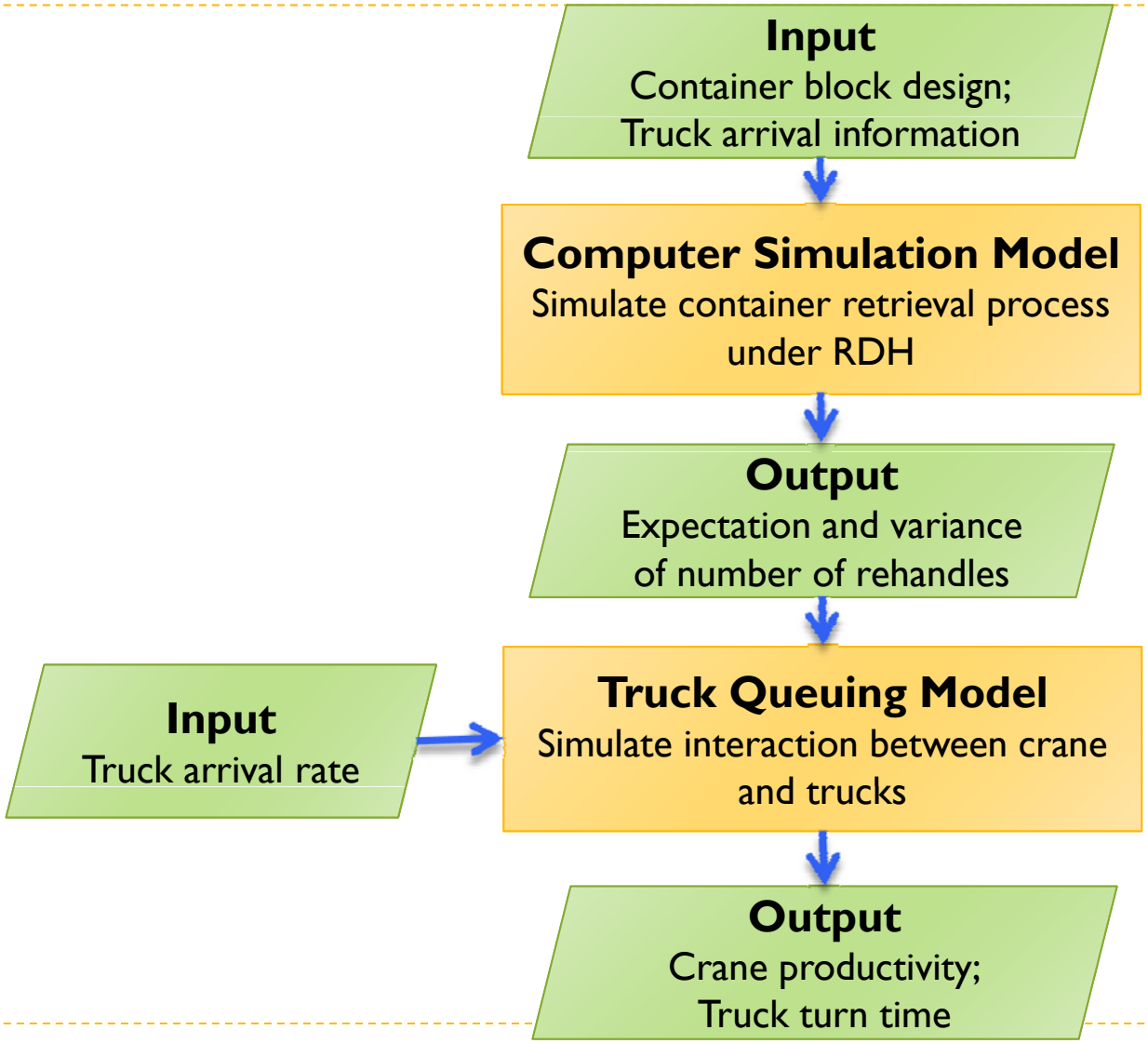
- Containers are re-handled to the slot in the same bay
- Containers randomly distributed within the block
- No additional containers added during retrieval process
- Trucks served with FIFO rule

Revised Difference Heuristic

4	3	
1	5	7
6	2	8

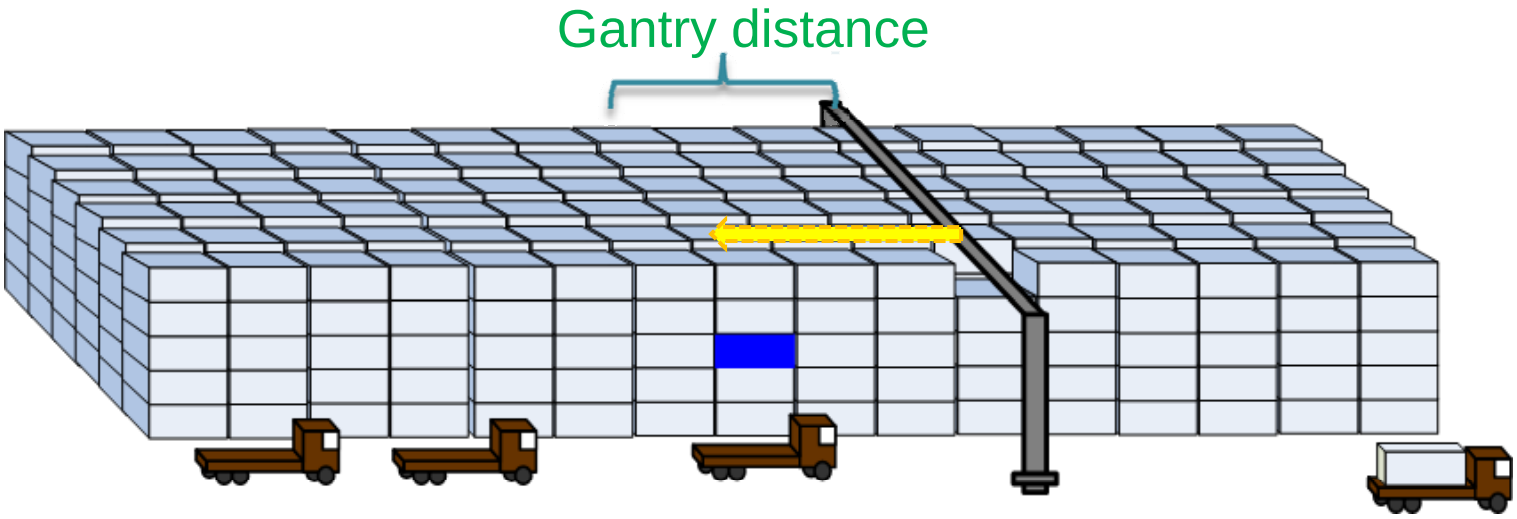


Research Methodology



Truck Queuing Model

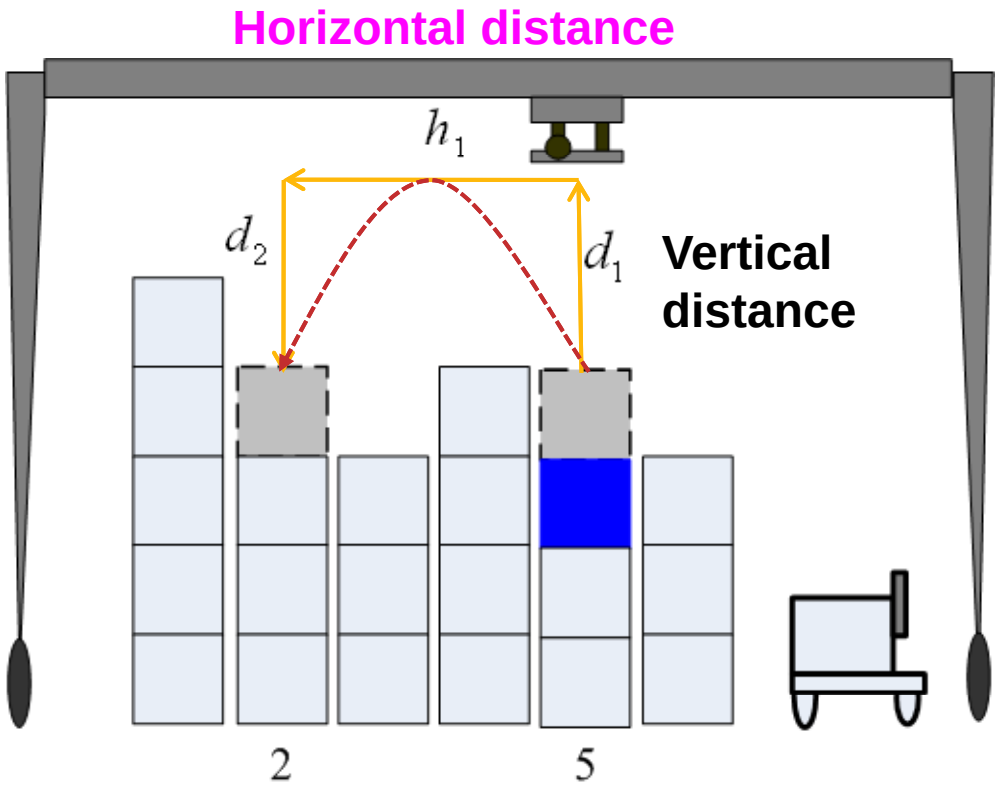
- M/G/1 model



- Crane service time

  = travel time + number of re-handles * time to re-handle one container + handling time

Evaluate re-handle time



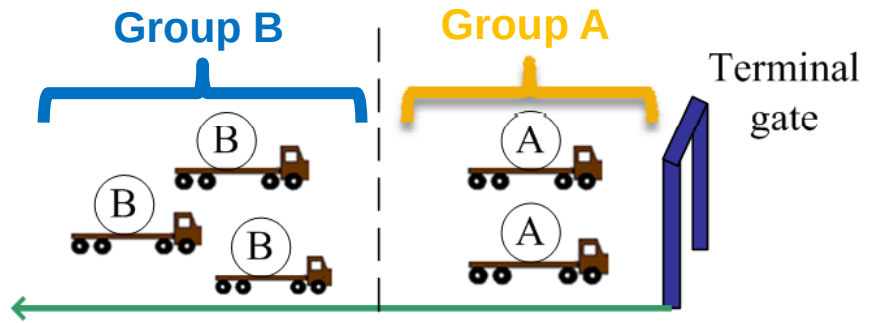
Research Scenarios

Little Information

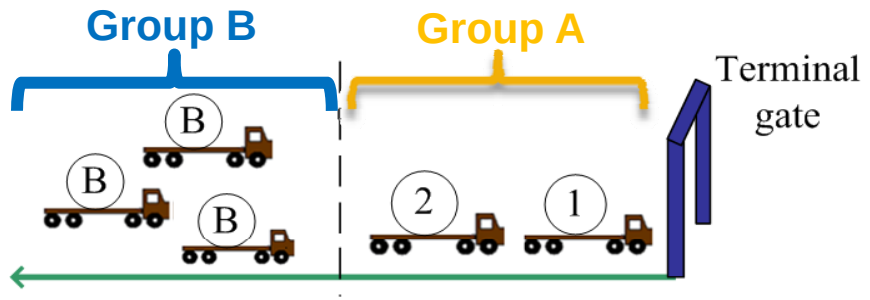
More Information

I. No truck information

II. Static group information



III. Static partial sequence



IV. Dynamic group information

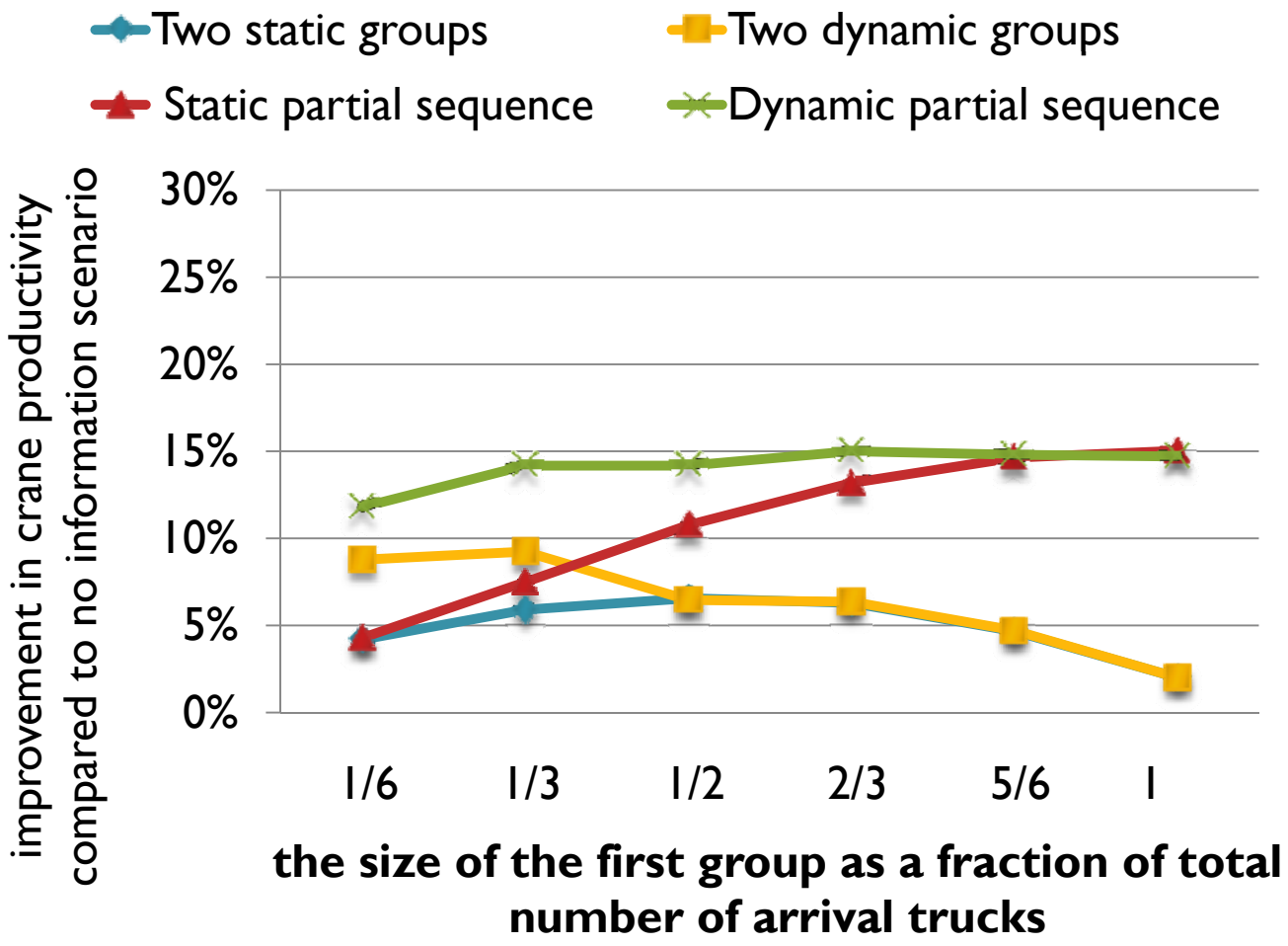
V. Dynamic partial sequence

VI. Complete sequence

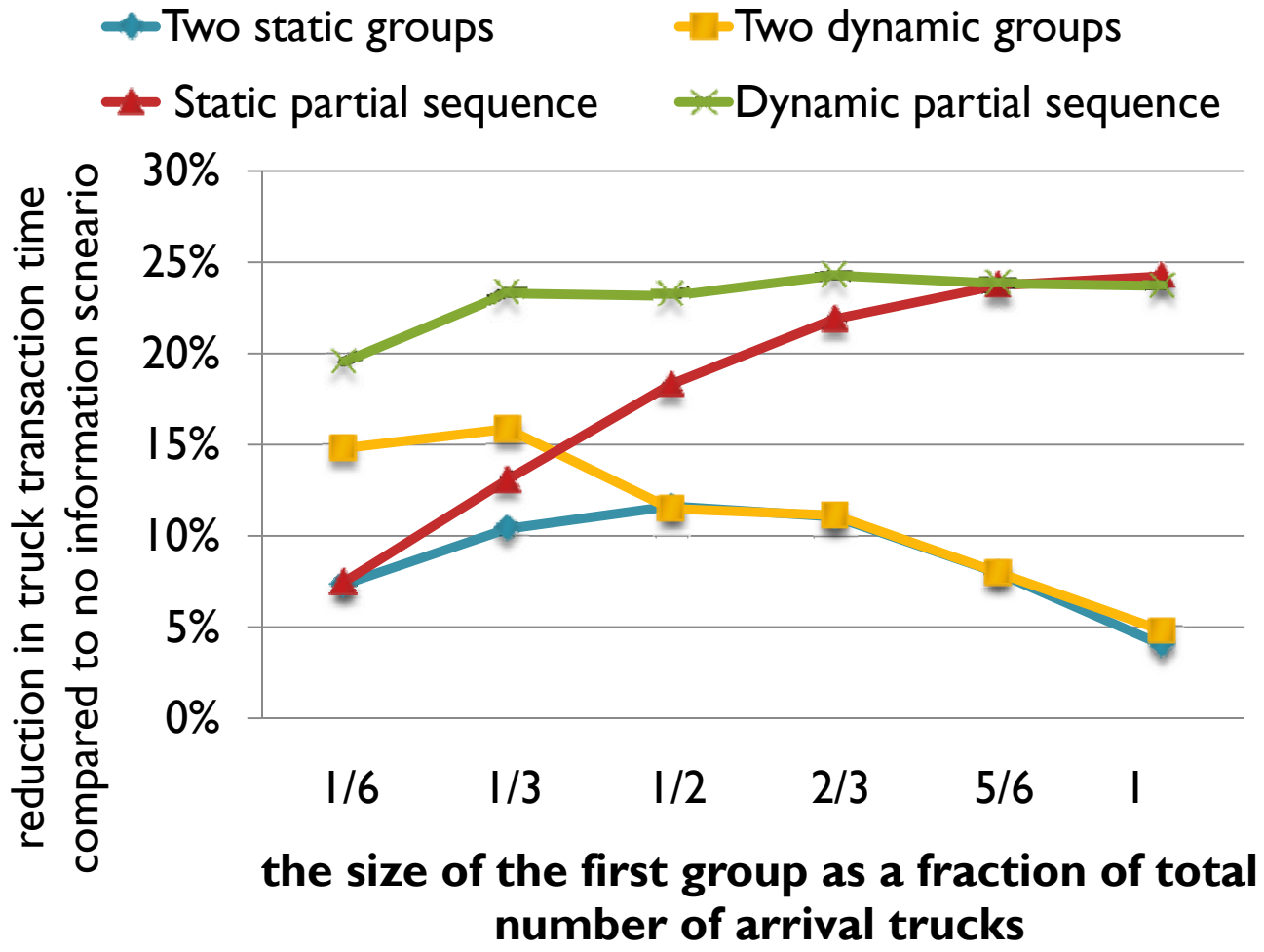
Numerical Result Analysis

- Impact of truck information quality
- Impact of truck arrival rate
- Impact of block configuration

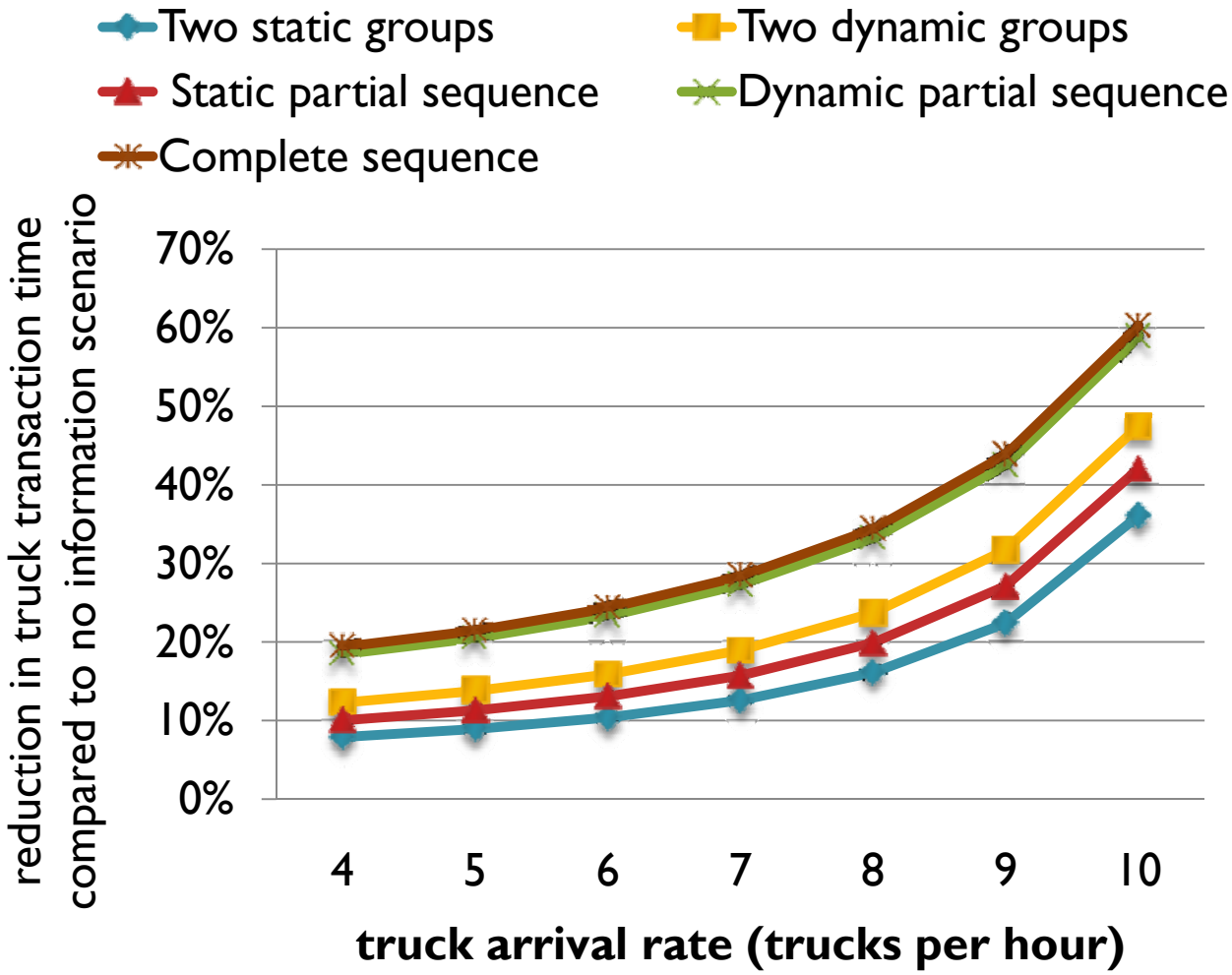
Impact of Information Quality on Crane Productivity



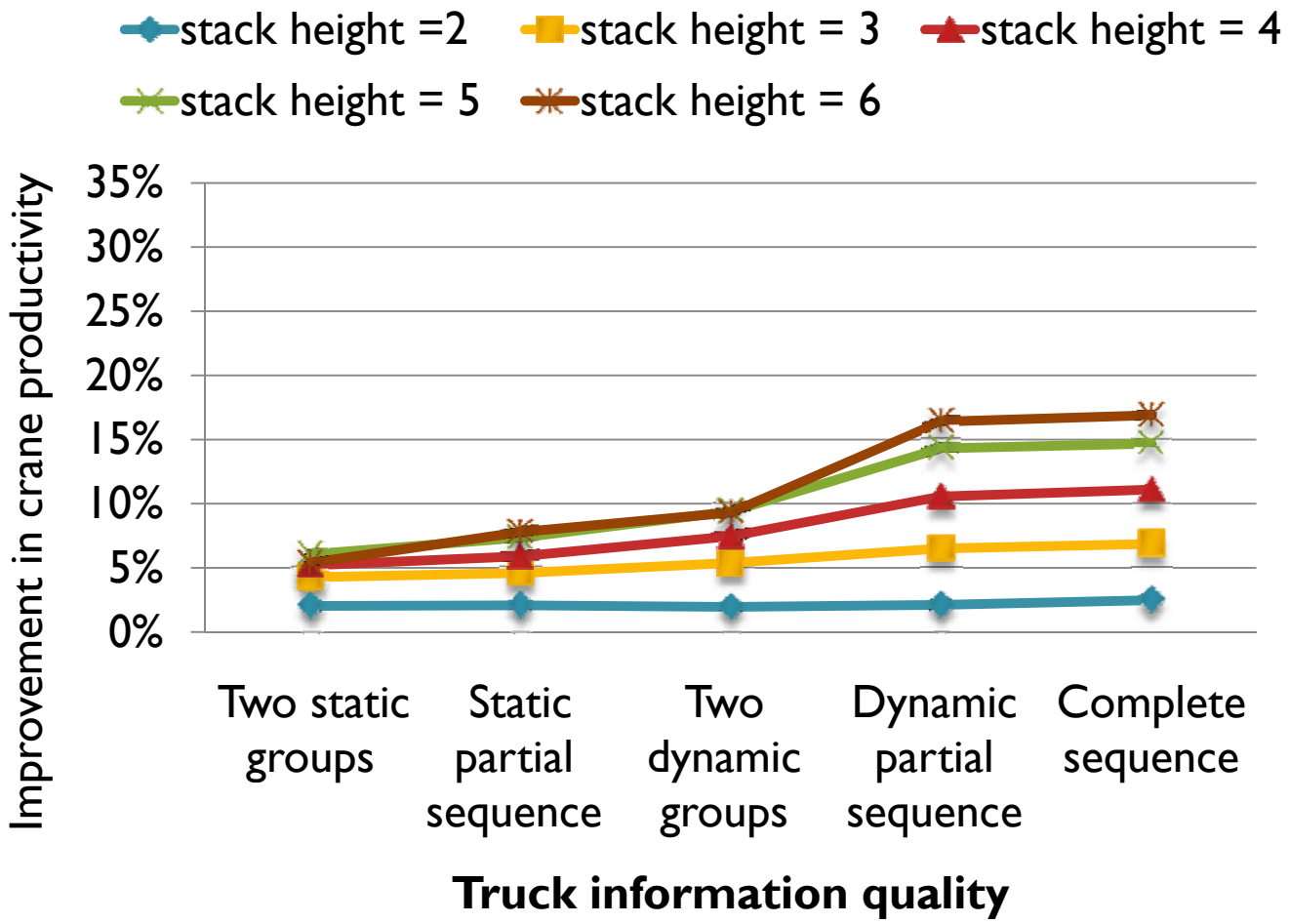
Impact of Information Quality on Truck Turn Time



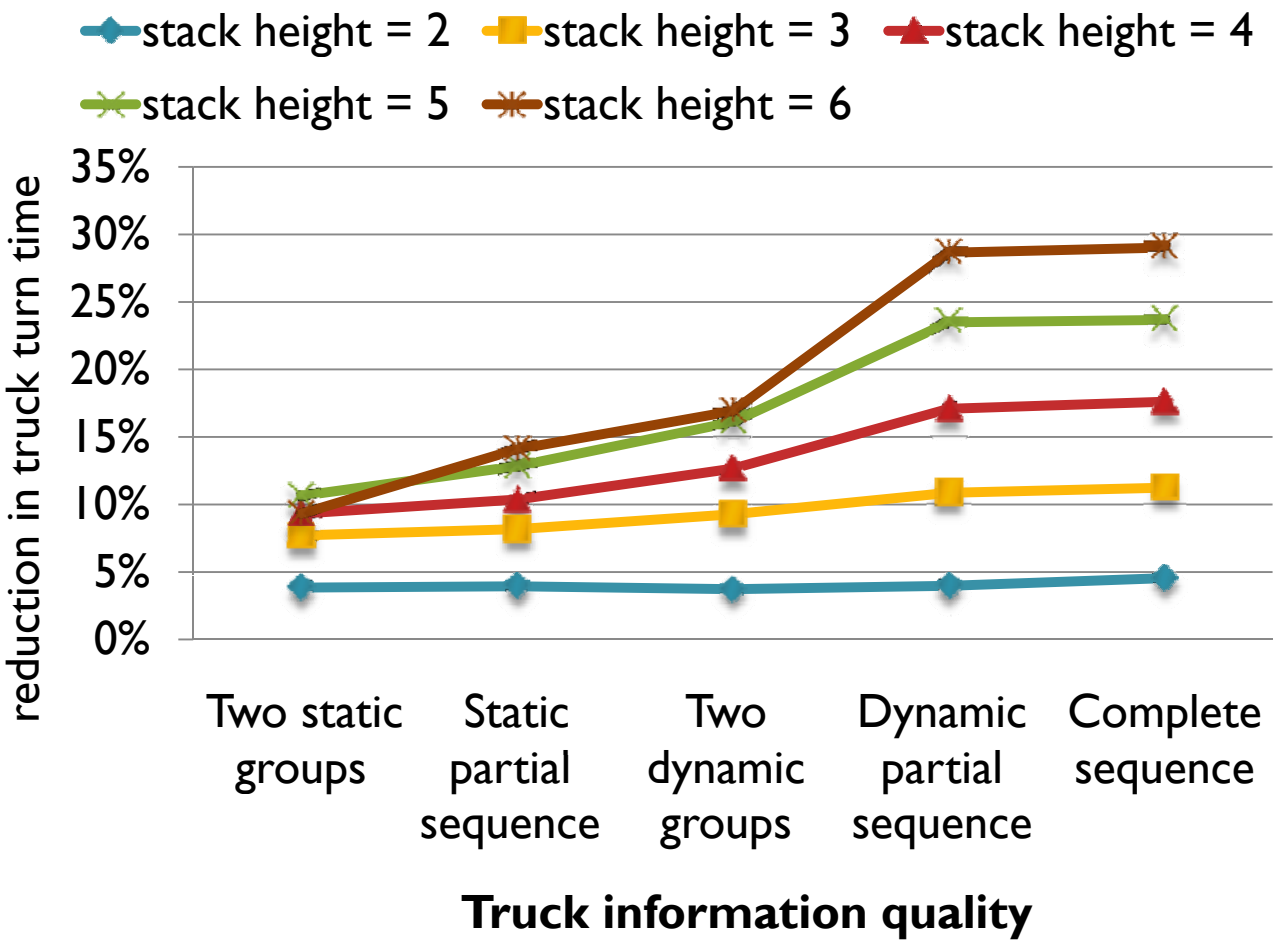
Impact of Truck Arrival Rate



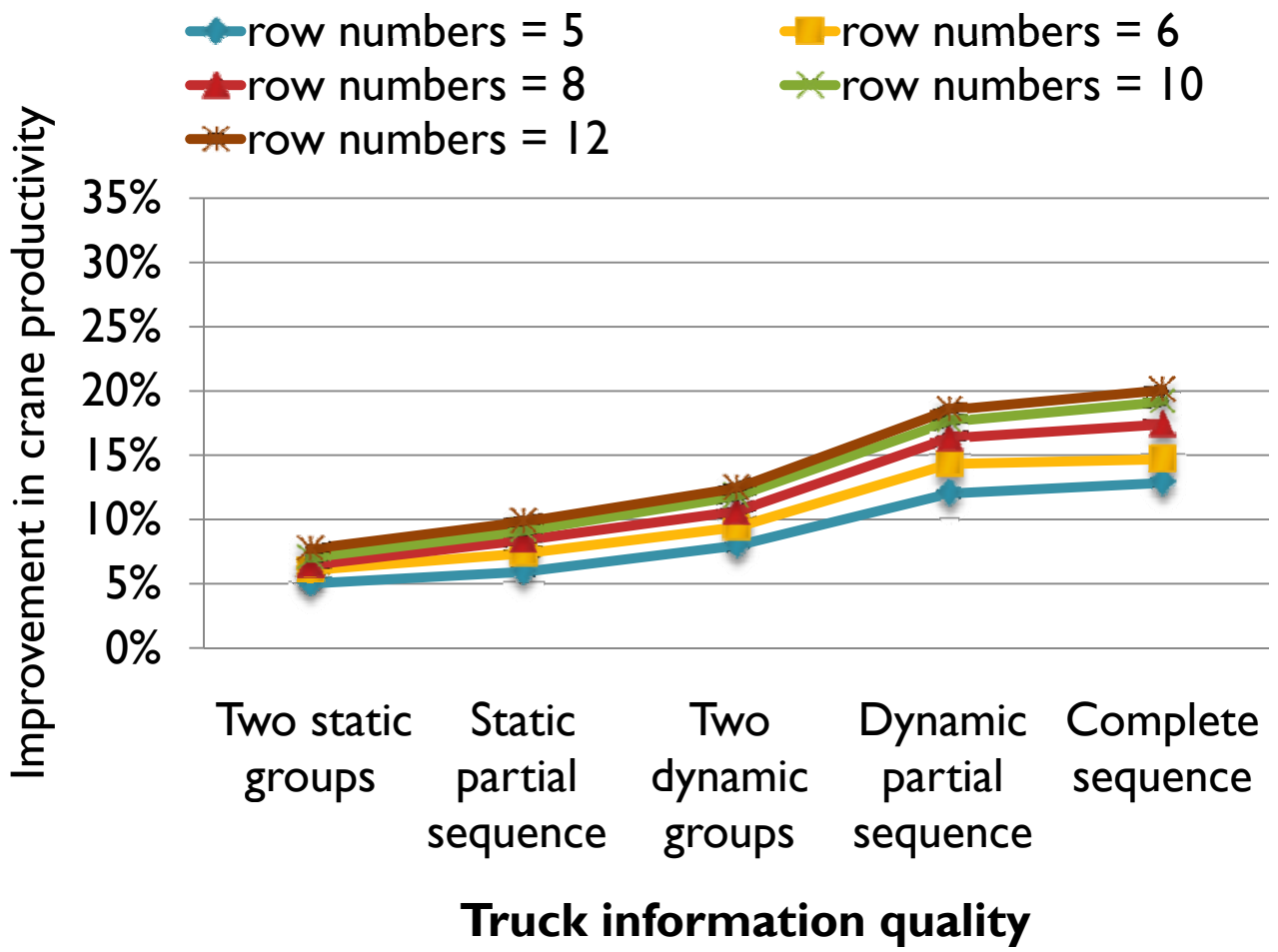
Impact of Block Configuration on Crane Productivity



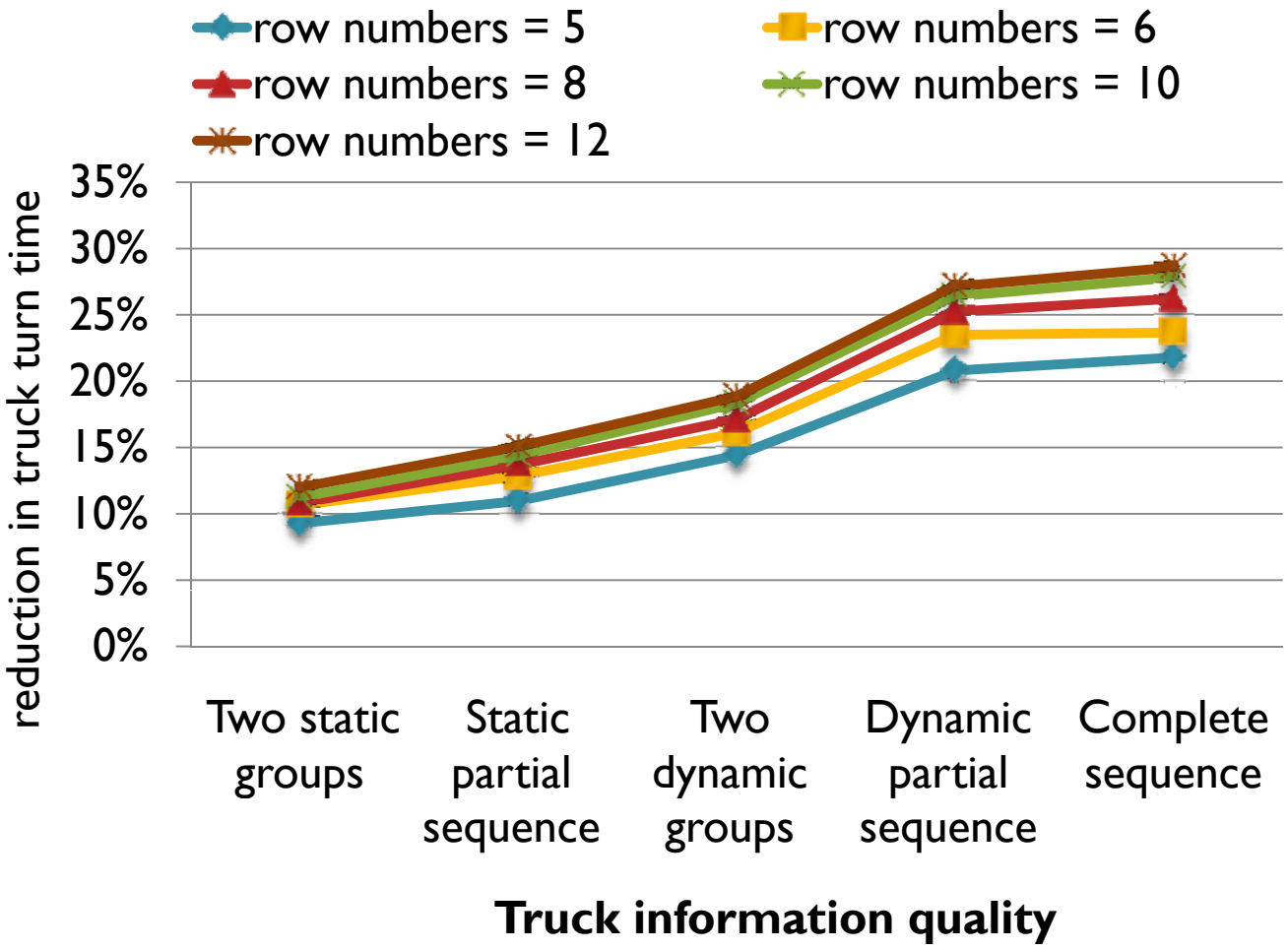
Impact of Block Configuration on Truck Turn Time



Impact of Block Configuration on Crane Productivity



Impact of Block Configuration on Truck Turn Time



Conclusion

- Significant benefit for terminal and trucks from small amounts of truck information, and bigger magnitude of benefit to trucks
- Real time information further enhances efficiency improvement
- Information most valuable for terminals approaching capacity
- Information more effective for terminals adopting high stacking strategy

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