CAP effects on labour use in agriculture

Evidence from alternative dynamic panel data models

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‘Putting rural development to work for jobs and growth’

1. Introduction

On 2 February 2005, the European Commission relaunched the Lisbon strategy for the European Union (EU). The strategy seeks to tackle the EU’s urgent need for higher economic growth and job creation and greater competitiveness in world markets. It is a major EU policy priority. The Lisbon strategy aims to provide people with a better standard of living in an environmentally and socially sustainable way.

The Lisbon strategy: key elements of the Commission’s launch

2. Agriculture — the heartbeat of rural areas

The agricultural and rural constituency is important. Rural areas (1) cover 90% of the EU’s territory and are home to approximately 50% of its population. Agriculture and forestry are the main land users and play a key role in the management of natural resources in rural areas and in determining the rural landscape. Agriculture makes a valuable contribution to the socioeconomic development of rural areas and fulfils demands of their natural potential.
Overview

1 Motivation & objectives
2 CAP effects in a dynamic labour adjustment model
3 Empirical strategy: dynamic panel data models
4 Results
5 Conclusions
Background & objectives

- Literature on dynamic factor adjustment, following duality framework by Epstein & Denny 1983.
- Mostly focused on capital, rarely used for direct evaluation of policies
- **Our objective**: estimate a dynamic labour equation augmented by full set of CAP measures at regional level
  - Simultaneous analysis of entire CAP portfolio
  - Methodological focus on endogeneity issues
  - Unit of observation is German Landkreise / NUTS-3
Agricultural labour use in Germany 1988-2006

Source: Petrick & Zier 2010, based on official statistics.
CAP expenses in Brandenburg, Saxony, Saxony-Anhalt (million euro)

Source: State paying agencies.
The dynamic labour adjustment model

The (primal) optimisation problem:

$$\max_{L_t} PV = \int_0^\infty \left\{ pf(L_t) - wL_t - C(\dot{L}_t) \right\} e^{-rt} dt$$

subject to $L_0$ given, with $PV$ present value of earnings, $L_t$ labour use at time $t$, $pf$ value of output, $w$ wage, $C$ convex adjustment costs, $r$ discount rate.

Solution by calculus of variations motivates a partial adjustment model:

$$L_t - L_{t-1} = \gamma (L_t^* - L_{t-1})$$

with $L^*$ steady-state labour use, $\gamma$ adjustment coefficient.
## Expected CAP effects on labour use in agriculture

<table>
<thead>
<tr>
<th>Category</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct payments</td>
<td>0</td>
</tr>
<tr>
<td>Development of rural areas</td>
<td>+</td>
</tr>
<tr>
<td>Processing &amp; marketing</td>
<td>+</td>
</tr>
<tr>
<td>Capital subsidies</td>
<td>−</td>
</tr>
<tr>
<td>Less favoured area payments</td>
<td>0</td>
</tr>
<tr>
<td>Agri-environmental payments</td>
<td>+</td>
</tr>
<tr>
<td>Decoupling</td>
<td>−</td>
</tr>
</tbody>
</table>
The estimating equation

\[ L_{jt} = \lambda L_{jt-1} + \beta_1 \theta_{jt} + \beta_2 p_{jt} + \beta_3 \tilde{Z}_{jt} + \beta_4 \bar{Z}_j + \varepsilon_{jt} \]

with \( \theta \) a vector of CAP measures, \( \tilde{Z} \) a vector of time-varying & \( \bar{Z} \) a vector of time-invariant regional characteristics, \( \lambda, \beta \) parameters, \( \varepsilon \) an iid error term.

Core **econometric challenges** of this model:

- Endogeneity of lagged dependent variable
- Endogeneity of policy variables
Empirical strategy

- Eliminating additively separable bias by fixed effects, also eliminates time-invariant rhs variables
- Instrumenting endogenous variables by lagged values of levels & first differences (dynamic panel data models)
- Time-varying price- & macro-effects captured by year dummies
## Overview of dynamic panel data models

<table>
<thead>
<tr>
<th>Approach</th>
<th>Fixed effects</th>
<th>Instruments</th>
<th>Estimation by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Least squares dummy variable (LSDV)</td>
<td>Dummy for each unit</td>
<td>-</td>
<td>OLS</td>
</tr>
<tr>
<td>Arellano Bond (1991)</td>
<td>First differences</td>
<td>Lags</td>
<td>GMM</td>
</tr>
<tr>
<td>Blundell Bond (1998)</td>
<td>First differences</td>
<td>Lags &amp; differences</td>
<td>GMM</td>
</tr>
<tr>
<td>Corrected LSDV (Kiviet 1995; Bruno 2005)</td>
<td></td>
<td>Use GMM results to correct LSDV</td>
<td></td>
</tr>
</tbody>
</table>
Database for estimation

- 69 Landkreise (counties) from 3 Länder (states) (16 Brandenburg, 24 Saxony-Anhalt, 29 Saxony)
- Dep variable: 11-13 years (1994-2006) unbalanced
- Rhs variables: 7 years (1999-2006) unbalanced
<table>
<thead>
<tr>
<th></th>
<th>LSDV</th>
<th>Arellano-Bond</th>
<th>Blundell-Bond</th>
<th>Corrected LSDV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ag employment lagged</td>
<td>0.64</td>
<td>0.45</td>
<td>0.81</td>
<td>0.76</td>
</tr>
<tr>
<td>Direct hectare paym</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Direct livestock paym</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dev. of rural areas</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Processing &amp; marketing</td>
<td>−</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Investment aids</td>
<td>+</td>
<td>0</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Less favoured areas</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Agri-environment</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Decoupling (2005/6=1)</td>
<td>0</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
</tbody>
</table>

N 483 414 483 483 483

Signs of significant parameters in blue, value only given for lagged employment. Regression also contains population density, annual wage all sectors, and five year dummies.
### Av. short- and long-run losses due to decoupling

<table>
<thead>
<tr>
<th></th>
<th>Arellano-Bond</th>
<th>Blundell-Bond</th>
<th>Corrected LSDV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Short-run</strong></td>
<td>-8</td>
<td>-6</td>
<td>-4</td>
</tr>
<tr>
<td><strong>Long-run</strong></td>
<td>-15</td>
<td>-34</td>
<td>-16</td>
</tr>
</tbody>
</table>

Percent of ag employees.

Mean employment per region = 1893 persons.
Conclusions

- Overall few desirable CAP effects on job maintenance in agriculture
- Slow adjustment of ag employment (2.5 years to move halfway to new steady state)
- Job creation via capital subsidies? (45 thousand euro/ person in short run)
- Modulation questionable on grounds of job creation
- Other CAP goals not considered here, have not made jobs safer
Data: Example direct payments (1000 EUR)

Source: Zahlstellen des MLU.
Political reforms in the period observed

- **Agenda 2000**
  - Increase in hectare-payments, simultaneous cuts of administrative prices
  - Increase in beef premia, simultaneous cuts of administrative prices
  - Rural development measures (reg 1257/1999)

- **Mid-term Review (after 2005)**
  - Stepwise transfer into decoupled single payment scheme (SPS)
  - Modulation, Cross compliance
Ag labour use & productivity in Germany

Source: Petrick & Zier 2010, based on official statistics.