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REPORT SUMMARY

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Estimating the Demand for Railroad and Barge Movements of Corn in the Upper Mississippi River Valley (Summary)

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This is a summary of "Estimating the Demand for Railroad and Barge Movements of Corn in the Upper Mississippi Valley," by Tobias Sytsma and Wesley W. Wilson.[1] This research and analysis received funding from USDA's Agricultural Marketing Service (AMS) through cooperative agreement number 18-TMTSD-TN-0012. The opinions and conclusions expressed are the authors' and do not necessarily reflect the views of USDA or AMS. The full paper is available at: https://ageconsearch.umn.edu/record/308938.

WHAT IS THE ISSUE?

Freight flows are determined by market forces of supply and demand. In general, shippers seek to maximize their return, given the prices offered in different locations and the costs (handling and transportation) to reach those markets. Many Midwestern grain shippers enjoy access to barge transportation, which costs less per ton-mile than truck or rail. However, barge transportation is practical only for limited origins and destinations. As a given shipper's distance to the waterway increases, barge becomes more expensive to access, and the shipper's modal choice (barge or an alternative) becomes less obvious.

When barge is unavailable or too costly to access, many grain shippers choose to ship by rail. Therefore, changes in both rail and barge rates affect decisions about which route is taken. Overall, barge and rail markets are closely related, but how they interact and compete in overlapping territory (e.g., within 300 miles of the inland waterway) is not well understood.

The researchers studied the substitutability of barge and rail transportation for Midwest corn shippers and measured how a given shipper's preference for each mode changed as the shipper's distance to the waterway changed. The research reveals how demand for barge and rail respond to relative price changes. Analysis also reveals how the distance to barge affects barge and rail demand.

1 Sytsma is a former graduate student, and Wilson is a professor in the Department of Economics (College of Arts and Sciences) at the University of Oregon.

WHAT DID THE STUDY FIND?

To study the interplay between barge and rail, the researchers established nine "catchment areas" along the Mississippi River, each containing potential origin and destination locations for barge and rail shipments of corn. They found barge handled most corn volumes in these areas, about 86 percent of the tonnage annually. The Central (Louisiana) Gulf was the most common destination for both barge and rail shipments originating near the Mississippi River. For barge movements originating in the region of study, nearly all tonnage terminated in the Central Gulf. For rail movements in the region, destinations were more diverse than for barge, but the Central Gulf was still the top destination. On average, 28 percent of annual rail tonnage terminated in the Central Gulf; 25 percent, in the Lower Ohio area; 16 percent, in the Illinois River area; and 15 percent, in the Mid-Mississippi River area.

The researchers found shippers substituted modes and, to a lesser extent, substituted destinations based on rail and barge prices. Specifically, shippers near a waterway generally preferred barge, but increasingly opted to ship by rail as the distance from the waterway grew. The preference for barge was strongest for shippers closest to a waterway and fell to approximately zero for shippers beyond 175 miles from the waterway.[2] Likewise, as barge rates increased, shippers became more likely to ship by rail.

HOW WAS THE STUDY CONDUCTED?

Much of the previous literature studying modal choice and demand by shippers involves expensive surveys. In contrast, this paper's new approach relied on data from the Surface Transportation Board's Carload Waybill Sample (for rail) and the U.S. Army Corps of Engineers' Waterborne Commerce Statistics (for barge) to calculate shipping rates and model barge and rail movements. Specifically, the researchers used data from corn shipments between 2000 and 2017 that originated and terminated within the nine defined areas—Upper Mississippi, Middle Mississippi, Illinois, St. Louis, Lower Ohio, Upper Ohio, Memphis, Lower Mississippi, and Central Gulf. The researchers used these definitions of area origination and termination to model shippers' choice of mode and destination as a function of transportation rates, distance to the waterway, and other shipment attributes.[3]

PREFERRED CITATION

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2 Some shippers close to the waterway may still choose to ship via rail based on contract obligations or special circumstances, such as time constraints.

3 More technically, they used a random utility model to reflect shipper decisions. The model assumed a shipper chose the destination and mode associated with the highest utility, where utility was based on (1) observed attributes of the route (e.g., transportation rates); (2) unobserved factors (e.g., commodity prices, which were taken as random); and (3) unobserved shipper-specific attributes (e.g., contracts). To study how a shipper's distance from the waterway affected modal shares of grain shipments, the researchers first established 250 distance bands, each representing a 1-mile increment of distance from the waterway. (The entire distances ranged between 50 and 300 miles.) Then, they conducted a regression at each distance band with modal shares as the dependent variable and several potential explanatory variables.