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

CATPRN Workshop, February 11, 2006

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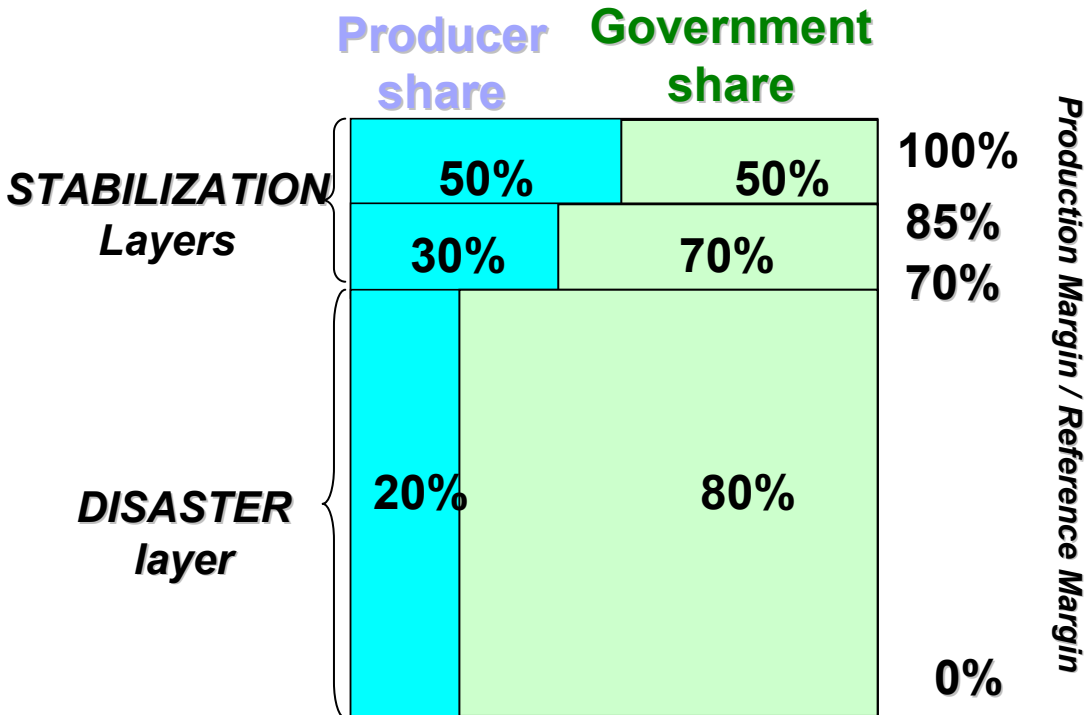
CAIS PROGRAM

- 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

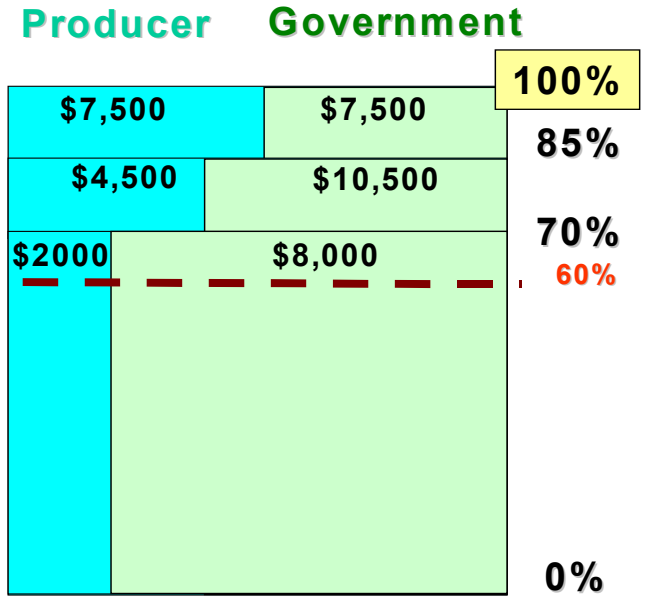
Inflows

• 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

$$\pi^{ce} = \alpha \cdot \bar{\pi} \cdot F(\pi) + \int_{\frac{\bar{\pi}-R_2-C}{X_1}}^{\infty} \int_{\frac{\bar{\pi}-R_1-C}{X_2}}^{\infty} [P_1 X_1 + P_2 X_2 - C] f(P_1 P_2) dP_1 dP_2 +$$

$$-\frac{\lambda}{2}(X_1^2 \sigma_{1I}^2 + X_2^2 \sigma_{2I}^2 + 2 \cdot X_1 \cdot X_{2\cdot} \cdot \rho \cdot \sigma_{1I}^2 \cdot \sigma_{2I}^2)$$

Where σ_{iI}^2 is the truncated variance:

$$E(P_i) = \bar{P}_i \cdot F(P_i) + \int_{\frac{\bar{\pi}-R_2-C}{X_1}}^{\infty} \int_{\frac{\bar{\pi}-R_1-C}{X_2}}^{\infty} P_1 f(P_1 P_2) dP_1 dP_2$$

$$\sigma_{iI}^2 = \bar{P}_i^2 \cdot F(P_i) + \int_{\frac{\bar{\pi}-R_2-C}{X_1}}^{\infty} \int_{\frac{\bar{\pi}-R_1-C}{X_2}}^{\infty} P_i^2 f(P_1 P_2) dP_1 dP_2 - (E(P_i))^2$$

How does output change?

$$\frac{\partial \pi^{ce}}{\partial X_1} = \int_{\frac{\bar{\pi}-R_2-C}{X_1}}^{\infty} \int_{\frac{\bar{\pi}-R_1-C}{X_2}}^{\infty} P_1 f(P_1 P_2) dP_1 dP_2 = MC_1 + \lambda(X_1\sigma_{1I}^2 + X_2 \cdot \rho \cdot \sigma_{1I}^2 \cdot \sigma_{2I}^2)$$

$$\frac{\partial \pi^{ce}}{\partial X_2} = \underbrace{\int_{\frac{\bar{\pi}-R_2-C}{X_1}}^{\infty} \int_{\frac{\bar{\pi}-R_1-C}{X_2}}^{\infty} P_2 f(P_1 P_2) dP_1 dP_2}_{\text{Marginal Revenue}} = \underbrace{MC_2 + \lambda(X_2\sigma_{2I}^2 + X_1 \cdot \rho \cdot \sigma_{1I}^2 \cdot \sigma_{2I}^2)}_{\text{Marginal cost}}$$

- 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 σ_{iI}^2s are smaller than with no program

WHAT ELSE SHOULD BE STOCASTIC? (X_1, X_2), C, 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 ↑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

	Wheat Output	Barley Output	Canola Output
Hypothetical 2002 Impact (CARA Preferences)	2.4%	1.3%	4.5%

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 …

LITTLE PICTURE … 50 FARMS