

Market Concentration, Supply Chain Resilience, and Producer Welfare

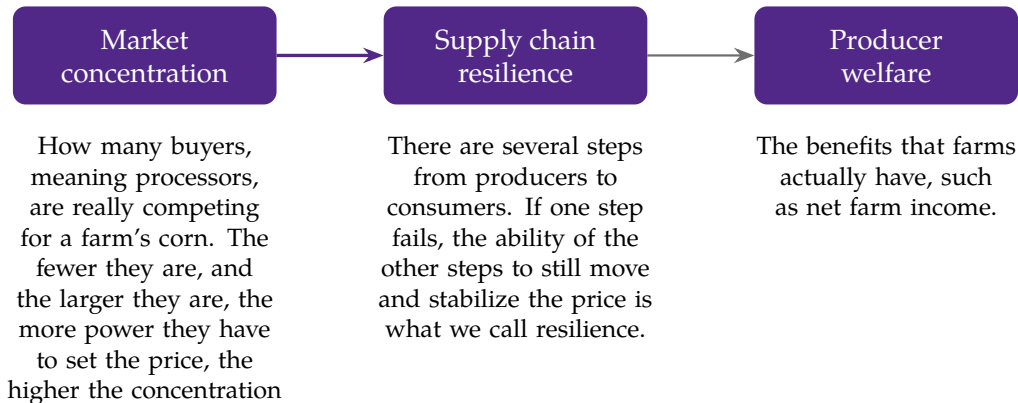
Lessons from the U.S. Ethanol Processing Industry

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2026 Risk and Profit Conference · Manhattan, KS · August 20, 2026

The three terms in the title



Roadmap

- 1 Motivation and Question
- 2 Method
- 3 Main Stage Results
- 4 Income Stage: Open Question
- 5 Policy Implications

Is one large local buyer good or bad for a farmer?

Bad?

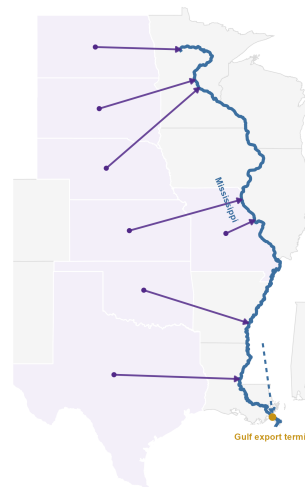
With fewer places to sell, the buyer has less reason to bid hard. It can set a price that protects its profit.

Good?

A large plant is also a large, steady buyer. That plant is more efficient and economic in dealing with the shock.

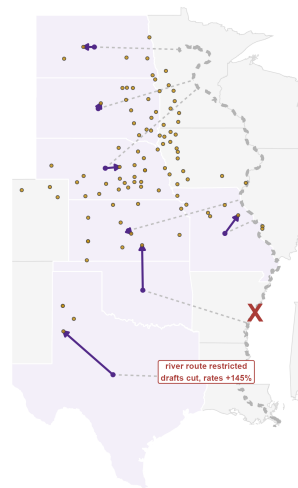
Normal movement of corn

- Roughly **half of U.S. grain exports** move by barge.
- About **90 percent of Gulf-bound grain** moves down the Mississippi.
- Inland, barge is not the only route. It does set the level that other buyers have to bid against.



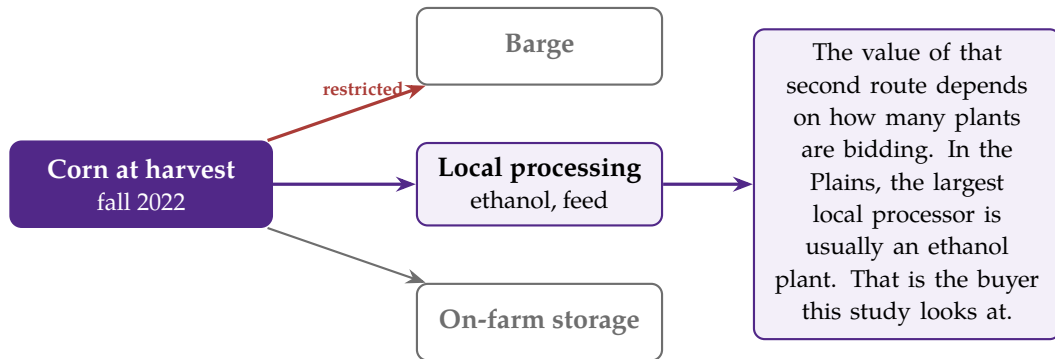
Fall 2022: the river route was restricted

- Low water led the Coast Guard to cut barge drafts. Tows were reduced from **36 barges to 25**.
- St. Louis barge freight rose **145 percent** against the prior year.
- Peak barge cost reached about **\$2.94 per bushel** of corn.



Sources: USDA-AMS Grain Transportation Report, Kennedy (2022), NCGA (2023).

Where the corn went instead



The question and a preview of the answers

The question

When the export route failed, did a concentrated local processing market **cushion** farmers or **squeeze** them harder?

- 1 **Concentration cushioned the price.** During 2022 and 2023 the corn basis held up about **3.5 cents per bushel** better in high-concentration counties. That is roughly \$4,200 for an 800-acre corn farm.
- 2 **But only deep inland.** The cushion operates in Kansas, Nebraska, North Dakota and South Dakota. Near a working river port it does not operate at all.
- 3 **The gain stops at the price.** Net farm income does not move. The second half of the talk is about why.

What was already known, and what is new here

Already known

- Fewer local buyers usually means a weaker local price. That is the long-standing finding.
- An ethanol plant raises the local basis in normal years.
- In 2022 the cost of barge freight showed up in basis, and the effect faded with distance from the river.

New here

Nobody had asked what concentrated processing does during a *disruption*, using a real one.

We put a dollar figure on that. We then follow the money past the elevator bid, into actual Kansas farm financial records.

The price measure: basis

\$/bu



Chicago
futures



local
cash bid



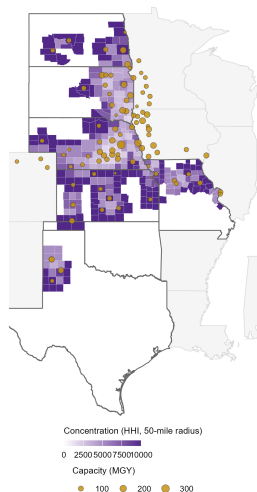
BASIS

Futures are the same for everyone in the country. A farmer cannot change them. Basis is the rest. It is the reason two elevators thirty miles apart can quote different prices on the same morning. A stronger basis means somebody nearby wants that corn.

The concentration measure

- Draw a **50-mile radius** around each county. That is roughly a practical truck haul.
- Add up the plants inside, **weighted by capacity**. Plants near the edge count for very little.
- Score it from 0 to 10,000. A score of **0** means no plant in range. A score of **10,000** means one plant on its own.
- About **22 percent** of counties score zero.

The gap between a several-buyer county and a one-plant county is about **5,000 points**.



Where the numbers come from

Corn basis Local elevator cash bid – CBOT futures, weekly. 51,247 county-weeks · 390 counties · 7 states · harvest weeks 35–48, 2014–2025 (K-State AgManager).

Ethanol concentration (HHI) Squared capacity shares of plants within 50 miles, distance-weighted (RFA 2023). 0 = no plants; 10,000 = a single plant. Scaled per 1,000 points.

Controls Distance to the Mississippi (per 100 mi) and share of the county in severe drought, D3+ (U.S. Drought Monitor).

Income stages USDA-RMA county insurance (2018–25) and KFMA farm financial records (~870 Kansas farms, 2019–23).

Two stages, two questions

Stage 1. Does concentration change the basis during a disruption?

The standard prediction

With exports gone, dominant buyers lowball farmers who cannot go anywhere else. The basis falls further. The supply chain is not resilient.

The alternative is that concentrated plants absorb the stranded corn. Local demand holds up, and so does the basis.

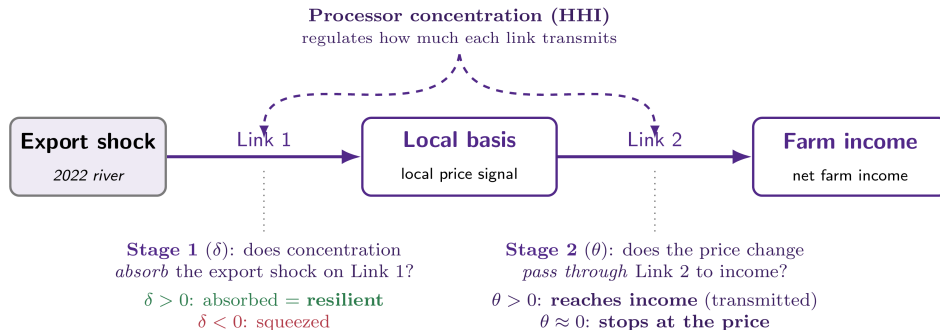
Stage 2. Does the price effect reach farm income?

The standard prediction

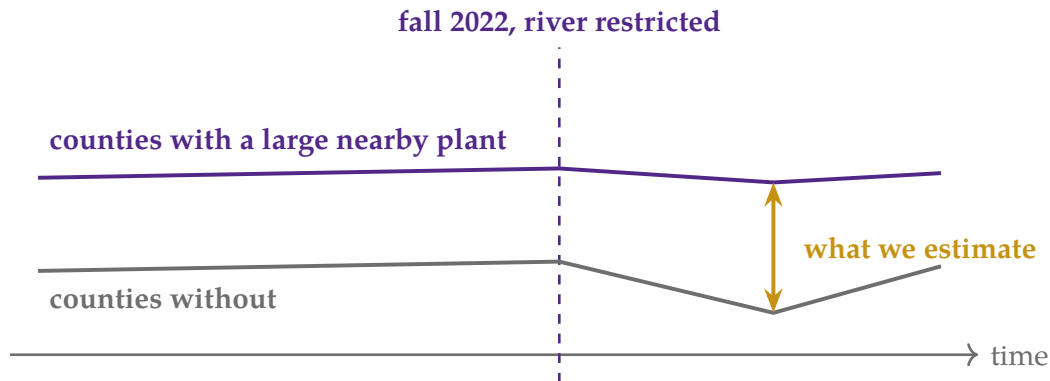
A change in basis shows up in net farm income. The benefit reaches welfare, not just price.

The alternative is that it does not. Then the question becomes why. Is it market power, the wrong outcome measure, or offsetting shocks?

Two stages, drawn



The comparison



Both groups get hit. What we estimate is whether **one group fell less than the other**, and whether the gap opens at the disruption and closes once the river reopens.

Stage 1: how the effect is estimated

During the disruption, did the basis rise more in high-concentration counties than in low-concentration counties? Each county is compared to itself. Common year and week movements are removed. River distance and drought are held fixed.

$$\text{Basis}_{iwt} = \delta (\text{Post}_t \times \text{HHI}_i) + \delta_2 (\text{Post} \times \text{Dist}_i) + \delta_3 (\text{Post} \times \text{Drought}_{iwt}) + \alpha_i + \tau_t + \gamma_w + \varepsilon_{iwt}$$

$\delta < 0$ means squeeze. $\delta > 0$ means cushion.

Why this comparison is credible

- The disruption came from rainfall over the Ohio Valley, so it had nothing to do with local ethanol markets.
- Running the same test on the 2021 fertilizer-cost shock finds nothing, which is what we would want from a year that was hard but not a logistics failure.

Post is the 2022 and 2023 harvest windows. We use ISO weeks 35 to 48 in every year. A 2022-only version appears in the appendix.

Stage 2: how transmission to income is estimated

Does the Stage 1 basis change show up in a farm's net income? The outcome is this year's net farm income relative to that same farm's own recent average.

$$R_{ijt} = \theta (\text{Post}_t \times \text{HHI}_j) + X'_{ijt}\beta + \mu_i + \nu_t + u_{ijt}, \quad R_{ijt} = \text{NFI}, \text{MarginalNFI}, \text{NFIindex}$$

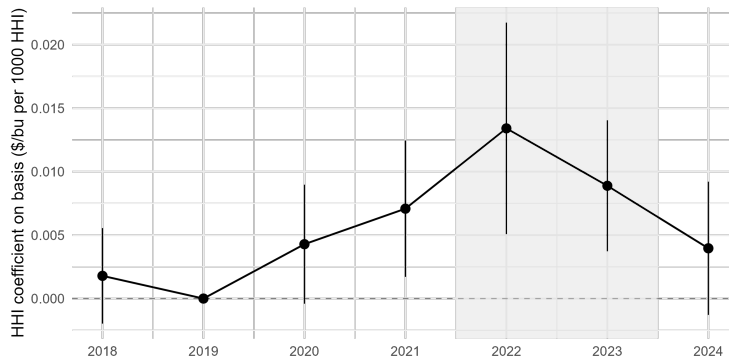
$\theta > 0$ means the price effect transmits. $\theta \approx 0$ means it stopped at the price level.

Farm controls include assets, leverage, irrigation share, corn-acre share, and operator demographics. Farm and year fixed effects are included. Standard errors are clustered by county.

Concentration paid off when the river failed

Event study: HHI effect on harvest-week basis, multi-state

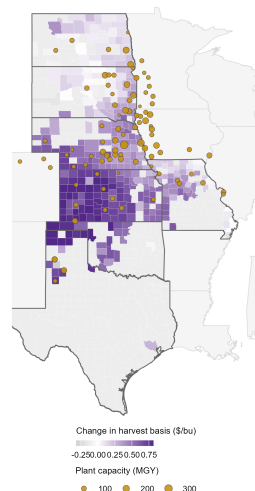
Reference year 2019; county, year, and week FE; Distance and Drought controls



Above zero means **the more concentrated counties held the stronger basis** that year. The effect peaks in 2022, and by 2024 it is gone.

Which counties held their basis

- Average harvest basis in **2022 and 2023**, minus average harvest basis in **2014 through 2021**, county by county.
- Purple is **stronger** than that county's own earlier years, grey is **weaker**.
- Gold dots are the plants, sized by capacity. The purple counties and the large dots line up.



What it is worth

+3.5¢/bu

moving from a several-
buyer county to a
one-plant county

\$4,200

800-acre corn farm
at 150 bu per acre,
over the two harvests

The effect offsets a real but modest share of the local price damage. At the 2022 peak alone the estimate is closer to 7 cents per bushel.

The effect is confined to inland states

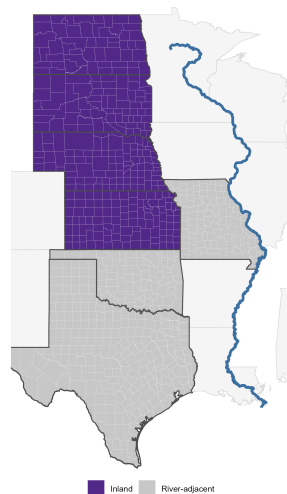
Inland: KS, NE, ND, SD

+1.2 cents per 1,000 index points
statistically significant

River-adjacent: MO, OK, TX

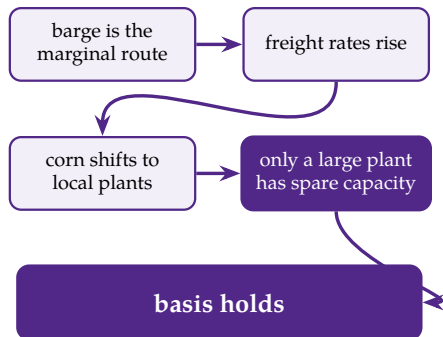
−0.4 cents
not different from zero

Distance to the river is priced in both groups.
Concentration is priced in only one of them.

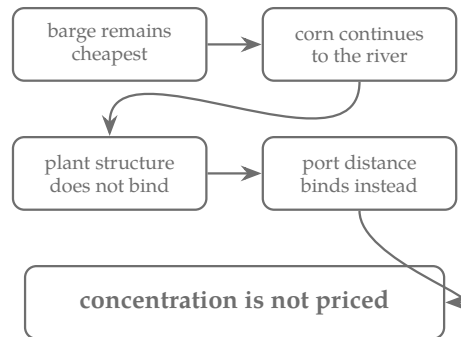


A possible explanation for the geographic pattern

INLAND



RIVER-ADJACENT



What we found

In the fall of 2022, a farmer in an inland county with one large ethanol plant nearby was offered a **better basis** than a comparable farmer in a county without multiple small plants.



The difference was about **3.5 cents a bushel**, which is roughly **\$4,200** on an 800-acre corn farm across the two harvests.



It showed up when the river closed. It went away once the river reopened. **The plant behaved like a cushion, not a squeeze.**

Does the basis effect reach income? Still exploring

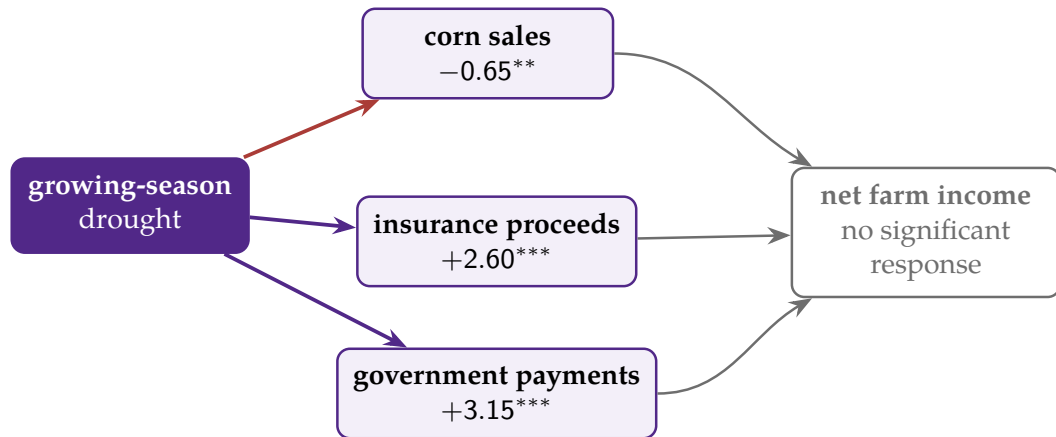
Current findings

- County stage: the cushion is not crowded out by insurance intensity (triple interaction -0.009 , n.s.).
- Farm stage (KFMA): every income measure in dollars or ratios is near zero. Net farm income is $-\$381$. Income per acre is $-\$87$. The resilience index is -0.017 .
- All four smoothing channels ≈ 0 : insurance, storage, corn sales, corn production.
- 2022 was also a drought year across the Plains. Yield losses plausibly offset the price gain.

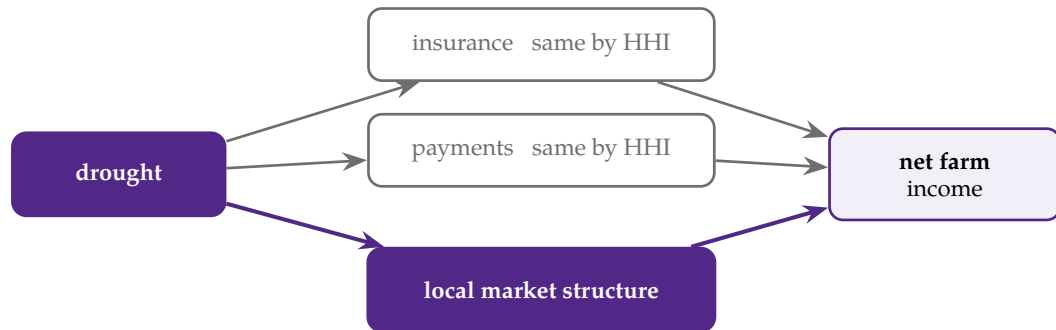
Possibilities

- Power: can $\sim 2,600$ farm-years detect a $\$0.035/\text{bu}$ effect inside annual net farm income?
- Would per-bushel marketing margins beat annual net income as the outcome?
- Should we be using farm-level data beyond Kansas?

What absorbs the shock



A third absorption channel, preliminary



Insurance and payments answer drought by about the same amount whether the county is concentrated or not. Neither runs through market structure.

Yet in drought years the concentrated counties sold **less** corn and held income **steadier**. That points to a third channel running alongside the two federal ones.

Policy implications

- ① Merger review of inland processors counts the cost of having fewer buyers, and stops there. There is a disruption-buffering benefit on the other side of that ledger, and it now has a size attached to it.
- ② Where you are determines which lever matters. Inland, processing structure is the thing to look at. Along the river, it is waterway reliability, and processor structure barely registers.

One caution. What we estimate is the response to a disruption, not the price level in an ordinary year, which is where the usual concentration concern lives.

Future exploration

- 1 Include other types of disruption, more crops, and more regions.
- 2 Explore how a plant's corporate affiliation matters, and how farmer-owned or cooperative plants differ. Value may return to producers as patronage rather than through the cash bid.
- 3 Separate the role of personal relationships and informal contracts between farmers and buyers from the pricing mechanism itself.

Summary

+3.5¢/bu

about \$4,200 for an
800-acre corn farm
across the two harvests

Inland only

Kansas is in the
group where the
effect shows up

**Absorbed by
the safety net**

drought cuts the
crop, insurance and
payments fill the gap,
and the price gain is
absorbed along with it

The price cushion is real. It does not reach net farm income, and now we know why. Whether local market structure smooths income in some other way is the question we are working on next.

Thank you

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With thanks to KFMA and AgManager.info

Appendix

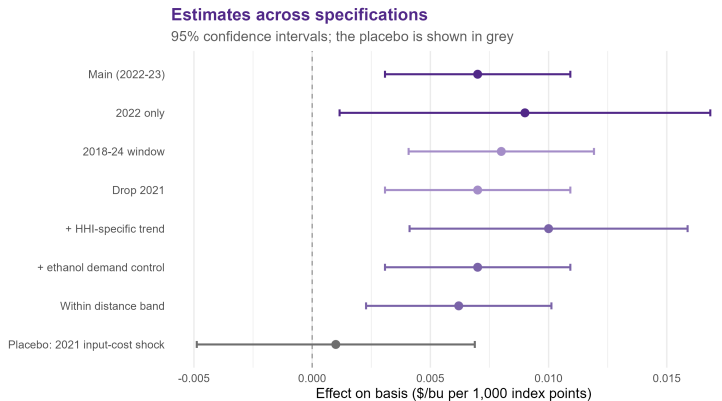
Specification, robustness, pre-trends, alternative measures, and the income stage

A1 · Specification

$$\text{Basis}_{iwt} = \delta (\text{Post}_t \times \text{HHI}_i) + \delta_2 (\text{Post} \times \text{Dist}_i) + \delta_3 (\text{Post} \times \text{Drought}_{iwt}) + \alpha_i + \tau_t + \gamma_w + \varepsilon_{iwt}$$

- Post = 2022 and 2023 harvest windows. County, year, and week fixed effects. SEs clustered by county.
- $\delta > 0$ indicates the buffering result. $\delta < 0$ would indicate the squeeze.
- Dependent variable: weekly county cash-corn basis (\$/bu), ISO weeks 35–48.

A2 · Robustness across specifications



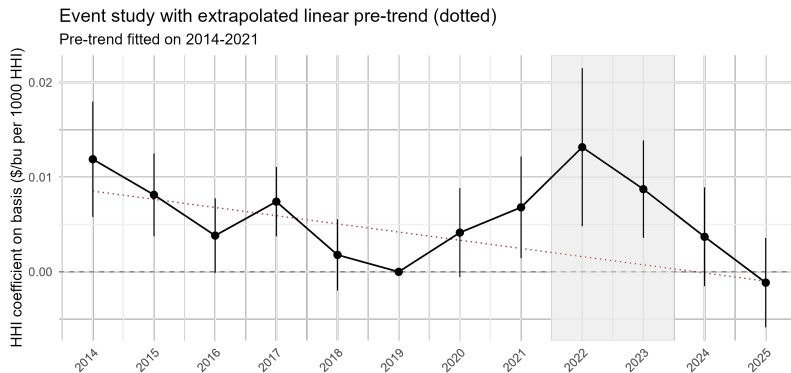
Every specification with 95% confidence intervals. The 2021 placebo is estimated at zero, as expected.

A3 • Full results table

	(1) Base	(2) +Dist	(3) +Drought	(4) 2018–24	(5) 2022 only
Post × HHI (per 1,000)	0.006 (0.004)	0.007** (0.003)	0.007*** (0.002)	0.008*** (0.002)	
2022 × HHI					0.009** (0.004)
Post × Dist (per 100 mi)		0.108***	0.082***		
Post × Drought (D3+)			0.299***		
County / Year / Week FE	Yes	Yes	Yes	Yes	Yes
Observations	51,247	51,247	51,247	30,199	46,810

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. SEs clustered by county.

A4 · Pre-trends



Mild upward drift before the disruption. The dotted line extrapolates it. The 2022–23 estimates sit above that line, and the effect decays afterward.

A5 · Formal test against the pre-trend

HHI effect <i>above</i> extrapolated trend	Estimate	SE	p
2022	0.0122	0.0048	0.011
2023	0.0088	0.0034	0.009
2024	0.0047	0.0036	0.188
2025	0.0009	0.0034	0.783

- Trend fitted on eight pre-years (2014–2021), then extrapolated.
- 2022–23 are significantly above. 2024–25 are not. The pattern peaks and decays, which a linear trend cannot generate.
- Two independent methods agree (0.0122 vs 0.0116, $p = 0.013$).

A6 · Is HHI proxying river distance?

	(1) Main	(2) Saturated
Post $\times$ HHI (per 1,000)	0.007*** (0.002)	0.0062** (0.002)
County FE	Yes	Yes
Year, Week FE	Yes	Yes
Distance-decile $\times$ Year FE	No	Yes

- Column (2) absorbs any shock to any distance band in any year, so identification is *within* a distance ring.
- HHI and river distance are nearly uncorrelated ($r = -0.02$).

A7 · Alternative concentration measures

	(1) HHI/1,000	(2) CR2	(3) Plant count
Post × Concentration	0.007*** (0.002)	0.054** (0.021)	−0.012*** (0.004)
Dist & drought × Post	Yes	Yes	Yes
County / Year / Week FE	Yes	Yes	Yes
Observations	51,247	51,247	51,247

CR2 rises with concentration, so its sign is positive. Plant count rises with dispersion, so its sign is negative. All three agree.

A8 • Placebo and trend checks

	(1) Main	(2) +HHI trend	(3) Drop 2021	(4) +Demand exp.
Post × HHI	0.007*** (0.002)	0.010*** (0.003)	0.007*** (0.002)	0.007*** (0.002)
HHI × linear trend		−0.001*** (0.000)		
HHI × ethanol demand (z)				−0.003*** (0.001)
Observations	51,247	51,247	47,141	51,247

2021 input-cost placebo: 0.001 (0.003), n.s.

A9 · Geographic split, full table

	Inland (KS/ND/SD/NE)	River-adjacent (MO/OK/TX)
Post × HHI (per 1,000)	0.012*** (0.003)	−0.004 (0.003)
Post × Dist (per 100 mi)	0.103*** (0.008)	0.078*** (0.008)
Post × Drought (D3+)	0.293*** (0.029)	0.289*** (0.050)
Observations	37,875	13,372

A10 · Construction of the concentration index

- **Market definition:** 50-mile radius around each county centroid (McNew & Griffith 2005).
- **Distance weighting:** rated capacity discounted by an Epanechnikov kernel with 50-mile bandwidth.
- **Index:** standard 0–10,000 scale. Counties with no plant in range, about 22 percent, score 0.
- **Scaling:** HHI/1,000, so 0.007 means +\$0.007/bu per 1,000 points.

A11 • Data sources

Variable	Source	Coverage	N
Weekly corn basis	AgManager (K-State)	7 states, wks 35–48, 2014–25	51,247 c-w
Ethanol HHI	RFA 2023 directory	50-mi kernel, 7 states	390 counties
Drought (D3+)	U.S. Drought Monitor	weekly, county	280,021 obs
Distance to Mississippi	Census TIGER 2022	county centroid	380 counties
Crop insurance	USDA-RMA COL files	annual, corn	3,799 c-y
Farm financials	KFMA databank	Kansas, 2019–23	2,607 f-y

A12 · Income stage: all outcome variants

Outcome	What it measures	Post × HHI
Resilience index R	NFI over its own prior 3-yr average, winsorized	−0.017 n.s.
NFI level (\$)	net farm income in dollars, 1/99 winsorized	−381 n.s.
$\text{asinh}(\text{NFI})$	log-like transform allowing zero and negatives	−0.164**
NFI / revenue	margin: net income per dollar of gross income	≈ 0 n.s.
NFI / acre	net income per operated crop acre	−87 n.s.

Farm and year FE, full controls, SEs clustered by county. Resilience-estimation subsample, $N \approx 2,711$. Every dollar and ratio measure is near zero. Only asinh turns negative, and that transform is unusually sensitive to farms near zero or negative income, so we read the sign as an artifact rather than an income effect.

A13 · What absorbs the yield shock

Outcome ~ growing-season drought	Coef. (SE)	<i>t</i>
Crop insurance proceeds (asinh)	+2.60 (0.68)	+3.84***
Insurance received > 0	+0.14 (0.05)	+2.70***
Government payments (asinh)	+3.15 (0.65)	+4.88***
Gov. payments received > 0	+0.25 (0.05)	+5.03***
Corn sales (asinh)	−0.65 (0.31)	−2.10**
Net farm income (\$)	+33,319 (24,425)	+1.36 n.s.
Net farm income (asinh)	−0.91 (1.13)	−0.81 n.s.

Full KFMA sample, $N = 3,111$, farm and year FE. Drought reduces corn sales while indemnities and payments rise sharply. Net farm income does not respond.

A14 • Drought × concentration

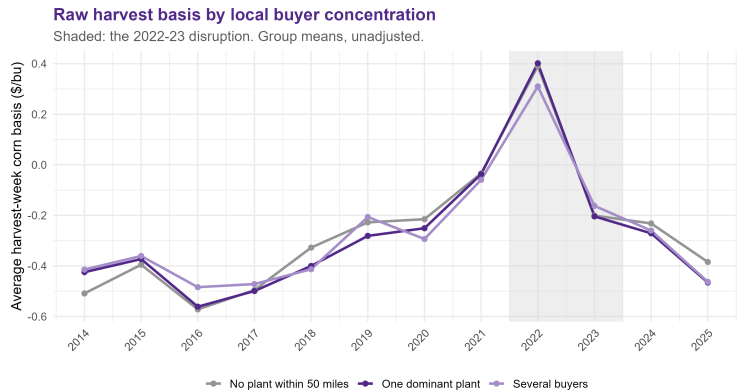
Outcome	Drought	Drought × HHI
Crop insurance proceeds (asinh)	+3.53**	−0.12 n.s.
Insurance received > 0	+0.23*	−0.01 n.s.
Government payments (asinh)	+4.71***	−0.21 n.s.
Corn sales (asinh)	+0.44 n.s.	−0.15*
Net farm income (\$)	−46,636 n.s.	+11,010*

Full KFMA sample, $N = 3,111$. **Units matter here.** The interaction is in dollars per unit of drought share, per 1,000 HHI points. It is not a flat dollar gain, and it should not be scaled to the 5,000-point gap used in the main results without checking the range of both variables. The safety-net response to drought is similar in high- and low-concentration counties. Two marginal results remain unexplained.

A15 • Magnitude arithmetic

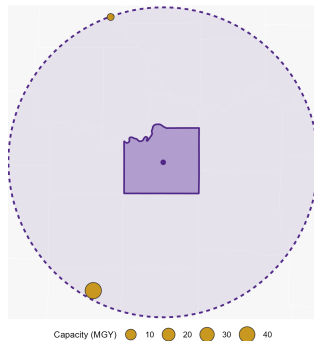
- Interquartile range of county HHI $\approx 5,000$ points.
- Pooled 2022–23: $0.007 \text{ \$/bu per } 1,000 \times 5 = \$0.035/\text{bu}$.
- 2022 peak (event study): $0.013 \times 5 \approx \$0.07/\text{bu}$.
- $800 \text{ acres} \times 150 \text{ bu/acre} \times \$0.035 \approx \$4,200$.
- Peak barge cost for comparison: $\approx \$2.94/\text{bu}$.

A16 · Raw basis by concentration group



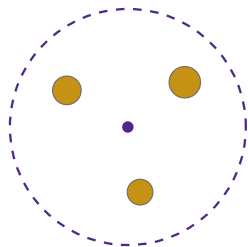
Group means with no adjustments of any kind.

A17 · The 50-mile radius, drawn



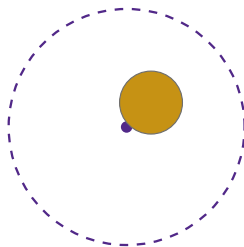
One county, its 50-mile radius, and the plants inside it.

A18 · Three types of county



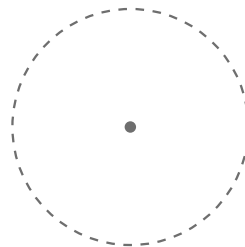
Several buyers

low concentration



One dominant plant

high concentration



No plant in range

about 22 percent

The gap between the first two is about 5,000 index points.

A19 • References

- Hadachek, Ma & Sexton (2024). Market structure and resilience of food supply chains under extreme events. *AJAE* 106(1).
- Zhang & Anderson (2026). When the river runs low: inland basis pass-through during the 2022 Mississippi disruption. *Agribusiness* 47(3).
- Sexton (2013). Market power, misconceptions, and modern agricultural markets. *AJAE* 95(2).
- McNew & Griffith (2005). Measuring the impact of ethanol plants on local grain prices. *AEPP* 27(2).
- Kenkel & Holcomb (2006). Challenges to producer ownership of ethanol and biodiesel production facilities. *JAAE* 38(2).
- DeLay, Brewer, Featherstone & Boussios (2023). The impact of crop insurance on farm financial outcomes. *AEPP* 45(1).
- Goodman-Bacon (2021). Difference-in-differences with variation in treatment timing. *J. Econometrics* 225(2).