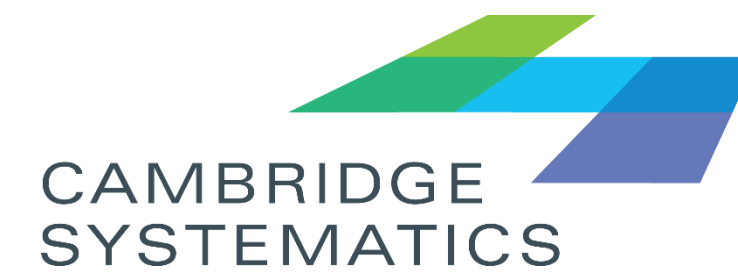# FIRMS IN THE FUTURE: APPLYING TODAY'S DATA TO FORECAST THE EVOLUTION OF FIRMS FOR FREIGHT MODELING

Brent Selby, Krishnan Viswanathan, Cambridge Systematics, Inc.
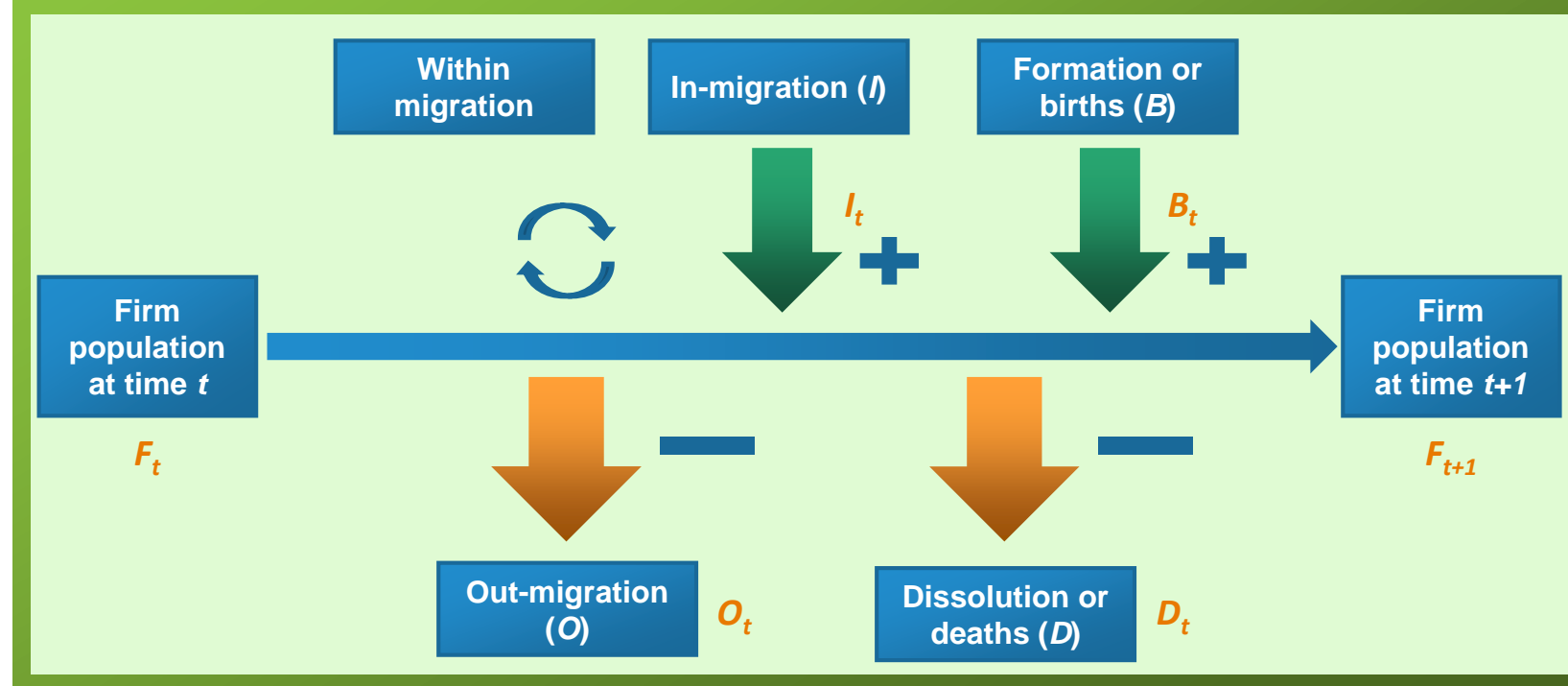*Frank Tabatabaee, Florida Department of Transportation*

CAMBRIDGE SYSTEMATICS

PURPOSE

» Freight and truck modeling depend on firm information.

» Different industries have different freight needs.

» Firms produce varying amounts of freight movement that correlate to their size. Employment or floor area can be used as a proxy for size.

» We are implementing a firm evolution model to create a synthetic, disaggregate set of firms as an input for a freight model.

FIRM EVOLUTION MODELING

» Based on the changes that actual firms experience.

» Iterative model of yearly changes.

» Firms join and leave the population.

» The number of employees of firms grows and shrinks.

Firm population at time t (F_t) → Firm population at time $t+1$ (F_{t+1})

Within migration · In-migration (I) · Formation or births (B) · $+I_t$ · $+B_t$

Out-migration (O) · O_t — · Dissolution or deaths (D) · D_t —

DATA NEEDS AND SOURCES

Estimate data needs:

» Yearly data

» Disaggregate set of firms by industry

» Locations of firms by point or zone

» IDs which track firms over many years

National Establishment Time Series (NETS):

» Meets all these needs

» Covers 1990-2014

» Tracks population of firms

» Thorough

Insufficient:

» Less frequent than once per year

» Aggregate totals

» Location by county

» Firms not identifiable year-to-year

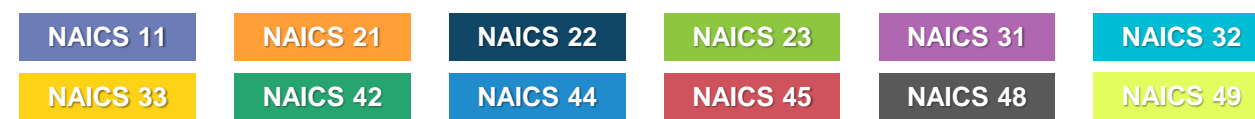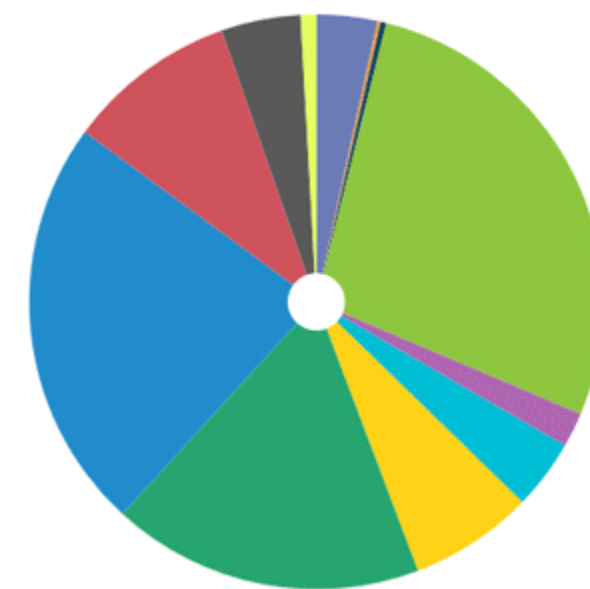**Other data used for reference:**

» QCEW (BLS)

» Census Employment

CHANGES IN THE MAKE UP BY INDUSTRY

Non-Service Firms by NAICS - 1990
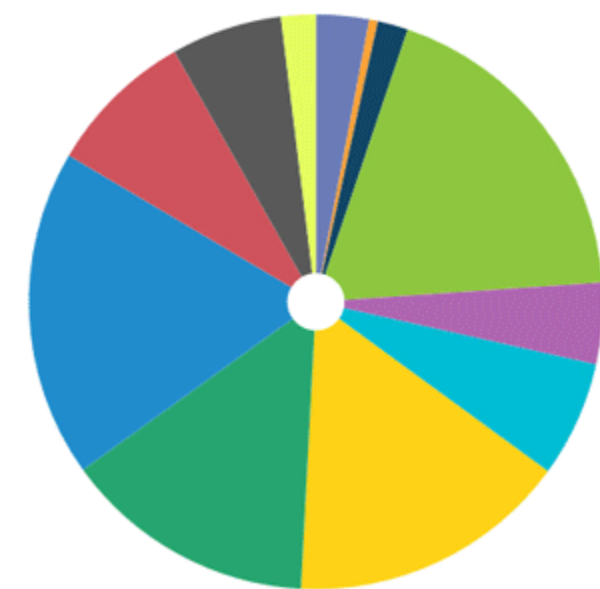
Non-Service Employment by NAICS - 1990

| NAICS 11 | NAICS 21 | NAICS 22 | NAICS 23 | NAICS 31 | NAICS 32 |
| NAICS 33 | NAICS 42 | NAICS 44 | NAICS 45 | NAICS 48 | NAICS 49 |

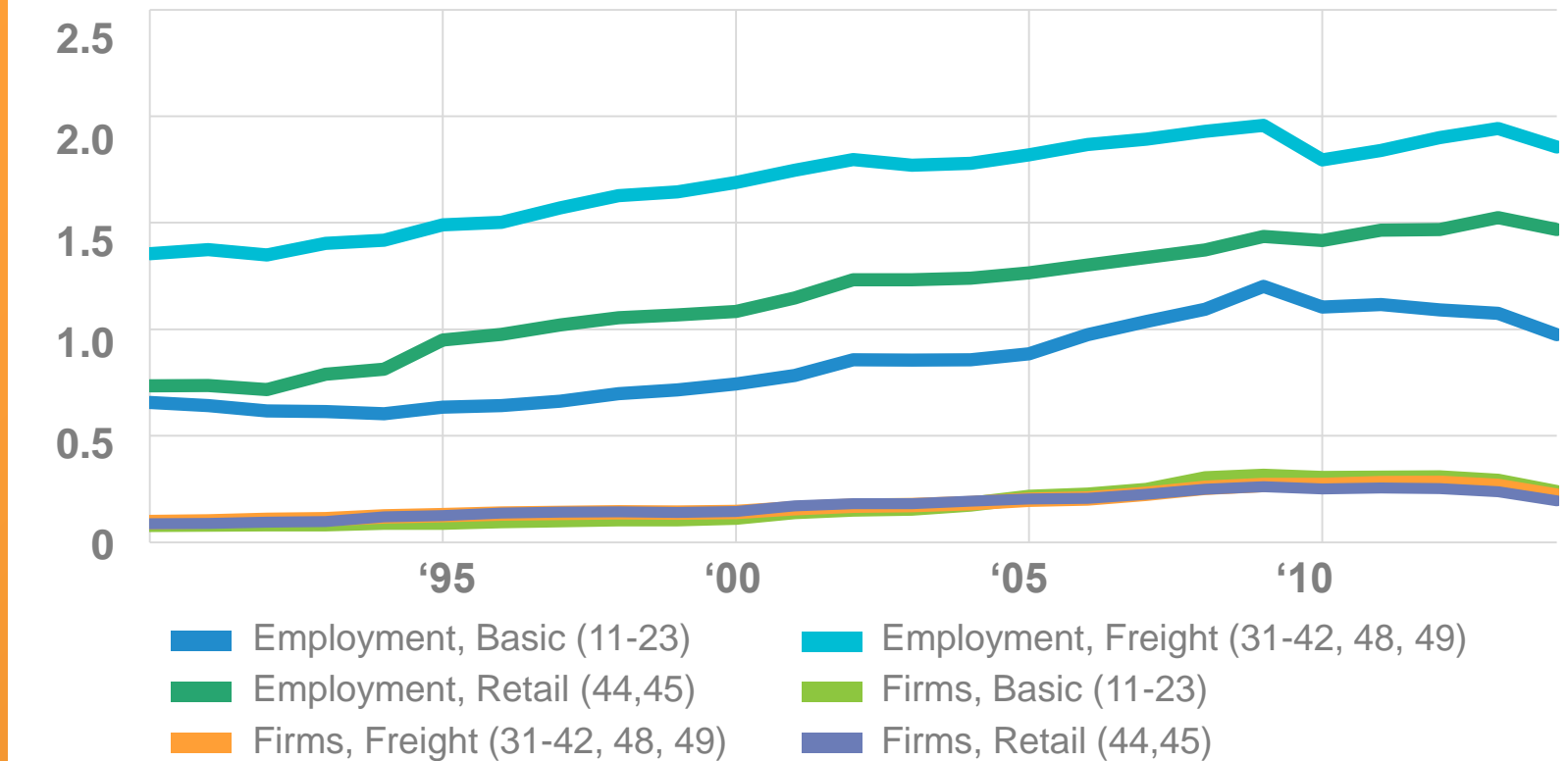### Births and Deaths by NAICS - 1990
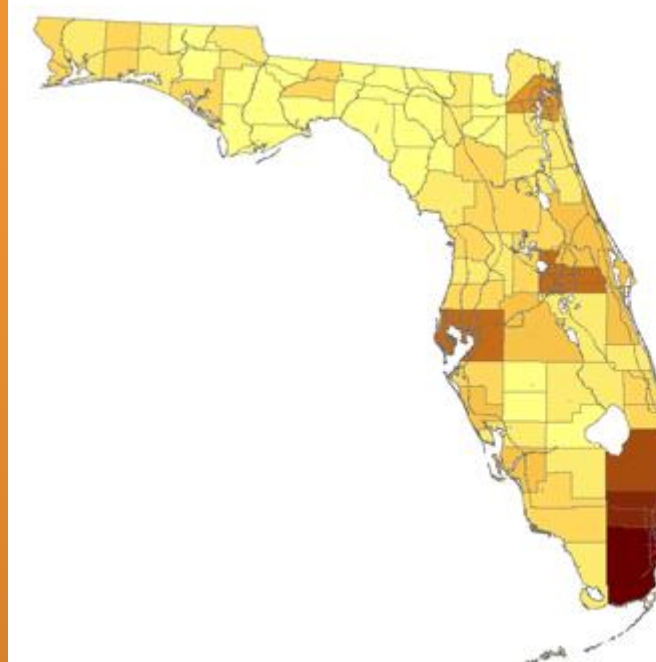

Thousands
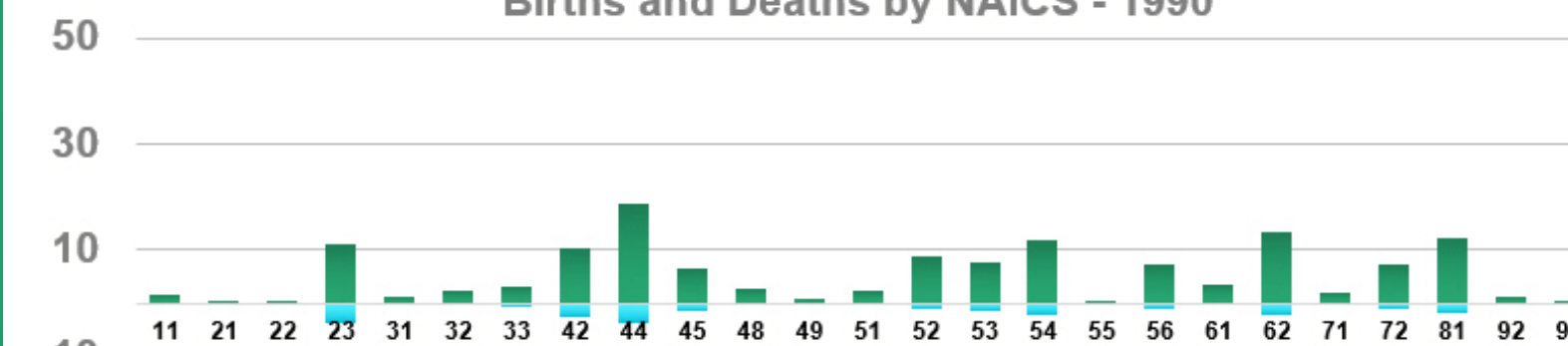
Percent Births and Deaths by NAICS - 1990

BIRTHS · DEATHS
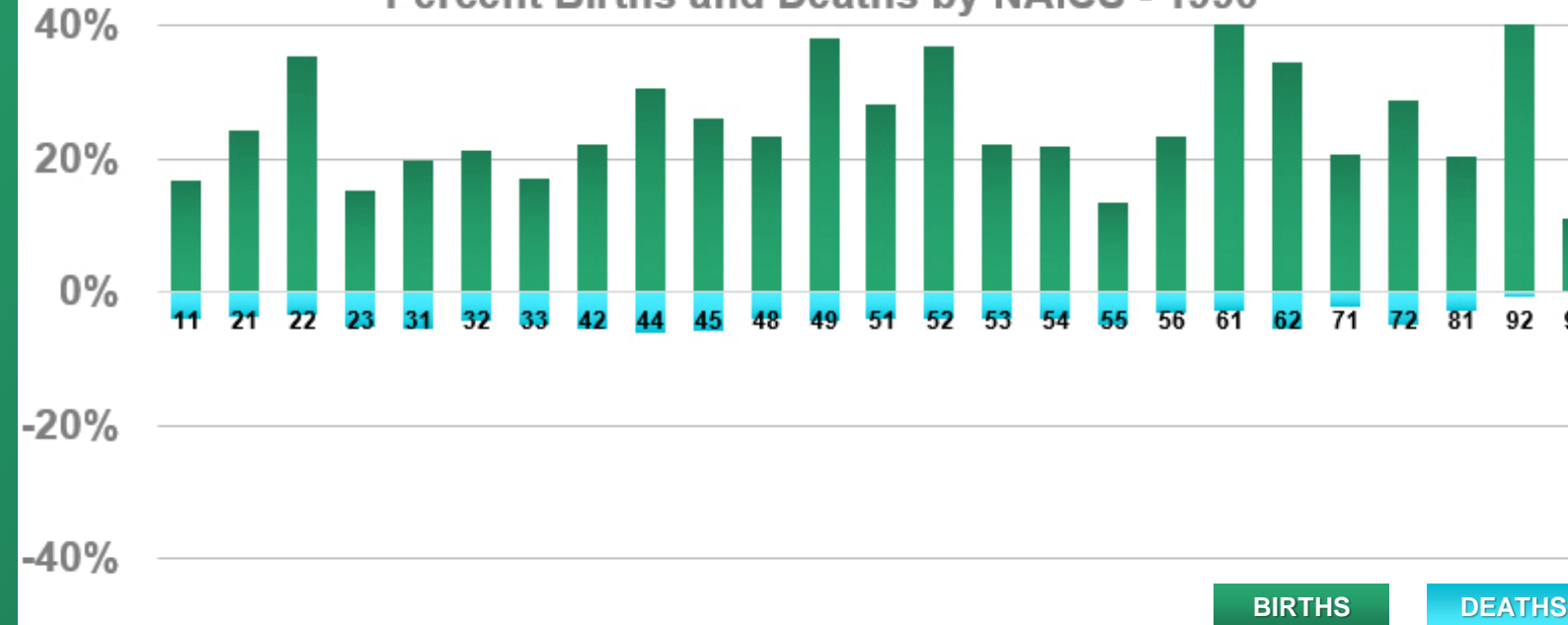
STATEWIDE EMPLOYMENT AND FIRMS

Statewide Employment and Firms for Freight Heavy Industries (MILLIONS)

- Employment, Basic (11-23)
- Employment, Retail (44,45)
- Firms, Freight (31-42, 48, 49)
- Employment, Freight (31-42, 48, 49)
- Firms, Basic (11-23)
- Firms, Retail (44,45)

Percent of Firms

Percent of Employment

1990
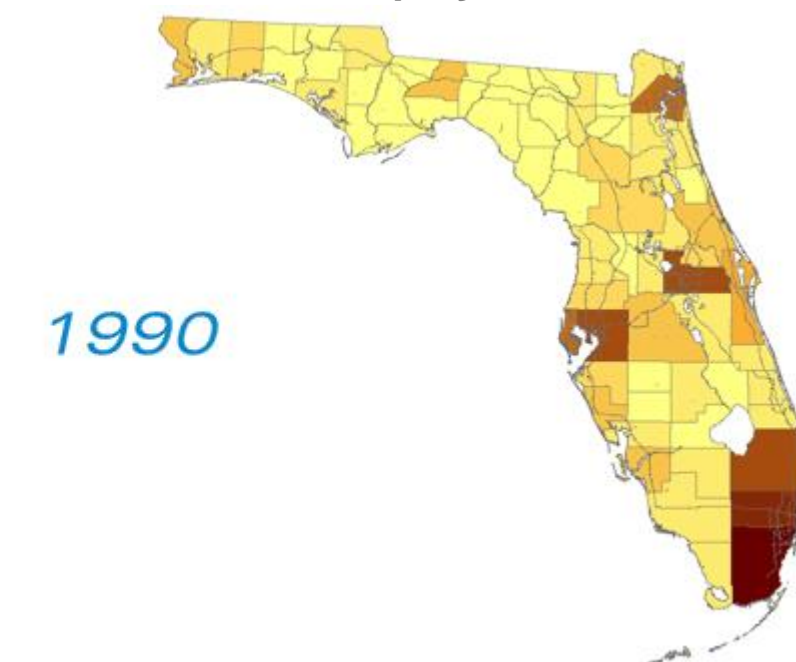
CONCLUSION

» Firm evolution – the method of using an iterative model to evolve existing firms to a future year – has strict data needs to produce a rich, disaggregate firm population for freight modeling. The NETS is the only dataset which contains all needed information for estimation and calibration.

» As with any dataset, modelers must be aware of its biases. NETS is biased towards very small firms which then draw down the average firm size over time. The validation of the model must address this. Including post-processing is necessary to synthesize iterations of the model and should also be used to keep aggregate results consistent with macroeconomic projections.