Grain and Soybean Industry Dynamics and Rail Service

Econometric Analysis of Rail Transport Rates

BACKGROUND

The Staggers Act of 1980 gave railroads considerable freedom in terms of price discrimination. Despite expectations of the contrary, rail transport rates decreased for most shippers after the Staggers Act. The Surface Transportation Board (STB) is responsible for handling rate disputes between shippers and railroads in regions where competition is limited. The STB collects a 1% stratified sample of all waybills originated by major carriers in the United States. A version of the data is available to the public. The analysis presented in this report uses the STB's publicly available carload waybill sample (CWS) to analyze rail transport rates.. The analysis examines trends in rail transport rates for (a) all shipments, (b) specific commodity-types including grain, and (c) specific regions of the country including two regions that produce a large amount of grain, the Upper Midwest and the I-states. The analysis additionally attempts to examine (a) the shipment characteristics that impact rail revenue per ton-mile (RPTM) and revenue per carload-mile (RPCM), (b) how the impact of the characteristics differ as a function of commodity-type and region of origin, and (c) how this impact fluctuated between 2001 and 2013.

METHODOLOGY

The CWS is a very large data set; hence, it was necessary to conduct an in-depth exploratory analysis of the data. First and foremost, the exploratory analysis revealed errors in the dataset; therefore, the data was cleaned to remove nonsensical shipments and also filtered in order to remove extreme outliers. Second, data exploration uncovered correlations between variables in the dataset and also determined important temporal trends of specific variables. The data exploration results informed econometric models, which were developed to further analyze rail transport rates. Multivariate regression models were developed to analyze rail transport rates and answer the research questions posed in the Background section.

SUMMARY OF THE RESULTS

Data Exploration Results

- The correlation matrix for the CWS's fields shows that freight revenue per ton-mile (RPTM) is negatively correlated with distance, route density, weight, and carload number. These correlations are tested more systematically in the econometric models.
- Average RPTM increased, in real terms, between 2001 and 2013. Specifically, RPTM for grain and coal increased, as did the RPTM for export shipments.

Econometric Modeling Results

All Waybills

- Average RPCM for rail shipments increased between 2006 and 2012.
- The following shipment types were associated with lower RPCM: long distance shipments (see Figure 1), large shipments, and shipments bound for export.
- After accounting for shipment characteristics, the RPCM for bulk grain was lower than every other commodity-type examined, including: crude oil and natural gas, coal, food products, non-grain agricultural products, and chemicals.
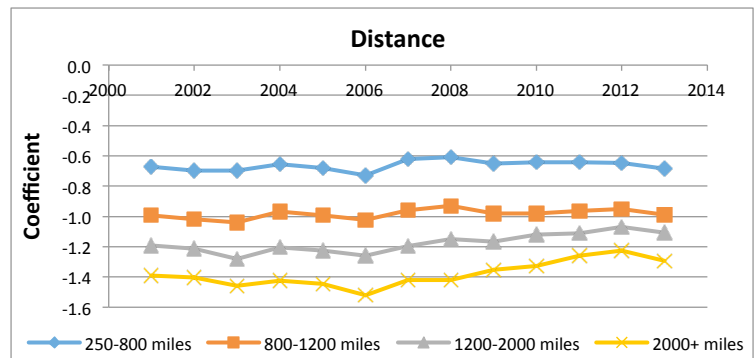

Figure 1: Coefficient values for the regression model's distance parameter. Points are relative to shipments traveling 20-250 miles.

Grain Waybills Only

- Average RPCM increased significantly between 2004 and 2011.
- Average RPCM for export grain shipments was lower than the RPCM for non-export shipments in the early 2000s; however in 2012 and 2013, export RPCM was higher than non-export.
- Interestingly, between 2010 and 2013 there was no noticeable difference between RPCM for 90+ carload shipments, 50-90 carload shipments, and 6-49 carload shipments.

Upper Midwest Waybills Only

- Average RPCM increased steadily between 2008 and 2013.
- RPCM for grain shipments was significantly lower than the RPCM of other commodities in the Upper Midwest between 2001 and 2013.
- Interestingly, between 2001 and 2003 the RPCM for shipments on very high density routes (100,000+ shipments annually) was significantly higher than the RPCMs for lower density routes. Conversely, between 2004 and 2013, the RPCM for very high density routes was lower than the RPCM of all lower density routes.

CONCLUSIONS

The econometric model results indicate that after controlling for shipment characteristics and other exogenous factors the average RPCM of rail shipments increased significantly, in real terms, between 2001 and 2013 with most of the increase occurring between 2004 and 2012. Further analysis shows that although RPCM increased for bulk grain shipments, the increase was consistent with a general increase in RPCM for all commodities during the period from 2001 to 2013. The regression model results show that the RPCM for bulk grain was consistently lower than the RPCM for many other commodity-types after holding other variables such as carload number, shipment distance, route density, and railcar ownership constant in the multivariate regression models. The methodology presented in the report provides a systematic means of determining trends in not only overall rail transport rates but also the shipment characteristics and exogenous factors that impact rates in different segments of the data.