Policy Impact Analysis in the Dairy Sector
- An Agent-Based Real Options Approach -

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Objectives

- Development of a conceptual agent-based real options market model allowing the impact assessment of different political schemes
- Application of the model to the German dairy sector by comparing exemplarily the effects of
  - lower price limits maintained by governmental purchases of excess supply
  - investment subsidies on investment trigger prices, firm profitabilities and economic efficiencies

Real Options Approach

- Analyses investment decisions in a stochastic and dynamic context
- Exploits analogy between a financial option and an investment project to evaluate entrepreneurial flexibility
- In contrast to financial options, real investment projects are also open to other market participants, which affects the price dynamics
- Prices need to be determined endogenously
- Competition has to be taken into account

Introduction

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Motivation/Research Gap

- Abolishment of EU milk quota system by 2015
- Higher levels of (dis)investments in the dairy sector can be expected
- Extreme milk price fluctuations in 2007-2009
- Dairy farmers and lobbyists started to ask for additional political support
- Studies have proven that the real options approach (ROA) is more advantageous for analyzing dairy investments than traditional investment models
- However, no real options model yet allows the analysis of investments under consideration of competition and political schemes

Basic Model Assumptions

- N homogenous competing risk-neutral firms
- Firms can make investments up to a given maximum output capacity
- Step-by-step investment possible over T years
- Production capacity can be adjusted via investments just once in a period
- Irreversible investment
- In every period, production declines corresponding to a geometric depreciation rate

ResultsSummary:

- Each firm maximizes its expected net present value by finding the optimal investment trigger price
- Firms with lower trigger prices have a stronger tendency to invest
- Firms do not make any profits despite of lower price limit
- Optimal trigger prices are derived by a combination of genetic algorithms and stochastic simulation
- Economic efficiency of political schemes is calculated as quotient of welfare with political schemes and welfare without political schemes

Effects of Lower Price Limits on Trigger Prices, Expected Net Present Values and Economic Efficiencies under General Conditions

- Results summary:
  - Increase of lower price limit induces decline in trigger prices
  - Economic efficiency decreases with implementation and increase of lower price limit
  - Increasing drift rates induce decreasing trigger prices

Empirical Application to the German Dairy Sector: Comparison of the Effects of Lower Price Limits and Investment Subsidies

- Results summary:
  - The higher the volatility, the stronger the reduction in trigger prices and economic efficiencies by increasing lower price limits

Future Research

- Besides investments integration of disinvestments in the model
- Investigation of effects of the EU milk quota abolishment

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