Farms’ Performance and Short Supply Chains in Italy: an Econometric Analysis

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OVERVIEW

I. Background
II. Research Objectives
III. Data and Descriptive Analysis
IV. Empirical Model and Estimation
V. Econometrics Results
VI. Concluding Remarks
I. Background – Short Supply Chain in Numbers

- Recent surge of number of farmers selling through short supply chains (SSCs) (Fondse et al. 2012).
  - Farmers Markets (FMs)
  - Community Supported Agriculture (CSA)
  - Other forms of direct selling (on-farm shops; pick your own...)

- USA: FMs has increased threefold in fifteen years (1994-2009), from 1,755 to 5,274 units (Martinez 2010);

- France: in 2007, direct selling was well established and covered 15% of consumers’ food purchases;

- UK: > 500 FMs, patronized by 15 million consumers a year, for 166 million pounds in sales.

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I. Background – Short Supply Chain in Numbers (Italy)

- Coldiretti reports 1,105 FMs (Coldiretti 2012): 4,739 farms, visited regularly by circa 7 million consumers and occasionally by 21 millions (>1/3 of the Italian population).

- 63,600 farms (+ 64% compared to 2001) (Coldiretti 2009) locally concentrated (most in the North and Centre)

- Product assortments: mostly fresh fruit and vegetables, and/or processed products (wine, olive oil, canned vegetables or fruit) (Pascucci et al. 2011).
I. Background – Why “Going Short?” (1)

**H1**: Reaching consumers directly allows farmers to bypass the middlemen and internalize larger shares of the supply chain margins

- Gilg and Battershill (1998) - France “vente directe”: access to consumers with higher w.t.p. for produce less intensively produced → farmers internalize higher margins.
- Verhaegen and Van Huylenbroeck (2001) - six different forms of direct channels in Belgium: farmers experience higher costs but also higher revenues.
- La Trobe (2001) - UK market: FMs can facilitate farmers to overcome crises, as they internalize higher shares of the channel’s profits.

I. Background – Why “Going Short?” (2)

**H2**: Reaching consumers directly allows farmers to bypass the middlemen and internalize larger shares of the supply chain margins

- Brown (2002) and Brown and Miller (2008) - FMs and CSAs in the US:
  - higher income of participant farms (especially small);
  - improvement of human capital;
  - positive social & economic impact for communities where they locate.
- Vivid debate during the previous decade, emphasizing the role for rural / sustainable development (Van der Ploeg et al. 2000; Renting, Mardsen and Banks 2003; Wiskerke 2009).

..BUT....

1. Supporting evidence from small (descriptive) case studies
2. No empirical test exists as of whether the above Hypothesis holds.
II. Research Objectives

- Assess, using official data (N~11,000) on Italian farms, whether participation in SSC allows farmers to improve their market performance (i.e. profitability)

  - (Preliminary) Econometric test of the impact of participation in short channels on a measure of SR profitability, accounting for endogeneity of participation decision (IV methods – GMM)

  - Indirectly assess drivers of participation decision through assessment of first stage results

III. Data and Descriptive Analysis

- 2010 Farm Accountancy Data Network (FADN) for Italy.

- Circa 11,000 farms (10,954) representative of the Italian farms’ population, collected by the Italian National Institute of Agricultural Economics (INEA).

- Within the Italian FADN sample, almost 9% (8.89%; N=971) of farms participate in one form of SSC.
III. Data and Descriptive Analysis

Incidence of farms with direct sales across geographic areas
- % relative: incidence of farms adopting SSC within the category
- % total: incidence of SSC farms for each category on total SSC
- % category: incidence of the category on total number of farms

III. Data and Descriptive Analysis

Incidence of farms with direct sales by primary type of activity
- % relative: incidence of farms adopting SSC within the category
- % total: incidence of SSC farms for each category on total SSC
- % category: incidence of the category on total number of farms
### III. Data and Descriptive Analysis

Incidence of farms with direct sales by class of economic size
- % relative: incidence of farms adopting SSC within the category
- % total: incidence of SSC farms for each category on total SSC
- % category: incidence of the category on total number of farms

![Chart showing incidence of farms with direct sales by class of economic size](chart.png)

### IV. Empirical Model and Estimation

3 issues:

1. Framework of analysis
2. Measure of profitability
3. Modeling / estimation approach
IV. Empirical Model and Estimation

Modelling approach: Structure, Conduct, Performance (SCP) paradigm (Bain 1951; 1968) market structure (i.e. demand, technology, etc.) impacts firms’ conduct (i.e. the behavior) in the industry and their performance.

Traditionally used to investigate the relationship between industry structure (mostly concentration) and performance (e.g. Clark, Davis and Waterson 1984; Conyon and Machin 1991).

Adopting a SSC is a strategic decision to enter and operate in a different market, not to share profits with other agents in the channel.

Æ Facing different consumers’ demand while incurring different costs;
Æ Potential to increase profits;

IV. Empirical Model and Estimation

Problem: how to capture ECONOMIC margins from ACCOUNTING data? (See Perloff et al (2007) for a discussion)

Assume a homogenous product market where firms have identical cost structure.
For every firm $j$ one has: $(p - MC)/p = -s_j/e$
where $MC$ is the constant marginal cost, $p$ the output price, $s_j$ firm ($j$) market share, and $e$ the elasticity of output demand.

Fisher (1987) using accounting data one needs to use average variable cost (AVC) in place of marginal cost, which introduces bias in the performance measure since

$$\text{MC} = \text{AVC} + (r + \delta) \frac{\text{Pe}_j}{e}$$

Where $r$ is the competitive rate off return of capital, $\delta$ the depreciation rate, $p$, the per-unit cost of capital and $K_j/e$ is the capital needed to produce one unit of output.

One can modify the equation above to

$$\frac{p - \text{AVC}}{p} = -\frac{s_j}{e} + (r + \delta) \frac{\text{Pe}_j}{e}$$


IV. Empirical Model and Estimation

Empirical (reduced form) Model

\[ PCM = \frac{P}{S} = \alpha_0 + \alpha_\text{SC}SC + \sum_j \alpha_j X_j + \sum_j \beta_j Z_j + \sum_t \gamma_t K\text{S}_t + \sum_m \gamma_m \text{OTH}_m + FE + REG + \varepsilon \]

Where

- \( PCM \): proxy for the Price-Cost-Margin (PCM) or Lerner Index (Gross profits over Sales)
- \( P \): Gross Sales minus total variable input cost and cost of labor (short-run profits)
- \( S \): Gross Sales
- \( SC \): indicator variable representing SSC participation
- \( X \): vector of demand related variables (e.g., number of inhabitants per province, total household consumption at regional level)
- \( Z \): vector of farm-specific variables (irrigation, characteristics of farmer, etc…)
- \( K\text{S} \): capital (land, working capital), deflated by sales
- \( \text{OTH} \): other factors impacting profitability (latitude zone, organic, certification etc.)
- \( FE, REG \): Farm Type and Regional (Macro Area) Fixed-Effects
- The \( \alpha, \beta, \gamma, \) and \( \varepsilon \) are parameters to be estimated and \( \varepsilon \) is an idiosyncratic error term.

Identification Assumption: local activities supporting direct sales create lead to exogenous (to farms’ profitability) variation in the probability of a farm to adopt a SSC:

- **Exclusion restrictions**: the pervasiveness of (local) activities facilitating direct sales of agricultural products impacts a farm’s profitability only if the short channel is adopted;
- **Weak Exogeneity**: after controlling for drivers of farms’ profitability (aggregate demand, fixed cost etc…) unobservables are uncorrelated with such activities

Estimation: Generalized Method of Moment (GMM).

Instruments (data at the province-level):
1. Number of Solidarity Purchasing Groups (SPGs) [www.retegas.org]
2. Number of farms participating in the “Campagnamica” initiative by Coldiretti
3. Number of FMs markets sponsored by “Campagnamica”
V. Empirical Results – OLS vs GMM

<table>
<thead>
<tr>
<th>OLS</th>
<th>GMM (1) IV (N FMs; N SPGs)</th>
<th>GMM (2) (N Camp Ans N SPGs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Sales</td>
<td>-0.575 (0.598)</td>
<td>-36.326** (14.125)</td>
</tr>
</tbody>
</table>

| Observations | 10864 | 10657 | 10847 |
| R-squared | 0.1569 | 0.1670 | 0.1348 |

J stat (Hansen 1982) J – Ho: overidentifying IVs are weakly exogenous
C stat (Hayashi 2000) – Ho: suspected endogenous variables are exogenous
F test on the first stage parameters of the IVs (Staiger and Stock 1992) – Rule of Thumb: Weak Instrument’s problem can be discarded if the values of the F-stat is > 10,

Note: *, **, and *** represent 10, 5 and 1% significance levels
St. err. in parenthesis.

V. Does such result make sense? (let’s go back to the data…)

<table>
<thead>
<tr>
<th>Sample Averages</th>
<th>Non-participating in SSCs</th>
<th>Participating in SSCs</th>
<th>A% (SSC – no SSC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price-Cost-Margin (PCM)</td>
<td>61.56</td>
<td>60.73</td>
<td>-1.38</td>
</tr>
<tr>
<td>Net income (€)</td>
<td>60,151</td>
<td>61,634</td>
<td>2.41</td>
</tr>
<tr>
<td>Variable costs (€)</td>
<td>63,212</td>
<td>62,966</td>
<td>-0.39</td>
</tr>
<tr>
<td>UAA (ha)</td>
<td>33.07</td>
<td>34.24</td>
<td>3.43</td>
</tr>
<tr>
<td>Land capital (€)</td>
<td>461,959</td>
<td>497,174</td>
<td>7.08</td>
</tr>
<tr>
<td>Working capital (€)</td>
<td>192,049</td>
<td>218,306</td>
<td>12.03</td>
</tr>
<tr>
<td>Agricultural working capital (€)</td>
<td>32,033</td>
<td>60,201</td>
<td>46.79</td>
</tr>
<tr>
<td>Total revenue (€)</td>
<td>139,544</td>
<td>153,251</td>
<td>8.94</td>
</tr>
<tr>
<td>Operating capital / total revenues</td>
<td>1.48</td>
<td>1.41</td>
<td>-4.77</td>
</tr>
<tr>
<td>Family employment (hours)</td>
<td>2,753</td>
<td>3,100</td>
<td>11.19</td>
</tr>
<tr>
<td>Family employment (€)</td>
<td>24,488</td>
<td>29,158</td>
<td>16.02</td>
</tr>
<tr>
<td>Agricultural subsidies (€)</td>
<td>14,249</td>
<td>16,566</td>
<td>-18.86</td>
</tr>
</tbody>
</table>
V. Empirical Results

Other findings:

- Capital deflated by sales impacts negatively PCM (only land capital significant: depreciation matters!!!)
- Larger farms tend to have higher margins
- Farms obtaining agricultural subsidies tend to have lower short-run margins
- Producing value added products (i.e. wine) improves short-run profitability
- Male, more experienced farmers can benefit from higher short-run margins
- Markets with higher demand have higher opportunities of profitability

V. Empirical Results – Direct Sales Decision: First Stage Results

The first stage-regression results present a first assessment of the drivers of SSC adoption decision (linear probability model)

Factors increasing the likelihood of joining a SSC
- Producing value added product (i.e. wine – processing)
- Quality Certifications
- Farmers’ Education
- Number SPGs

Factors reducing the likelihood of joining a SSC
- Larger land capital
- Financial public help
- Organic certification
- N Participants Campagna Amica
V. Empirical Results – Robustness Checks

- Controlling for Region Fixed Effects instead of Macro Area fixed effects does not affect the main result (although it increases the goodness of fit)
- Controlling for farm’s economic size dummies does not impact the main result
- Alternative Measures of PCM
  - Subtracting Subsidies from total sales → no effect on results
  - Subtracting Farmers’ labour retribution from Sales 1/3 of sample shoes PCM<0…
- Running separate models for farms belonging to different type of farming activities: effect of SSC either non statistically significant or similar to the main result.

Note: *, **, and *** represent 10, 5 and 1% significance levels. St. err. in parenthesis.
VI. Concluding Remarks

➢ Italian Farms participating in SSCs are not necessarily “small”

➢ Distribution of farms adopting SSC in Italy asymmetric across regions and show unexpected patterns for farming activity

➢ Preliminary result do not lend empirical support (so far) to the notion that (short-run) profitability improves by participating in SSC

**Where do we go from here?**

➢ Experiment (more) with alternative measures of profitability
➢ Add more years of data (hopefully…)
➢ Should we use a structural approach?
➢ Consider focusing on specific activities (easier said than done)…
➢ Should we consider agriturism as well?

Thank you!

Comments & questions are welcome