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A joint model of mode and shipment size choice using the first generation of CFS Public Use Microdata

Monique Stinson [a], Zahra Pourabdollahi [b,*], Vladimir Livshits [c], Kyunghwi Jeon [c], Sreevatsa Nippani [c], Haidong Zhu [c]

[a] Massachusetts Institute of Technology, United States
[b] RS&H Inc., United States
[c] Maricopa Association of Governments, United States

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ABSTRACT

A behavior-based supply chain and freight transportation model was developed and implemented for the Maricopa Association of Governments (MAG) and Pima Association of Governments (PAG). This innovative, data-driven modeling system simulates commodity flows to, from and within Phoenix and Tucson Megaregion and is used for regional planning purposes. This paper details the logistics choice component of the system and describes the position and functioning of this component in the overall framework. The logistics choice model uses a nested logit formulation to evaluate mode choice and shipment size jointly. Modeling decisions related to integrating this component within the overall framework are discussed. This paper also describes practical insights gained from using the 2012 Commodity Flow Survey Public Use Microdata (released in 2015), which was the principal data source used to estimate the joint shipment size-mode choice nested logit model. Finally, the validation effort and related lessons learned are described.
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Introduction

Freight movements have significant impacts on the transportation system, regional wellbeing and economic growth of any region. Ongoing changes in supply chain management and the emergence of new technologies have made freight decision-making processes more sophisticated than previously. This reveals the need for more reliable freight demand models that can be used to better account for the complex interactions among decision makers in the freight system and to gain a clearer picture of regional or national freight movements.

The vast majority of existing freight transportation models have an aggregate nature due to lack of disaggregate data (de Jong, 2007) and the challenge of developing a suite of disaggregate models. This can significantly affect model precision, as different freight decision-makers and shipments may have completely different characteristics. Moreover, logistics decisions, such as mode choice and shipment size, are treated insufficiently in freight transportation models. Most extant freight demand models in practice lack an explicit treatment of these logistics choices or model these choices separately, whereas

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* Corresponding author.
E-mail addresses: mstinson@mit.edu (M. Stinson), Zahra.Pourabdollahi@rsandh.com (Z. Pourabdollahi), VLivshits@azmag.gov (V. Livshits), KJeon@azmag.gov (K. Jeon), SNippani@azmag.gov (S. Nippani), HZhu@azmag.gov (H. Zhu).

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the review of literature shows that mode and shipment size choices are mostly made simultaneously and are highly correlated.

A freight modeling system that addresses these issues was developed for the Maricopa Association of Governments (MAG) and Pima Association of Governments (PAG) (Hong et al., 2017; Strategic Highway Research Program, 2017; Pourabdollahi et al., 2016). Commodity flows to, from and within the Phoenix and Tucson Megaregion are simulated at

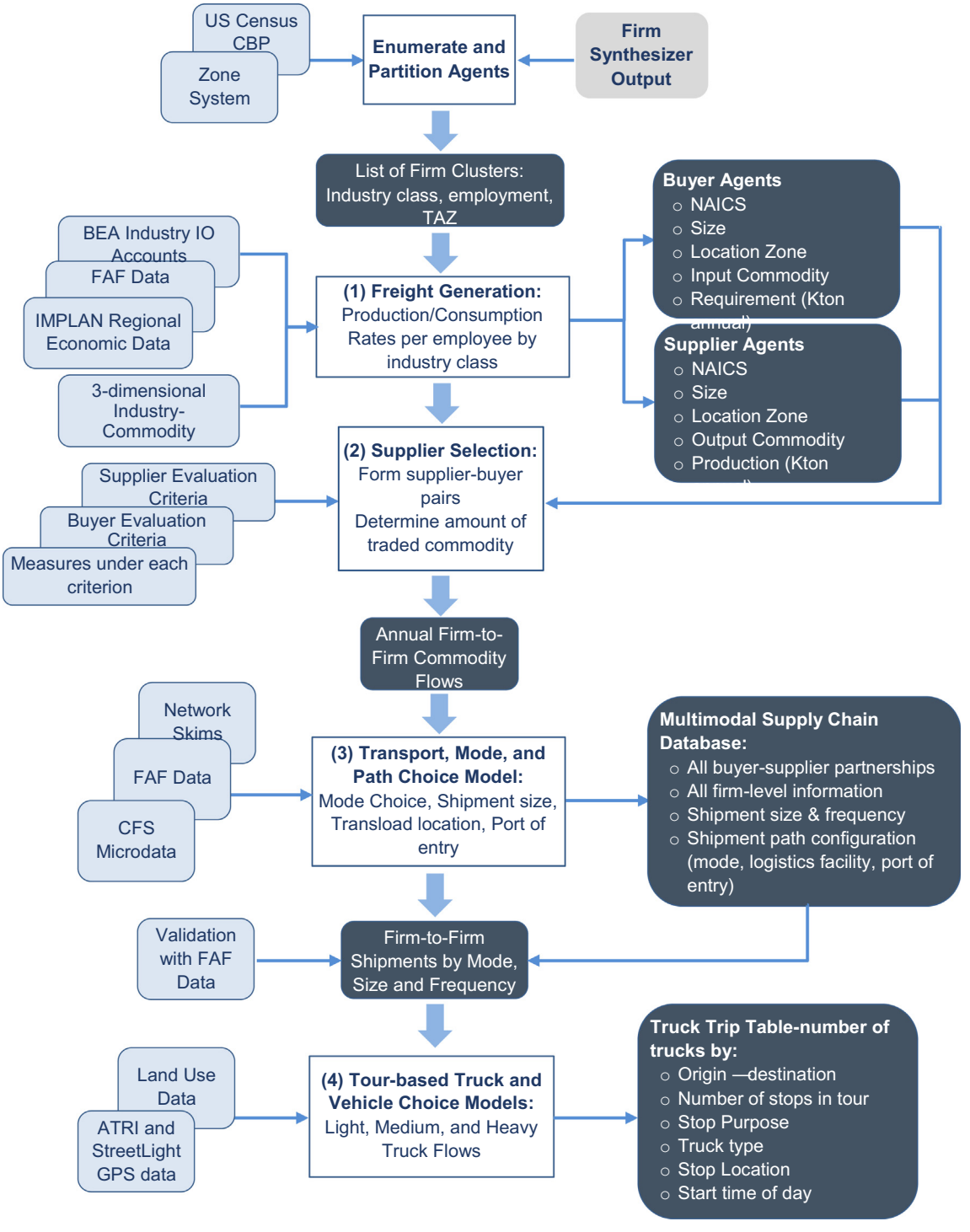

Fig. 1. Overview of MAG's Next Generation Freight Demand Model. Adapted from Hong et al. (2017) and enhanced by the authors.

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