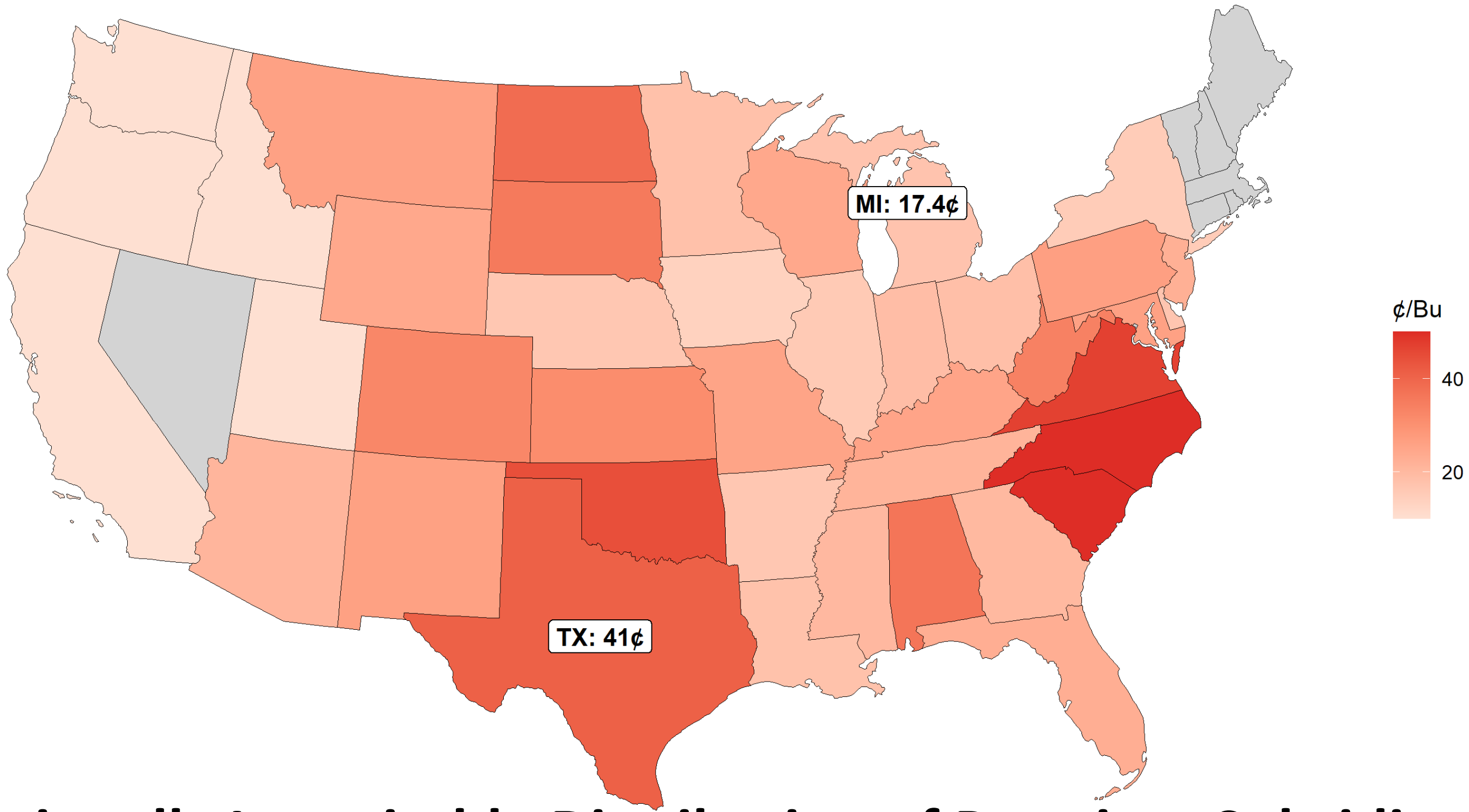


Motivation

Corn Subsidies per Bushel by State

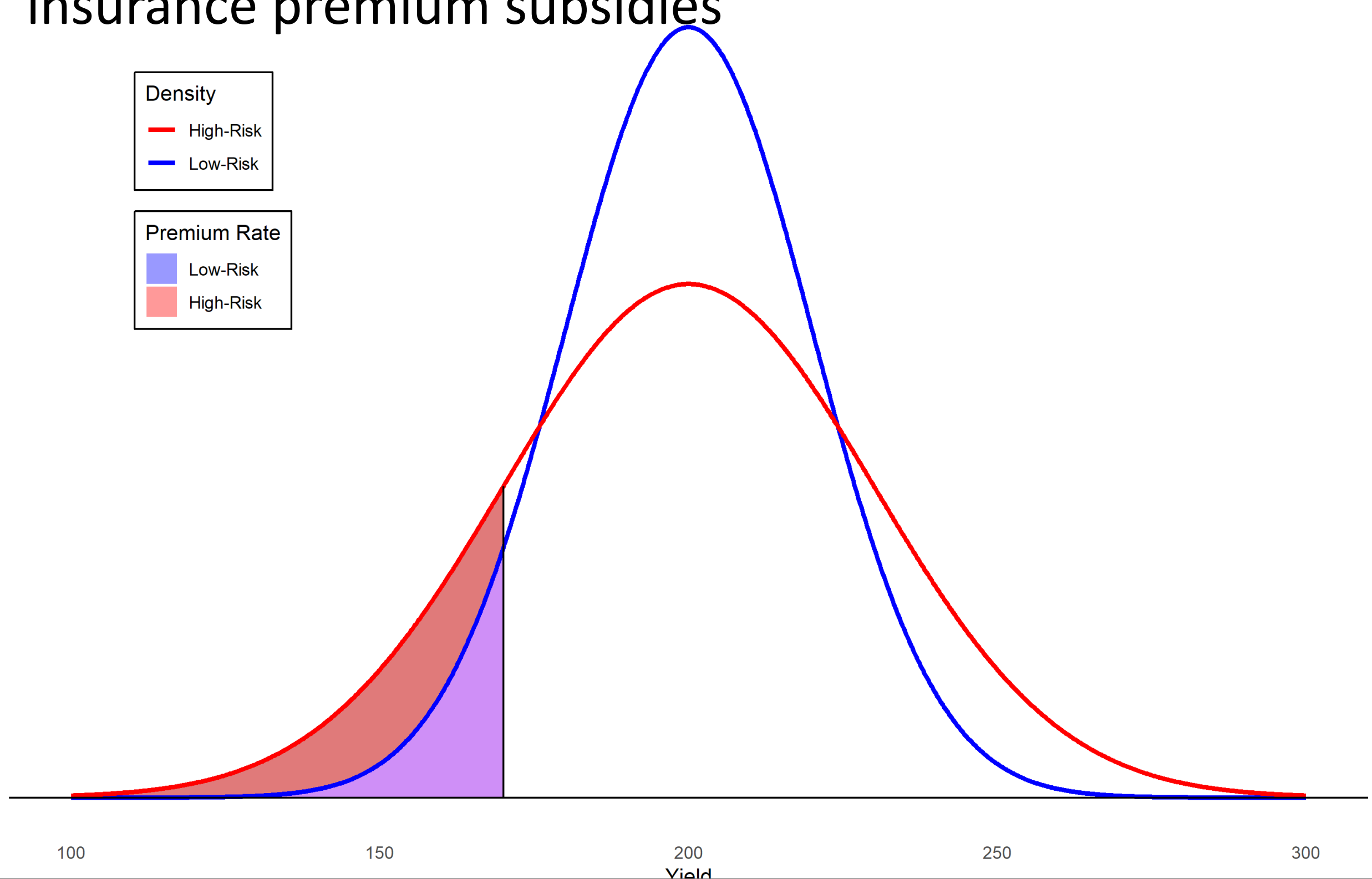


Regionally Inequitable Distribution of Premium Subsidies

- Riskier regions of the U.S. receive higher crop insurance subsidies per acre
- The inequity is even greater on a per bushel basis

Penalty for Adopting Risk-Reducing Technology

- Consider a producer deciding whether to adopt a new technology (e.g. irrigation, drought resistant genetics)
- The only effect of the new technology is a reduction in variance- no mean effect
- Under Current Policy- Distance Based Guarantee (DG) – The producer would be penalized by receiving fewer crop insurance premium subsidies



| | Low-Risk DG | High-Risk DG |
|---|----------------|-----------------|
| Expected Yield in Bushels per Acre | 200 | 200 |
| Yield Guarantee | 170 | 170 |
| Premium Rate per Acre | \$13.19 | \$55.49 |
| Subsidy per Acre | \$7.91 | \$33.30 |
| Producer Premium per Acre | \$5.27 | \$22.20 |
| Expected Subsidy per Bushel | \$0.04 | \$0.17 |
| Expected Rate of Return from Insurance | 2.5 | 2.5 |
| Expected Profit from Insurance per Acre | \$7.91 | \$33.30 |
| Expected Profit from Insurance for 2500 acres | \$19,775 | \$83,250 |

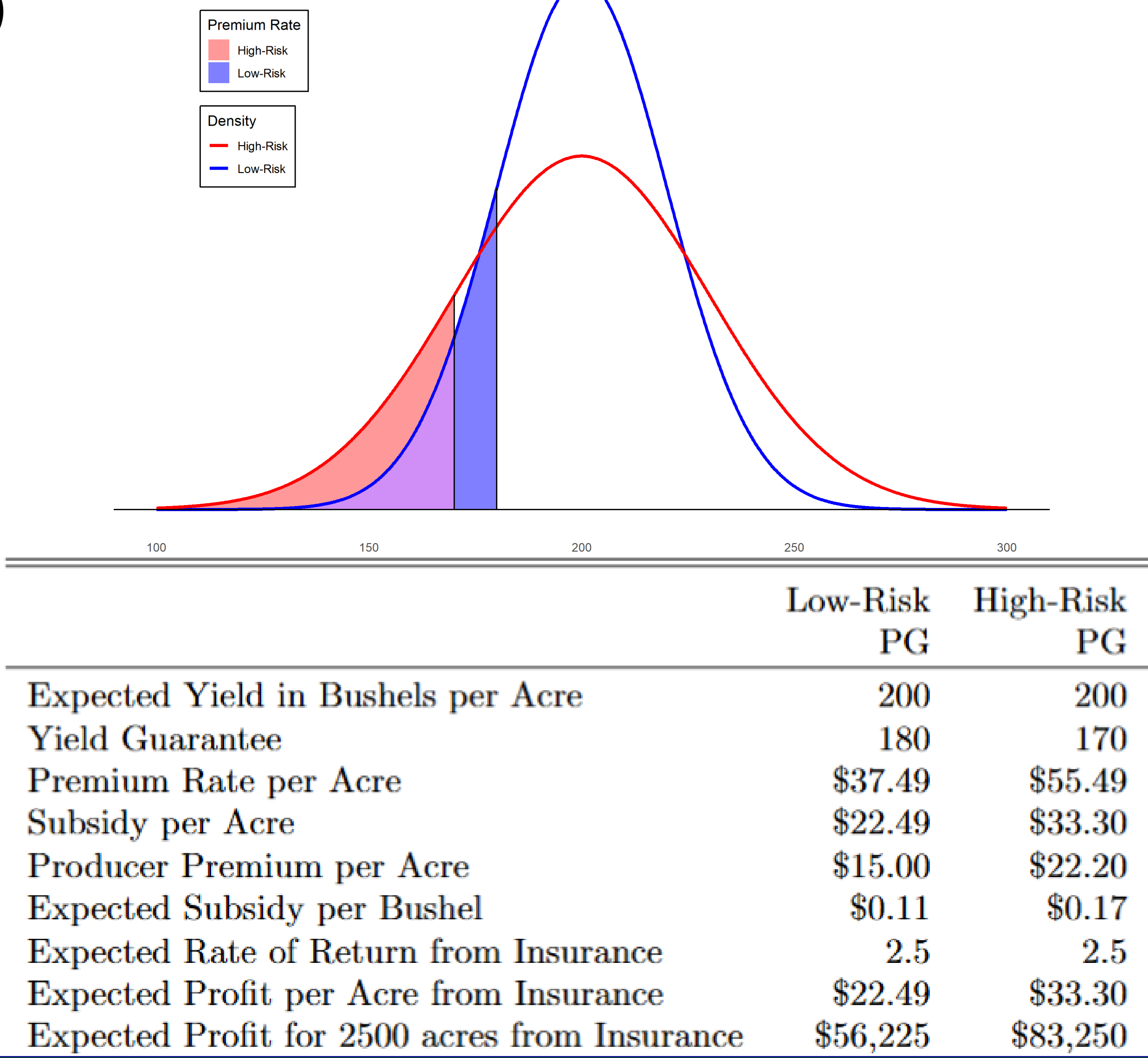
Solution

Define Coverage Level Based on Probability of Loss

- Current design is distance-based yield guarantees (e.g., 70% coverage level)
- Probability-based yield guarantees (PGs) adjust to the riskiness of the underlying distribution
- PGs provide coverage based on a probability of loss (e.g., 1 in 4 year probability of loss)

Example Continued

- Under a 1 in 6.3 year probability of loss yield guarantee the low-risk producer would have a 180 bu. coverage level, while the high-risk producers' yield guarantee remains at 170 bu.
- Under the 1 in 6.8 PG, the low-risk producer receives 2/3 of the subsidies that the high-risk producer receives, compared to just 1/4 of the subsidies under the current design (DGs)



Objectives

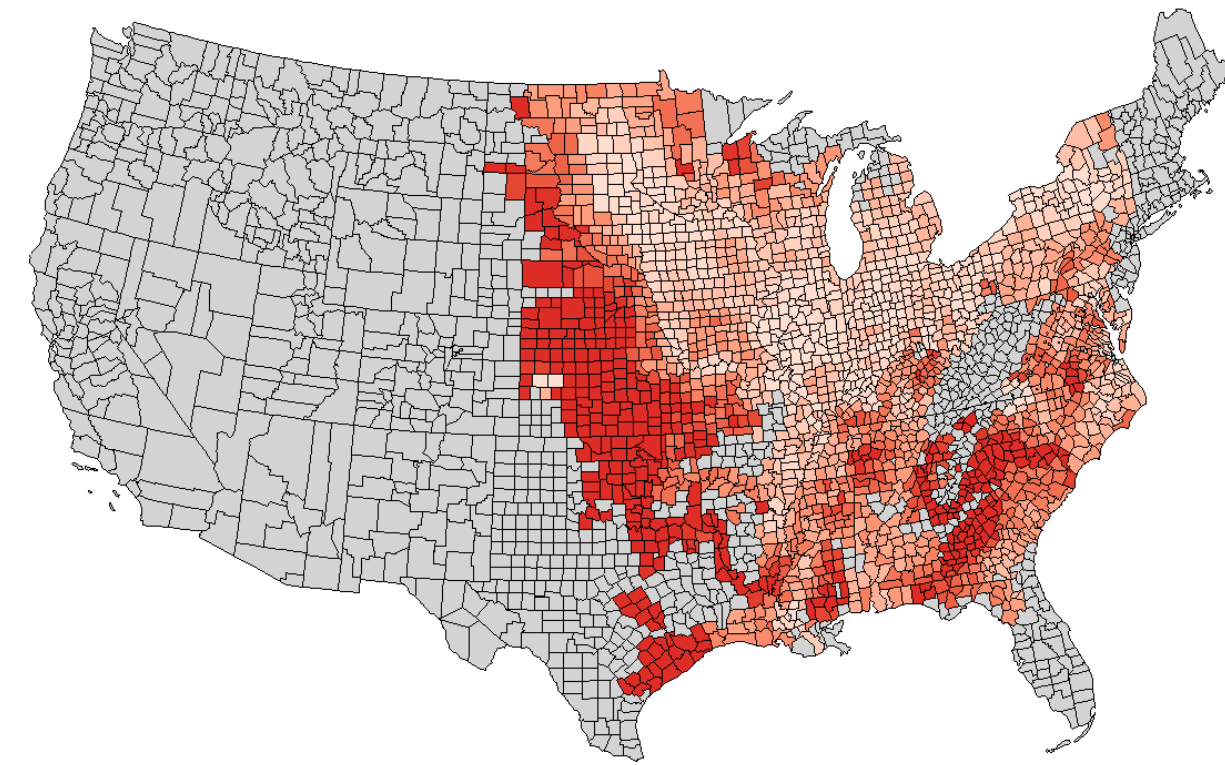
- Simulate the changes in premium subsidies by county/crop from a change from DGs to PGs for Corn, Soybeans, and Wheat
- Estimate different effects for Yield Protection, Whole Farm, and SCO
- Estimate the land use changes caused by the subsidy effects of the change to PGs

Methodology

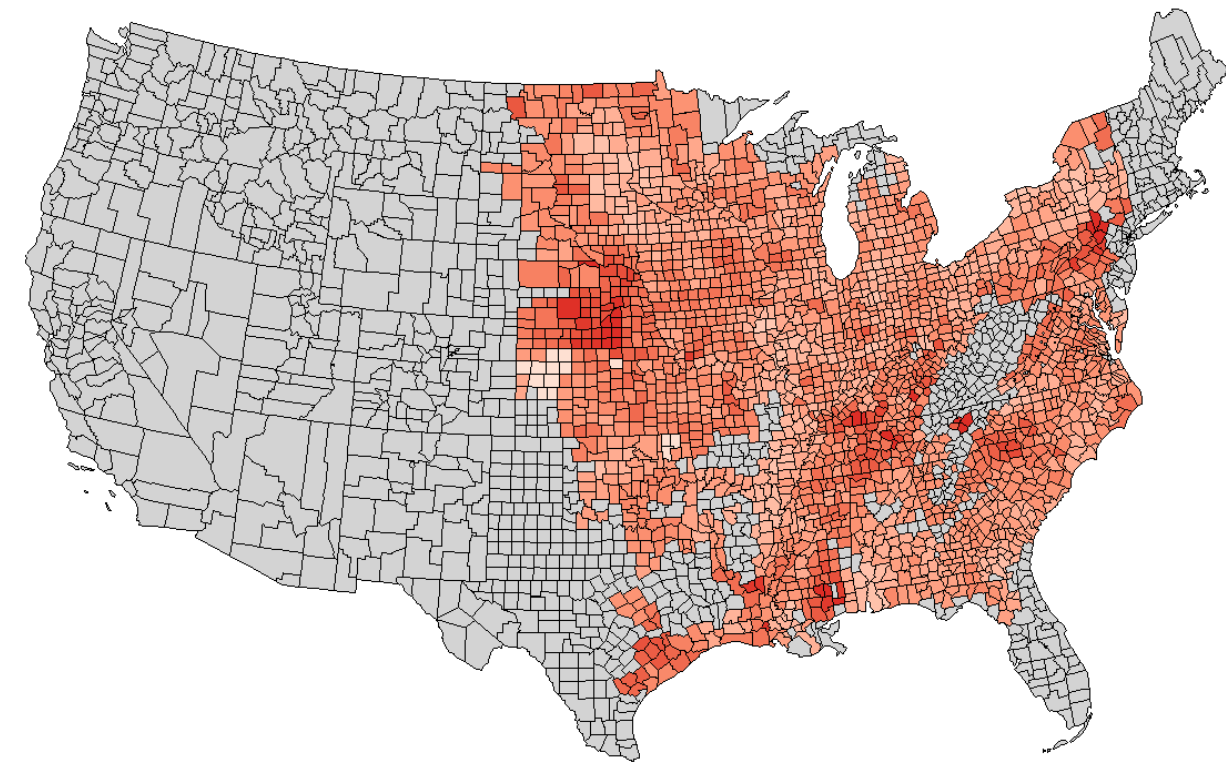
- County-level yield data from RMA- what they use to rate area based policies
- Follow the RMA's detrending process and apply a kernel density estimate (KDE) on residuals
- Estimate premiums by numerical integration on KDEs
- **YP**- Estimate effect of change from 60, 70, 80, and 90% DGs to PGs
- **Whole Farm**- Estimate effect of change from 70, 80, and 90% DGs to PGs
- **SCO**- Estimate effect of change from the 75-86% sleeve to a PG sleeve

Results

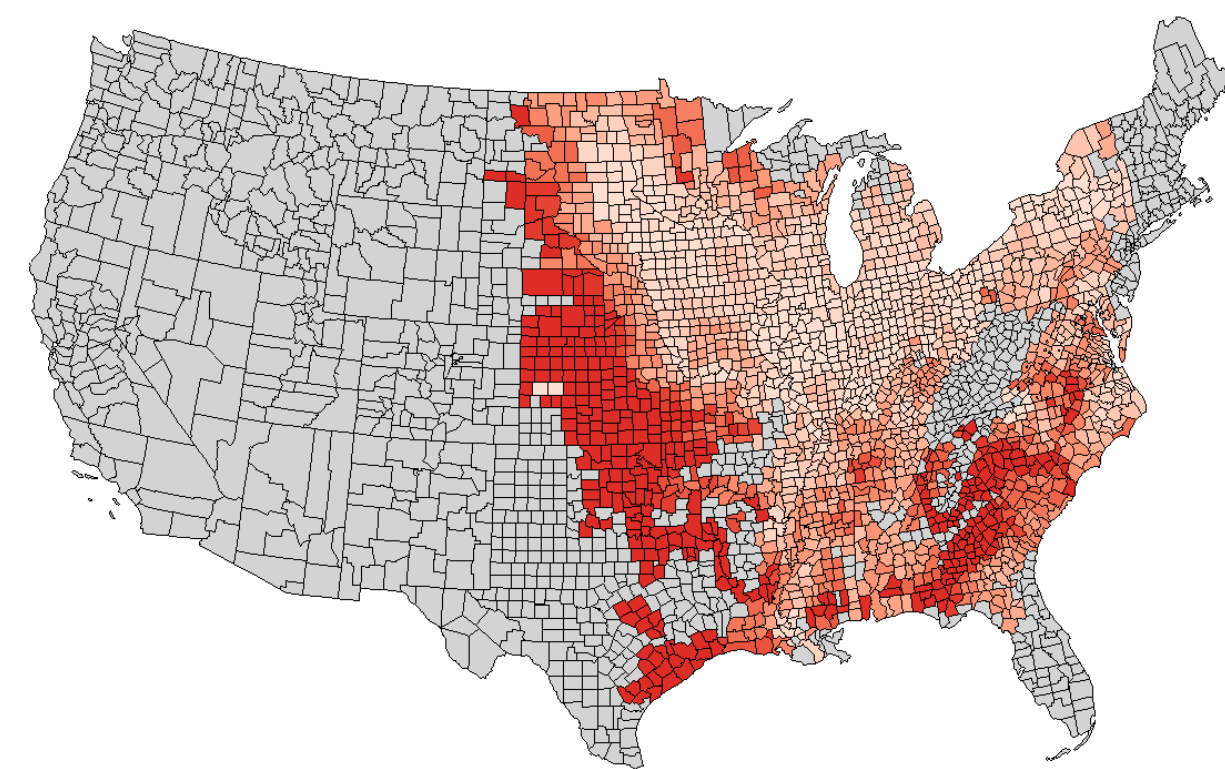
Non-Irrigated Soybean 80% Subsidy Per Acre



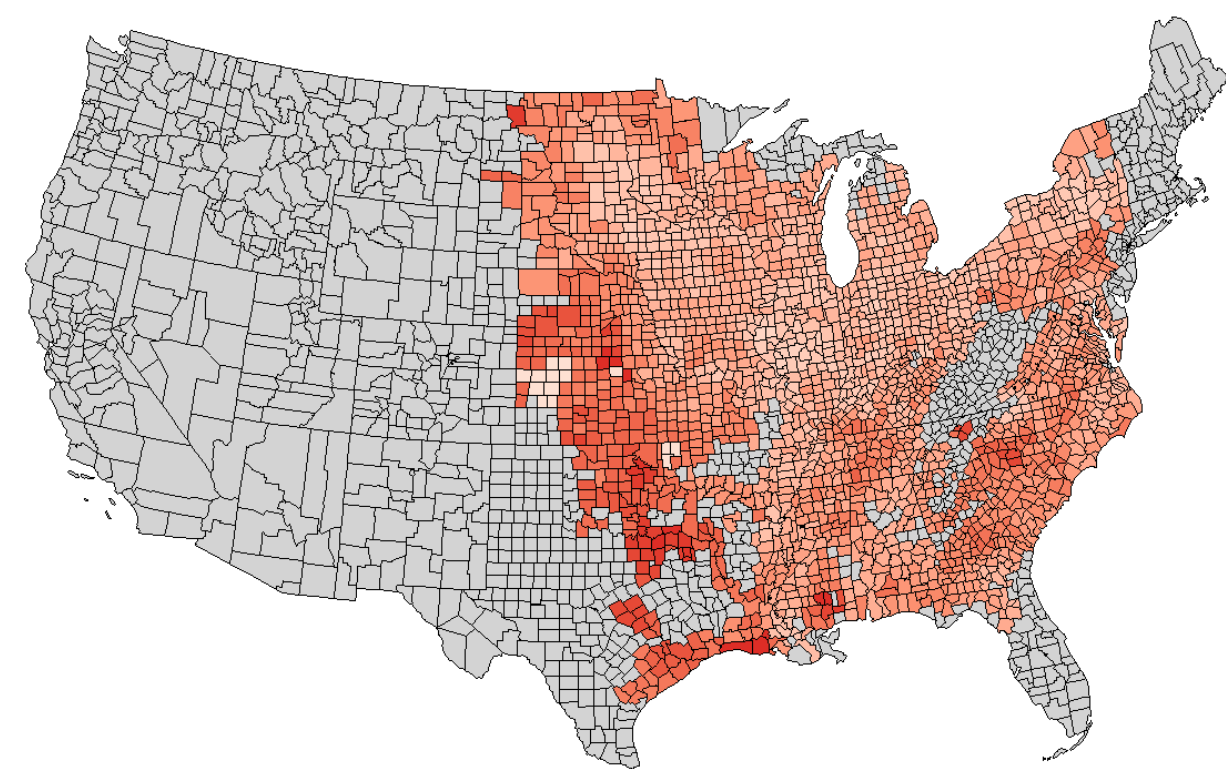
Non-Irrigated Soybean 1 in 6 PG Subsidy Per Acre



Non-Irrigated Soybean 80% Subsidy Per Bushel

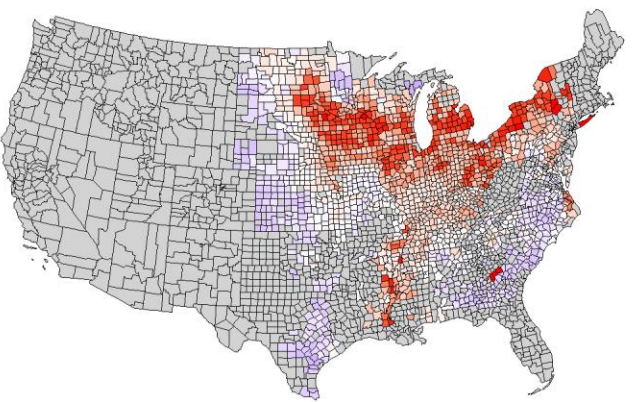


Non-Irrigated Soybean 1 in 6 PG Subsidy Per Bushel

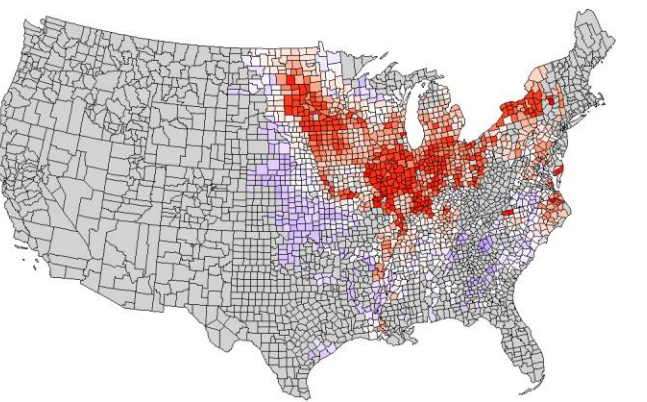


| DG | PG | Unit | DG | | | PG | | | Ratio |
|-----|-------|-----------|-------|--------|------|-------|-------|------|-------|
| | | | Mean | Var | CoV | Mean | Var | CoV | |
| 60% | 1/13 | \$ per Ac | 3.56 | 16.46 | 4.62 | 3.46 | 3.27 | 0.95 | 0.20 |
| | | ¢ per Bu | 3.53 | 26.84 | 7.60 | 2.40 | 1.15 | 0.48 | 0.06 |
| 70% | 1/8 | \$ per Ac | 6.29 | 34.67 | 5.51 | 6.34 | 6.79 | 1.07 | 0.19 |
| | | ¢ per Bu | 5.91 | 52.96 | 8.95 | 4.52 | 3.44 | 0.76 | 0.08 |
| 80% | 1/5 | \$ per Ac | 10.77 | 64.54 | 5.99 | 11.49 | 17.21 | 1.50 | 0.25 |
| | | ¢ per Bu | 9.59 | 95.27 | 9.94 | 8.41 | 13.16 | 1.56 | 0.16 |
| 90% | 1/3.5 | \$ per Ac | 18.43 | 97.79 | 5.31 | 17.97 | 37.10 | 2.06 | 0.39 |
| | | ¢ per Bu | 15.43 | 151.30 | 9.81 | 13.44 | 38.98 | 2.90 | 0.30 |

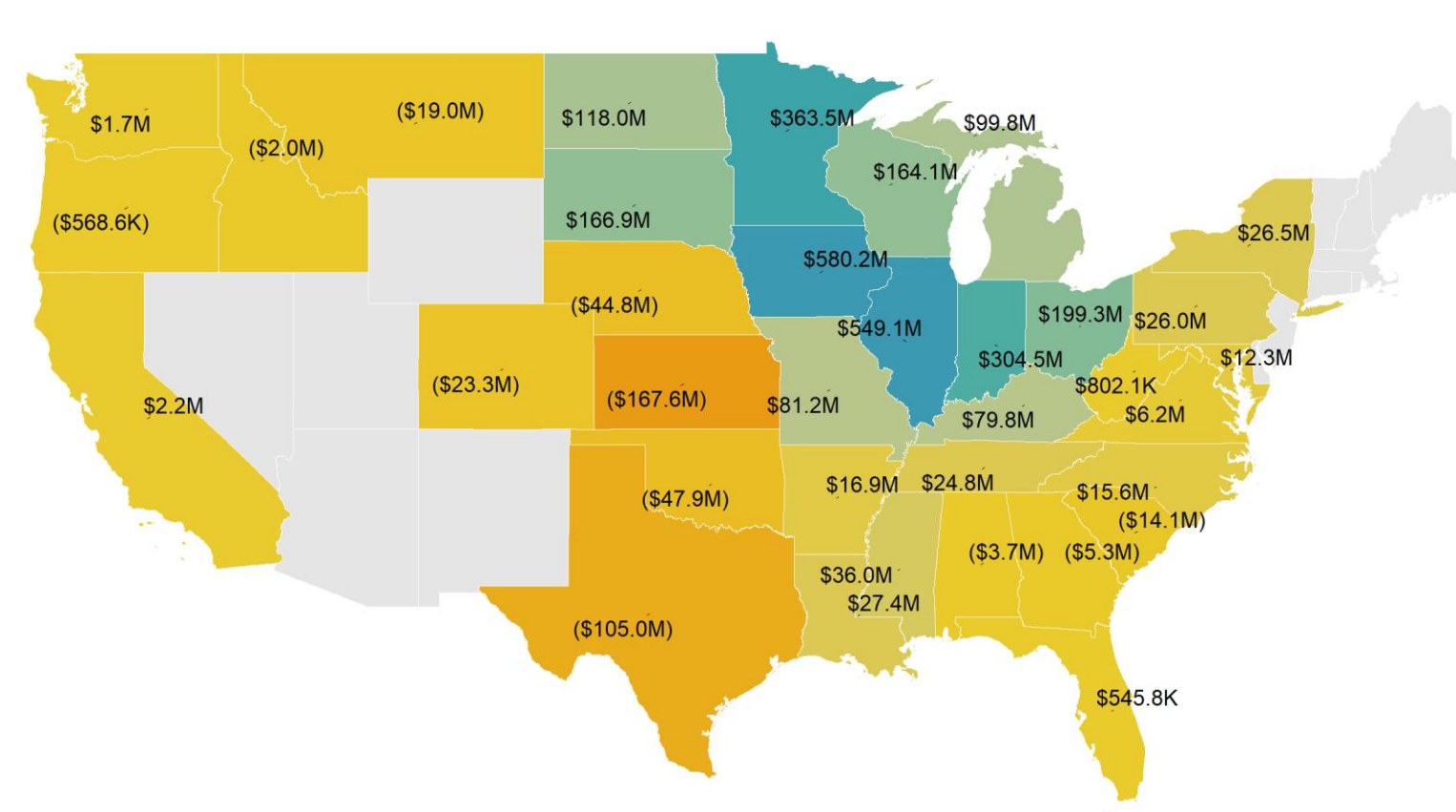
% Change in Corn Acres by County 80% DG



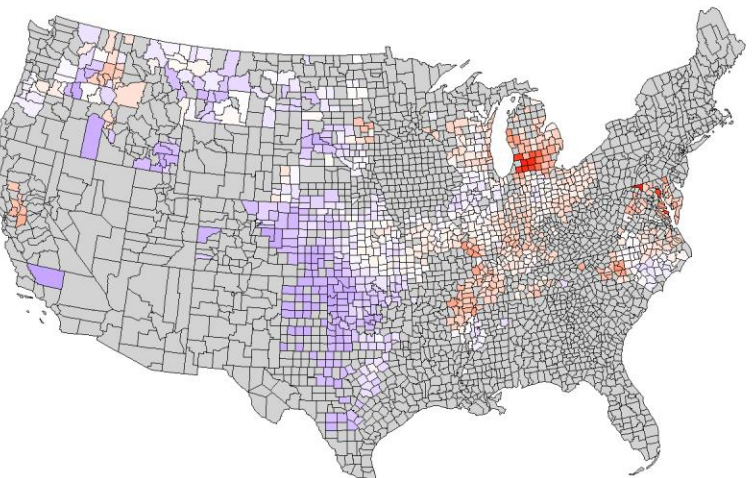
% Change in Soybean Acres by County 80% DG



Change in Subsidy by State across Corn, Soybeans, and Wheat for 80% DG



% Change in Wheat Acres by County 80% DG



Policy Implications

- Moving to PGs dramatically decreases the variance of premium subsidies across counties on a per bushel and per acre basis across all three crops for all three types of crop insurance- YP, Whole Farm, and SCO
- Would result in premium subsidy redistribution of \$3.36 billion annually and around 3% average absolute change in acres by county
- Results are directly applicable to the Canadian context. Canada also uses DGs and between the federal and provincial governments subsidizes 60% of crop insurance premiums