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**Evaluation of the Conservation Reserve Program:
Disaggregate slippage**

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*Poster prepared for presentation at the Agricultural & Applied Economics Association's 2011
AAEA & NAREA Joint Annual Meeting, Pittsburg, Pennsylvania, July 24-26, 2011*

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Evaluation of the Conservation Reserve Program : Disaggregate slippage

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Introduction

- Environmental effectiveness of voluntary land retirement programs is open to question, since they may induce some offsetting behavior that crowds out targeted environmental benefits of the programs.
- This unwanted effect, known as ‘**slippage**’, arises from multiple channels due to reallocation of inputs by both program participants and non-participants.
- Slippage consequences pertaining to farm’s land allocation behavior at the **extensive margin** are:
 - (i) Within-a-farm land conversion from uncultivated land to cropland;
 - (ii) Between-farms land substitution through the local farmland market; and
 - (iii) Price feedback effect through the commodity market.
- Important questions are to identify, if any:
 - how and what types of farms** engage in such offsetting behaviors; and
 - what kinds of** and the degree to which slippage arise.

Objective

- While some empirical studies have attempted to estimate the aggregate slippage effects, this study rather attempts to **disaggregate them by identifying one unique source of slippage**.
- Specifically, **I examine slippage defined above in (i)** caused by participants in the U.S. Conservation Reserve Program (CRP).
- The mechanism and the testable hypothesis of within-a-farm slippage at the extensive margin were illustrated below by Wu (2000). The theory suggests that **slippage increases proportionally with the relatively inelastic crop or elastic non-crop acreage supply**.

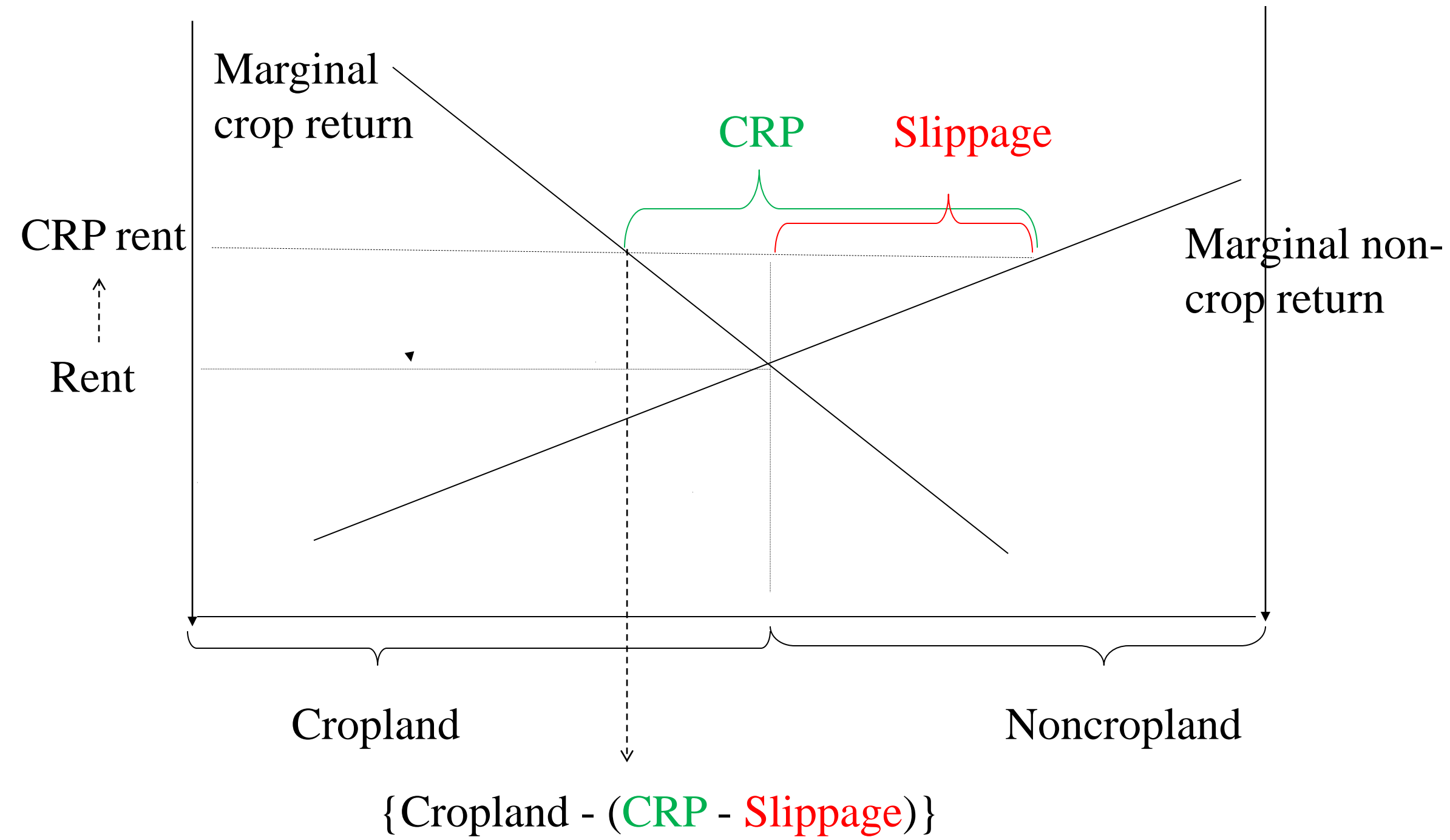


Figure 1. Slippage mechanism through within-a-farm land substitution from noncropland to cropland (Source: Wu, 2000)

Data and Methods

- Agricultural Census farm-level longitudinal data on detailed farm production and demographic characteristics during the 1982-1992 period and CRP enrolled acres during the 1986-1991 period.
- Futures commodity prices from the Chicago Board of Trade (CBOT)
- An econometric model is specified with the first differences technique:

$$\Delta A_{it}^C = \alpha_1 \Delta A_{it}^{CRP} + \Delta \mathbf{X}_{it} \alpha_3 + \Delta C_{jt} + \Delta \theta_t + \Delta \varepsilon_{it},$$

where

- A_{it}^{CROP} : Cropped acres ;
- A_{it}^{CRP} : CRP acres ;
- \mathbf{X}_{it} : Farm characteristics ;
- C_{jt} : Time - varying county effects ;
- θ_t : Year dummy ,

- The identifying assumption is

$$E[\Delta A_{it}^{CRP} \Delta \varepsilon_{it} \mid \Delta \mathbf{X}_{it}, \Delta C_{jt}, \Delta \theta_t, \mathbf{X}_{i,1982}] = 0.$$

- The parameter of interest, α_1 , captures the average net reduction in acres used for cropping activities between 1982-1992 due to 1986-1991 CRP enrollment.**

- The identifying assumption above results from the following strategies:
 - The analyses focus only on farm observations that **take no farmland transactions record (i.e., fixed farm size) over the periods**. This restriction conditions out other CRP-induced effects between farms defined by (b).
 - The slippage estimate may not suffer from endogeneity of CRP participation and production decisions, because of the **difference in the timing of the enrollment decision and actual enrollment**. In general, the CRP contract becomes effective in the following crop year.
 - The irreversible CRP decision adheres to the farm’s future return from production activities through farm’s underlying parameters such as entrepreneur skill and farmland productivity. These farm characteristics, likely unobservable, influence both the CRP participation decision in year $t-1$ and the crop production decision in year t , hence the failure to control for them would bias the estimate of interest. **With the farm fixed effects, employing the first differencing technique eliminates such unobserved farm heterogeneity.**
 - Regional time-varying effects account for the change in such as **weather and local farmland market structure**, which affect the crop production decision for both participants and non-participants.
 - The CRP enrollment decision is contingent on the cropping history, which is in turn correlated with current production. I account for this correlation by **controlling for exogenous pre-CRP-period variables that characterize the inherent crop production capacity**.

Results

- An average partial-farm CRP participant (i.e., retiring a part of farmland) converts 25% of noncropland to cropping activities as a consequence of CRP enrollment.**
- This slippage rate results merely from the source of (i), while the aggregate analysis by Wu (2000) and Roberts and Bucholtz (2005) that cover (i), (ii), and (iii) have similar slippage estimates.
- Moreover, the following results show some evidences of heterogeneous slippage effects across farm types:

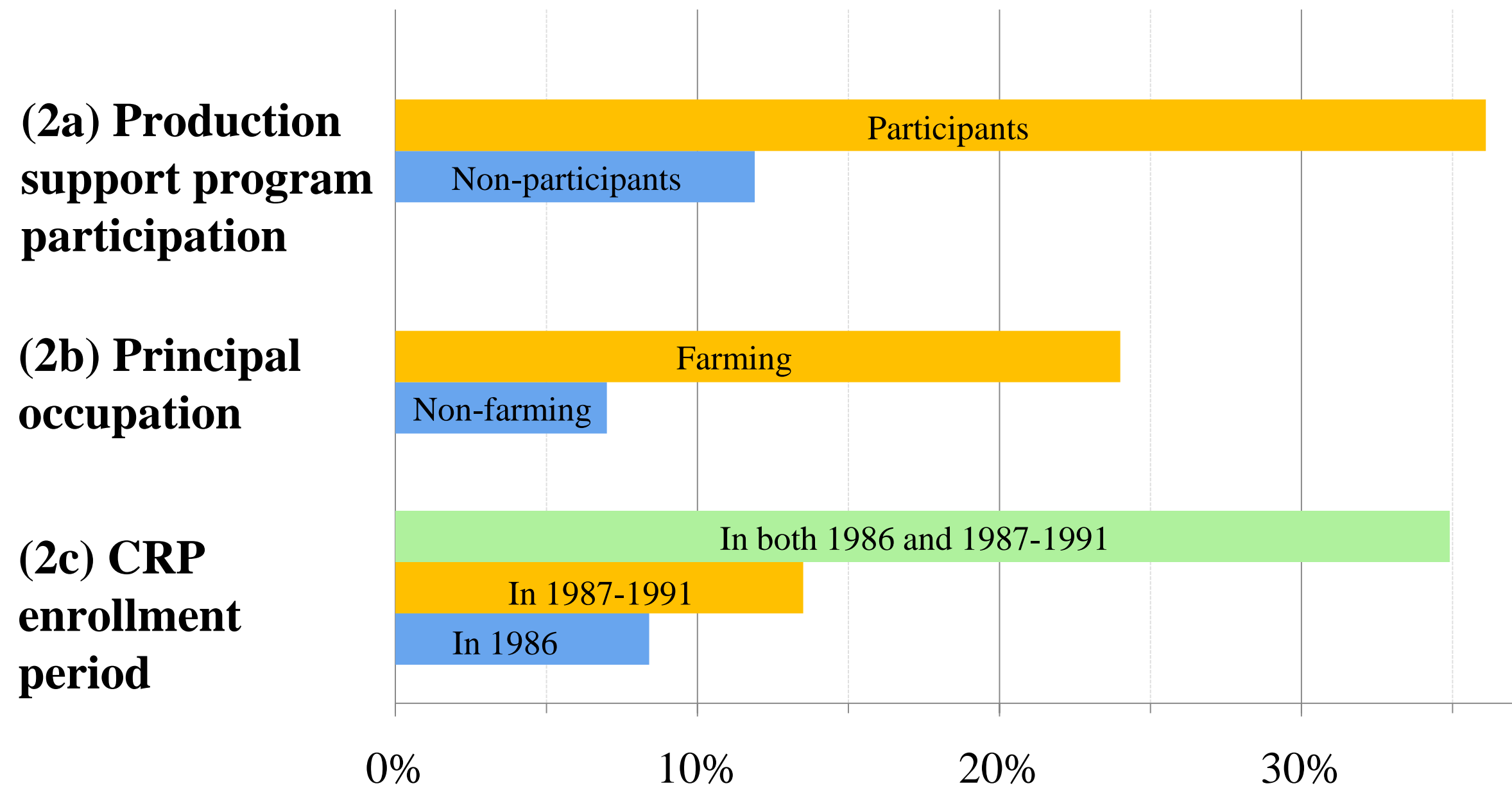


Figure 2. Slippage in 1982-1992 cropland use due to 1986-1991 CRP enrollment, by farm type

- A subsidized farm has more inelastic cropland demand relative to noncropland demand, thereby causing more slippage (**fig. 2a**)
- More active farms lead to more slippage (**fig. 2b**)
- A slippage rate increases for participants who accumulate CRP acres over time, suggesting that the slippage problem got worse as farmers became more familiar with the program and accumulated rents from the policy (**fig. 2c**)
- Slippage varies across region possibly due to the distribution of land quality and a production subsidy participation rate (**fig.3**)

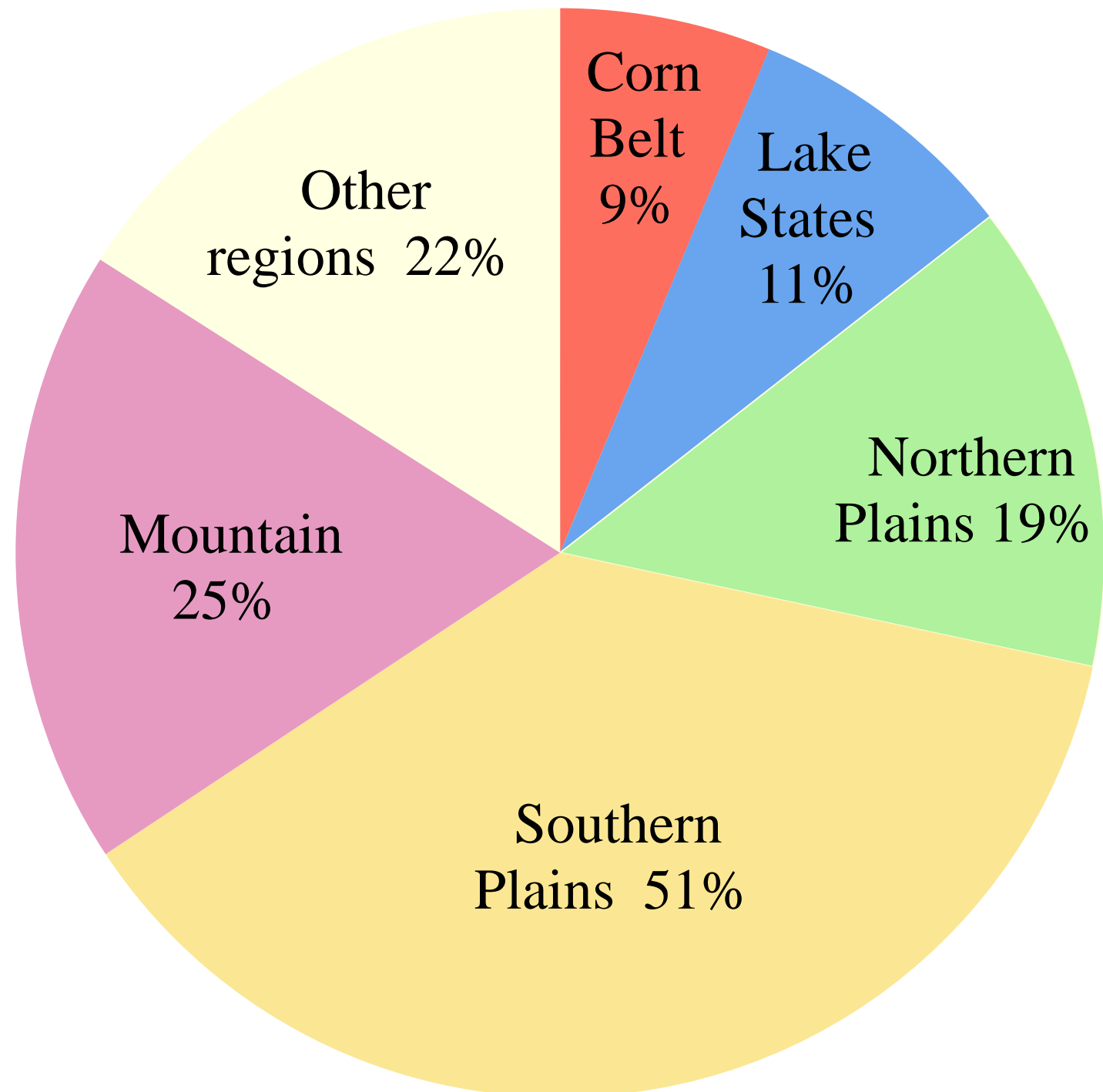


Figure 3. Slippage in 1982-1992 cropland use due to 1986-1991 CRP enrollment across Farm Production Region

Conclusions

- Results indicate that the voluntary land retirement program is likely to generate some offsetting behavior, with farmers shifting crop production to previously uncropped land in response to subsidized land retirement.
- Findings suggest that active farms with relatively inelastic crop acreage supply lead to more slippage.
- Knowledge about the mechanisms through which slippage occurs should help policymakers devise programs with features designed to avoid or mitigate slippage incentives by pinpointing the sources of slippage.
- Findings will be useful to similar policies recently developed in developing countries, e.g., the Sloped Land Conversion Program in China and payments-for-environmental-services programs for reforestation in Asia and Latin America, where cropped activities of peasant farms can be more price inelastic.

Literature cited

- Roberts, M., and S. Bucholtz. 2005. Slippage in the Conservation Reserve Program or Spurious Correlation? A Comment. *American Journal of Agricultural Economics* 87(1): 244-50.
- Wu, J. J. 2000. Slippage Effects of the Conservation Reserve Program. *American Journal of Agricultural Economics* 82(4): 979-92.

Acknowledgments

I am grateful to Barrett Kirwan, Erik Lichtenberg, and Charles Towe for their insightful comments and suggestions. I also thank to Jameson Burt, Robert Hunt and Brad Suma at the USDA National Agricultural Statistical Services and Eldon Ball, Vince Breneman, Robert Dubman, Daniel Hellerstein, Sun Ling Wang and Ryan Williams at the USDA Economic Research Service for generous assistance in providing data access and learning.

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