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Delayed delivery

Using event-based analytics to understand shifts in the supply chain

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Ministry of Transport

Disruptions to supply chain processes

- **Reactive change**
 - Ship backlog from delays en route
 - Processing times for import containers
 - Processing times from export transshipment to export
- **Deliberate change**
 - Shipping line schedule adjustment
 - Shipping line service adjustment
 - Port re-direction : Auckland to Northport / Tauranga



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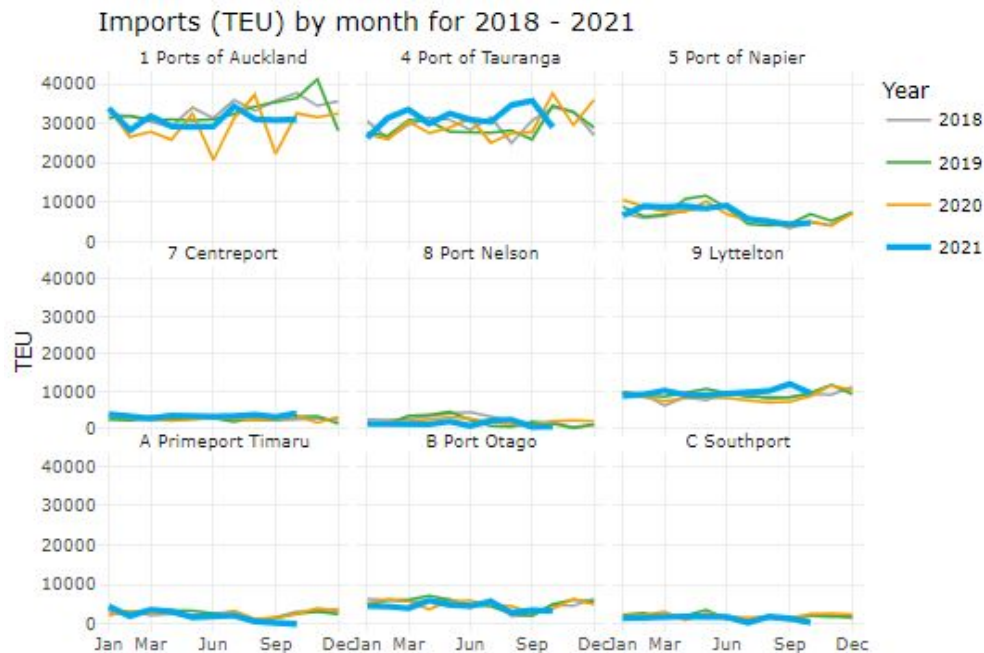
Misfit metrics

Existing indicators are fit for a different purpose

Macro indicators for macroeconomic trends

Useful for macroeconomic monitoring.

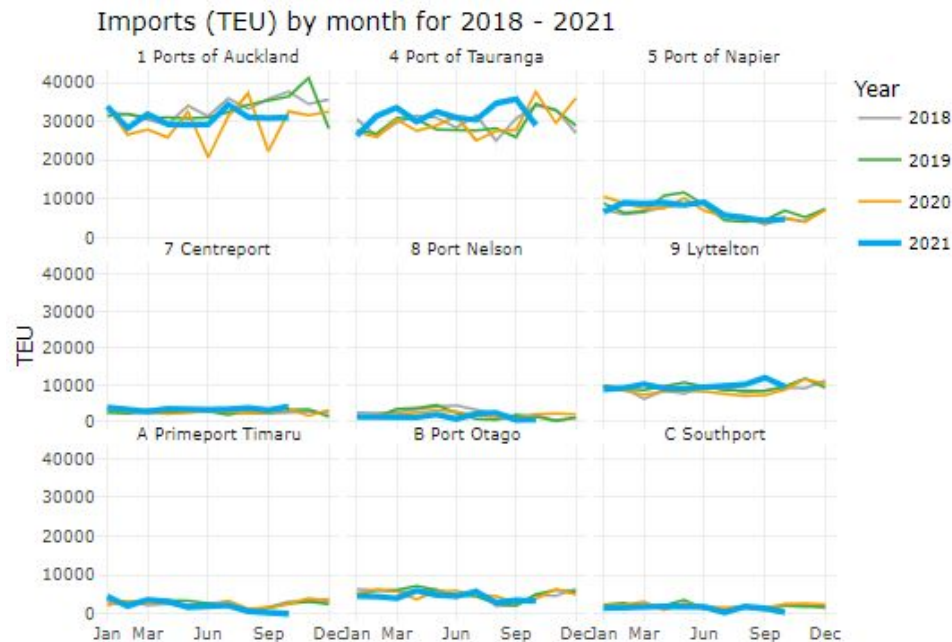
- Difficulties at POAL in June and September 2021 and POT accommodating more TEU after September 2021.
- POAL stability restored in 2021.



Macro indicators disconnected from processes

Cannot be used to analyse the impact on underlying processes.

- Where and why are containers getting stuck?
- Effect of busy / full distribution hubs?
- Are ports getting too congested?





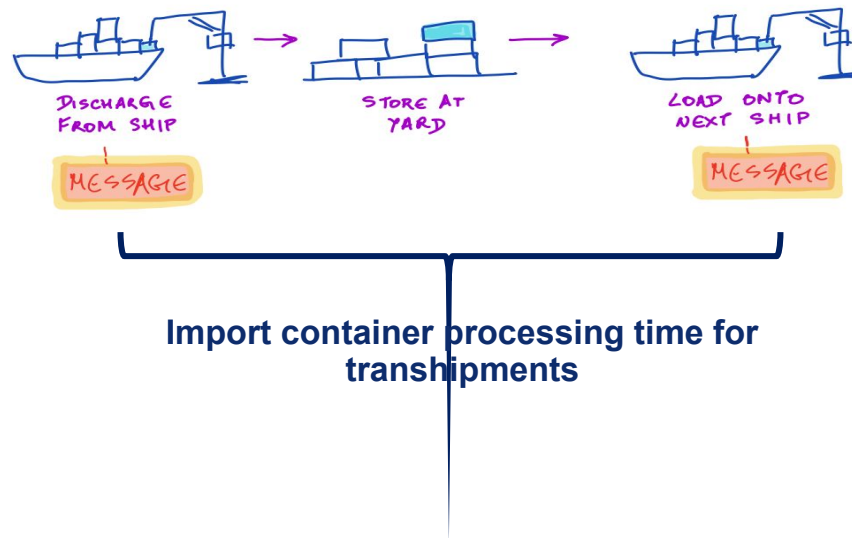
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Event analytics

Connecting metrics to the real world

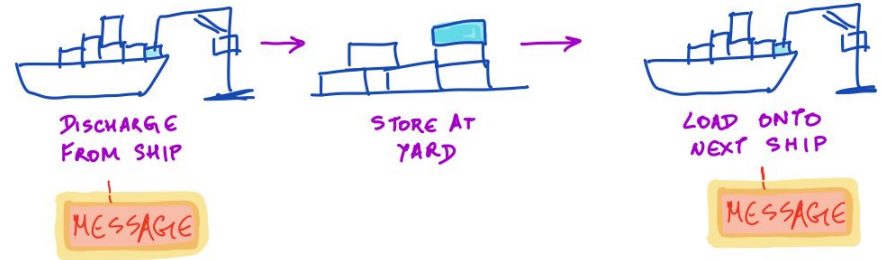
Single stream event analytics with container messages

- FIGS container data stream is comprised of 4 container movement messages: discharge, load, gate in, gate out.
- Metrics like measuring time between different events are better suited for deeper analyses.



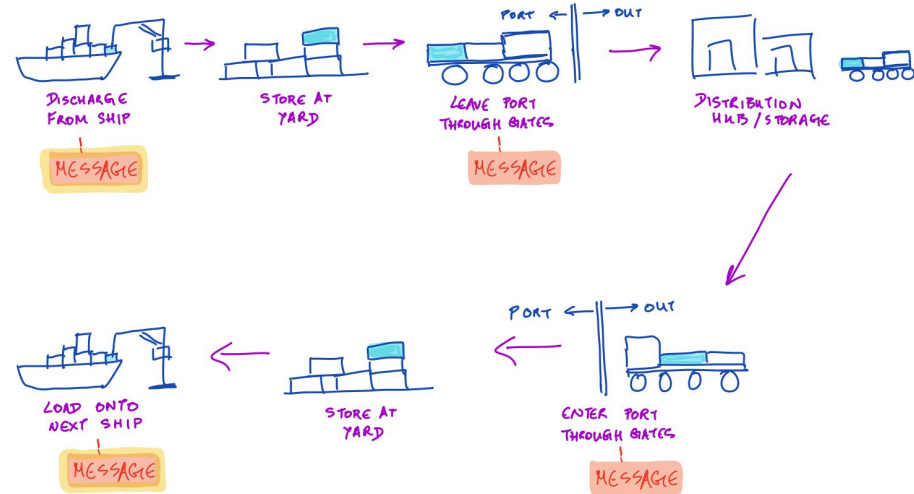
Metric I : Import container processing time (for import transshipment)

- Time from import container discharge to load onto next ship (taking container to another NZ port).
- Captures the time spent at port (at various states: yard, loading area etc.), loading onto inland transport.



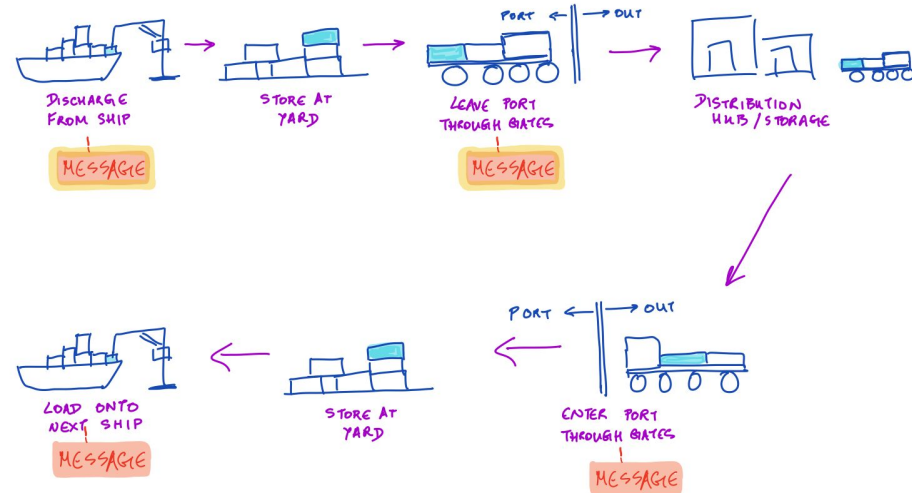
Metric II : Import container processing time (for domestic)

- Time from import container discharge to load onto next ship (taking container to another NZ port).
- Captures processing times at distribution hubs / storage depots and any road/rail congestion issues.



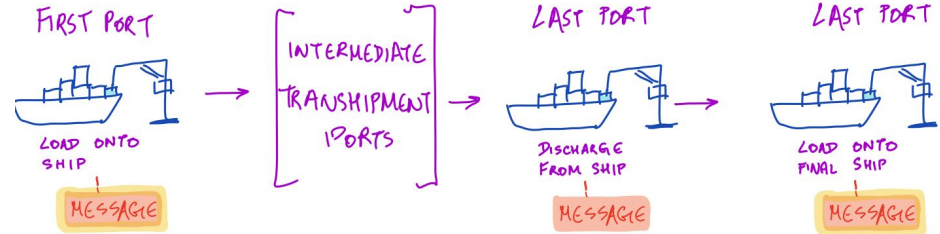
Metric III : Import container processing time (processing at port)

- Time from import container discharge to leaving port gates on inland transport.
- Captures the time spent at port (at various states: yard, loading area etc.), loading onto inland transport.



Metric IV : Export container processing time

- Time from export container load at first NZ port to final load onto ship going out of NZ.
- Captures the full journey time for exports including coastal shipping, road, rail and multiple port efficiencies.





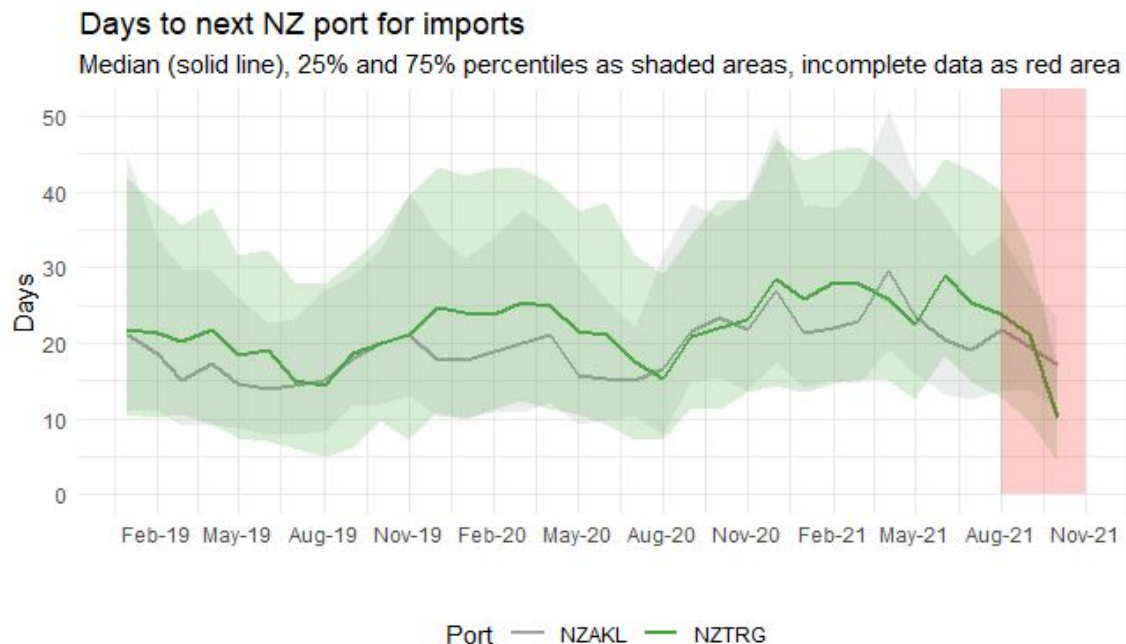
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Insights

Connecting metrics to policy

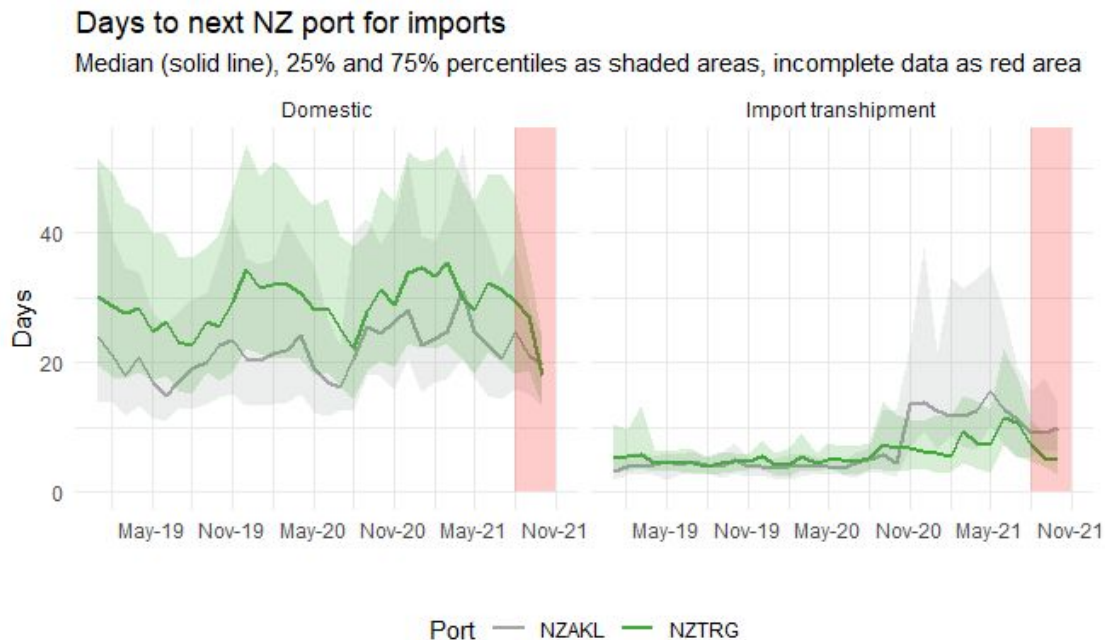
Import container processing time

- Combined metrics I and II
- Auckland (NZAKL) and Tauranga (NZTRG) both have similar historical turnarounds for moving import containers.
- Disruptions have moved the median of ~16 days in 2019 to 22 days in 2021 at Auckland. From 19 days to 25 days at Tauranga.



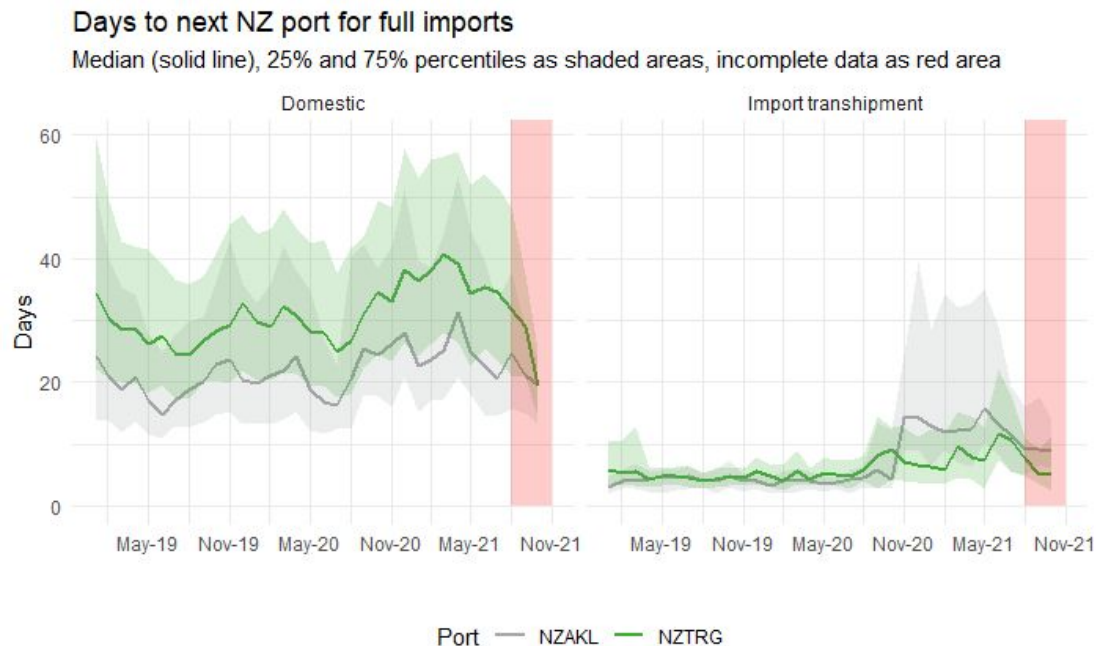
Decomposing aggregate metrics

- **Domestic = Metric II.**
Import transhipment = Metric I
- **Higher volatility for transhipments at Auckland.**
- **Higher median since November 2020.**



Faceting metrics by categories

- **Trend in container processing times are driven by full import containers.**

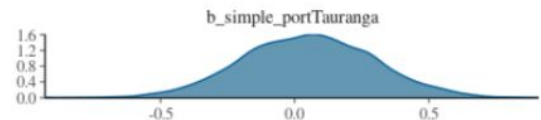
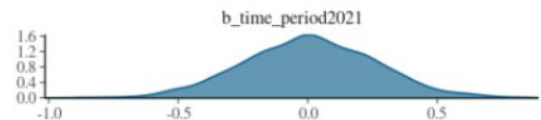
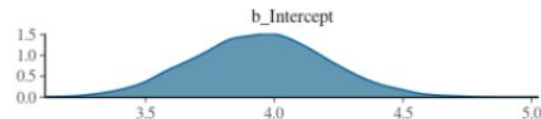


Next steps

- Single stream analytics so far – just messages about container movements.
- Multi-streams to include other types of events e.g. ship visits, movements on other modes like rail / road etc.
- Modelling extent of delays (e.g. lag periods) for key period of shocks.
- Impact of seasonality, relative busy-ness (number of ships being processed concurrently), size of ship etc. on container processing times.

Population-Level Effects:

	Estimate	Est.Error	l-95% CI	u-95% CI	Rhat	Bulk_ESS	Tail_ESS
Intercept	3.94	0.26	3.45	4.46	1.00	4105	3038
time_period2021	0.01	0.26	-0.50	0.52	1.00	3979	2842
simple_portTauranga	0.05	0.24	-0.42	0.53	1.00	3912	2763





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END

Thank you!