Breeding strategies for early maturity in beef cattle

Silvan Wyss

11/22/2018

Content

- Present master thesis
- Material and method to get first results
- First results
- Outlook

Master thesis

Goal

- Predicting: Which strategy is suitable to breed for early maturity in beef cattle?

Definition of early maturity

- Animal with same price at the slaughterhouse but younger

Economic relevance

- Younger -> less costs for the farmer

Master thesis

Four strategies sorted by increasing complexity:

1. Carcass fat as auxilliary trait.
2. Index over carcass traits.
3. “Deviation in age at slaughter” from Berry, Cromie, and Judge (2017).
4. Growth models.

-> Starting with strategies one and two.

Master thesis

- Index as selection criterion
- Selecting for most economic animal (Hazel 1943)
- For each trait a breeding value
- Main result until this stage of master thesis

Index

$$I = a^T u$$

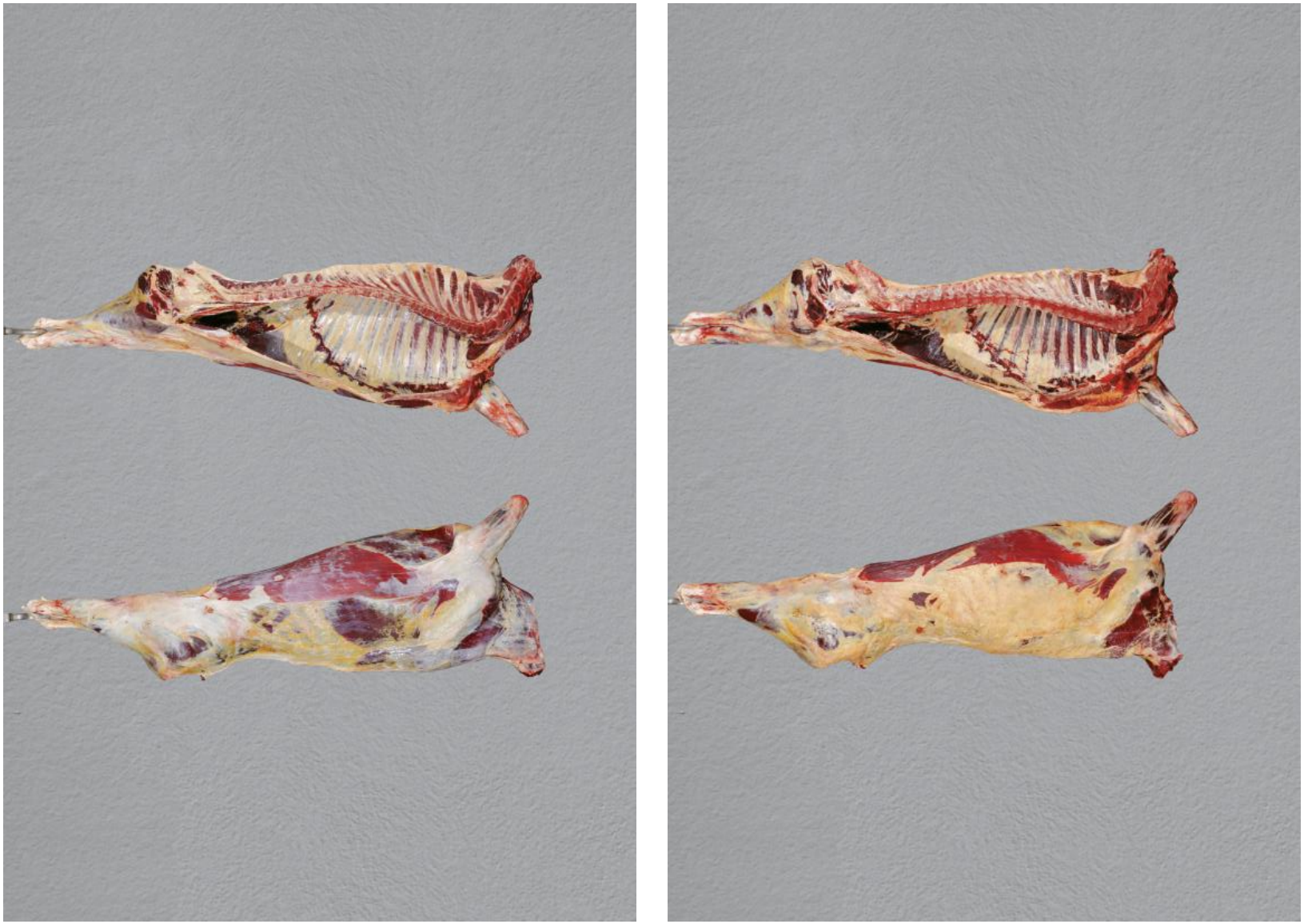
where

a is the vector of economic weights –> not available,

u is the vector of estimated breeding values –> available.

- Carcass conformation, carcass weight and carcass fat for calves and adults each.
  - Six breeding values -> six traits
  - Routeneley recorded by Proviande in slaughterhouses

Carcass fat



Classified to fat class one and four

Image source: Proviande

Carcass conformation

Classified to decreasing conformation classes.

Image source: Proviande

Groups

- Calves are less than 180 d old
- Adults are between 180 and 701 d old

Economic weights

- Definition: Change in profit per change in carcass trait (Brascamp, Smith, and Guy 1985)
- Simplification:
  - Costs constant
  - Price per kg carcass weight as profit
- Prices from August 2018, based on payment system CHTAX.
  - For calves and adults on different levels but same pattern
  - Shown: prices for adults

Carcass fat

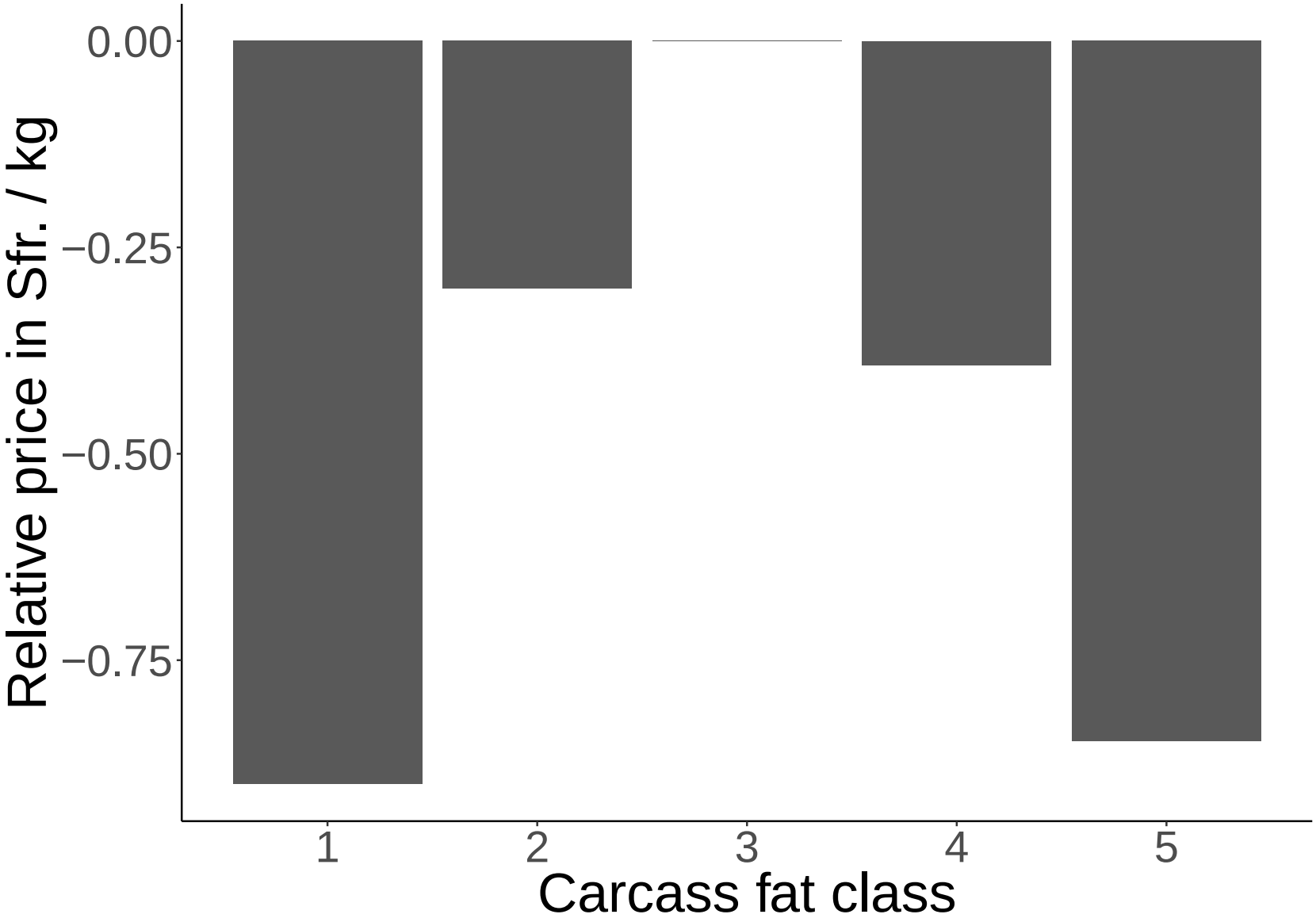
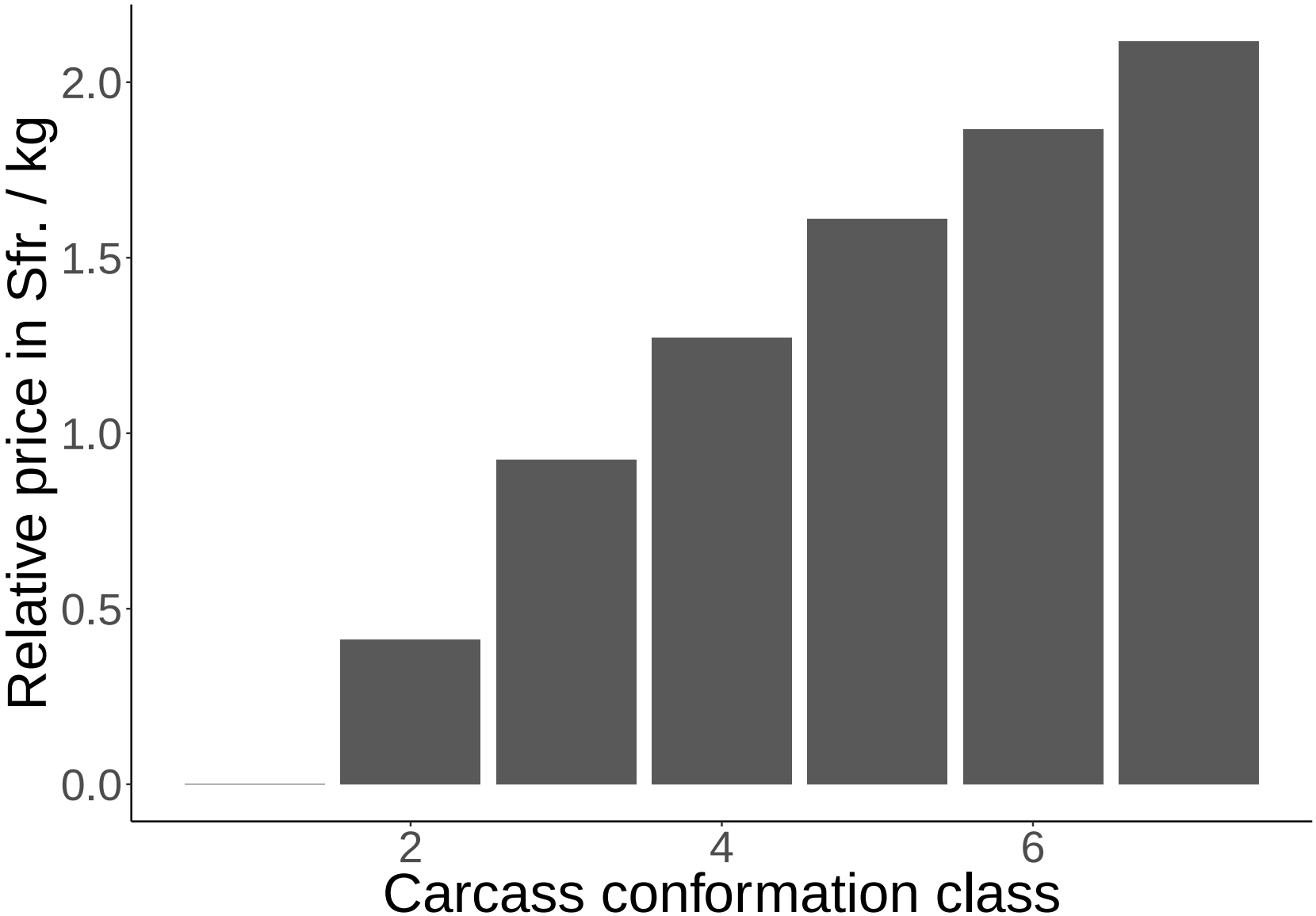
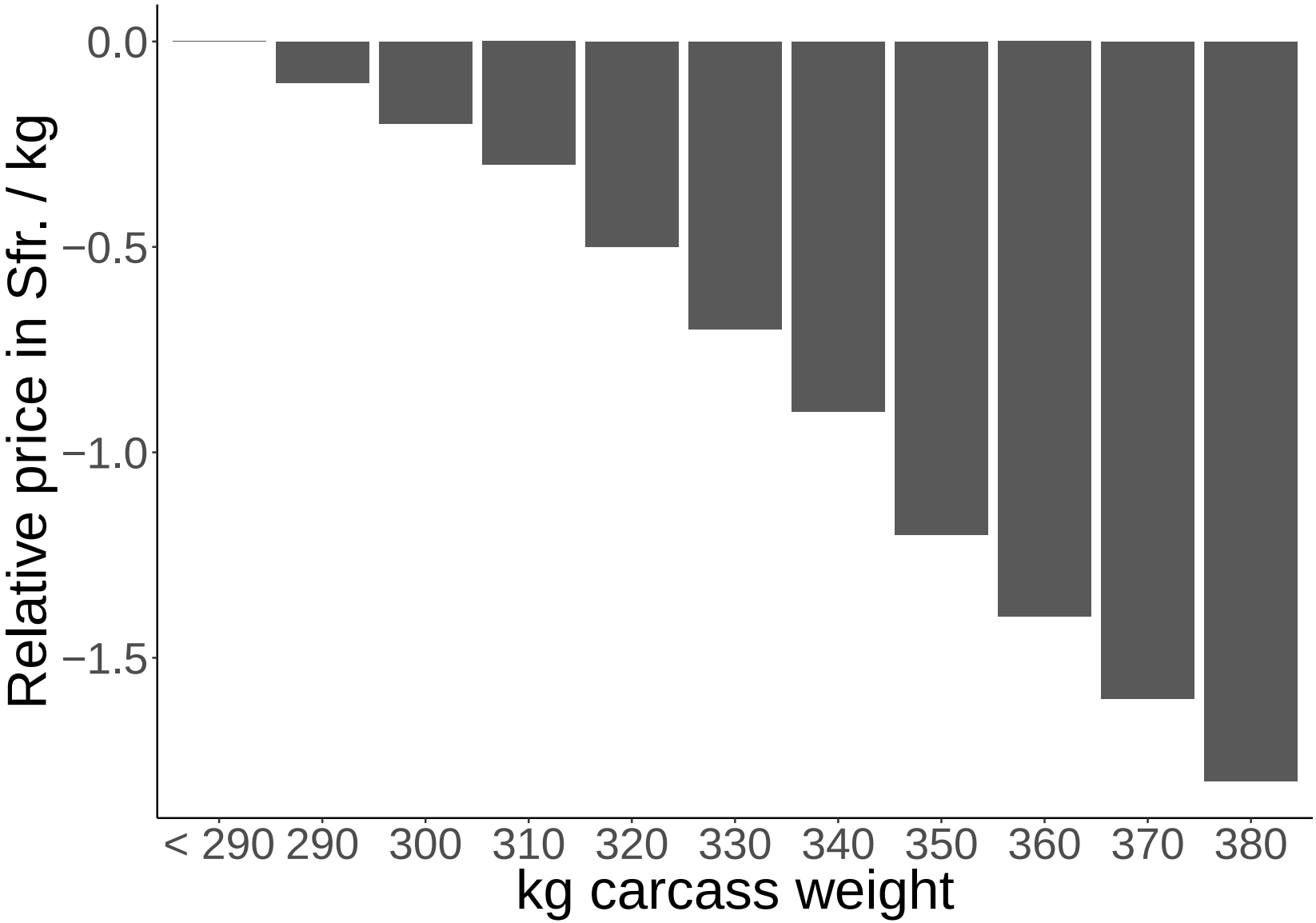


Image source: Proviande

Carcass conformation



Carcass weight

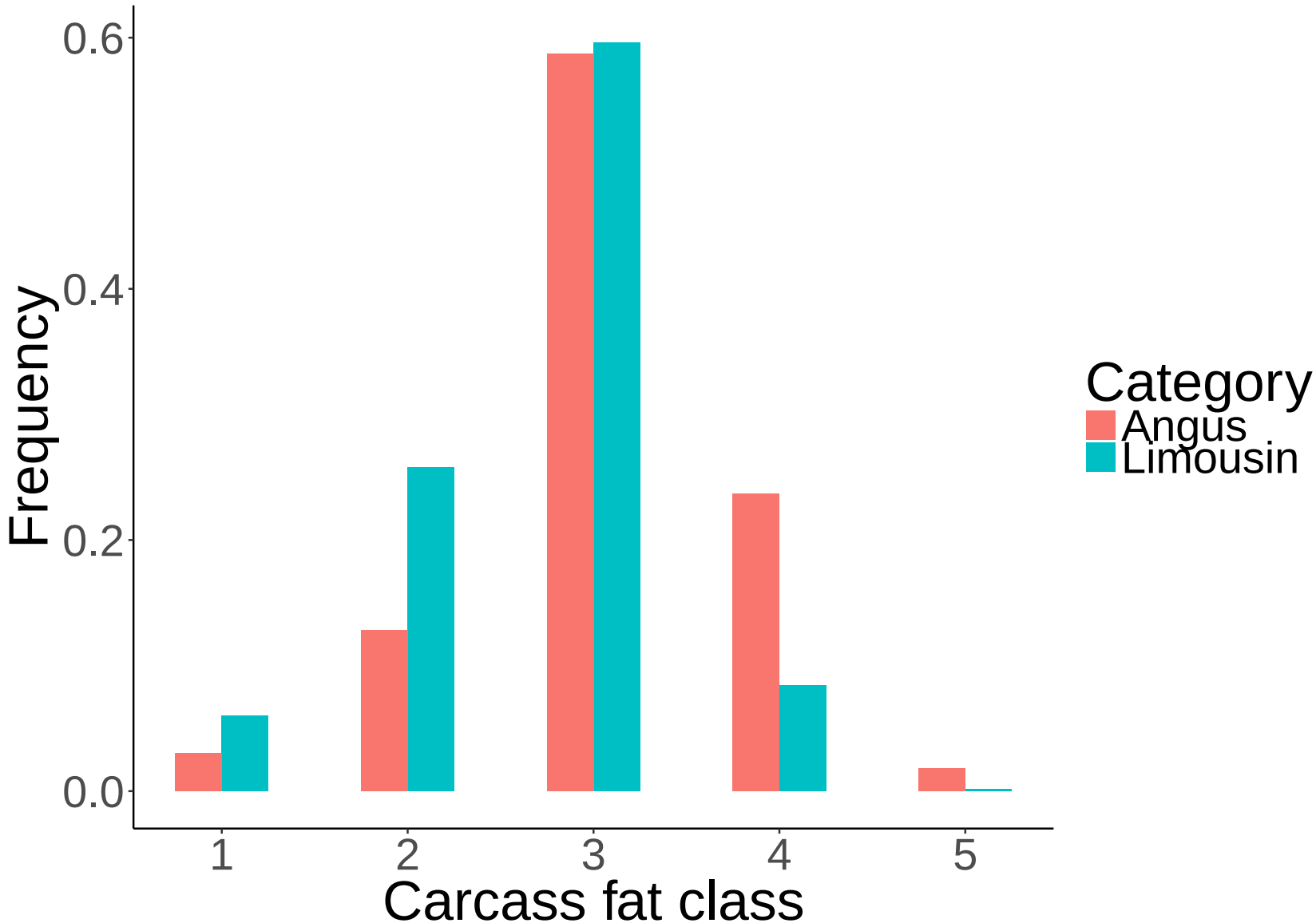


Groups

- Calves are less than 180 d old
- Adults are between 180 and 701 d old
- Different prices and distributions

Breeds

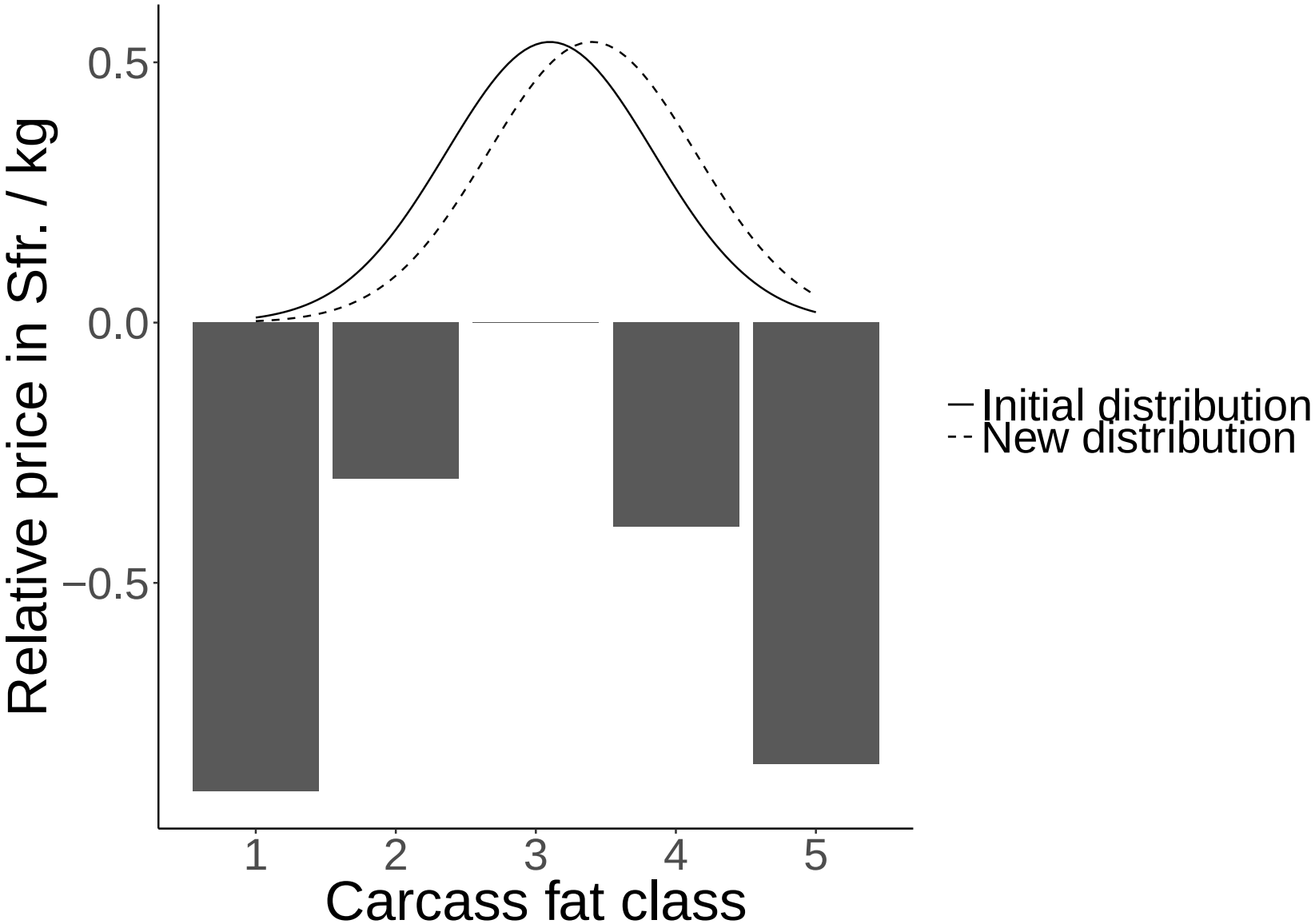
- Same prices, different distributions –> animals from 2010 - 2015



Method

- Programm R using own functions (R Core Team 2017)
- Mean difference in price per difference in trait
- Model potential increase in population mean -> scaling up to one unit

Method Exemplary



Relative economic weights

Trait	Angus	Limousin
Calves conformation	0.19	0.16
Adults conformation	0.10	0.08
Calves fat	0.05	0.07
Adults fat	-0.01	0.02
Calves weight	-0.49	-0.92
Adults weight	-0.03	-0.03

- Per genetic standard deviation -> comparable
- Carcass conformation in relation to carcass fat more important for Angus than Limousin
- Negative economic weights for carcass weight
- Calves more important than adults

Discussion

- Profit in price change per carcass weight -> Underestimation of carcass weight
- Costs not considered
- Explaines differences to Åby et al. (2012), where carcass weight has highest positive economic weight.
- Breeding values corrected for age at slaughter
  - The lower the age the higher the breeding values
  - Negative weight for carcass weight -> Breeding for animals which grow slowly

Outlook

- Evaluation of strategies: Carcass fat and index
- Tool: Genetic Gain
- Genetic Gain –> Improvement of carcass traits per year
- Characterization of the two other strategies

In association with

References

Åby, B. A., L. Aass, E. Sehested, and O. Vangen. 2012. "A bio-economic model for calculating economic values of traits for intensive and extensive beef cattle breeds." *Livestock Science* 143 (2-3): 259–69. doi:10.1016/j.livsci.2011.10.003.

Berry, D. P., A. R. Cromie, and M. M. Judge. 2017. "Rapid communication: Large exploitable genetic variability exists to shorten age at slaughter in cattle." *Journal of Animal Science* 95 (10): 4526–32. doi:10.2527/jas2017.2016.

Brascamp, E W, C Smith, and D R Guy. 1985. "Derivation of economic weights from profit equations." *Animal Science* 40 (1). Cambridge University Press: 175–79.

Hazel, L N. 1943. "The Genetic Basis for Constructing Selection Indexes." *Genetics* 28 (6): 476–90.

R Core Team. 2017. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. https://www.r-project.org/.