Emergence of Organic farming under imperfect Competition

Economic analysis and Policy Implications

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Aims

• Competition among two agricultural technologies
• In the context of imperfect competition
• We draw some conclusions and propose policy measures
Questions

• How the oligopoly will react to the potential development of the organic technology?
• Do there exist endogenous drawback to the development of organic farming?
• What are the possible effects of public support to the development of organic farming:
  – on the firm’s profits
  – on the development of organic production itself?
Organisation

• I. Model’s outline
• II. Main results
• III. Implications for Policy Instruments Selection
I. Model’s outline
Strategic interactions between farmers and firms

• 3 stages game:
  – First stage: Farmers choose the technology
  – Second stage: firms chose the quantity of seeds and pesticides to supply to farmers
  – Third stage: Farmers are implementing their choice considering the conditions made by firms.
Production Function

• Seeds are the unique input in the model
• Seeds and Seed’s prices are different for conventional and organic production
• But they could be used with or without chemicals
• Yield in organic production is lower than in conventional one:

\[ y_o = f(s_o) \]
\[ y_c = f(s_c) \]
Technology and Market for Organic Rice

• For organic farming, we assume a collective learning process: the gap factor Beta depends on the number of farmers adopting organic technology.

• Nevertheless:

\[
(N) < 1
\]

• Market for organic rice is a niche market: the price premium disappear with the growing number of farmers adopting organic technology

• Set:

\[
k(n) = p_o(n) \ast (n)
\]
Equilibrium of Organic versus conventional Farming

- Equilibrium arises when no organic farmer is willing to turn into a conventional one and reciprocally no conventional farmer is willing to change his choice of technology:

\[
\frac{C_O}{K(n)}, m, n^*, \divides \frac{C_b}{p_c}, m_{\divides}
\]
Imperfect Competition

• Few (m) Agribusiness firms supply seeds and chemicals and buy rice production to farmers
• On the rice market, firms are price-takers
• On the seeds market they control the prices by the way of quantities (Cournot modeling)
II. Main results
Equilibria

- The equilibrium quantities of seeds in organic sector, and in conventional one
- are decreasing respectively with the ratio
  \[ S_O \frac{c_o}{k(n)}, m : \]
  \[ S_C \frac{c_b}{p_c}, m : \]
- and increasing with the degree of competition measured by the number \( m \) of inputs providers.
- Moreover as \( m \rightarrow \infty \) these quantities converge toward the competitive equilibrium quantities
- Oligopoly has the power to capture rent from organic farmers production
Organic Farmers Profits

• The profit function of the organic farmer is \( \cap \)-shaped in \( n \):
  – It is first increasing because of the gain from learning process, then dominated by the losses induced by the erosion of the price in the niche market.

  – The learning effect works up to a critical number \( n_{\text{max}} \), while the erosion of the price will dominate after that number.
Conditions of emergence

• (i) if \[ \max_n p(n) < (n) 0, \frac{C_o}{C_b} \times p_c \] organic farming never occurs;

• (ii) if \[ \max_n p(n) \geq (n) \] \[ p_c \] there is always an equilibrium distribution of the farmers which involves organic farming;

• (iii) if none of these conditions is satisfied, organic farming occurs if and only if:

\[
\frac{C_o}{K(n_{max}), n_{max}, m} \quad \quad \frac{C_b}{p_c}, m
\]
III. Policy Implications

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Implications for Regulation

• Taking onto account the Imperfect competition in the Industry drives to very counter intuitive results in the identification and design of Policy Instruments
More public research?

- to speed up the learning process so as the technology gap does not depend anymore on the number of farms already practising organic technology.
- But the trade-off between learning and erosion of the niche effect remains.
- The only residual effect is the erosion of the rent of early adopters through the erosion of the niche market effect.
Price premium to the organic farmers?

Does not precludes the capture of the premium by the oligopoly due to his marketpower. It will simply decrease the quantity of organic seeds.

• This very counterintuitive result arises from the lack of competition among inputs providers and could even explain how the price premium given to the organic products could have perverse effect and decrease the equilibrium quantity of organic products.
Increase Oligopoly’s Marginal Costs?

• As oligopoly control their profits through quantities supplied, what could be the effect of a selective support to the production of organic seeds? And how the selective support should be designed?

• To increase the marginal cost of production of the conventional bundle through a tax (with a constant rate) on the volume, because $p_C$ is a competitive and exogenous price while $p_O$ depends on the volume of organic production: $k(n):=p(n)\cdot\beta(n)$.

• Remark: conventional seeds producing firms actually receive support from CAP, our model shows is not socially optimum, and even hinders the emergence of organic production.
Research still in progress
Thanks for your attention

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