Breeding strategies for early maturity in beef cattle

Silvan Wyss

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Content

- Present Master Thesis
- Material and Method to get first Results
- First Results
- Outlook

Early maturity

Master Thesis

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

Definition with example

- 2 beef carcasses, same price at slaughterhouse, but different age at slaughter. The younger one was earlier mature than the older one.

Relevance

- Younger –> Less –> decreased costs.

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
- 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
  - Six economic weights

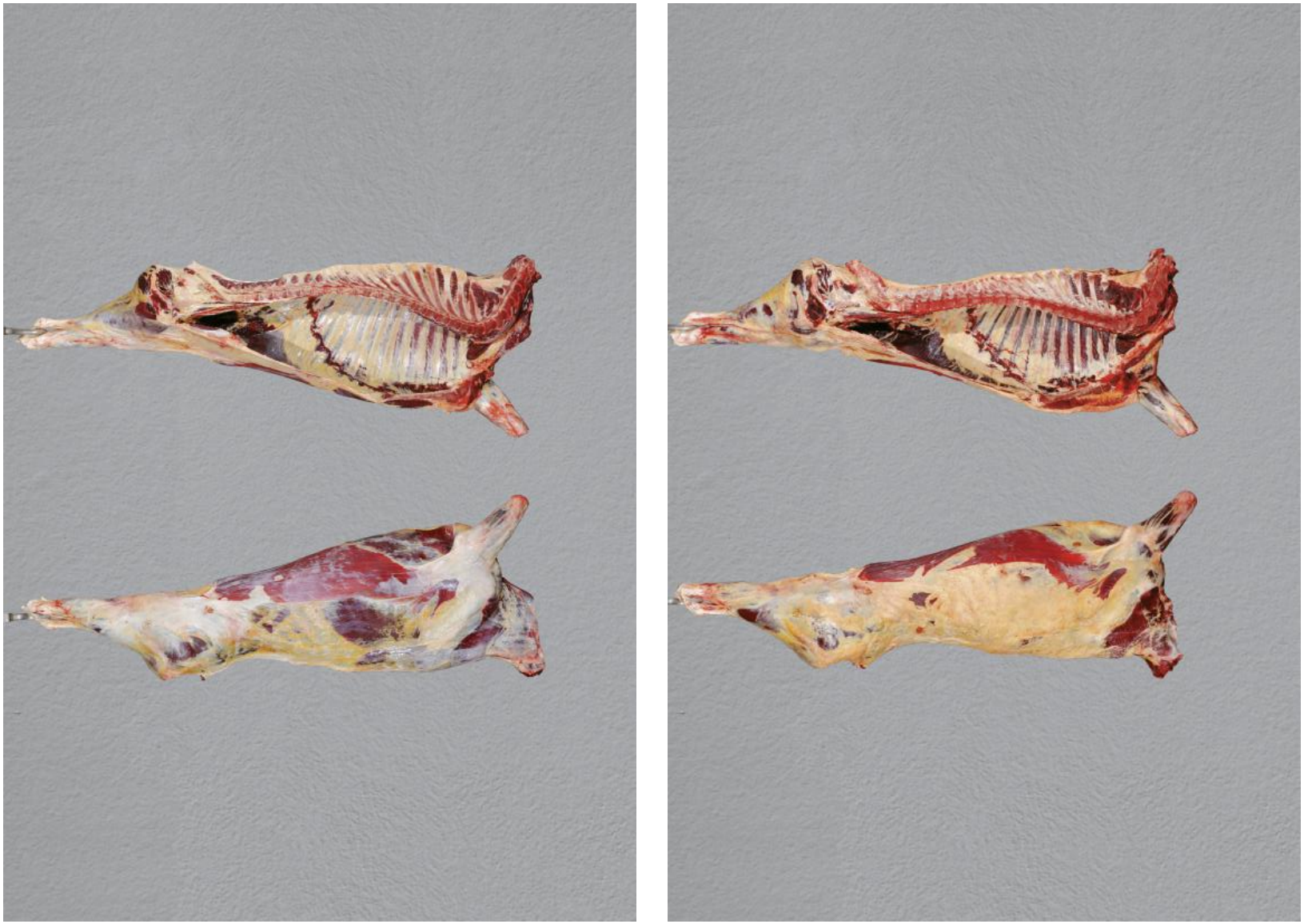
Economic Weights

- Definition: Change in profit per change in carcass trait.
- Simplification:
  - Costs constant
  - Price per kg carcass weight as profit
- Prices from August 2018.

Traits

- Carcass fat -> Visual fat coverage
- Carcass conformation -> Visual meat
- Carcass weight -> kg

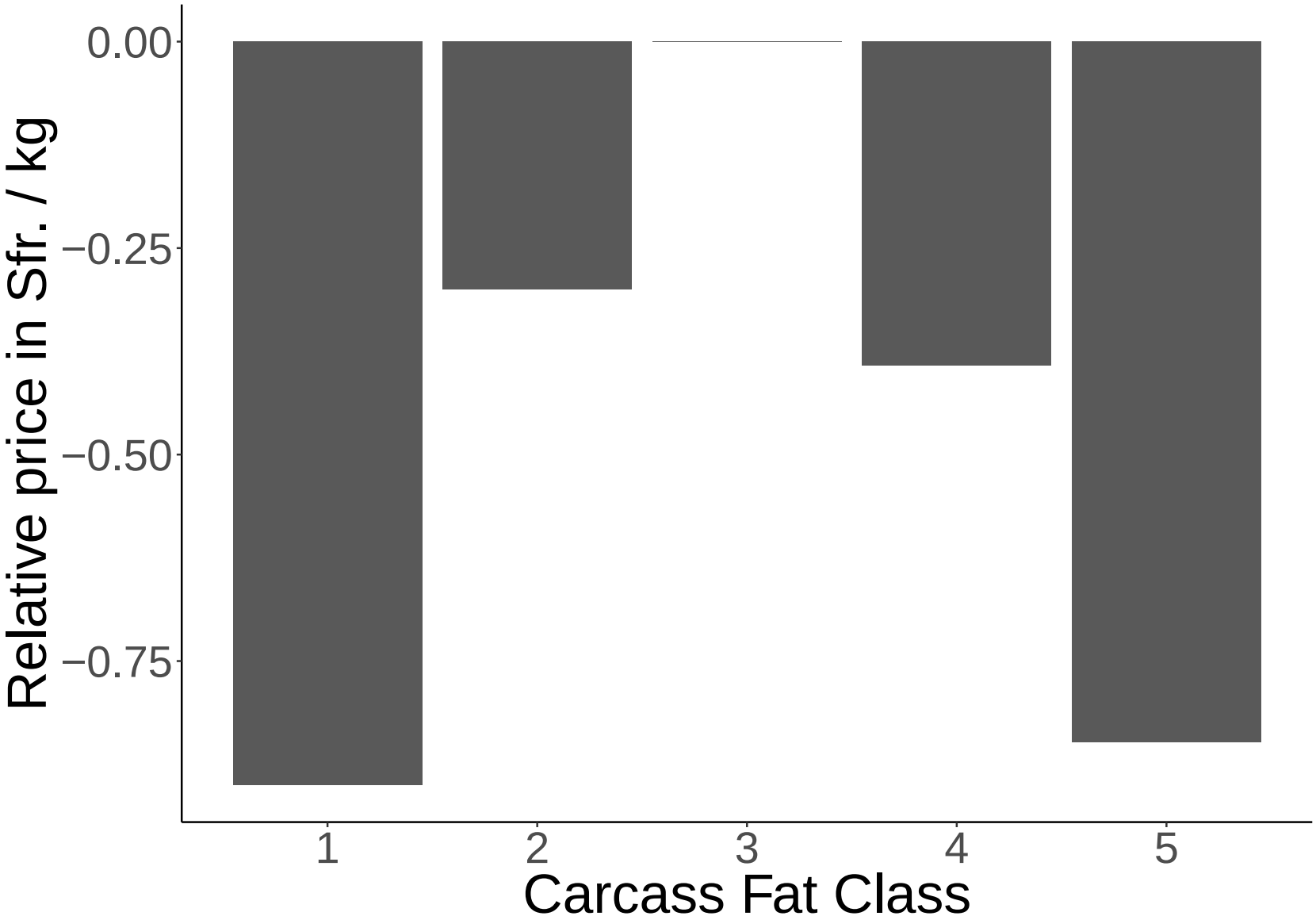
Carcass Fat



Carcass Fat Classes 1 and 4

Image source: Proviande

Carcass Fat

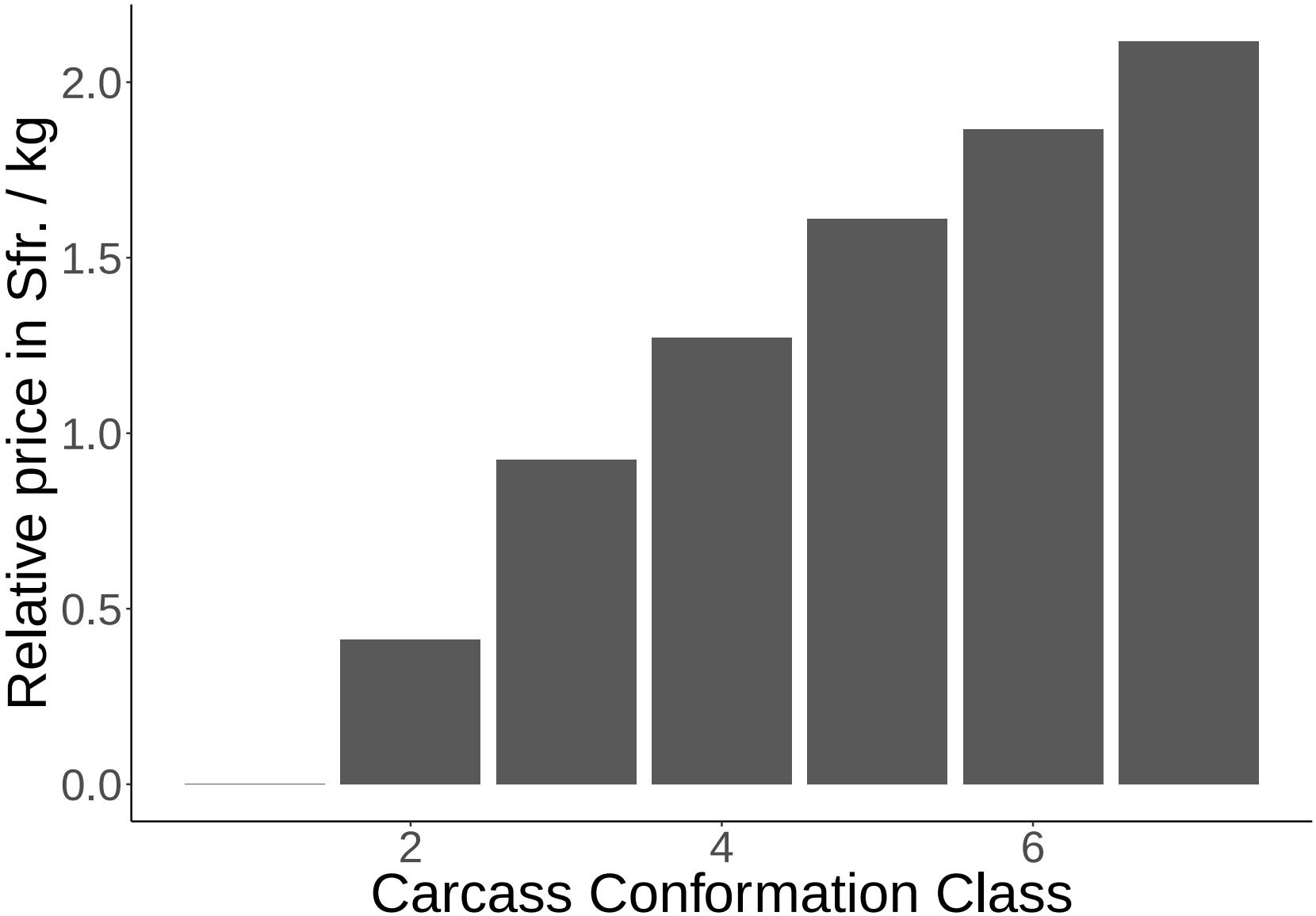

0.00
−0.25
−0.50
−0.75
Relative price in Sfr. / kg
1
2
3
4
5
Carcass Fat Class

Carcass conformation

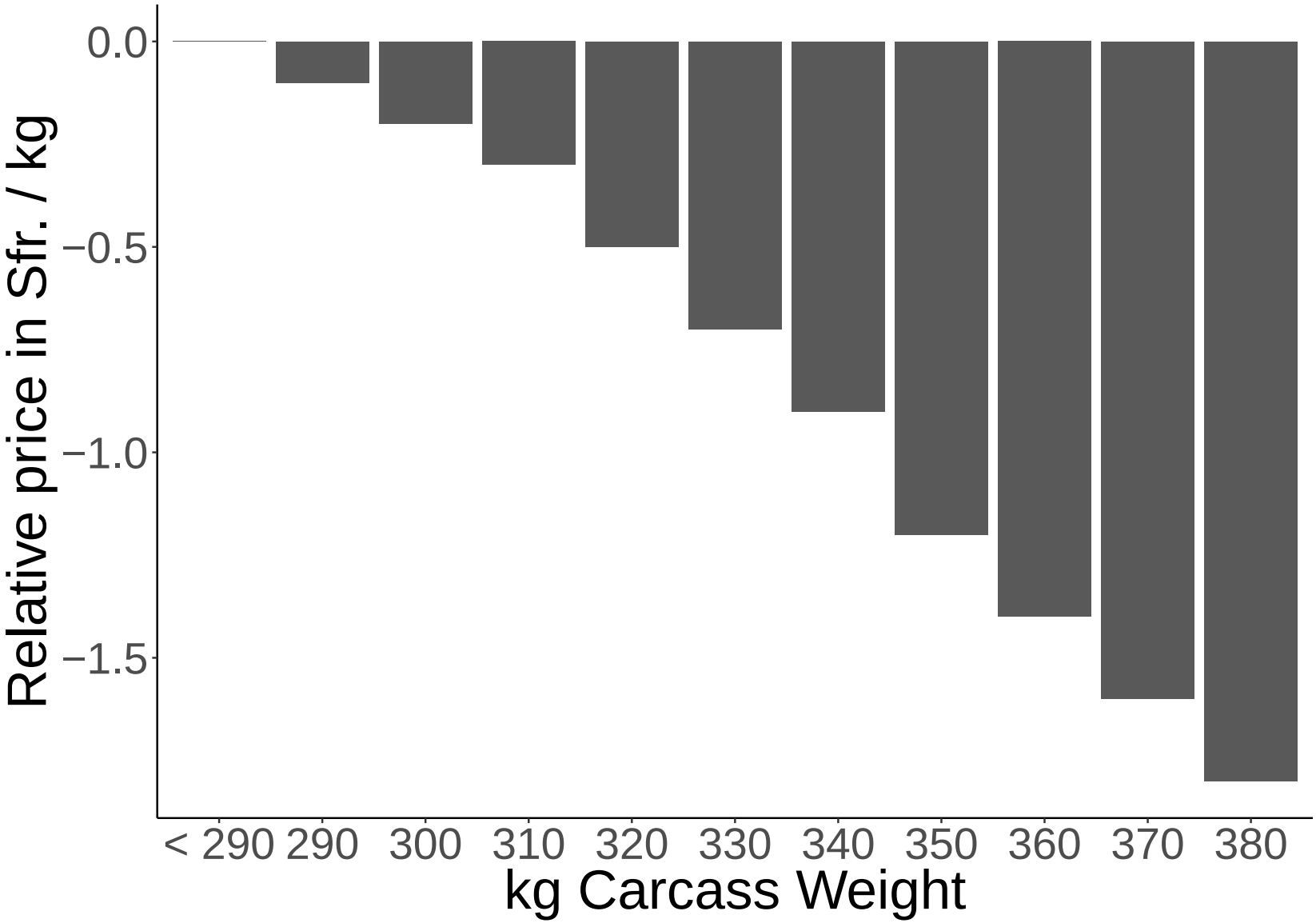
From left to right decreasing carcass conformation.

Image source: Proviande

Carcass conformation



Carcass weight

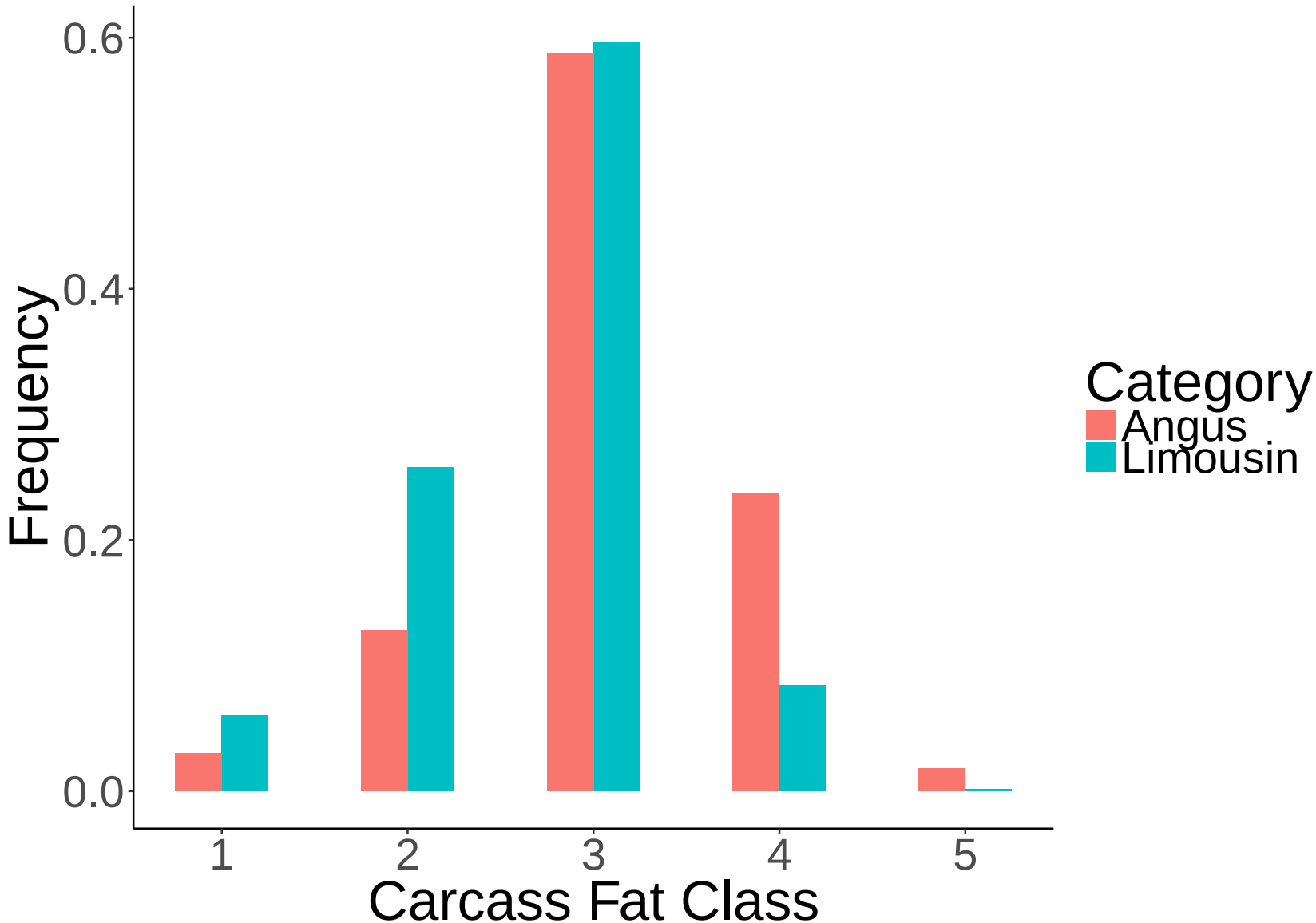


Groups

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

Breeds

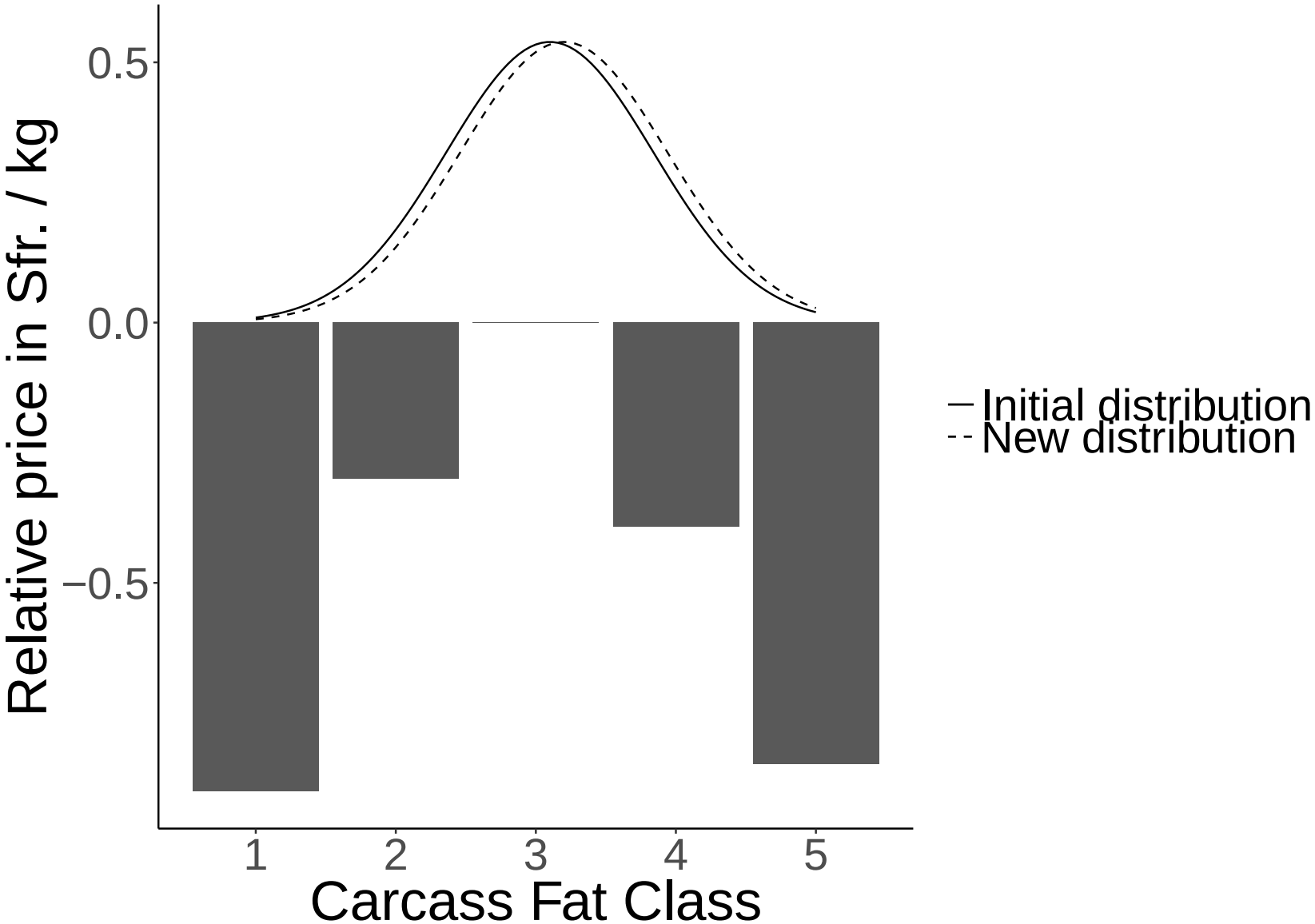
- Same prices, different distributions –> animals from 2010 - 2015



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
- Prices from August 2018.

Method


0.5
0.0
−0.5
Relative price in Sfr. / kg
1
2
3
4
5
Carcass Fat Class
Initial distribution
New distribution

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
- Carcass conformation in relation to Carcass fat more important for Angus than Limousin, plus negative for adults
- Negative economic weights for carcass weight
- Calves more important than Adults

Discussion

- Costs not considered
- Explaines differences to Åby et al. (2012), where carcass weight has highest positive economic value.
- Breeding values corrected for age at slaughter
  - Would need positive weight to breed for early maturity
- More information needed to compare the two strategies

Outlook

- Evaluation of Strategies
- Tool: Genetic Gain
- Genetic Gain –> Improvement of carcass traits per year
- Characterization of 2 other Strategies

Thank you

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.

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