Does CAIS (Canadian Agricultural Income Stabilization) affect production decisions?

CATPRN Workshop, February 11, 2006

James Rude
Barry Coyle
and
Ran Wei
CAIS PROGRAM

• Combines stabilization assistance (NISA) and disaster assistance (CFIP) into one program

• Deficiency payment which puts a floor on farm income defined as a reference “production margin”

• Production Margin = Allowable commodity sales – Allowable expenses + Accrual Adjustment
  ➢ List of expenses is narrower than those used to calculate a gross margin. Only includes expense items directly related to primary production
  ➢ Exclude expenses what are within a farmer’s control
  ➢ Exclude expenses that are subject to moral hazard
Pulling the Trigger

Reference Margin

➢ “Olympic” average of the last five years’ production margins, with highest and lowest years dropped

Payment Trigger: Payments are made when the program year margin falls below the reference year average

Share of producer coinsurance is inversely proportional to loss
Inflows

• Producers can deposit 14%, 18.5% or 26% of reference margin and the level of the deposit determines the point at which the government will stop paying

Outflows ($100K ref. margin)

If the producer deposited $14,000 and then had a 40 per cent margin decline...

• First $2,000 of producer funds applied to loss from 60–70% of margin
• Next $4,500 in funds applied to loss from 70–85% of margin
• Finally $7,500 in funds applied to loss from 85-100% of margin
• Producer brought back up to 100% of margin = $40,000 total payment

When this money is used up, no further government funding

• Producer deposits are not a premium … the producer gets the money back
How do you measure the impact of CAIS?

Judge program’s effects by how it affects producers’ incentives …specifically the incentive to access larger government payments

- Alter outputs and inputs to access more program payments
- Alter the product mix to access more program payments
- Intentionally induce production margin losses to access more money
  - Want to do this in a way that causes a minimal reduction in future reference margins … don’t want the manipulated production margin to be part of next year’s Olympic average

The effects will have both static and dynamic dimensions
A Static Set-up

\[
E(\pi) = \int_0^{0.7 \cdot \bar{\pi}} [\pi + (\alpha_I \cdot \bar{\pi} - \pi)]f(\pi)d\pi + \int_{0.7 \cdot \bar{\pi}}^{0.85 \cdot \bar{\pi}} [\pi + (\alpha_{II} \cdot \bar{\pi} - \pi)]f(\pi)d\pi
\]

\[
+ \int_{0.85 \cdot \bar{\pi}}^{\bar{\pi}} [\pi + (\alpha_{III} \cdot \bar{\pi} - \pi)]f(\pi)d\pi + \int_{\bar{\pi}}^{\infty} [\pi]f(\pi)d\pi
\]

Simplifying assumptions: 2 goods; price risk only; one loss level; risk aversion

Certainty Equivalent Profits = Expected Profits - Risk Premium

\[
\pi^{ce} = \alpha \cdot \bar{\pi} \cdot F(\pi) + \int_{\pi-R_2-C}^{\infty} \int_{\pi-R_1-C}^{\infty} \int [P_1X_1 + P_2X_2 - C]f(P_1P_2)dP_1dP_2 +
\]

\[
-\frac{\lambda}{2} \left( X_1^2 \sigma_{1I}^2 + X_2^2 \sigma_{2I}^2 + 2 \cdot X_1 \cdot X_2 \cdot \rho \cdot \sigma_{1I}^2 \cdot \sigma_{2I}^2 \right)
\]

Where \( \sigma_{II}^2 \) is the truncated variance:

\[
E(P_i) = P_i \cdot F(P_i) + \int_{\pi-R_2-C}^{\infty} \int_{\pi-R_1-C}^{\infty} P_1f(P_1P_2)dP_1dP_2
\]

\[
\sigma_{II}^2 = P_i^2 \cdot F(P_i) + \int_{\pi-R_2-C}^{\infty} \int_{\pi-R_1-C}^{\infty} P_i^2f(P_1P_2)dP_1dP_2 - (E(P_i))^2
\]
How does output change?

\[
\frac{\partial \pi_{ce}^{\pi}}{\partial X_1} = \int_{\bar{\pi} - R_2 - C}^{\infty} \int_{\bar{\pi} - R_1 - C}^{\infty} P_1 f(P_1P_2) dP_1 dP_2 = MC_1 + \lambda (X_1 \sigma_{11}^2 + X_2 \cdot \rho \cdot \sigma_{11}^2 \cdot \sigma_{21}^2)
\]

\[
\frac{\partial \pi_{ce}^{\pi}}{\partial X_2} = \int_{\bar{\pi} - R_2 - C}^{\infty} \int_{\bar{\pi} - R_1 - C}^{\infty} P_2 f(P_1P_2) dP_1 dP_2 = MC_2 + \lambda (X_2 \sigma_{21}^2 + X_1 \cdot \rho \cdot \sigma_{11}^2 \cdot \sigma_{21}^2)
\]

• Expected prices are higher for both commodities … although there are some off-setting effects there will be an incentive to produce more of the riskier commodity
• Marginal costs are lower since the risk premium is lower because \(\sigma_{iI}^2\)'s are smaller than with no program

WHAT ELSE SHOULD BE STOCASTIC? \((X_1, X_2), C, \text{ AND } \bar{\pi}\)
• Including uncertainty w.r.t. yields will complicate the solution but the same basic result holds that expected prices ↑ and risk premiums ↓ so that output ↑
  • cost uncertainly will help to partially off-set the effect of increased expected prices
Dynamic Impacts

• Intentionally triggering payouts can only happen periodically
  • Use of negative price movements to induce a 5 year minimum margin discourages the use of risk management and further shifts the product mix to more risky outputs
  • Cost uncertainty reduces incentive to trigger payments by manipulating input decisions
  • Unlike CFIP (30% threshold) the immediate trigger increases the probability of opportunistic behaviour
  • Furthermore limiting eligible expenses $\uparrow$production margins and the potential for a payout

• Policy risk (potential for elimination of the program) reduces the potential to manipulate the program (or *Not*)
Impact of CAIS on Manitoba Grains Production

- Aggregate Manitoba data (1966-2002)
  - estimate a supply response model (area and yields)
  - simulate CAIS OVER SAMPLE PERIOD

**Impacts: Program versus No Program**

<table>
<thead>
<tr>
<th></th>
<th>Wheat Output</th>
<th>Barley Output</th>
<th>Canola Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothetical 2002 Impact (CARA Preferences)</td>
<td>2.4%</td>
<td>1.3%</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

Coyle and Wei (2006)

- Impacts are modest in short run assuming CARA, however long run impacts are larger
- Need farm level data to get a reasonable picture of what is going on …