Origin-Destination Transportation Surveys
New Directions in Canada

INTERNATIONAL TRANSPORTATION FORUM

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New Directions in Canada: Transactional Surveys & new technologies

- Context
- Industry versus Activity Surveys
- A Need for Transactional Processing
- An Integrated Approach: Trucking
- New Technologies: Examples
- Next Steps

CONTEXT: REGULATION IN CANADA

- Regulatory reform of federal transport markets:
  - **1987 *National Transportation Act***
  - **1996 *Canada Transportation Act***
- Data needs evolved from financial for regulation …
  - ***How the industry is doing?*** (e.g. revenues, prices)
- … to activity that can address policy :
  - ***What the industry is doing?*** (e.g. pass. & freight flows)

INDUSTRY VERSUS ACTIVITY SURVEYS

- Some Statistics Canada business surveys tend to be industry-based and collect financial data for measures such as value-added GDP
  - For example, Trucking surveys cover establishments classified to the for-hire trucking industry (NAICS 484)
- Other surveys are activity-based (e.g. agriculture, R&D) and, in the case of transportation, there is a need to collect passenger and freight flow data
  - A trucking activity survey must include others classified to manufacturing and wholesale (NAICS 31-33, 41)

THE NEED FOR TRANSACTIONAL PROCESSING

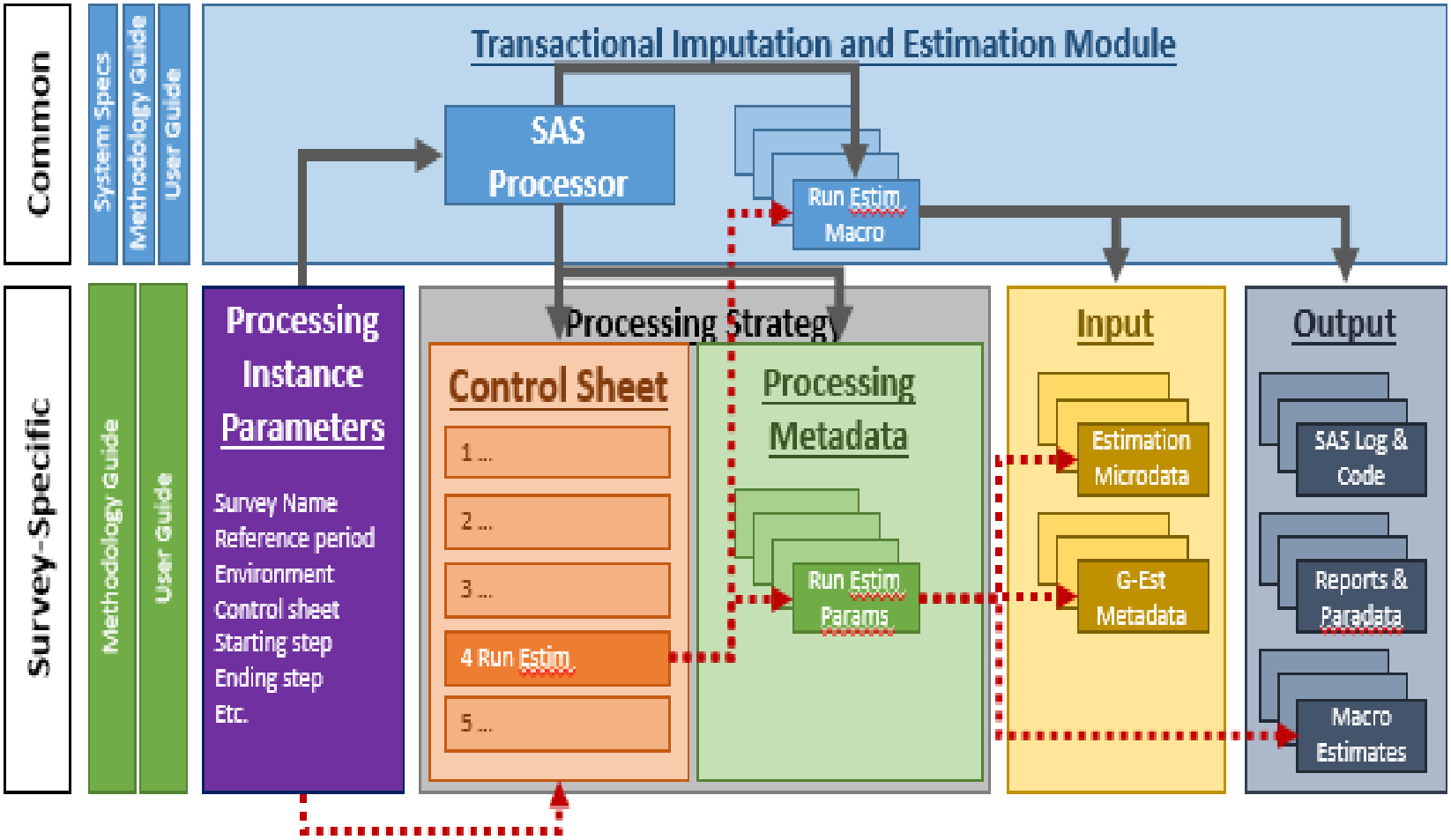
- Transactional surveys in transportation:
  - *Fare Basis Survey* (FBS), measures average base and total airfares of Canadian airlines by segment;
  - *Aircraft Movement Statistics* (AMS), measures landings and take-offs reported by NAVCanada control towers;
  - *Trucking Commodity Origin Destination* (TCOD), surveys shipments by commodity, geography and weight; and
  - *Rail Commodity Origin and Destination* Statistics, census of waybills from mainline carriers and others that inter-line.

- Freights flows (air, marine rail, truck, pipe) required for the Canadian Freight Analysis Framework

The Need for Transactional Processing

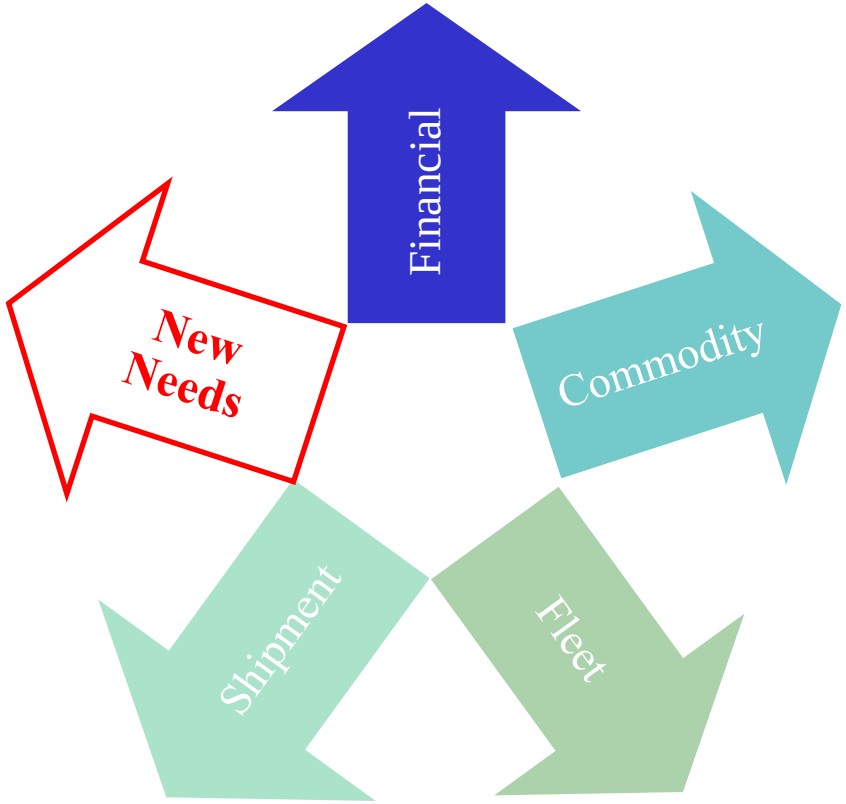
- Methodology designing one generic, SAS-based processor for these surveys which uses Statistics Canada standard processing tools where possible:
  - Edit & Imputation
  - Estimation
- The modular design adaptable to different processing models and production to be “push button” to run the processor every quarter/year, analyze data.

TRANSACTIONAL SYSTEM DESIGN

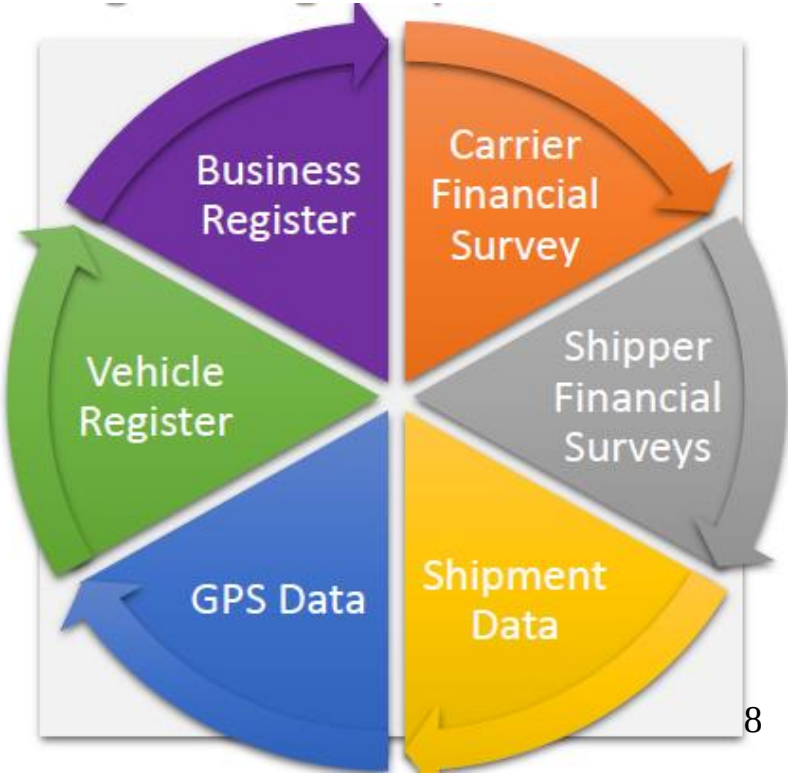


An Integrated Approach: Trucking

Current Framework: New data needs have to fit existing surveys or require developing a new instrument



Proposed Framework: New data needs can be addressed by linking existing data and survey components

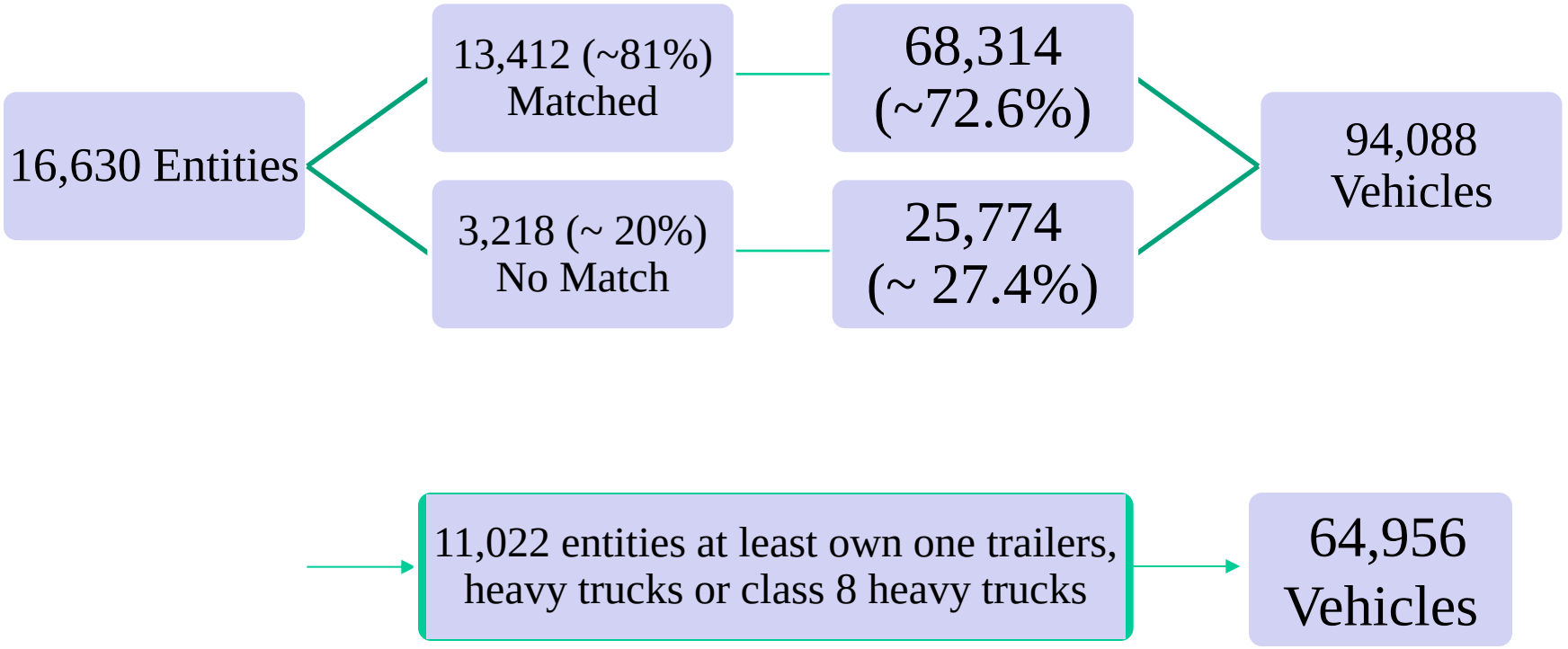


NEW TECHNOLOGIES – LINKAGES

- Need to identify survey frame for private trucking: Provincial vehicle registration files (VRF) to identify commercial trucks and link to establishments on the agency's Business Register; and

- Test case of a smaller province – Nova Scotia – achieves **80%** match rate on first attempt as proof of concept: Process for frame creation now in production for 2019 application.

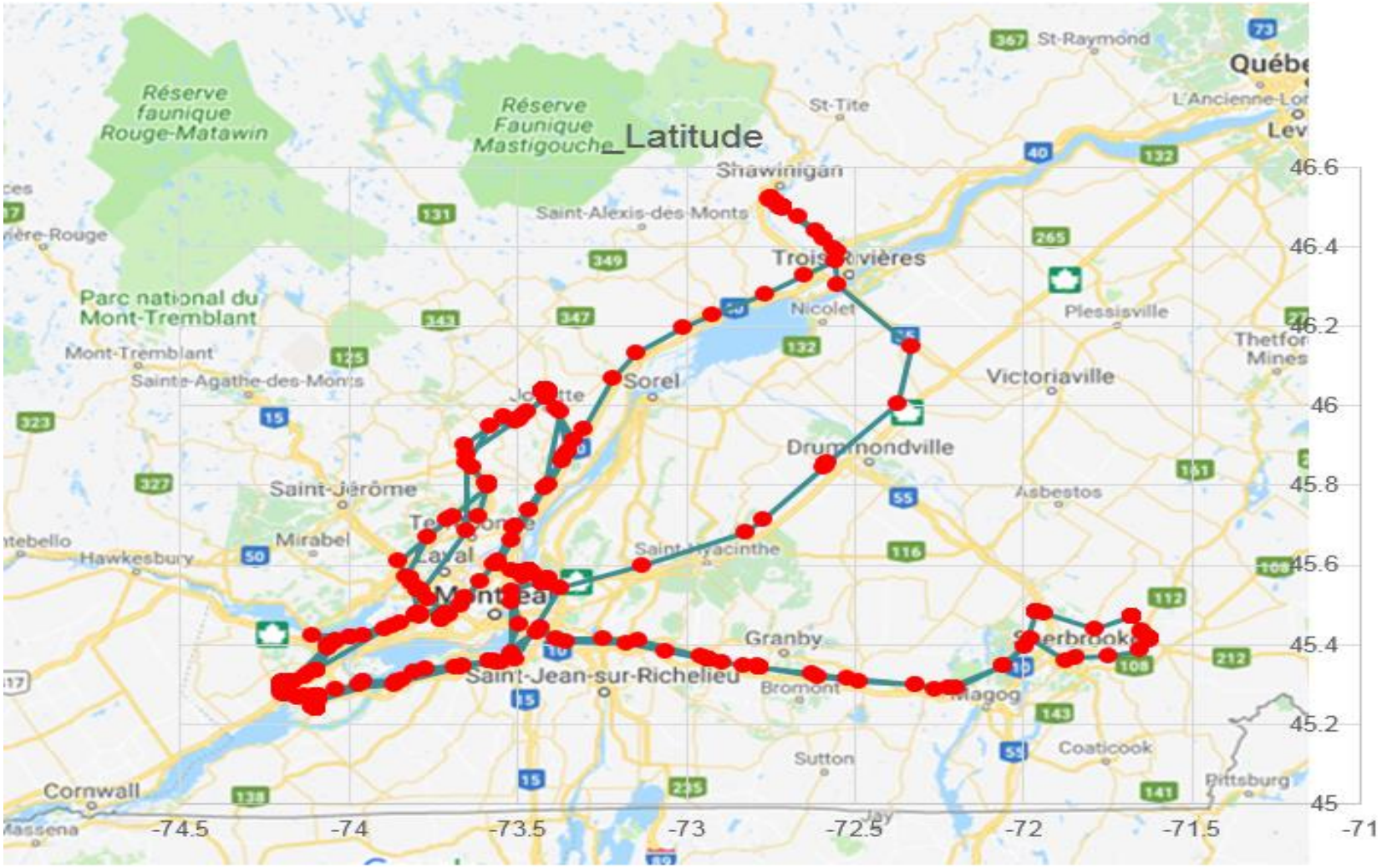
Linkage Example: Nova Scotia



New Technologies – GPS Measures

- Assess potential use of GPS data to increase consistency of the imputed values for TCOD;
- GPS variables - Company & truck identifiers, Date, time, latitude & longitude of the ping – used to derive others - time & distance between pings, Cumulative distance; and
- Algorithm by Gingerich, Maoh & Anderson (2016) used to derive the stops (primary vs. secondary) and then another algorithm used to identify "correct" company at the stop location.

NEW TECHNOLOGIES – GPS MEASURES

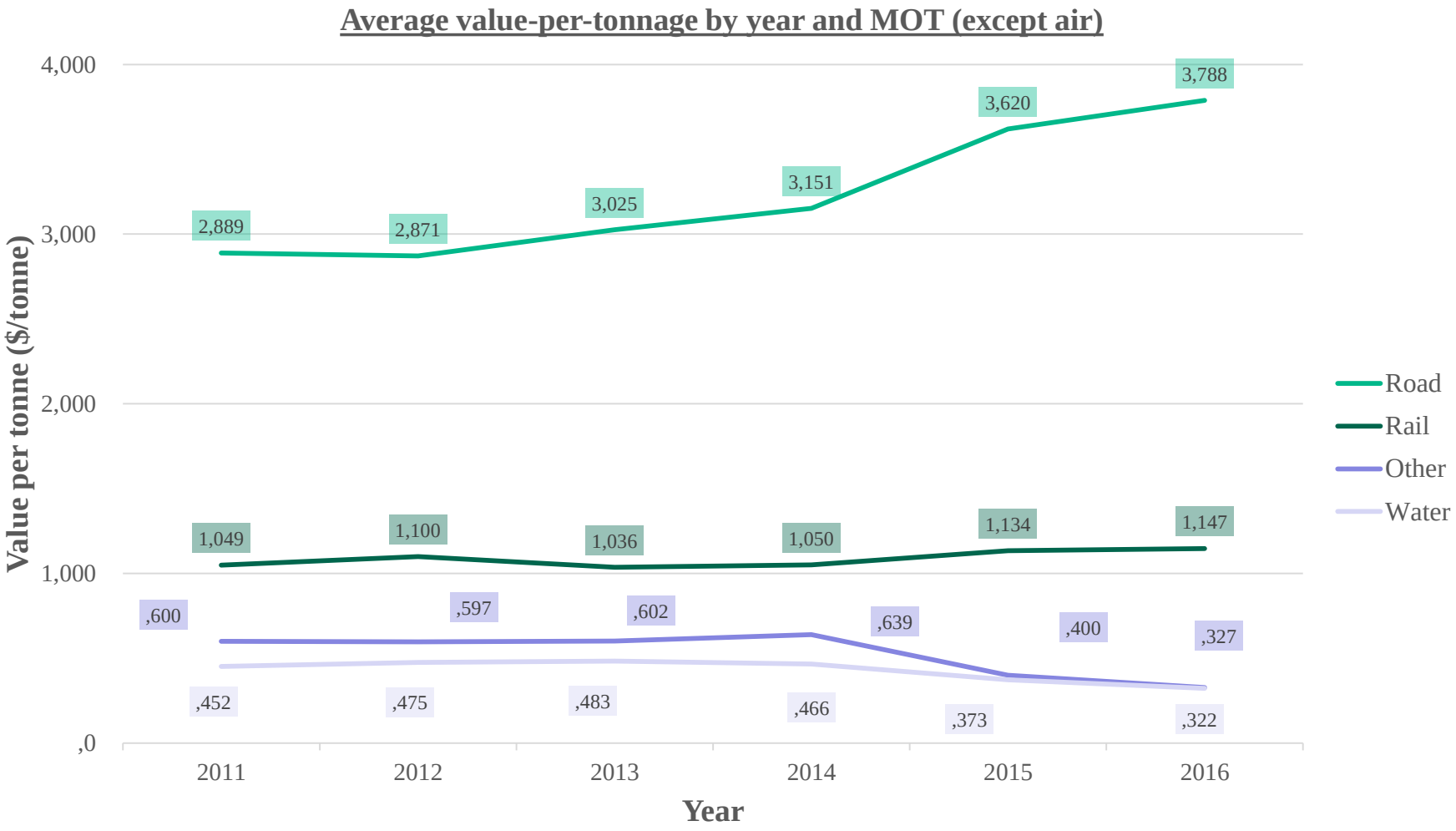


New Technologies – Machine Learning

- From the carrier, Statistics Canada collects weight but not value of shipments; obtained International Trade files for 2011 to 2016 which contain 12 to 14 million records per year; and

- Grouped data by HS code and mode of transport and then used various methods such as:
  - Outlier detection (ABOD, BACON)
  - Clustering algorithms, Robust regression and
  - Updated concordances from HS8 code to Standard Classification of Transported Goods (SCTG)

ESTIMATE THE VALUE PER TONNE BY MODE



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