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# **The Incidence of Foreign Market Accessibility on Farmland Rental Rates**

**Jisang Yu, Nelson Villoria, and Nathan Hendricks**

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# The Incidence of Foreign Market Accessibility on Farmland Rental Rates

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# Background and motivation

- U.S. agriculture and its profitability are closely linked to the export market environment.
- Yet, empirical evidence on whether (and how) the changes in market accessibility affect factor prices is rather limited: Notable exceptions are Taylor and Brester (2005) and Donaldson and Hornbeck (2016).
- We focus on the relationship between the changes in tariffs that U.S. export crops face and farmland cash rental rates.

# Research questions

- How do export tariffs that U.S. agriculture faces affect farmland cash rental rates?
- What is the localized impact of the 2018 Chinese retaliatory tariff on U.S. soybeans?

# Key challenges

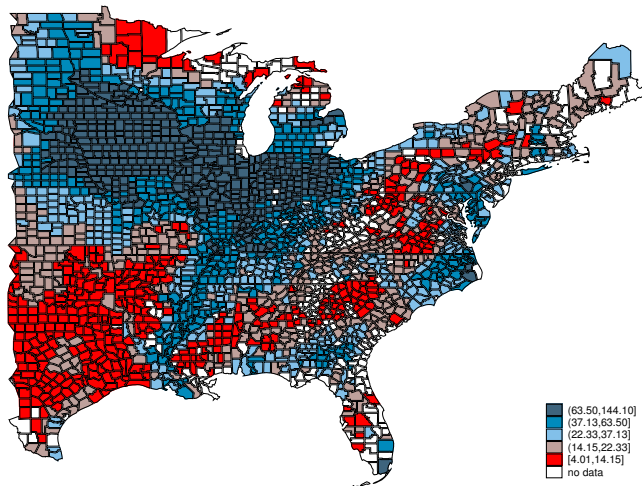
- Cash rents are observed at county-level: How do we measure “localized” export tariffs?
  - Aggregation across different destinations for each crop
  - Aggregation across different crops in each county
- The two aggregation issues are crucial in identifying the effect of localized export tariffs on cash rents.
  - **Contemporaneous destination-specific export volumes (thus, shares) and contemporaneous crop shares can be correlated with unobservables that affect cash rents.**

## Cash rent and production data

- We use annual county-level cash rents data for non-irrigated fields in the U.S. dryland from 2008 to 2017 (NASS survey): 2,165 counties total.
- Per-acre cash rents are adjusted by Producer Price Index (1982=100, BLS)
- We focus on the seven field crops: barley, corn, oats, sorghum, soybeans, upland cotton, and wheat: annual county-level planted acreage data from NASS survey.
- To compute the share of each crop, we use county-level data on total cropland, and total harvested irrigated cropland from NASS census (we use the difference between the two as the denominator).

# Average cash rent

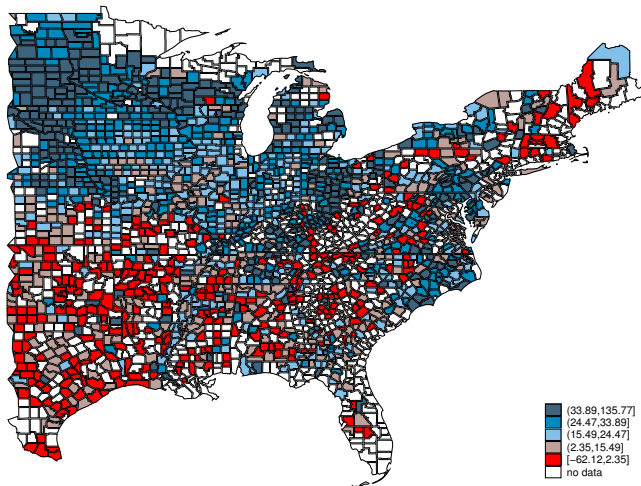
Cash rent, Non-irrigated, Average, 2008 – 2017





# Changes in cash rent

Cash rent, Non-irrigated, % changes, 2008 – 2012 vs 2013 – 2017



# Tariff and trade data

- We extract the importer-exporter pair level data for the seven field crops using 4-digit Harmonized Tariff Schedule (HS) codes (1001; 1003; 1004; 1005; 1007; 1201; 5201).
- Tariff data are from TRAINS and trade volume data are from UN Comtrade.
- Both data are extracted from the World Integrated Trade Solution (WITS).

# TRAINS tariff data

Two issues with the TRAINS tariff data:

- Missing tariff lines: Most Favored Nation rates are missing for some years in some countries. We use the most recent years for the missing years in those countries.
- TRQ: In general, TRAINS reports out-of-quota rates. Chinese imports of U.S. corn and wheat are less than the quota during the sample period – we replace the reported out-of-quota rates with in-quota rates for these two cases.

# Constructing crop-specific tariffs

For importing country  $d$  for crop  $j$  in year  $t$ , we denote the ad valorem tariff as  $\tau_{jdt}$  (we treat the domestic consumption as an “export” to the U.S., i.e.  $d = US$ , with  $\tau_{jUS_t} = 0$ ).

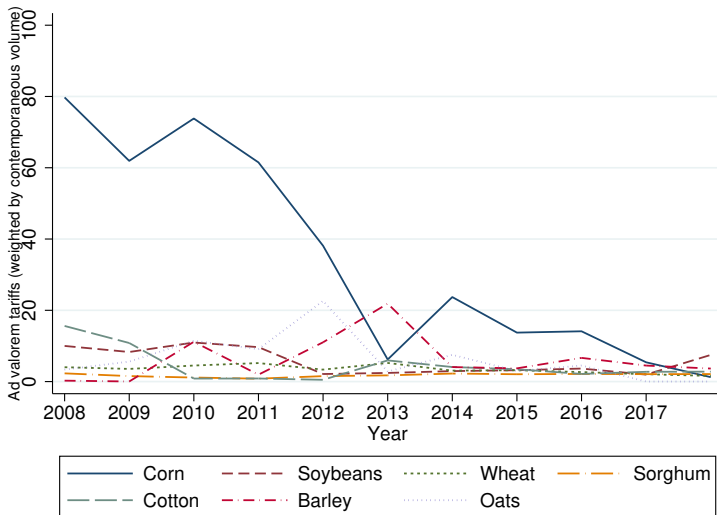
For crop  $j$ , in year  $t$ , the crop-specific tariff for crop  $j$  in year  $t$ ,  $\tau_{jt}$ , is

$$\tau_{jt} = \sum_d \theta_{jdt} \times \tau_{jdt} \quad (1)$$

where  $\theta_{jdt}$  is a weight.

A naïve approach is to use  $\theta_{jdt} = \frac{\text{Imported Volume}_{jdt}}{\sum_d \text{Imported Volume}_{jdt}}$ .

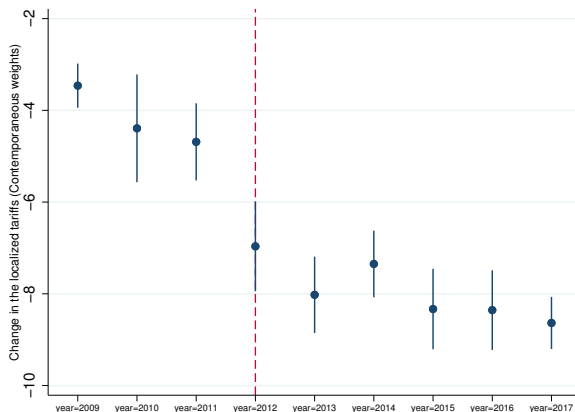
# Trends in crop-specific tariffs



# Preliminary event study: 2012

- The free trade agreement between the U.S. and South Korea became effective in 2012.
- The localized tariff,  $LT_{it} = \sum_j \tau_{jt} \times S_{ijt}$ , which is computed based on contemporaneous crop shares, dropped significantly in 2012.
- Contemporaneous crop shares can be correlated with unobservables (possible endogeneity bias).
- Thus, we present preliminary evidence via shift-share design (e.g. Bartik 1993; Autor, Dorn, and Hanson 2013; Kovak 2013; Adão, Kolesár, and Morales 2019).

# Trends in localized tariffs



Note: The base year is 2008. The reported coefficients are the estimated year fixed effects after controlling for state-specific quadratic trends, weather covariates, and county fixed effects. The standard errors are clustered at the state and year levels.

# Event study via shift-share design

We estimate the following regression equation for each year  $t$  (shift-share design):

$$\Delta Rent_{it} = \beta_0 + \beta_1 \Delta LT_{it} + \Gamma \Delta Z_{it} + u_s + \varepsilon_{it} \quad (2)$$

where  $\Delta Rent_{it} = Rent_{it} - \overline{Rent}_i$  2009–2011, and  $\Delta LT_{it} = \sum_j (\tau_{jt} - \bar{\tau}_j \text{ 2009–2011}) \times S_{ij \text{ 2011}}$ .

By weighting the crop-specific shocks with the “initial” shares ( $S_{ij}$ ), we mitigate the possible bias from  $S_{ijt}$  being correlated with unobservables that affect cash rents.



# Preliminary evidence

VARIABLES	(1) Year 2012 Rent Change (USD/acre PPI 1982=100)	(2) Year 2013 Rent Change (USD/acre PPI 1982=100)	(3) Year 2014 Rent Change (USD/acre PPI 1982=100)	(4) Year 2016 Rent Change (USD/acre PPI 1982=100)	(5) Year 2017 Rent Change (USD/acre PPI 1982=100)
Tariff Shock	-0.939*** (0.197)	-1.460*** (0.246)	-2.467*** (0.432)	-2.687*** (0.336)	-1.887*** (0.240)
Observations	1,890	1,880	1,906	1,902	1,895
Weather Covariates	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes

Note: The base period is 2009 – 2011. Standard errors are clustered at the state level.

# Estimating the incidence of localized export tariffs

## Estimation equation

The preliminary evidence is based on cross-sectional analyses. We now leverage within-variations throughout the sample period.

Thus, our main empirical specification is

$$Rent_{it} = \beta_0 + \beta_1 LT_{it} + \Gamma Z_{it} + u_i + v_t + \varepsilon_{it} \quad (3)$$

where  $LT_{it}$  is the localized (ad valorem) export tariff, and  $Z_{it}$  is the vector of other covariates including weather variables and state-specific quadratic time trends.

# Measuring localized export tariff

We define the localized (ad valorem) export tariff rate for county  $i$  in year  $t$  as

$$LT_{it} = \sum_j \tau_{jt} \times S_{ijt} \quad (4)$$

where  $S_{ijt}$  is the weight for crop  $j$ . And note that  $\tau_{jt} = \sum_d \theta_{jdt} \times \tau_{jdt}$ .

**What are the right measures of  $S_{ijt}$  and  $\theta_{jdt}$ ?**

# Identification issues with contemporaneous shares

We face the possibility of  $Cov(LT_{it}, \varepsilon_{it}) \neq 0$  in eq 3 because of

- $Cov(S_{ijt}, \varepsilon_{it}) \neq 0$ : Non-tariff demand/supply shifters
- $Cov(\theta_{jdt}, \varepsilon_{it}) \neq 0$ : Destination-specific profitability

Thus, we use

- $S_{ij0} = \frac{\text{Planted Acreage}_{ij0}}{\text{Non-irrigated Cropland}_{i0}}$
- $\theta_{jd0} = \frac{\text{Imported Volume}_{jd0}}{\sum_d \text{Imported Volume}_{jd0}}$

Both of them are computed by using the five-year averages over the years 2003 -2007.

# Results

VARIABLES	(1) Real Cash Rent (USD/acre PPI 1982=100)	(2) Real Cash Rent (USD/acre PPI 1982=100)	(3) Real Cash Rent (USD/acre PPI 1982=100)
LT (Contemporaneous shares)	-1.191*** (0.204)		
LT (Contemporaneous export and initial crop shares)		-1.383*** (0.299)	
LT (Initial export and crop shares)			-1.960*** (0.510)
Observations	16,540	16,540	16,540
Weather Covariates	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
County FE	Yes	Yes	Yes
State-specific trend	Yes	Yes	Yes

Note: Standard errors are clustered at the state and year levels.

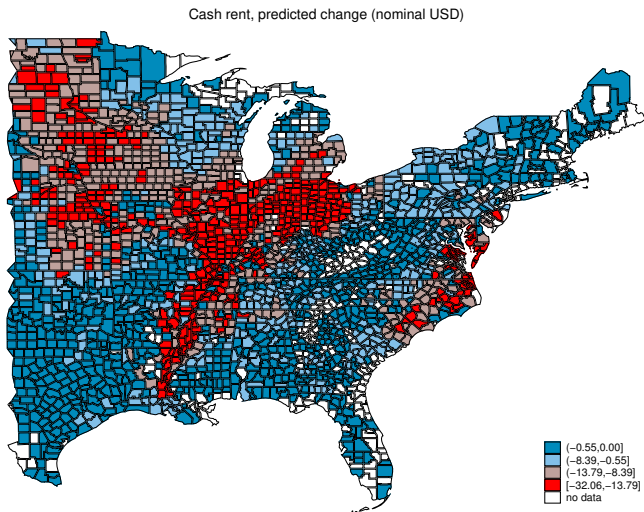
# Predicted effect of the 2018 Chinese tariff

In July 2018, in response to the implementation of U.S. tariffs on Chinese products, China increased the tariff on U.S. soybeans from 2.5% to 25%. Based on our estimation of eq 3, we predict the effect on the increase in the soybeans tariff (i.e.  $\hat{\beta}_1$  from col (3)  $\times \Delta_{China} \hat{L}T_i$ ).

- No trade adjustment: The average predicted reduction is about \$7.06, which is 7.12% lower than the 2017 cash rents.
- Allowing trade volume reallocation (GTAP): The average predicted reduction is about \$0.43, which is 0.44% lower than the 2017 cash rents.

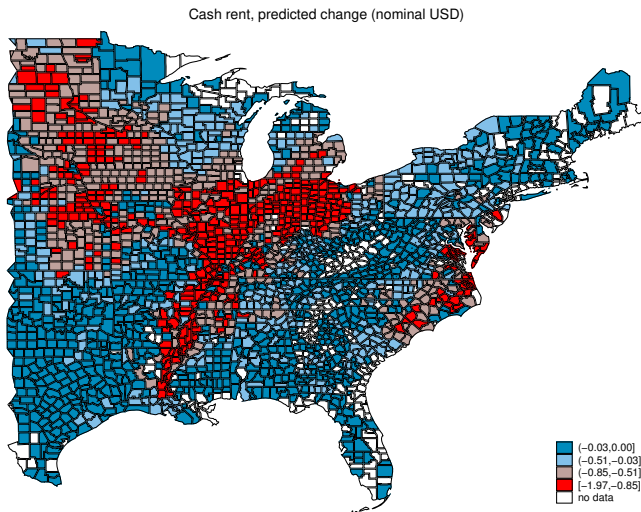
# Predicted effect of the 2018 Chinese tariff

No adjustment



# Predicted effect of the 2018 Chinese tariff

## Trade allocation adjustment





# Concluding Remarks

- We find that the changes in nominal tariffs in destination markets have substantial effects on land rents.
- Results are robust to different specifications that try to minimize confounding effects due to the adjustment of both, the crop and export destinations as tariffs in destinations change over time.
- Limitation: If the export destinations were lowering their tariffs to other countries at the same time as they were lowering their tariffs to the U.S, this could attenuate the estimates.
- Including the variation in tariffs faced by the U.S. vis-à-vis the variations in tariffs faced by U.S. competitors is part of our future research.