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GROWTH OF GERMAN DAIRY FARMS UNDER THE EU MILK QUOTA

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Objectives

Empirical findings for farm growth:

1. Which farms grow and which do not?

2. Which farms grow at higher rates?

3. Does farm growth depend on farm size? (Gibrat‘s Law)

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Structure

1. Literature
2. Milk quota system in Germany
3. Method
4. Data and Results
5. Conclusions

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Literature

1. Foltz (AJAE, 2004) estimates farm size:

$$S_{it} = (1-\rho)\alpha + \rho S_{it-1} + (x_{it} - \rho x_{it-1})\beta + u_{it} - \rho u_{it-1}$$

S = cows (farm size), farmer *i,* period *t,* x = size determinants

Problem: ρ differs among farm groups, e.g.

$\rho = 1$ for stagnating farms,

$\rho < 1$ for declining farms,

$\rho > 1$ for growing farms,

$\rho = 0$ for exiting farms,

$\Rightarrow$ **selection bias?**

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Literature

2. Weiss (AJAE, 1999) estimates growth rate G:

$$G_i = \frac{S_{iT} - S_{it0}}{S_{it0}} = \gamma + x_{it0}\beta + \alpha S_{it0} + u_i$$

Selection correction for exit (from farming):

$$G_i = \gamma + x_{it0}\beta + \alpha S_{it0} + \delta f\left(prob_i\left(S_{iT} = 0\right)\right) + u_i$$

⇒ selection bias among growth, decline, stagnation?

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Literature

3. Hinrichs, Mußhoff and Odening (Appl. Econ, 2008) estimate regime choices:

$$\text{Prob}\left(decline\middle|\mathbf{x}\right)=\Phi\left(-x_i\beta\right)$$

$$\text{Prob}\left(stagnation\middle|\mathbf{x}\right)=\Phi\left(\mu_1-x_i\beta\right)-\Phi\left(-x_i\beta\right)$$

$$\text{Prob}\left(growth\middle|\mathbf{x}\right)=\Phi\left(\mu_2-x_i\beta\right)-\Phi\left(\mu_1-x_i\beta\right)$$

$\mu_2 > \mu_1 > 0$; Φ = cumulative normal

Ordered probit for the choice among decline, stagnation, growth

⇒ **no size / growth rate determinants**

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Quota system in Germany

- Milk quota introduced in 1984 in the EU
- Farmes can only sell the amount of milk they hold quota for (‚overproduction' can be penalised).
- Quota transfer among farmers by sales and leasing / renting
- Many long-term renting contracts
- New renting contracts forbidden since 2000
- Quota sales only via a central exchange platform (no bilateral contracts)

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Methodological implications of the Quota system

Size changes may follow from quite different ‚theories‘:

- buying quota is like an investment with sunk costs
- short-term leasing is like buying variable inputs
- long-term leasing is like an investment with low sunk costs and only small need for capital
- no renewal of a leasing contract maybe random due to the owner‘s decision (re-entry into dairy, selling quota ...)

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Method

=> ‚complex' selection bias correction in ‚growth equation'

$$G_i = x_i\beta + \mu_i + u_i \qquad \text{with}$$

$$\mu_i = \mu\left(P_{1i}, P_{2i}, P_{3i}, P_{4i}, \delta\right)$$

P_i = probablities for growth, decline, stagnation, exit from dairy; estimated by multinomial logit

μ_i is approximated by polynomial series expansion; summands are weighted by parameter estimates (Dahl, Econom., 2002)

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Data

- change rate of milk quota between 1997 and 2004 (Western Germany)
- farms: 2243 grow, 1060 stagnate, 343 decline, 293 exit from dairy
- selected variables of growth farms (on average, 38% growth):

Variable 1997	mean
Quota endowment	**225,000 kg**
Milk yield per cow	**5,900 kg / year**
Land	**59 ha**
Family labour	**1.7 FTE**

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Results (growth determinants)

Determinants of growth rate (average 38%)

Significant Variable	Impact on growth rate
Milk yield per cow (+ 1,000 kg)	**+ 22 %-points**
Family labour (+ 1 FTE)	**+ 9 %-points**
Interest expenditure (+ 1,000 €)	**- 0.6 %-points**
Interest subsidies (+ 1,000 €)	**+ 2 %-points**
‚Age' of buildings (% of purchase value; - 10%-points)	**- 3 %-points**
Land (+ 10 ha)	**- 2 %-points**
Age (+ 10 years)	**- 5 %-points**

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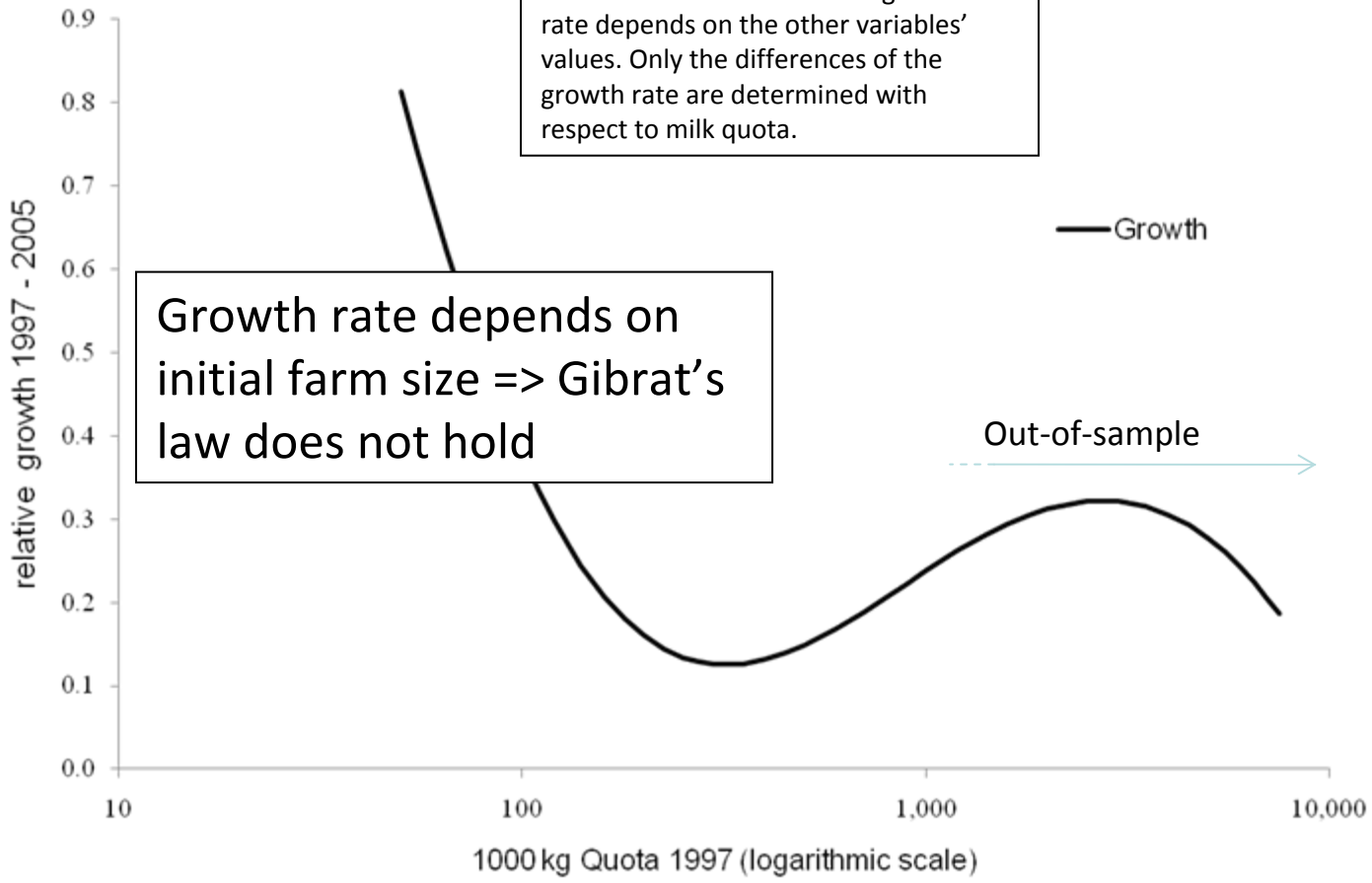
Gibrat‘s Law (‚no impact of size on growth rate‘)

Note that the location of the growth rate depends on the other variables’ values. Only the differences of the growth rate are determined with respect to milk quota.

Growth rate depends on initial farm size => Gibrat’s law does not hold



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Results (probability of growing)

Determinants for „growth“ against other regimes

Variable	Marginal probability for „growth“ against: Stagnation	Decline	Exit
Family labour	**+**	**++**	**n.s.**
Age	**-**	**-**	**n.s.**
Milk yield per cow	**++**	**++**	**++**
Crop subsidies	**n.s.**	**n.s.**	**-**
County unemployment	**-**	**+**	**n.s.**

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Conclusions I

1. Determinants that increase growth rates:
   - **higher milk yield per cow**
   - Family labour, younger buildings, interest subsidies
2. Age, land endowment, interest payments decrease growth rates
3. Regime „growth“ becomes more probable with
   - **higher milk yield per cow**
4. Younger farmers and farms with more family labour tend to grow instead of stagnating or declining

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Conclusions II

- Selection bias correction is necessary
- Correction based on choice among four regimes does not seem to be necessary
- Although, multinomial logit among the regimes reveals more differentiated results than binary choice
- Results of Dahl procedure are sensitive to choice of variables

- Exit from farming / from data set as a fifth regime
- Other procedures for selection bias correction