Does crop insurance participation encourage cropping of environmentally sensitive land?

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Criticism of FCIP

• Work is still in progress.
• Broadly stated, crop insurance (availability, subsidization, participation) causes or leads to farming of environmentally sensitive land.
• Typically equates environmentally sensitive and marginally productive.
Testing this criticism

- If environmentally sensitive and marginally productive are the same – expect to see lower county level yields.

- Measure of crop insurance participation – net reported acres (insured)/total acres planted by county – essentially opt in or out for an acre (avoiding some endogeniety by leaving level of coverage out of the question).
Controlling for...

- Other potentially influential forces
  - Weather (problematic)
  - Credit costliness and availability (problematic)
  - Profitable (or not) eras
  - Time/Technology
  - Prior Year Price
factor value cooling degree days units fahre
anomaly cooling degree days units fahre
value heating degree days units fahre
anomaly heating degree days units fahre
value precipitation units inches
anomaly precipitation units inches
value temperature units degrees fahr
anomaly temperature units degrees fahr
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anncllddbase60 anncllddnormal anncllddbase70
anncllddbase72 annhtddbase40 annhtddbase45
annhtddbase50 annhtddbase55 annhtddbase57
annhtddbase60 annhtdddnormal annprcpnormal
annsnownormal annprcpavgndsge001hi
annprcpavgndsge010hi annprcpavgndsge050hi
annprcpavgndsge100hi annsnwdavgndsge001wi
annsnwdavgndsge003wi annsnwdavgndsge010wi
annsnwdavgndsge005wi annsnnowavgndsge001ti
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mineigen(1)
Credit

- Average prime rate
- Demand for loans
- Loan fund availability
- Loan repayment rates
- Renewals or extensions
RE Panel Data Model

- \( Yield = \beta_{0it} + \beta_{1it}Time + \beta_{2it}Weather + \beta_{3it}Credit + \beta_{4it}Percent\ Insured\ Acres + \beta_{5it}Price + \beta_{6it}Pre86 + \beta_{7it}Post05 + \epsilon \)

- Sample initially defined using the boundaries of the Federal Reserve Bank of Kansas City
  - Modified to include all of Missouri and none of New Mexico. Other states include: Colorado, Kansas, Nebraska, Oklahoma, and Wyoming

- 1981-2013

- Corn and Soybean Production
Reminder about Random Effects

- Stronger Assumptions than Fixed Effects
  - “…any unobserved heterogeneity as being distributed independently of the regressors. Then the effects are called random effects, though a better term is purely random effects” (Cameron and Trivedi 2005, p.697).
  - Inconsistent if this assumption is untrue.
  - \( y_{it} = \alpha_i + \gamma_i + x'_{it}\beta + u_{it} \)
    - N individual dummies, T-1 individual time dummies
    - \( \alpha_i \sim [\alpha, \sigma^2_\alpha], \varepsilon_{it} \sim [0, \sigma^2_\varepsilon] \) both individual random effects, \( \alpha \), and the error term are iid.
    - The RE model assumes that the expectations of the individual specific effects are constant over time.
  - Hausman tests indicate that RE is proper model.
  - Panel-Robust Sandwich Standard Errors used.
Distribution of dependent variable

- **SOYBEANS - YIELD, MEASURED IN BU / ACRE**
  - Kernel density estimate
  - Density scale: 0 to 0.04
  - Data points: 0 to 80

- **CORN, GRAIN - YIELD, MEASURED IN BU / ACRE**
  - Kernel density estimate
  - Density scale: 0 to 0.01
  - Data points: 0 to 250

Kernel = epanechnikov, bandwidth = 1.5363
Kernel = epanechnikov, bandwidth = 4.8839
Regression Results: Robust Random-effects GLS regression, Dependent Variable: Corn Grain Yield in Bushels per Acre

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>P&gt;z</th>
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</thead>
<tbody>
<tr>
<td>Year</td>
<td>1.072821</td>
<td>0.1289402</td>
<td>0.000</td>
</tr>
<tr>
<td>Weather Index</td>
<td>2.277613</td>
<td>0.4475849</td>
<td>0.000</td>
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<tr>
<td>Credit Index</td>
<td>1.17251</td>
<td>0.2715144</td>
<td>0.000</td>
</tr>
<tr>
<td>Insured Proportion of Planted Corn</td>
<td>-8.71162</td>
<td>2.919534</td>
<td>0.003</td>
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<tr>
<td>Corn Grain Price Received (t-1)</td>
<td>-1.56348</td>
<td>0.3847299</td>
<td>0.000</td>
</tr>
<tr>
<td>Before 1986 (binary)</td>
<td>-7.83009</td>
<td>1.432134</td>
<td>0.000</td>
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<tr>
<td>After 2005 (binary)</td>
<td>4.041813</td>
<td>1.194719</td>
<td>0.001</td>
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<tr>
<td>Constant</td>
<td>-2018.3</td>
<td>255.7451</td>
<td>0.000</td>
</tr>
</tbody>
</table>

*275 Groups (Counties), 7170 Observations, Prob>χ^2 = 0.0000
Weather index causes 155 (36%) observations to drop out
Regression Results: Robust Random-effects GLS regression, Dependent Variable: Soybean Yield in Bushels per Acre

|                              | Coefficient | Standard Error | P>|z| |
|------------------------------|-------------|----------------|-----|
| Year                         | 0.322368    | 0.034          | 0.000 |
| Weather Index                | 1.893497    | 0.104          | 0.000 |
| Credit Index                 | 0.829861    | 0.110          | 0.000 |
| Insured Proportion of Planted Soybeans | -3.50936    | 0.740          | 0.000 |
| Soybean Price Received (t-1) | 0.288461    | 0.064          | 0.000 |
| Before 1986 (binary)         | -5.42451    | 0.503          | 0.000 |
| After 2005 (binary)          | 1.218922    | 0.384          | 0.002 |
| Constant                     | -606.127    | 68.253         | 0.000 |

228 groups (counties), 6003 observations, Prob>|χ|² = 0.0000
Conclusions

- Results indicate that insured proportion has a small statistically significant negative effect on yield.
- This *may* in turn show that participation has encouraged cropping of environmentally sensitive land.
- Several limitations
  - Need better measures.
    - Weather, credit
  - More crops
  - Better estimation technique
Questions or Comments?