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Rail Rates for Grain Shipments Over Time (Summary)

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WHAT IS THE ISSUE?

U.S. agricultural producers sell their products in an extremely competitive world market and depend on efficient transportation, including low rail prices. Rail rates shape the volume of traffic flow, the origins and destinations involved, and ultimately, the economic well-being of shippers. This influence is particularly notable in agricultural markets with low profit margins. Higher transportation rates mean higher prices relative to competitors and reduced returns to American farmers.

For these reasons—and given the inherent contention between transportation providers and users on rates—agricultural stakeholders and policymakers benefit from a solid understanding of rail transportation for grain and the factors that affect grain rail rates. For 20 years after passage of the Staggers Rail Act of 1980 (hereafter, referred to as “Staggers”), railroad rates declined significantly. However, real rates (i.e., controlled for inflation) began to increase in 2003, rising sharply until 2014, before falling somewhat in 2015 and 2016. The report aims to examine—for the transport of corn, wheat, and soybeans—the sources of change in (real) rail rates since 2000.

WHAT DID THE STUDY FIND?

Rail rates and their changes over time are determined by a variety of factors, not all of which are discussed here (see the full report for more details). One key set of factors consists of shipment characteristics, such as the commodity being shipped, availability of alternative transportation options (e.g., a barge option or another railroad), and shipment size, distance, and route. Another important factor is how railroads price to these characteristics; that is, the railroads' pricing strategies. For example, railroads offer "discounts" (per ton-mile) for shipping more cars in the set and shipping over longer distances. Finally, other factors, like the railroad's costs for fuel, also determine rail rates.

The following are the major findings on shipping characteristics found to have the greatest influence on rates over time:

- **Distance**. Shippers of corn, wheat, and soybeans received a discount on longer distance shipments, reflected by railroads' receiving a lower revenue per ton-mile (RPTM) when distance was increased. From 2000 to 2015, that discount remained somewhat stable (decreasing slightly) for corn and wheat shippers but increased for soybean shippers.

- **Car ownership**. Although shippers of corn, wheat, and soybeans have received a discount on rail rates for using their own "private" cars, that discount has diminished over time, particularly for corn and soybean shippers. From 2000 to 2016, the average discount corn shippers received for private car ownership fell from 8.9 percent to 2.3 percent.

- **Contracts**. Private contracts provide a discount to public (common carriage) tariff rates for all commodities and across all years. However, for corn and wheat, discounts for contracting have increased, while soybean discounts have declined.

- **Railroad competition**. For all three commodities, access to an additional railroad produces a small discount in rates, as expected. Interestingly, however, the effect has dissipated over time. The discount started off in 2000 at around 1.5 to 2.0 percent but fell to around 0.5 percent by the early 2000s, remaining stable through 2016.

- **Distance to water**. Similarly, distance to water—a measure of waterway competition—had a much larger effect on rail rates in 2000 (higher rates for shipments originating further from the water) but fell for all commodities throughout the time period, to near zero for corn and soybeans. This suggests that barge competition has become less important in rail pricing over time.

Between 2000 and 2014, rail rates increased on average by 31 percent for corn shipments, 30 percent for wheat, and 30 percent for soybeans. The total increase in rates stemmed from the net effect of all of the determining factors. Some of these factors tended to push rates down, as others tended to push them up. For example, changes in average shipment characteristics, like longer distances and bigger trains, pushed rates down, by 9 percent for corn, 15 percent for wheat, and 16 percent for soybeans. In contrast, changes in rail pricing strategies (like lowering the discount on longer distance shipments, for instance) pushed rates up, by 50 percent for corn, 48 percent for wheat, and 70 percent for soybeans. The result was increased rates overall, because the positive effects of changes in rail pricing strategies outweighed the negative effects of changes in shipment characteristics.

As a component of the changes in rail pricing strategies, fuel costs were found to play an integral role in the rate increases. This result held even after controlling for commodity prices.

HOW WAS THE STUDY CONDUCTED?

Particularly in the years since Staggers, a wide academic literature has sought to explain how and why rail rates have changed. Previous studies pointed to the role of distance traveled, shipment size, number of railroad interchanges, proximity to water competition, and degree of rail competition as explanatory variables. This research builds on the previous literature, using three separate, but related, econometric models to understand the changes in grain rail rates between 2000 and 2016.

The first model estimates a separate ordinary least squares regression for each commodity and year to uncover the relationship between rail rates and a variety of shipment characteristics, such as distance, shipment size (i.e., number of cars), car ownership (e.g., private versus railroad), type (i.e., contract versus common carriage), and degree of inter- and intramodal competition. Running separate yearly regressions has the benefit of providing not only within-year estimates of the factors behind rail rates, but also information about how those relationships changed over time.

The second model is called an "Oaxaca-Blinder decomposition."[1] This approach focuses on breaking down ("decomposing") the total change in rates over time into the parts that drove the change. The method takes two regression equations and results from the first model—namely, those from 2000 and 2014. In the Oaxaca-Blinder model, these serve as the beginning and ending periods, respectively, which compare how the components in each regression changed to produce the overall change in the average rail rate.[2]

The components of those regression results include the following changes:

- The variables, which reflect the underlying shipment characteristics, such as average shipment distance and average number of interchanges. For example, the average shipment distance for corn was approximately 800 miles in 2000 but 1,200 miles in 2014. Thus, there seems to be a sizeable change in the distance variable for corn.
- The estimated coefficients, which measure the relationships between the explanatory variables (e.g., shipment distance) and rates. For example, an increase in the shipment distance of 1 percent for corn was associated with a decrease in the rail rate per ton-mile of 0.44 percent in 2000 (all else equal). This was about the same as 2014, where the distance variable had a coefficient of −0.43. Therefore, there seems to be a small change in the distance variable coefficients for corn.

Although a portion of rate changes can be explained, inevitably there is a portion of rate changes that cannot be explained by the variables in the model: a portion of unexplained variation is encompassed in the intercept. The first and second models reveal that something affects rail rates over time that is not captured by the other variables. However, because neither model reveals what that something is, a third model is necessary.

The third model applies a Saxonhouse regression to help identify the potentially missing variables.[3] Specifically, it models the unexplained portion from the first model (the intercept estimates) as a function of annual fuel prices and commodity prices. As the author explains, this is done because these variables are theoretically relevant to understanding rail rate changes, but data limitations prevented them from being included directly in the more granular models.

[1] This method stems from two papers, Oaxaca, R. (1973), "Male-female wage differentials in urban labor markets," International Economic Review (1973): 693-709; and Blinder, A.S. (1973), "Wage discrimination: reduced form and structural estimates," Journal of Human Resources 8(4): 436-455.
[2] More precisely, the Oaxaca-Blinder decomposition breaks down the change in rates in (1) changes in the variables, (2) changes in the coefficients, and (3) an interaction term that captures the effects of simultaneous change in variables and coefficients. Although Wilson's results do include interaction term effects, they are less important and left out of this summary.
[3] This approach stems from Saxonhouse, G.R. (1976) "Estimated parameters as dependent variables," The American Economic Review 66(1): 178-183.

PREFERRED CITATION

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