EconomicWeightsDescription

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Economic weights

Economic weights are weighing factors to produce an aggregate genotype H

$$H = \sum a_i u_i \tag{1}$$

where

a is an economic weight,

u is a true breeding value and

i is a trait.

In this thesis the aggregate genotype consists of the traits carcass fat, carcass conformation and carcass weight. Consequently the three traits needed an economical weight each. The economical weight for a trait is the change in profit in Swiss Francs (Sfr.) per additional unit of the trait. It is given by the equation

$$a = \frac{\Delta_p}{\Delta_\mu} \tag{2}$$

where

a is the economic value of a trait,

Δ_p is the change in revenue in Sfr and

Δ_μ is the increase in population mean by one unit of a trait.

However, there is no information available about the true change in profit per unit carcass fat, carcass conformation and carcass weight. This change is therefore approximated by only using the difference in revenue which is caused by price differences per kg carcass weight in the slaughterhouse. The change in revenue $Delta_p$ has been computed by the equation

$$\Delta_p = \frac{r_1^T p - r_0^T p}{0.1} \tag{3}$$

where

r is the vector of population frequencies belonging to each price class,

p is the vector of price change per kg carcass weight,

T means, it is the transpose,

0 indicates the initial population and

1 indicates the population after the change in population mean by 0.1.

The price changes per unit of a carcass trait p are based on CHTAX. There the price differences do not have the same value over the whole scale of the carcass traits. For example the change in revenue from carcass fat class 1 to 2 is not the same as from 2 to 3. The changes in revenue are different for “adults” and “calves”. It

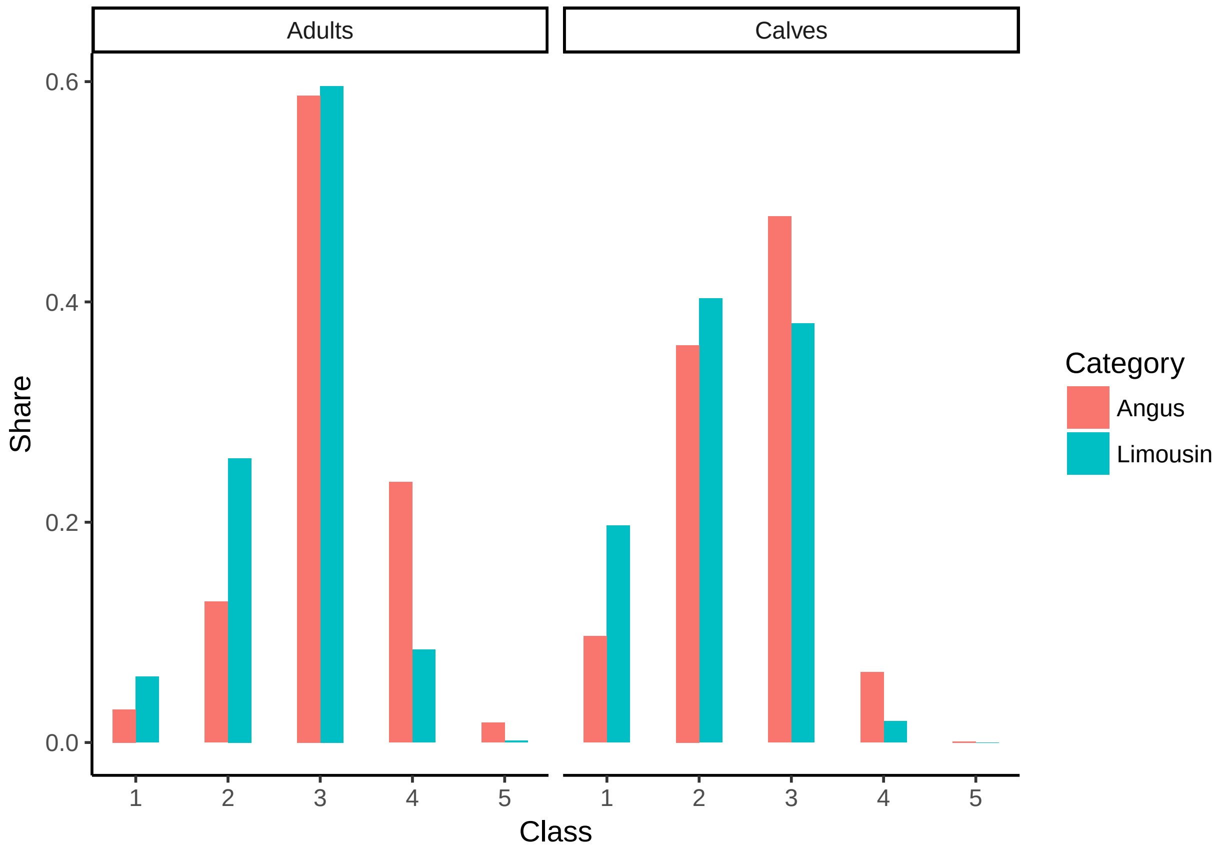

Figure 1: Population shares for each carcass fat class in Angus and Limousin calves and adults (Kunz, 2018)

is assumed that the group “calves” are all classified to the carcass category KV while the group “adults” are classified to MT, OB or RG. For the group “adults” the changes in revenue have been taken from a weighed mean of MT, OB and RG. Its weights have been chosen from the relative number of slaughtered carcasses classified to MT, OB and RG. Due to the non-linear changes in revenue for the carcass traits, the economic weight depends on the initial distribution of the population over the scale of a carcass trait. The initial distribution is different for each beef cattle breed, which also results in different economic weights for each breed. In this thesis the economic weights have been computed for the breeds Angus and Limousin.

While the revenue changes from class to class in carcass fat and carcass conformation, it changes at thresholds in carcass weight. In a continous normal distribution thresholds are needed to get the frequencies of population r for each price class. The price class indicates a range of a carcass trait at which the price per kg carcass weight stays the same. For carcass fat and carcass conformation the thresholds have been difficult to set, because they are discreteley distributed (see Figure @ref(fig:InitialSharesCF_barplot)). There the thresholds have been set after the creation of the initial normal distribution approximated to the discrete distribution (see Figure @ref(fig:NormDistApprox)). The tresholds have been set in a way that the population frequencies known by the discrete distribution have fitted to the frequencies in the normal distribution. After this step the procedure to compute the economic weight was again basically the same for all carcass traits: The initial normal distribution conserved its shape (standard deviation constant), but has been shifted by increasing the mean by 0.1 (see Figure @ref(fig:ShiftMean)). Then the population frequencies within each price class have been computed again using the characteristics of the normal distribution and using the computed thresholds. The population frequencies from the initial distribution 0 and the changed distribution 1 enabled the computation of the change in revenue for a change in population mean by Δ_{μ}.

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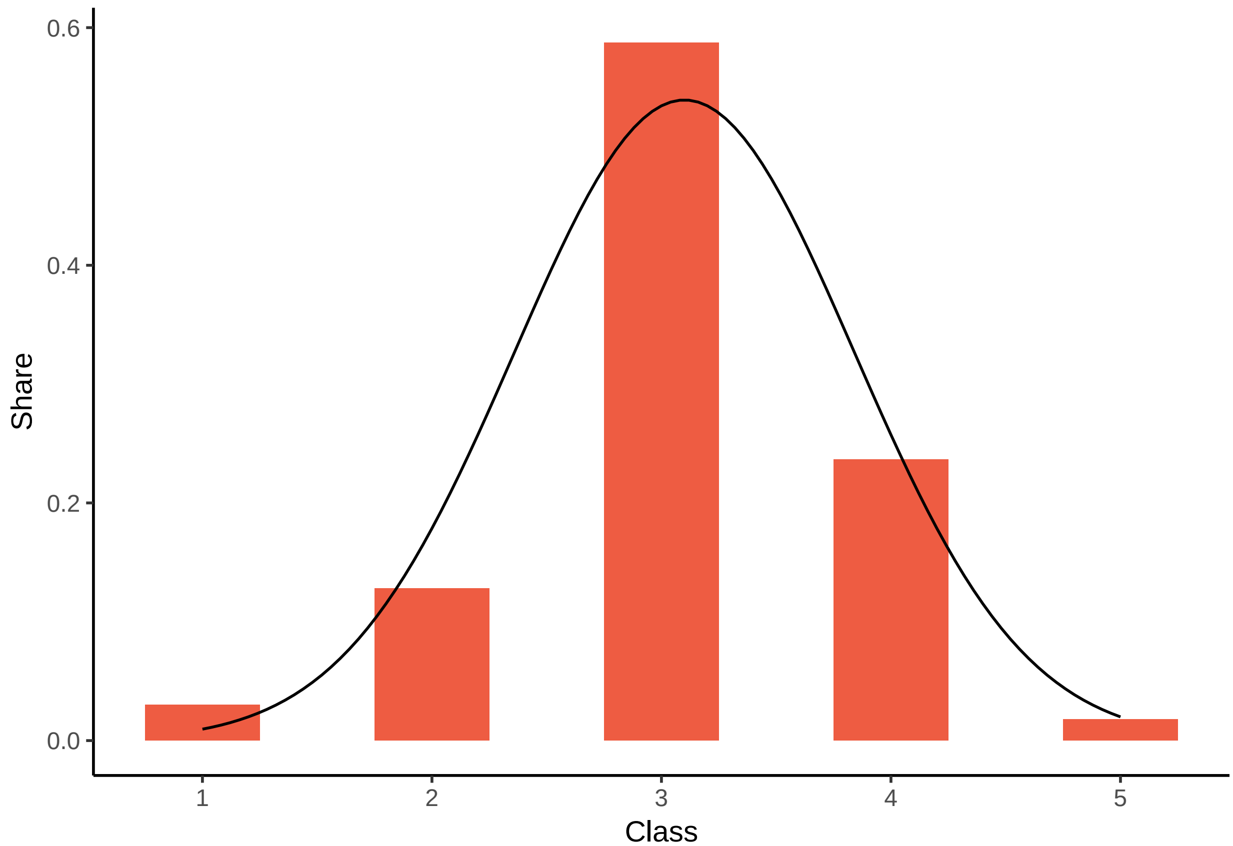

Figure 2: Exemplary approximation of a normal distribution to a discrete distribution.

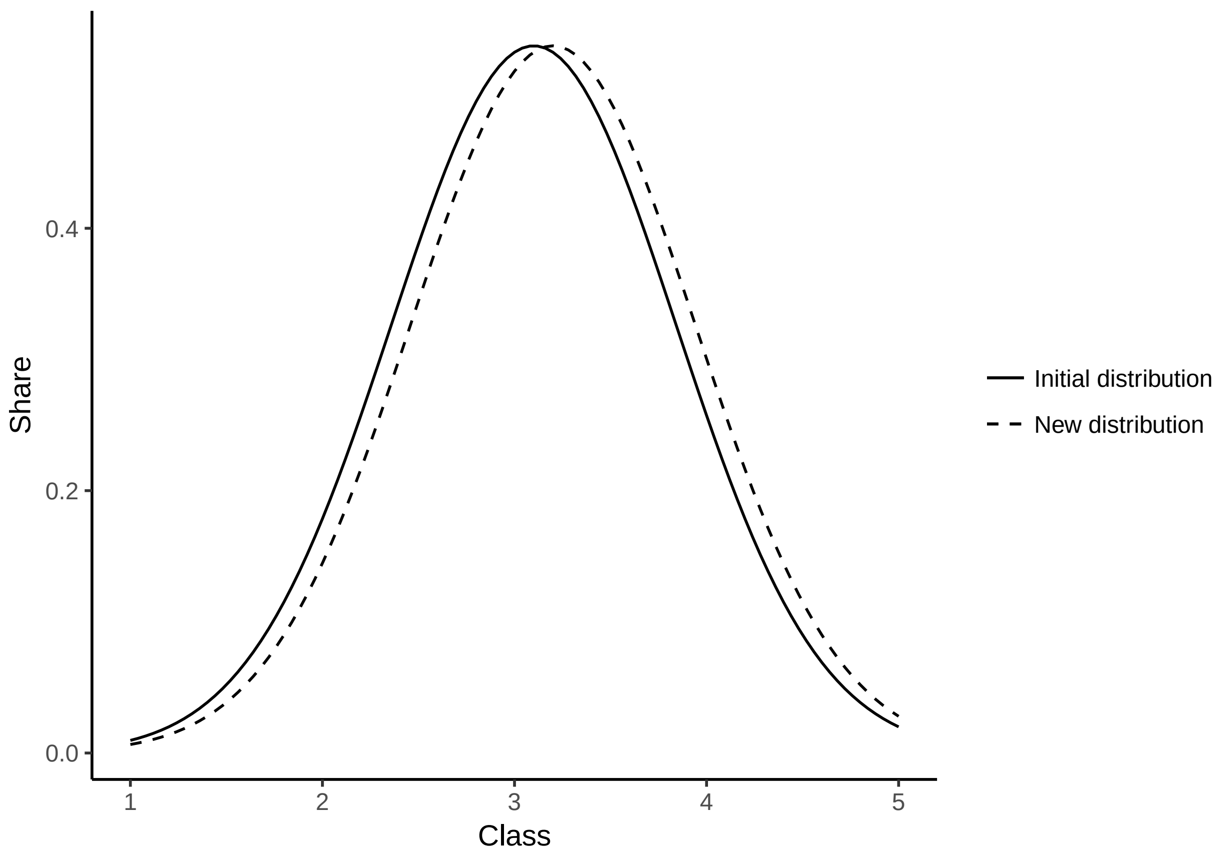

Figure 3: Exemplary shift from initial to new distribution by increasing the mean of the initial normal distribution by 0.1