Production Effects of Decoupled Commodity Program Payments:

An Instrumental Variables Approach

PRELIMINARY—PLEASE DO NOT CITE, QUOTE, OR DISTRIBUTE

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Introduction

The 1996 Federal Agricultural Improvement and Reform (FAIR) Act removed most price-contingent agricultural subsidies and replaced them with Production Flexibility Contracts (PFC) —lump sum payments with few ties to farmers’ production decisions or prices. The payments were envisioned as a way to maintain income transfers to agricultural interests while minimizing production distortions. The extent to which these lump-sum or “decoupled” payments affect production has been a significant dispute among academics and in recent World Trade Organization negotiations (FAO, 2005; Sumner, 2005).

While a large and growing literature examines the relationship between agricultural production and the decoupled payments embodied in the PFC payments of the FAIR Act (see OECD, 2005 for a review), several fundamental problems plague this literature. Because decoupled subsidies are essentially factor-specific subsidies to land, farmers chose the subsidy they now receive by historically choosing the amount and quality of land dedicated to program crops. Thus, while PFC payments were largely decoupled from contemporaneous planting decisions, they were intimately tied to historical decisions, decisions that were tied as much (or more) to land attributes as to subsidy levels. Research that ignores the simultaneity of these decisions attributes greater effect of subsidies than warranted because cross-sectional variation in subsidy payments cannot adequately control for unobserved heterogeneity (e.g., soil quality) that is closely associated with payment levels, leading to estimates that are almost surely biased too large. A related critique is found in the joint determination of subsidies and production; as farmers alter the number of base acres they operate each year, e.g., through farmland rental or purchase, they simultaneously alter the total subsidy they receive and the total amount they
produce. This relationship is not causal however. It is simply the by-product of the farmer’s
decision to farm more or fewer base acres. Conversely, measurement error in self-reported
subsidy receipts results in finding a smaller-than-warranted effect.

Empirical Strategy

The data and methods of this paper overcome these sources of bias to estimate the true, causal
effect of decoupled subsidies on production. Scientists use careful, experimental techniques to
draw causal inference, often relying on randomization or case-control studies. Social scientists
rarely have the opportunity to use markets as experimental laboratories. Consequently, existing
studies highlighting the association between decoupled agricultural subsidies and crop
production cannot make credible causal inferences without making strong assumptions about
unobservable and/or mis-measured confounding factors. The contribution of this paper is to use
an instrumental variables approach to isolate variation in decoupled subsidies that is unrelated to
myriad confounding influences, such as a farmer’s entrepreneurial skill or farmland productivity
(see Angrist and Krueger, 2001, for an excellent overview of the usefulness of instrumental
variables in this context). The instrumental variables approach makes it credible to assert that an
observed association between payments and agricultural production is a causal relationship
rather than simply a correlation.

Using random, weather-induce yield shocks, we isolate exogenous variation in decoupled
subsidies that is unrelated to confounding influences on production. As is often the case in the
program evaluation literature (Meyer, 1995; Angrist and Krueger, 2001), the policy details
provide useful exogenous variation. In this case, it is found in the subsidy calculation. A farmer’s
total decoupled subsidy receipt equals the product of the legislatively set subsidy rate, the number of subsidized (i.e., base) acres, and the farm’s program payment yield (PPY). This paper’s unique contribution can be found in the details of the PPY. A base acre’s PPY was determined in 1986 as the 5-year Olympic (dropping the highest and the lowest values) average of that acre’s yield from 1981-1985. The PPY used to determine subsidies in 1997 is thus a function of the idiosyncratic yield variation between 1981 and 1985.

Data
Using crop-specific, county-level yield data from the National Agricultural Statistical Service from as early as 1919, we calculate yield shocks as the deviation of the actual yield from the expected yield. Averaging the yield shocks between 1981 and 1985 provides a summary measure of the idiosyncratic component of the PPY, and thus the random component of decoupled subsidies. Administrative data obtained from the Farm Services Agency through a Freedom of Information Act Request ensure an accurate measurement of subsidy receipts tied to each commodity.

Results
Preliminary results indicate the strength of this instrument (see table 1). Early-1980’s yield shocks alone explain 25 percent of the 1997 rice PFC payment variation and 15 percent of the cotton subsidy variation. The instrument explains 10 percent of the corn subsidy variation in the Heartlands and 13-percent of the corn subsidy variation in the Northern Great Plains. Across all other program crops there is good statistical evidence of this instrument’s ability to explain decoupled subsidy variation.
For the second-stage, we consider several production measures: the share of cropland dedicated to the specific program crop, the share of cropland dedicated to any program crop, and total sales per acre of farmland. Preliminary 2nd-stage results indicate modest positive production effects for the share of acreage dedicated to the subsidized crop, but little or no effect on other program crops or on total agricultural sales. The level of the effects estimated for 1992 (well before policy makers seriously considered decoupled payments), are similar to those estimated for 1997, and 2002 (one and six years after the policy change). While decoupled payments appear to have significant if modest effects on production, effects stemming from the 1996 FAIR Act appear minimal.
References


## Table 1 - First-Stage

**Instrument: 1981-1985 Average Yield Shock**

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<th>Commodity</th>
<th>U.S.</th>
<th>Heartland</th>
<th>Crescent</th>
<th>Northern</th>
<th>Great</th>
<th>Plains</th>
<th>Gateway</th>
<th>Eastern</th>
<th>Southern</th>
<th>Fruitful</th>
<th>and</th>
<th>Basin</th>
<th>and</th>
<th>Mississippi</th>
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<tr>
<td>Crop</td>
<td>F</td>
<td>1981-1985 Avg Yield</td>
<td>Deviation from Linear Trend</td>
<td>R²</td>
<td>PFC Payment per Base Acre</td>
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*Notes:* Dependent variable = County-level 1997 PFC payment per Base acre. Explanatory variable = 1981 - 1985 Average Yield Deviation from linear trend.