Strategies to Link Farm Business and Household Data Over Time: Insights from Research on Farm Transitions

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Linking Farm Data Over Time

• Insights from working with Census of Agriculture data
• We study farm transitions
  – Changes in farm size and structure
  – Entry/exit of farms or operators (business vs. personal transitions)
Strategies of linking data (or not) to study dynamics

• Farmer age distributions
  – Cross-sectional data

• Farmland ownership and leasing growth
  – Repeated cross-sectional data doesn’t show trends
  – Linked-farms longitudinal data (farms identified by person operation ID)

• Farm entry and exit
  – Linked farm data overstates entry & exits
  – Cohort analysis is alternative (using year-started-business question)
Age distribution of farmers over time

• Provide insights into farmer’s age distribution
  – Farmers are aging
  – Farmers don’t retire from farming
  – Fewer beginning farmers
Number of Farms and Beginning Farms by Age

Number of Farms in Thousands

Farmer Age

All Farms 1997
All Farms 2002
All Farms 2007
All Farms 2012

Farmer Age

All Farms 1997 — Green
All Farms 2002 — Red
All Farms 2007 — Blue
All Farms 2012 — Black
Growth in farmland ownership and leasing

- Illustrating cross-sectional vs. linked-farms longitudinal approach
Acres Owned, Rented, and Operated by Farmer Age
Using Cross-Sectional Data from the 2012 Census

Number of Acres

Farmer Age

Acres Owned 2012
Acres Rented 2012
Acres Rented to Others 2012
Acres Operated 2012
Acres Owned, Rented, and Operated by Farmer Age
Using Cross-Sectional Data from 2002, 2007, and 2012 Censuses

Farmer Age

Number of Acres

Acres Owned 2002
Acres Rented 2002
Acres Rented to Others 2002
Acres Operated 2002
Acres Owned 2007
Acres Rented 2007
Acres Rented to Others 2007
Acres Operated 2007
Acres Owned 2012
Acres Rented 2012
Acres Rented to Others 2012
Acres Operated 2012
Acres Owned, Rented, and Operated by Farmer Age For Continuing, Linked Farms in 2002-2012

Farmer Age as of 2002

Number of Acres

- Acres Owned 2002
- Acres Rented 2002
- Acres Rented to Others 2002
- Acres Operated 2002
- Acres Owned 2007
- Acres Rented 2007
- Acres Rented to Others 2007
- Acres Operated 2007
- Acres Owned 2012
- Acres Rented 2012
- Acres Rented to Others 2012
- Acres Operated 2012
Acres Owned, Rented, and Operated by Farmer Age
For Continuing Farms that Were Beginning Farms in 2002

Number of Acres

Farmer Age as of 2002

- Acres Owned 2002
- Acres Rented 2002
- Acres Rented to Others 2002
- Acres Operated 2002
- Acres Owned 2007
- Acres Rented 2007
- Acres Rented to Others 2007
- Acres Operated 2007
- Acres Owned 2012
- Acres Rented 2012
- Acres Rented to Others 2012
- Acres Operated 2012
## Annual growth rates over 2002-2012 for continuing farms

<table>
<thead>
<tr>
<th>Groups</th>
<th>Acres Owned Growth Rates</th>
<th>Acres Rented Growth Rates</th>
<th>Acres Operated Growth Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>0.8%</td>
<td>-0.2%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Younger than 35</td>
<td>7.5%</td>
<td>5.6%</td>
<td>6.3%</td>
</tr>
<tr>
<td>Age 35-64</td>
<td>1.2%</td>
<td>-0.5%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Older than 65</td>
<td>-0.2%</td>
<td>-2.9%</td>
<td>-1.3%</td>
</tr>
<tr>
<td>Beginning farmers</td>
<td>1.3%</td>
<td>2.2%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Established farmers</td>
<td>1.0%</td>
<td>-0.9%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
Growth in land ownership and leasing

• Using linked-farms longitudinal data
  – Young farmers rapidly expand their operations by both owning more and renting more
  – Older farmers don’t change their operation size much; small reduction of acres rented
  – Beginning farmers if they are older do not expand much

Trends can only be seen in the linked farm data!
Farm entry and exit rates: Linked-farms vs. cohort approach

- What are the entry and exit rates in agriculture?

- Two approaches:
  - Linked farm data overstates entry & exits
  - Cohort analysis is alternative (using year-started-business question)
Calculating entry and exit rates based using linked-farms approach

- Use linked farms and to see if farmers are included in the Census for every period
- **Problem**: farms may not fill their Census survey, leading to much higher entry or exit rates
Proportion of farms entering and exiting agriculture

<table>
<thead>
<tr>
<th>5- and 10-year rates</th>
<th>All farmers</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Entry rates</td>
<td>Exit</td>
<td></td>
</tr>
<tr>
<td>1997 to 2002</td>
<td>7.4%</td>
<td>8.6%</td>
<td></td>
</tr>
<tr>
<td>2002 to 2007</td>
<td>8.6%</td>
<td>8.2%</td>
<td></td>
</tr>
<tr>
<td>1997 to 2007</td>
<td>5.5%</td>
<td>5.7%</td>
<td></td>
</tr>
</tbody>
</table>

Problem: since farmers may not answer Census survey, rates may be too high.
Proportion of farms entering and exiting agriculture

<table>
<thead>
<tr>
<th></th>
<th>All farmers</th>
<th>Young farmers</th>
<th>Old farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Entry rates</td>
<td>Exit rates</td>
<td>Entry rates</td>
</tr>
<tr>
<td>5- and 10-year rates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997 to 2002</td>
<td>7.4%</td>
<td>8.6%</td>
<td>12.4%</td>
</tr>
<tr>
<td>2002 to 2007</td>
<td>8.6%</td>
<td>8.2%</td>
<td>14.4%</td>
</tr>
<tr>
<td>1997 to 2007</td>
<td>5.5%</td>
<td>5.7%</td>
<td>8.3%</td>
</tr>
</tbody>
</table>

Problem: since farmers may not answer Census survey, rates may be too high.
Calculating entry and exit rates using year-started-farming approach

• Methodology
  – Use farmers’ responses for “the year they started farming this farm business”
  – Of all farmers that start in a given year, check how many farmers are remaining in subsequent Censuses to calculate exit rates

• Problem
  – There is no requirement for new farmers to report their farmer status to NASS
  – Beginning farmers are less likely to be known to NASS
<table>
<thead>
<tr>
<th>Reported year started this business</th>
<th>2002 Census, 1,000 farms</th>
<th>2007 Census, 1,000 farms</th>
<th>2012 Census, 1,000 farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td></td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>2011</td>
<td></td>
<td></td>
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<tr>
<td>2010</td>
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<tr>
<td>2009</td>
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<td>2008</td>
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<td>2007</td>
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<td>2004</td>
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<td>2002</td>
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<td>51</td>
</tr>
<tr>
<td>2001</td>
<td>45</td>
<td>66</td>
<td>52</td>
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<tr>
<td>2000</td>
<td>68</td>
<td>96</td>
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<td>1999</td>
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<td>1996</td>
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<td>54</td>
</tr>
<tr>
<td>1995</td>
<td>83</td>
<td>69</td>
<td>62</td>
</tr>
</tbody>
</table>
Findings about exit rates

- The greatest number of farms that started farming in a given year should be in the Census for that year.
- Fewer farms should remain in subsequent Censuses because of exits.
- It takes NASS about 3 years to identify BFR, as evidenced by decreasing number of farms that started farming in a given year from one Census to the next.
Exit rates = percent differences in number of farms between two Censuses
Exit rates depending on the year farm started business.
Findings about farm exit rates

<table>
<thead>
<tr>
<th>Number of years farming</th>
<th>Annual exit rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-10</td>
<td>3.8%</td>
</tr>
<tr>
<td>10-19</td>
<td>3.0%</td>
</tr>
<tr>
<td>20-29</td>
<td>2.2%</td>
</tr>
<tr>
<td>30-39</td>
<td>2.6%</td>
</tr>
<tr>
<td>40-49</td>
<td>3.9%</td>
</tr>
<tr>
<td>50-59</td>
<td>4.9%</td>
</tr>
</tbody>
</table>

- Exit rates depend on the number of years in business
- Can’t calculate exit rates for first 3 years of farming
- Years 3-6 – rates still unreliable
- Exit rates are much lower using this cohort approach than rates using the linked-farms approach
Conceptual issues in farm linkages

• Going beyond farm operators: landlords
• Personal, within farm transitions
• Transitions in and out of agriculture
• Use of proper IDs
• Linking across NASS data sets
Transition of Agricultural Land

• Tenure, Ownership, and Transition of Agricultural Land (TOTAL)
  – Survey of farm operator and landlords
  – Operators and landlords are not linked
• Who owns and who operates land?
  – Farm operator vs land owners
• Farm transfer: ownership, control, and participation (in revenue)
Transitions within farm

• Personal/operator transitions and order of operators
  – Principal operator – male vs female bias
  – Older/younger operators

• Important to study how operators are listed
Transitions in and out of agriculture

• When studying farm entry and exit, we can only link data on operators
• What did farmers do to prepare to enter agriculture (raise capital)?
• What happened to the farm after they left agriculture (farm succession)?
• Need additional information, questions added
Farm IDs

• Definition and proper assignments/tracking of Farm ID number is important
  – POID – person operation ID
  – PID – person ID
  – OID – operation ID
  – StateID – farm ID

• Even in “Census” of Agriculture, there are some “sample” issues, such as farmers not filling a survey in a given Census year so no linkages can be made
Linking across data sets

• Importance of inclusion of farm identifiers (POID and OID) in NASS data sets
• ARMS and Census linkages
• June Area Survey
Summary about farm linkages

- Studying changes or dynamics necessitates farm linkages.
- For growth/trend issues within the sample:
  - Changes can be seen only from linked data, not from repeated cross-sectional data.
- For issues regarding transitions into and out of the sample:
  - Linked data doesn’t seem to work well, cohort analysis may alleviate this problem.
Questions?

For more information, please contact:

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