



# The value of information sharing for truckload shippers <sup>☆</sup>



Alex Scott <sup>\*</sup>

Pennsylvania State University, Smeal College of Business, Department of Supply Chain & Information Systems, 463A Business Building, University Park, PA 16802, United States

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## ABSTRACT

This study explores the potential value to shippers of sharing load offers with carriers and obtaining carriers' responses in advance of the scheduled pickup date. Using a private transactional dataset from a large national shipper, we find that truckload spot prices increase considerably as the lead time before pickup decreases. As an extension of this empirical analysis, we develop a method to estimate near-real-time market prices, which does not currently exist in the truckload industry. A key insight is that market prices persist through time, meaning that current prices are good predictors of future prices.

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## 1. Introduction

Why should truckload shippers share load information in advance with contracted carriers? Previous studies have shown the value of advance load information for truckload carriers because it allows them to plan more efficiently (Tjokroamidjojo et al., 2006; Zolfagharinia and Haughton, 2012). The incentive for shippers to provide such information is not so clear. Modeling studies past and present (e.g., Hirsch and Dantzig, 1968; Roberti et al., 2014, among many others) frequently assume that costs for shippers are simply linear in volume. Contract rates for carriers are typically negotiated in advance with a duration of a year or more (Caplice, 2007), so it would seem that a shipper only benefits from sharing load information if it reduces the likelihood that the load is rejected.

Despite the significant breadth of research on information sharing for supply chain partners (e.g., Gavirneni et al., 1999; Lee et al., 2000; Sahin and Robinson, 2002; Angulo et al., 2004), including in a truckload transportation context (Powell, 1996; Tjokroamidjojo et al., 2006; Zolfagharinia and Haughton, 2012), we are unaware of any studies that address information sharing from a shipper's perspective in a shipper-carrier relationship. This is surprising given the size (\$300 billion in 2013; Corridore, 2014) and importance (approximately 67% of freight by weight in the United States moves by truck; Costello, 2014) of the trucking industry to the economy of the United States.

In this study, we empirically examine a year of spot transactions to explore whether and to what extent shippers benefit from the advance sharing of load information. We find that spot market truckload prices increase considerably as the time between load offer and pickup decreases. This finding, combined with the right-of-refusal in industry-standard shipper-carrier contracts in for-hire trucking (Scott et al., 2015), means that shippers are naturally incentivized to offer loads in advance and receive timely responses from their carriers to minimize spot prices.

We estimate the value of lead time for truckload shippers. Because the estimates result from an analysis of tens of thousands of bids in a competitive spot-bidding process from numerous brokers and carriers spread throughout the country, these results are likely generalizable to other shippers in the United States. Knowledge of the value of lead time is important

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<sup>\*</sup> Tel.: +1 814 865 0607; fax: +1 814 863 7067.

E-mail address: [alexscott@psu.edu](mailto:alexscott@psu.edu)

for shippers because they regularly decide how far in advance to offer freight to contract carriers, with some probability of rejection, or offer it on the spot market.

Further, we provide other insights into the truckload spot market, a market that is virtually unstudied despite its economic significance.<sup>1</sup> While there is not much publicly-available empirical information about the spot market, there is anecdotal evidence that it is important for carriers. For instance, in a 2012 earnings release, J.B. Hunt Transport stated that “operating income increased 27% compared to 2011” due to “favorable changes in freight mix, *strong seasonal spot pricing* [emphasis added]...and improvements in fuel efficiency” (Hunt, 2012). Our analysis of the data supports J.B. Hunt’s emphasis on spot pricing, because the spot prices we observe have significantly higher revenue than loads moving at previously-contracted rates.

Finally, we propose a method to estimate market prices for for-hire trucking in the United States. Due to the highly private nature of and lack of a centralized market in for-hire trucking (Tsai et al., 2009), there is no near-real-time index that adequately captures market prices (Bignell, 2013). A novel insight from our analysis is that market prices have significant serial correlation. Knowing that prices persist from week to week impacts decision-making for both shippers and carriers. For example, a carrier who observes high spot prices might be better off accepting fewer contract loads in the near future and allocating more capacity to spot customers. Likewise, a shipper might benefit from providing price incentives above contract rates to encourage more capacity from contract carriers in expensive markets.

The rest of the paper proceeds as follows. Section 2 reviews the relevant literature. We propose our hypotheses and discuss factors that affect carrier pricing in Section 3. Section 4 discusses our methodology and data. Results and robustness checks are discussed in Section 5. Section 6 discusses the major findings of the study and implications for truckload shippers.

## 2. Literature review

### 2.1. Information sharing

Information sharing has become central to supply chain research over the past couple of decades (e.g., Cooper et al., 1997; Gavirneni et al., 1999), and is still active (e.g., Özer et al., 2014). Chen (2003) and Sahin and Robinson (2002) provide thorough reviews of the significant problems considered in information sharing. Most of this research has focused on the interplay of suppliers, manufacturers, and retailers. A fundamental insight is that information sharing between partners can reduce inventory costs and improve forecast accuracy.

With regards to the transportation industry, the value of information sharing has been studied from a truckload carrier’s perspective by Powell (1996), Tjokroamidjojo et al. (2006), and Zolfagharinia and Haughton (2012). The insight from these studies is that carriers are able to plan more efficiently with knowledge of their future loads.

Lindsey et al. (2015) provided the only study that we are aware of that included a measure of the impact of lead time on truckload prices. These authors analyzed truckload spot prices observed at a broker. They included a dummy variable to capture lead time as “greater than 8 days” (p. 11). For the large national shipper used in our study, spot market lead times are much shorter than 8 days and the impact of lead time appears to drop off quickly after the second day.

The lack of research attention is due to the fact that finding information about truckload spot prices is challenging (Tsai et al., 2011) because these transactions occur between private parties. We have overcome this problem by receiving access to a full year’s worth of spot transactions from a large national shipper (henceforth, “Acme”).

### 2.2. Dynamic pickup and delivery problem

The dynamic pickup and delivery problem is central to transportation research, and has been for decades (e.g., Powell, 1987). Berbeglia et al. (2010) provide an excellent review. For the current study, the essence of the problem is as follows. A shipper contracts with for-hire truckload carriers who operate fleets of trucks and service demand (loads) from many customers. From a carrier’s perspective, load offers are received at random geographic locations at random times; hence planning how to most efficiently operate a fleet is a very challenging problem. Quite often, carriers will reject freight at previously contracted rates.<sup>2</sup> If all contracted carriers reject a load offer from a shipper, the shipper must utilize the spot market.

Within the dynamic pickup and delivery problem, future knowledge of potential loads is valuable for a carrier because it allows them to plan more efficiently. Interestingly, Zolfagharinia and Haughton (2012) claimed that the value of knowledge decreases considerably after the second day. For example, they estimated that the second day of advance information makes a carrier 22% more profitable on average, but the third additional day makes the carrier only 6% more profitable.

### 2.3. Truckload contracts

Truckload contracts between shippers and for-hire carriers in the United States differ from other types of contracts because they specify a price but not a legally-enforceable service obligation (Caplice, 2007; Scott et al., 2015). When a

<sup>1</sup> In a study of truckload futures contracting, Tsai et al. (2011) acknowledged that finding “reliable truckload spot price data can be challenging” and that no published papers were found “that analyzed industry data.” This is consistent with our review of the literature.

<sup>2</sup> Scott et al. (2015) provide an example where spot market usage can, at times, exceed 20% of freight for a shipper.

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