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# **Changing Economic Geography of U.S. Soybean Transportation**

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# Changing Economic Geography of U.S. Soybean Transportation

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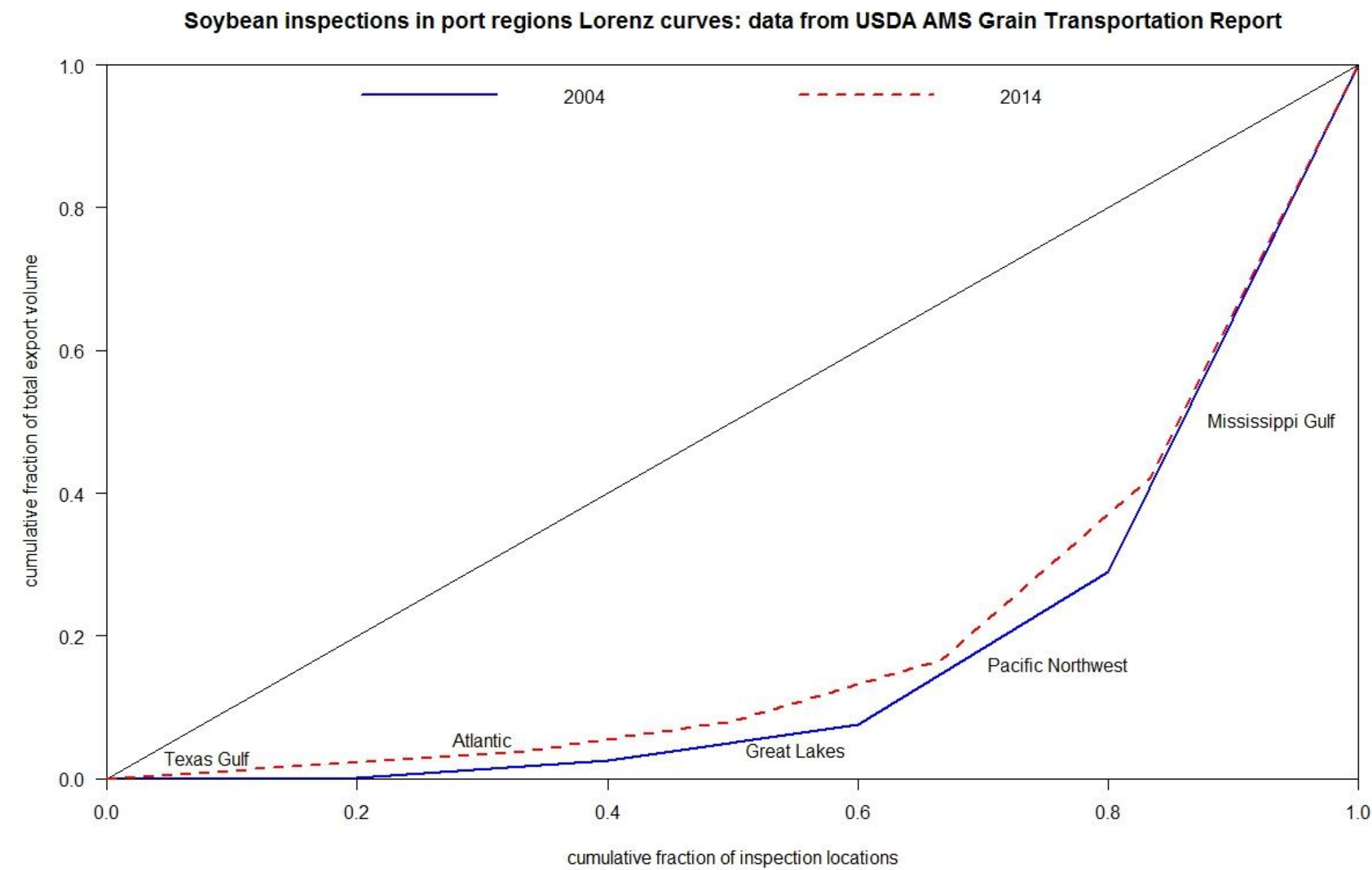
## RESEARCH QUESTION

How will the expansion of the Panama Canal affect where U.S. elevators send grain and oilseed for export?

## BACKGROUND

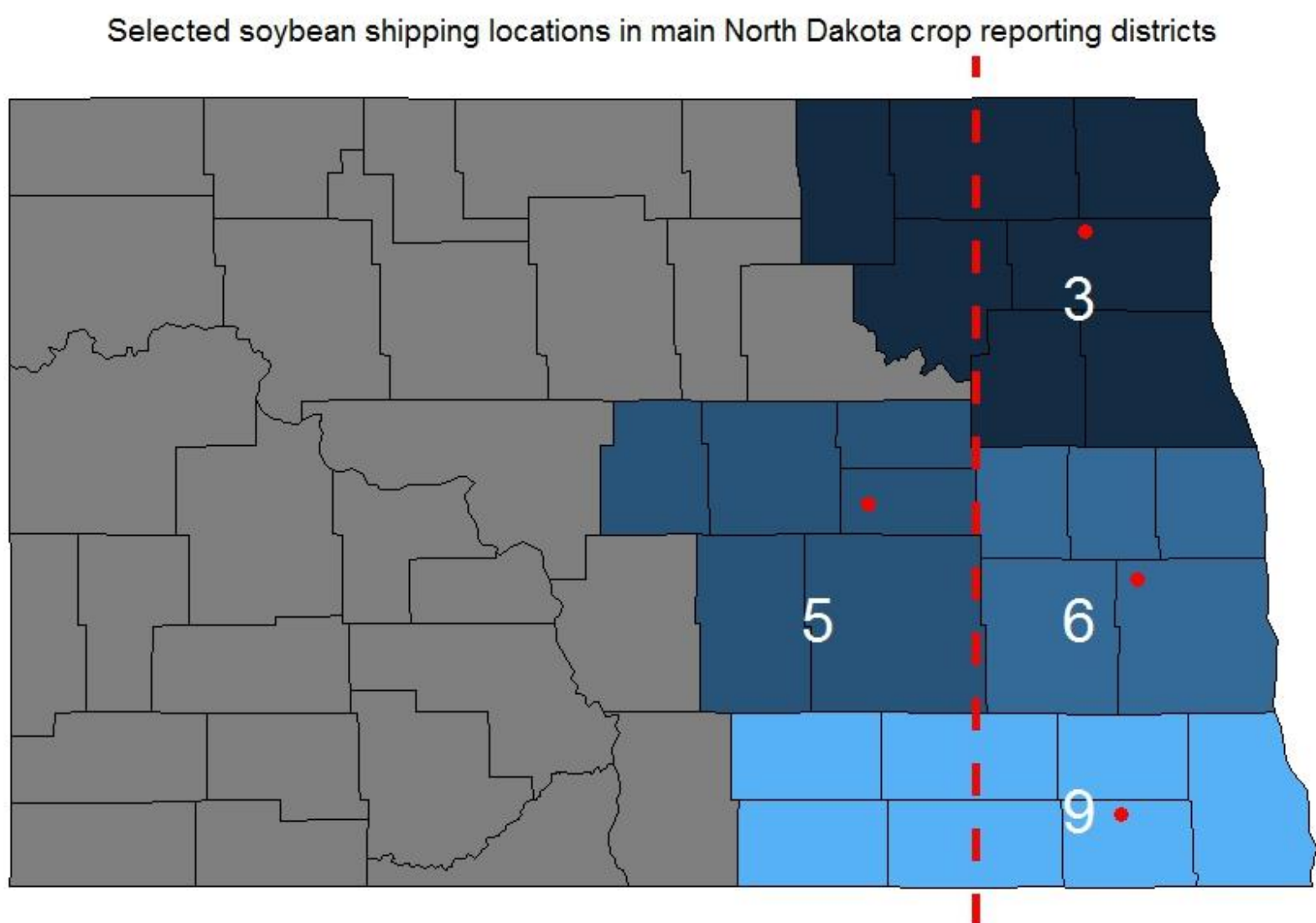
- The Panama Canal expansion opened June 26, 2016. The expansion features an additional channel with larger locks that can accommodate bigger New-Panamax-sized vessels.
- U.S. Department of Transportation (2013) estimates the canal's cargo volume capacity will double.
- Dry bulk cargos through the Panama Canal are usually westbound and dominated by U.S. grain and oilseed exports.
- Soybean ocean transportation costs could decrease by 13 percent, or 35 cents per bushel (Informa 2011).

## OTHER FACTORS AFFECTING U.S. GEOGRAPHY?



These Lorenz curves compare the actual annual distributions of soybean inspections at port regions in 2004 and 2014 to a uniform distribution, the 45-degree line. Despite increasing exports to Asia, there has been little change in the market shares of port regions. If shipping from the Gulf becomes cheaper then we can expect an even higher degree of concentration.

## METHODOLOGY



A GAMS programming model of North Dakota grain and oilseed flows is used to explore the geographic response to a large decrease in shipping costs from the Gulf of Mexico to Asia. The goal is to see which elevators switch from sending oilseed to Pacific Northwest ports to sending oilseed to Gulf ports.

## MODEL AND DATA

The GAMS model solves for rail and truck soybean flows between the North Dakota crop reporting districts 3, 5, 6, 9 and destinations Minneapolis, Portland, and Kansas City for the years 2010 to 2015. The objective is to maximize industry surplus subject to storage constraints. Choice variables are quantities shipped by rail and truck from production regions to destination regions within each year. Parameters were generated using information from the sources below.

- North Dakota prices: FINBIN farm financial calculator
- Prices in Minneapolis, Portland , and Kansas City: USDA AMS
- Rail costs: BNSF rail mileage calculator and USDA AMS Grain Transportation Report
- Truck costs: Google maps and USDA AMS Grain Transportation Report
- Storage costs: assumed to be \$.05/bu/month
- Production and storage capacity: Upper Great Plains Transportation Institute

## PRELIMINARY EVIDENCE

Historical flows show that over 50 percent of soybeans from the selected crop reporting districts go to the Pacific Northwest for the years 2010 to 2014.

Results from the preliminary GAMS model		
Crop reporting district	Year	GAMS result: rail shipping to PNW?
3	2010	No
	2011	Yes
	2012	Yes
	2013	No
	2014	Yes
5	2010	No
	2011	Yes
	2012	Yes
	2013	No
	2014	Yes
6	2010	No
	2011	Yes
	2012	No
	2013	No
	2014	Yes
9	2010	No
	2011	Yes
	2012	No
	2013	No
	2014	Yes

The Panama Canal is expected to lower Gulf ocean transportation costs. This could change the relative prices of soybeans in the Pacific Northwest versus locations on U.S. inland waterways. All else equal, if the prices of soybeans in Minneapolis increase 3.5 percent then re-solving the model results in crop reporting districts 3,6, and 9 shipping to Minneapolis instead of Portland.

## NEXT STEPS

- Acquire better price data so more spatially distinct origins can be used and the model can be better calibrated
- Add grain crops so the model optimizes shipping for wheat, corn, and soybeans
- Make rail rates adjustable to flows

## REFERENCES

Informa Economics. 2011. *Panama Canal Expansion: Impact on U.S. Agriculture*. Memphis TN, September. Available at: <http://unitedsoybean.org/wp-content/uploads/2013/07/Panama-Canal-Expansion-Impact-on-US-Agriculture.pdf>.  
U.S. Department of Transportation Maritime Administration. 2013. *Panama Canal Expansion Study: Phase I Report*. Washington DC, November. Available at: [http://www.marad.dot.gov/wp-content/uploads/pdf/Panama\\_Canal\\_Phase\\_I\\_Report\\_-\\_20Nov2013.pdf](http://www.marad.dot.gov/wp-content/uploads/pdf/Panama_Canal_Phase_I_Report_-_20Nov2013.pdf).

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