Modeling the Effects of Heterogeneity on Producers' Preferences

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Research Objective

We study the influence of heterogeneity on member preferences (i.e., utility) for attributes that drive cooperative structure in an empirical context.

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Motivation

- The study of economic behavior requires the **empirical investigation of heterogeneity** and diversity in the economic life of different market actors (Heckman 2001);
- Individuals (i.e., producers) respond differently to economic stimuli: Studying heterogeneous behavior → formulation of economic policy.

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Agricultural Economics Literature

- **1980's** : Recognition of decision-makers' (i.e., farmers) **heterogeneity** on agribusinesses **decision-making**, i.e., **cooperative firms, caused by:**
  - member firms' economic size;
  - production outputs;
  - entrepreneurial skills;
  - asymmetric bargaining power;
  - Risk preferences.
- **1990's**: Theoretical research and modeling refined (i.e., game-theory; neoinstitutional economics);

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Constraints & Challenge

- **Current Constraints:**
  - **Lack of realism; solid case studies** (Cotterill, 2002)
  - **Unbalanced tradeoffs** between **formalism** and **realism** (Cook et al, 2004)

- **The study of decision-making behavior of heterogeneous members using subjective evaluations has been the challenge of empirical validation**

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Research Approach & Question

- **Behavioral Approach:** allows **individual decision** makers' (i.e., members') **subjective evaluations** (i.e., preferences) to be **incorporated into formal decision analysis** for the study of complex business problems (i.e., Keeney and Raiffa, 1972, 1993, McFadden, 1999).

- **What is the subjective utility that heterogeneous members attach to different levels of cooperative structure?**

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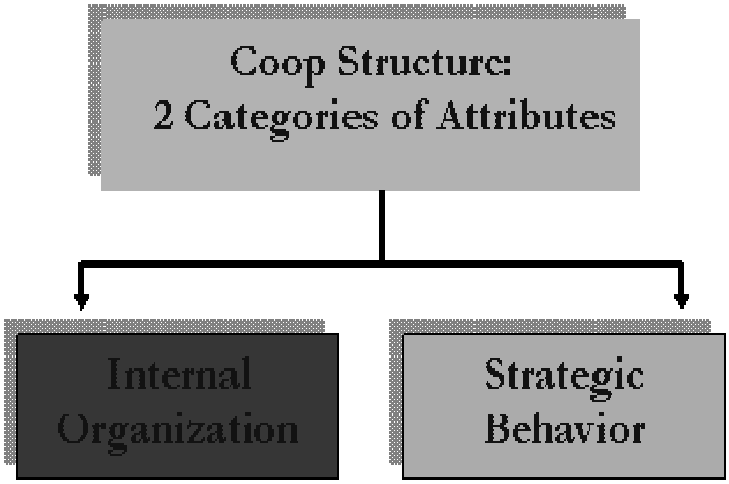
Cooperative Structure



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Modeling Framework (1): Conjoint

- Conjoint analysis is grounded in the utility framework (Green and Srinivasan, 1978)
- **We assume that the levels of cooperative's structural attributes contribute in an additive way to member preferences.**
- The conjoint model can be formulated as follows:

$$P_{ik} = \alpha_i + \sum_{j=1}^{m} \sum_{l=1}^{L_j} x_{klj}\, p_{ilj}$$

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Modeling Framework (2): Mixture-Regression

- We use a generalized linear regression mixture model (Wedel and DeSabro, 1995) which allows us to **identify segments of members, which behave according to the same regression (con-joint) equation**.
- Within a segment, each member's responses can be adequately reflected by the regression equation, while this **regression equation differs across segments.**

Modelling Framework(2): Mixture-Regression

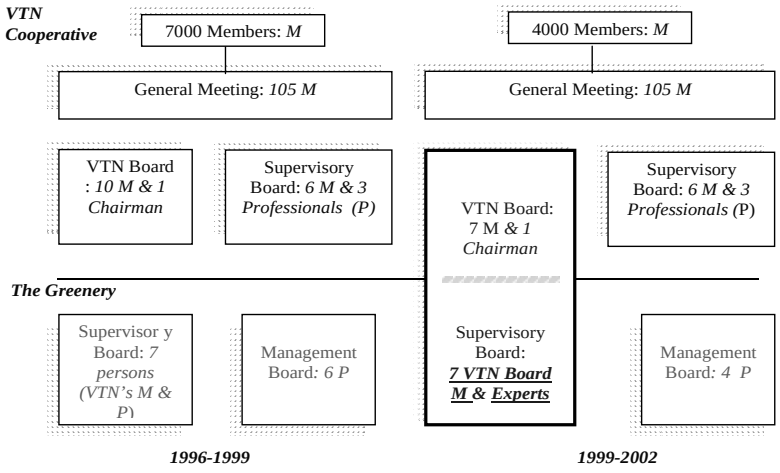
- The unconditional distribution of y_n is obtained as (De Sabro and Croon, 1988):

$$f_j(y_{jk} \mid \Phi) = \sum_{s=1}^{S} \pi_s f_{j|s}(y_{jk} \mid \beta_s),$$

Decision Context (1)

- VTN/The Greenery (Netherlands): Dutch MC of fresh produce (fruit & vegetables) resulted after the merger of nine auctions in 1996.
- The Greenery is a distribution, sales, and marketing company whose shares are owned by the horticultural co-op VTN.
- 2002: 3000 members
- The majority of VTN/TG's members are small, family owned, with the manager often being the owner.

Decision Context (2)



VTN/TG's Corporate Control

Decision Context (3)

- Loss of Members' Commitment:
  - mismatch between producers' vision and management ;
  - "unity in diversity" policy : members associations (EU subsidies);
  - concerns regarding the transparency in the corporate management of the organization;
  - organizational restructuring of the VTN/TG is an ongoing process.

Research Design

- **Qualitative Research**:
  - Desk-research;
  - Discussions between co-op experts and managers of VTN/The Greenery; and
  - 2 group discussions (15 members in each discussion, Spring-Summer 2002)
- **Quantitative Research**:
  - Experimental Conjoint Study : 120 Members (Spring - Winter 2003)

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Focus Group Results (1)

Attribute	Levels
Business Issue/Scope	Entrepreneurial Market-Oriented Organization
	Intermediary Organization
Corporate Governance	*VTN*: BOD (Members) *TG:* Managers supervised by BOD of VTN
	VTN: Managers supervised by BOD of VTN *TG:* Managers supervised by Prof. Board.
Product-related Decision-Making	Managers
	Members

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Focus Group Results (2)

Attribute	Levels
Financial Structure	General reserves
	Individualized equity
Members' Benefits	Product price
	Product price & return on capital
Product Quality	General grading of products
	Specific/client's grading of products

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Design of Conjoint Study

- Full-profile conjoint method (Green and Srinivasan, 1978)
- Fractional factorial orthogonal main-effects design:
  - ***8 calibration profiles***
  - ***3 graded paired comparisons***
  - ***self-constructed MC***
- Pilot test : 8 face-to-face computer-guided interviews.
- Sampling: a) economic & financial criteria (largest in size members), and b) the degree of participation in the MC's functioning (participation in decision making committees at corporate and product-related level): ***120 computer-guided face-to-face interviews***

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Table 1: Average Part Worths of MC's Attributes based on Individual Estimates

	APWs	*Std. D.*	*Std.E.*	*Percentiles*		
				25	50	75
Business Issue/Scope						
Entrepreneurial market-oriented organ.	0.309*	0.560	0.051	0.000	0.250	0.625
Intermediary organisation	-0.309					
Corporate Governance						
VTN: governed by *BOD* (members);						
TG: governed by managers supervised by *VTN's BOD*	0.183*	0.643	0.054	-0.125	0.125	0.625
VTN: governed by managers supervised by *BOD*	-0.183					
TG: governed by managers supervised by experts						
Product-related Decision-Making						
Members	0.247*	0.636	0.058	-0.125	0.250	0.625
Managers	-0.247					

*$p < 0.05$

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Table 1: Average Part Worths of MC's Attributes based on Individual Estimates

	APWs	*Std. D.*	*Std.E.*	*Percentiles*		
				25	50	75
Financial Structure						
General reserves	-0.215					
Individualised equity	0.215*	0.501	0.046	0.500	-0.125	0.125
Member Benefits						
Product price	-0.213					
Product price & return on capital	0.213*	0.515	0.047	-0.125	0.125	0.500
Product Quality						
General grading of products	-0.271					
Specific/clients' grading of products	0.271*	0.571	0.052	-0.125	0.250	0.625

*$p < 0.05$

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MC's Attributes' Importance

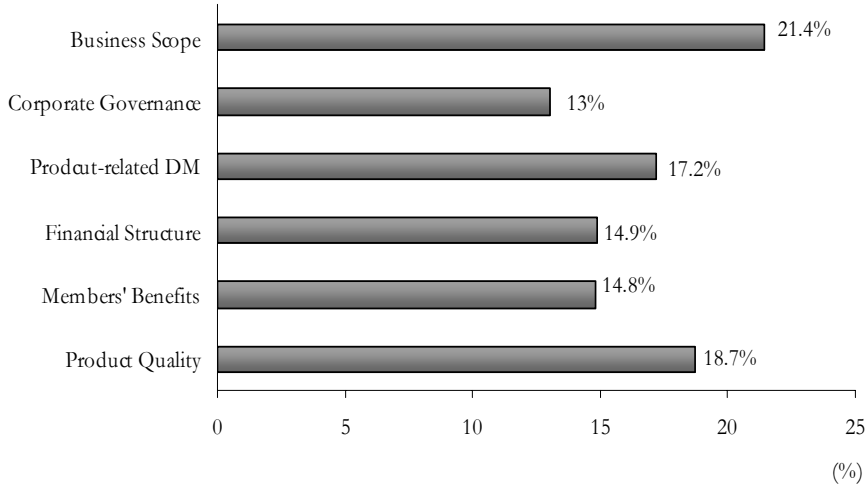

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Table 2: Aggregate Mixture Regression Parameter Estimates (N=120)[a]

	Coefficient Estimates
Business Issue/Scope	-0.604*
Corporate Governance	-0.358*
Product-related DM	-0.483*
Financial Structure	0.420*
Member Benefits	0.416*
Product Quality	0.529*
Intercept	0.118
	-1921.2
Log Likelihood	
CAIC	3905.4
R^2	0.023

$p < 0.05$

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Table 3: Fit Statistics of the Mixture Models for the Segments, S =1 to S=6

Segments S	*Log-likelihood*	*CAIC*	E_s	R^2
1	-1731	3525	1.000	0.034
2	**-1682**	**3497**	**0.767**	**0.097**
3	-1661	3527	0.752	0.216
4	-1647	3569	0.750	0.267
5	-1633	3613	0.794	0.280
6	-1618	3654	0.822	0.309

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Table 4: Mixture Regression Results for the Two-segment Solution

	s =1	*s* = 2
Regression Coefficients		
Business Issue/Scope	-0.740*	-0.318*
Corporate Governance	-0.594*	0.135*
Product-related Decision-Making	-0.828*	0.237*
Financial Structure	0.670*	-0.100**
Members Benefits	0.449*	0.348*
Product Quality	0.647*	0.281*

** p < 0.05, ** p < 0.10*

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Table 5: Profiling the Segments (1)

	s =1	*s* = 2
Percentage of producer member type in segments		
Fruit-producers	30,7% (*n*=12)	25,9% (*n*=21)
Vegetable-producers	69,3% (*n*=27)	74,1% (*n*=60)
Descriptive statistics for identified segments[b]		
Average number of employees	62	10
Full time employees	32	4
Seasonal employees	30	6
Annual gross revenue (in Euro)		
< 250.000	24.3%	45.0%
250.000 – 750.000	28,2%	49.8%
> 750.000	47,5%	5,2%

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Table 6: Profiling the Segments (2)

	s =1		s = 2		Significance[c]
	Mean	SD[b]	Mean	SD	
Attitude towards innovation	4.3	0.7	4.2	0.9	0.655
Market-orientation	5.9	0.9	6.0	0.7	0.405
Risk-attitude	**5.0**	**1.5**	**4.2**	**1.2**	**0.035**

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Conclusions

- The identified attributed drive significantly producers preferences regarding the cooperative structure;
- Co-op attributes are not equally preferred throughout our sample because of:
  - Economic size of member firms
  - Risk attitude of members
- Members in both segments attach high importance to strategic attributes

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Implications

- Theory
  - Provide **guidelines for conceptualization of cooperative structure** subject to **heterogeneous membership** (i.e., sources of members derived utility);
  - Impact of unobserved heterogeneity in designing marketing cooperative structure may enhance insights for **factors** should be considered in the study of **cooperative constitutional setting/reengineering**.

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Implications

- Practice
  - The identification and evaluation of attributes that member attach high importance (i.e., strategic) may ameliorate **members' commitment**;
  - Development of differential policies in order to **satisfy heterogeneous members' demands**

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Limitations

- Usefulness of these attributes for cooperatives that operate in other production sectors or other cooperative models;
- Possibility that interaction effects among the levels of the examined attributes exists;
- Analysis of members risk preferences
- effects that preferences and incentives of cooperative agents (i.e., professional management) may have on the cooperative structure