Improving the model for genetic evaluation of calving traits in the US Holstein and Brown Swiss

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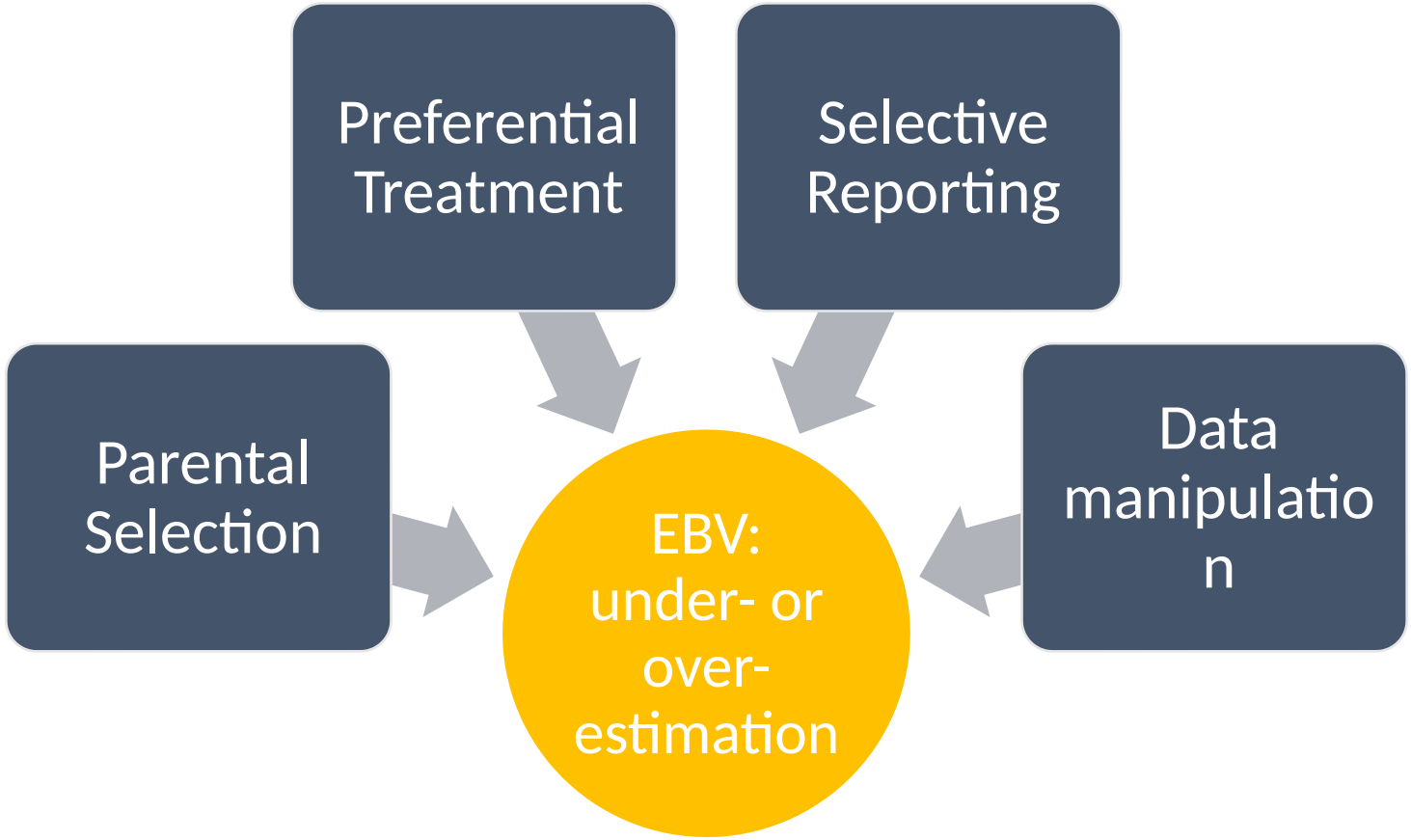
Background


Preferential Treatment
Selective Reporting
Parental Selection
Data manipulation
EBV: under- or over-estimation

Background

2. an additional and possibly underestimated source of bias: excluding one source of variation from the model

- preadjusting milk production for age and parity → under- or over-estimation of the genetic trend
- Lidauer and Mäntysaari (1996): redefining the herd effect in the Finnish repeatability animal model evaluation ↓ bias
- ICAR's guidelines on Dairy Cattle Genetic Evaluation : the importance of model's unbiasedness

Aim

- The aim of the present study was to

1. Investigate possible improvements of the current National Genetic evaluation for Calving Ease (CE) and Stillbirth (SB) in the US Holstein and Brown Swiss

2. Validate results by ITB methods 1 and 3

Data

- CDCB Data from the official April 2019 run were used
  - Calving Ease (CE): 32,194,410 records
    - 1st parity 29.8%, 2nd parity 29.3%, 3+ parities 40.9 %
  - Stillbirth (SB): 20,902,357 records
    - 1st parity 30.9%, 2nd parity 29.2%, 3+ parities 39.9 %

Current Model

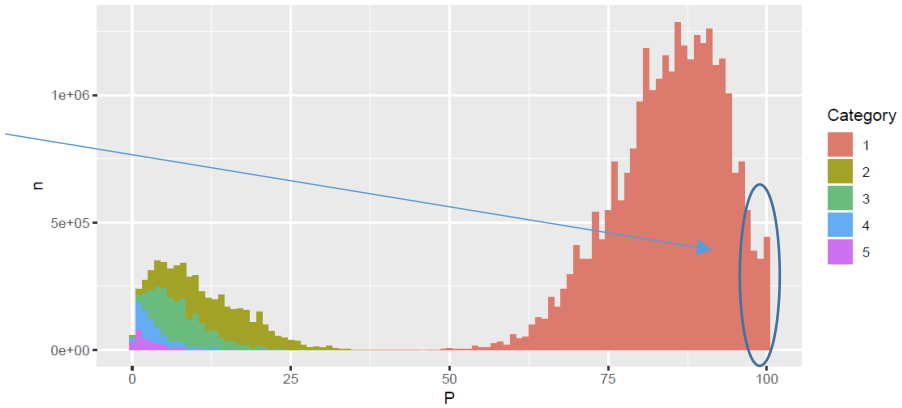
- Current model for calving traits (Van Tassell et al, 2003; Cole et al, 2005)
  - Single-trait threshold sire-maternal grandsire (MGS) model
  - environmental effects: Random herd-year, fixed year-season, parity-sex, sire/mgs birth year group, MGS breed (CE only)
  - PTA: % difficult births (CE score 4 & 5) in heifers and percent stillbirths (score 2 & 3) over all parities

Preliminary Analyses

- Possible model improvements

1. Exclude herds with > 95% of easy calvings/no stillbirth
2. CE: join category 4 & 5
3. Include parity in the definition of HY groups
4. Include the interaction of Parity-Sex-Year of birth of Sire and MGS

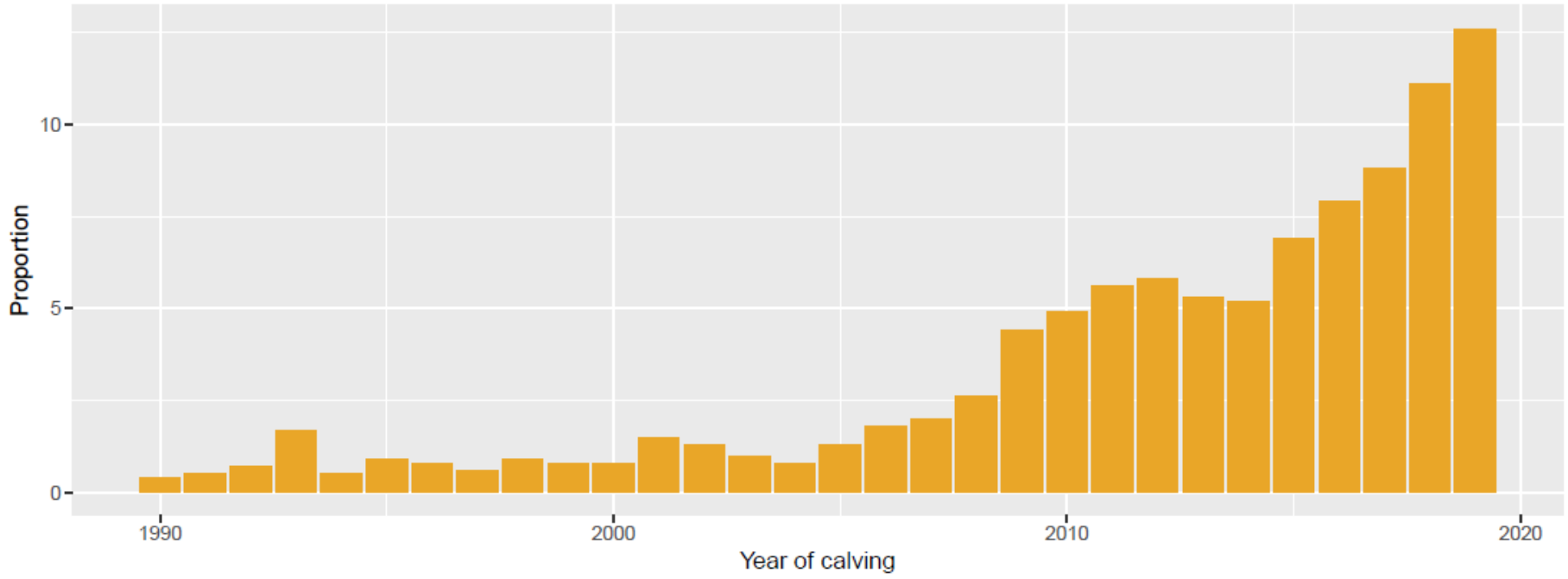
Figure 1: Herds distribution across Calving Ease categories



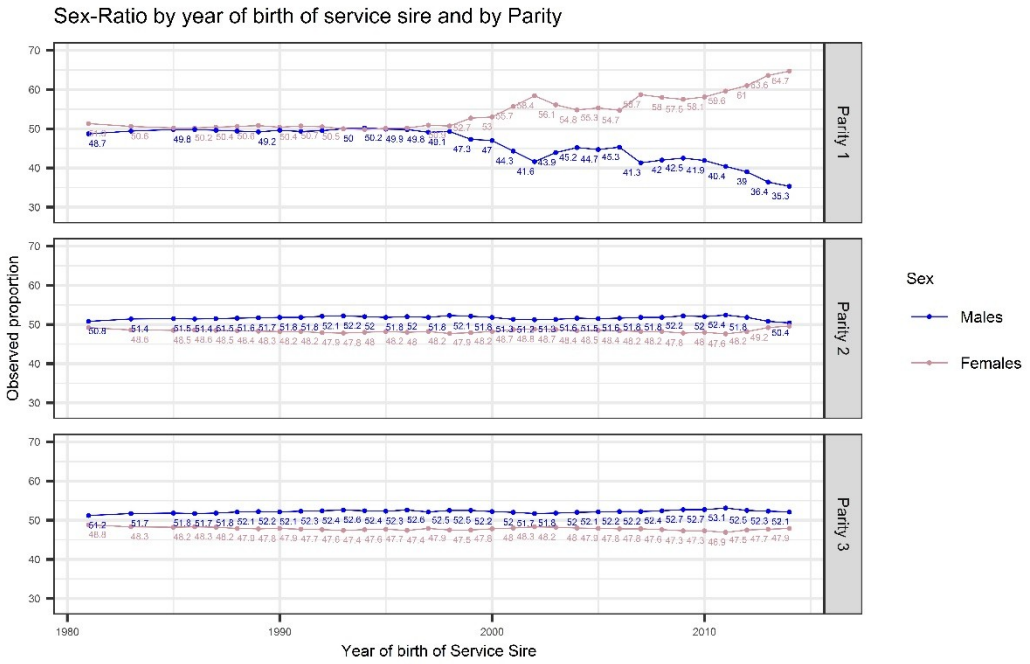
Has the sex-ratio by sire changed across years ?

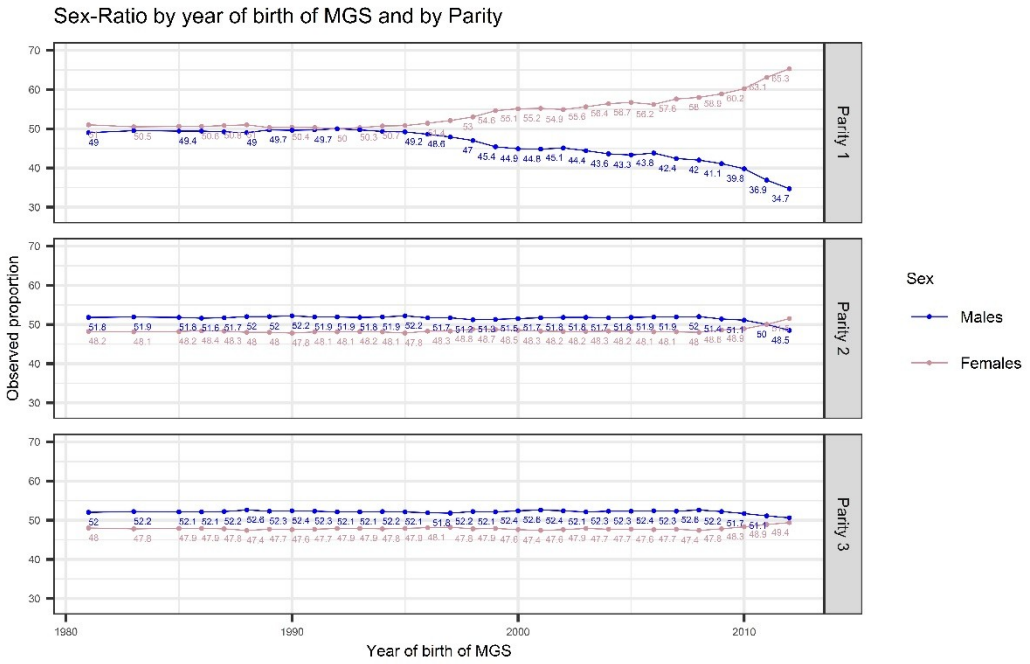
YES!

Figure 5: Proportion of Sires who deviates from the theoretical 1:1 sex−ratio ($p < 0.001$)



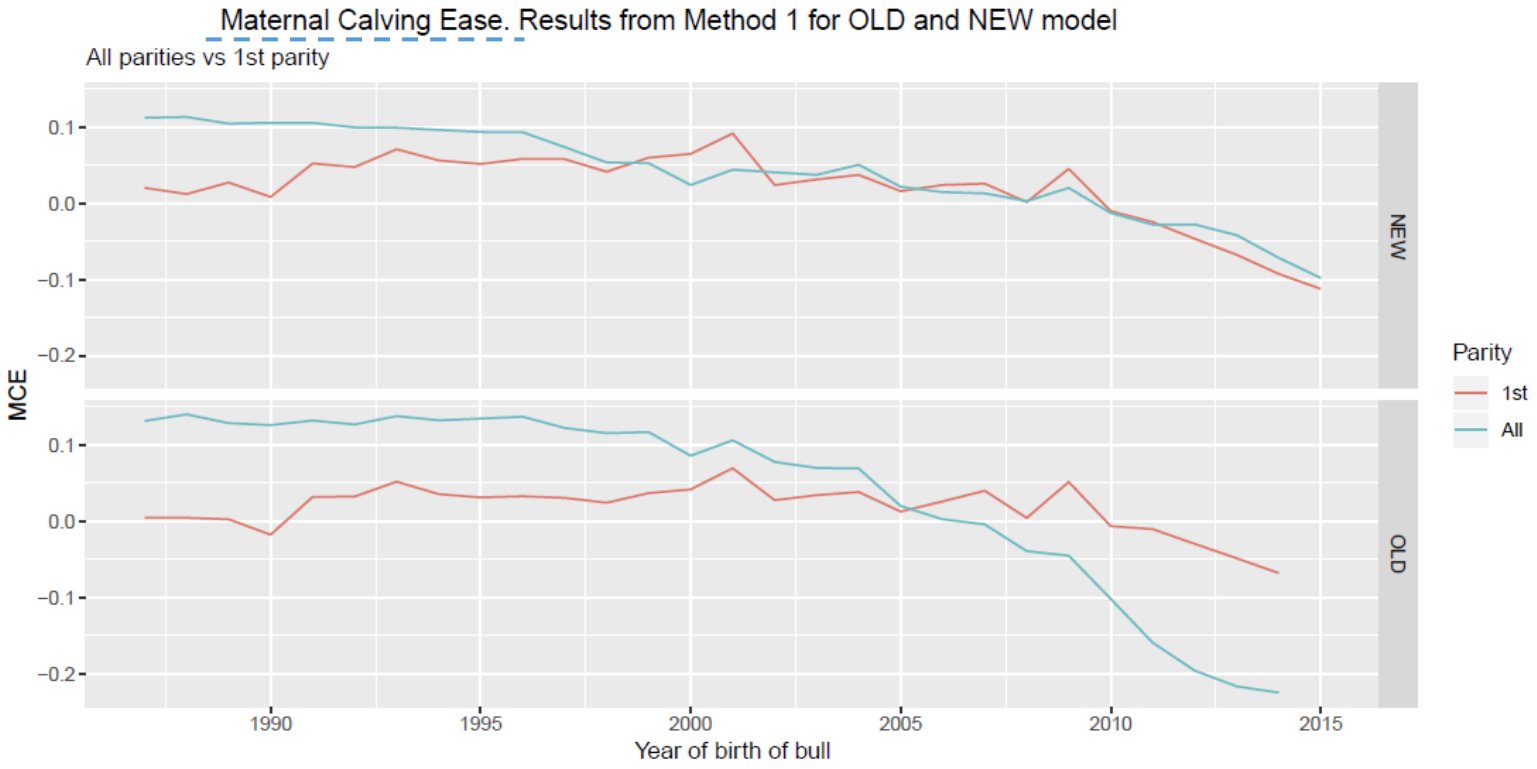
Has the sex-ratio by sire/MGS changed across years ?





Results – ITB method 1

- routine national genetic evaluations: compares genetic trends estimated using only first lactation versus all lactations
  - All traits passed ITB 1
  - Largest impact on CE



Results – ITB method 1

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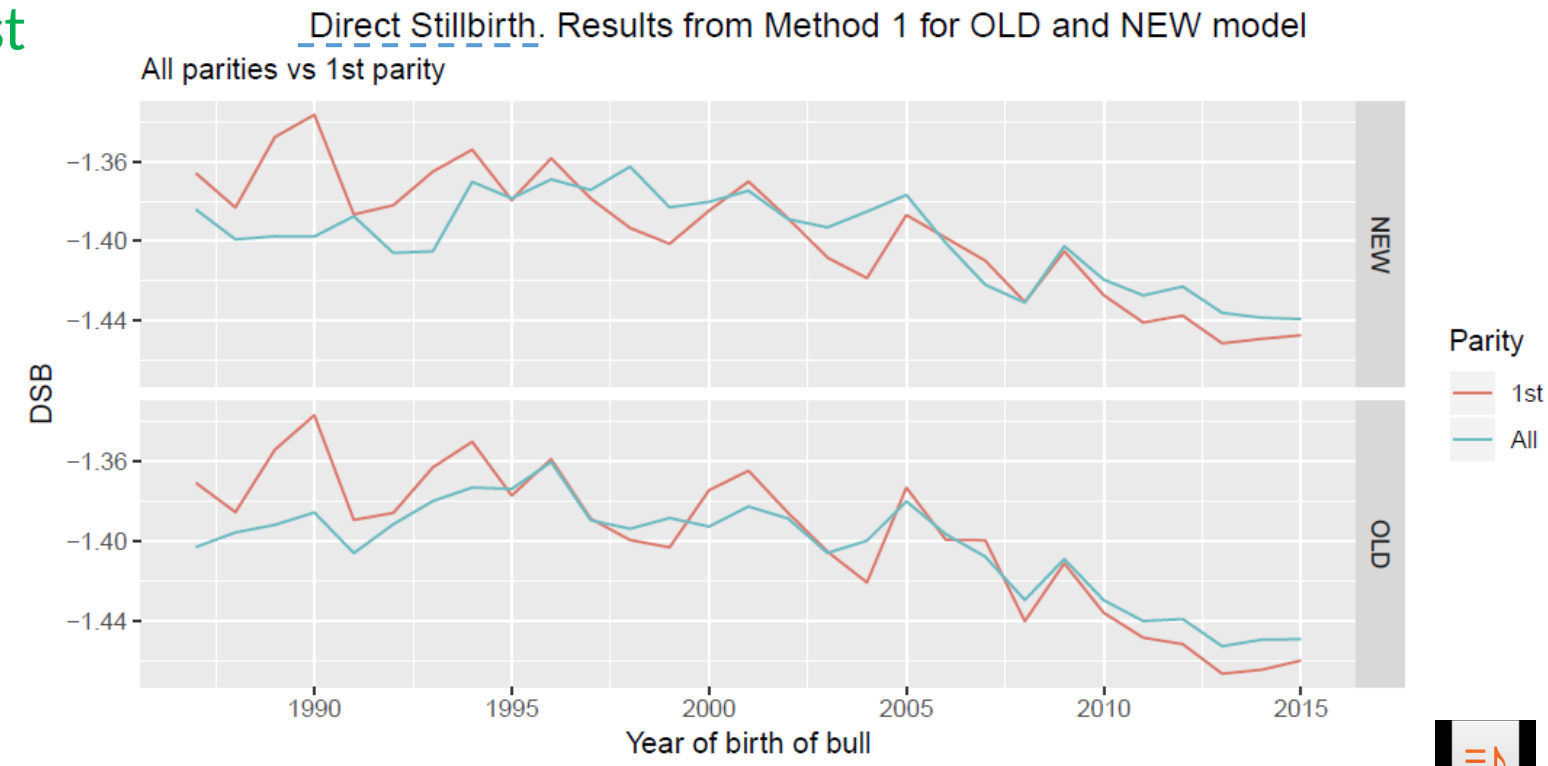
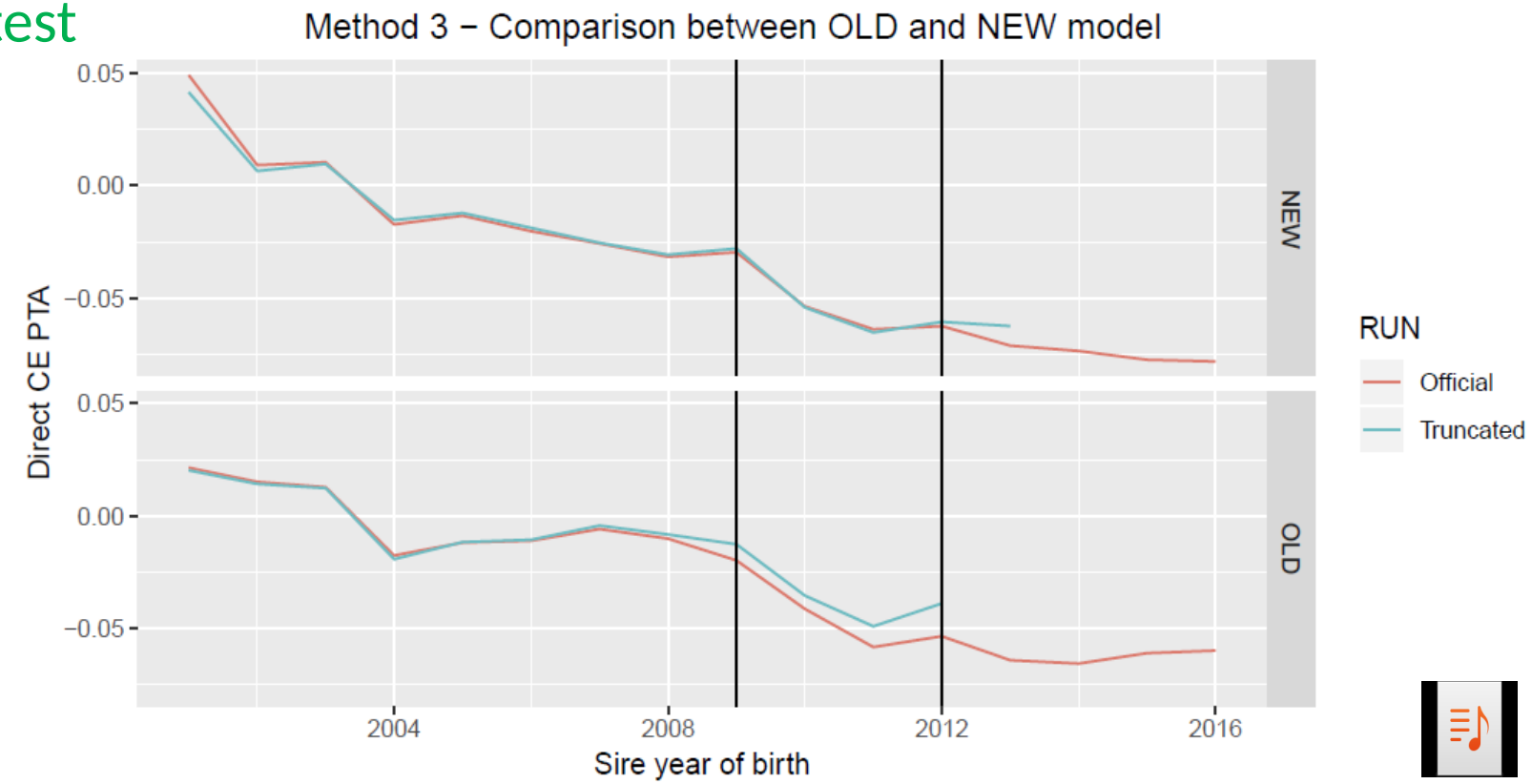


Results – ITB method 3

- routine national genetic evaluations: analyses the official national predicted genetic merit variation across evaluation runs
  - All traits passed ITB 3 test
  - Largest impact on CE

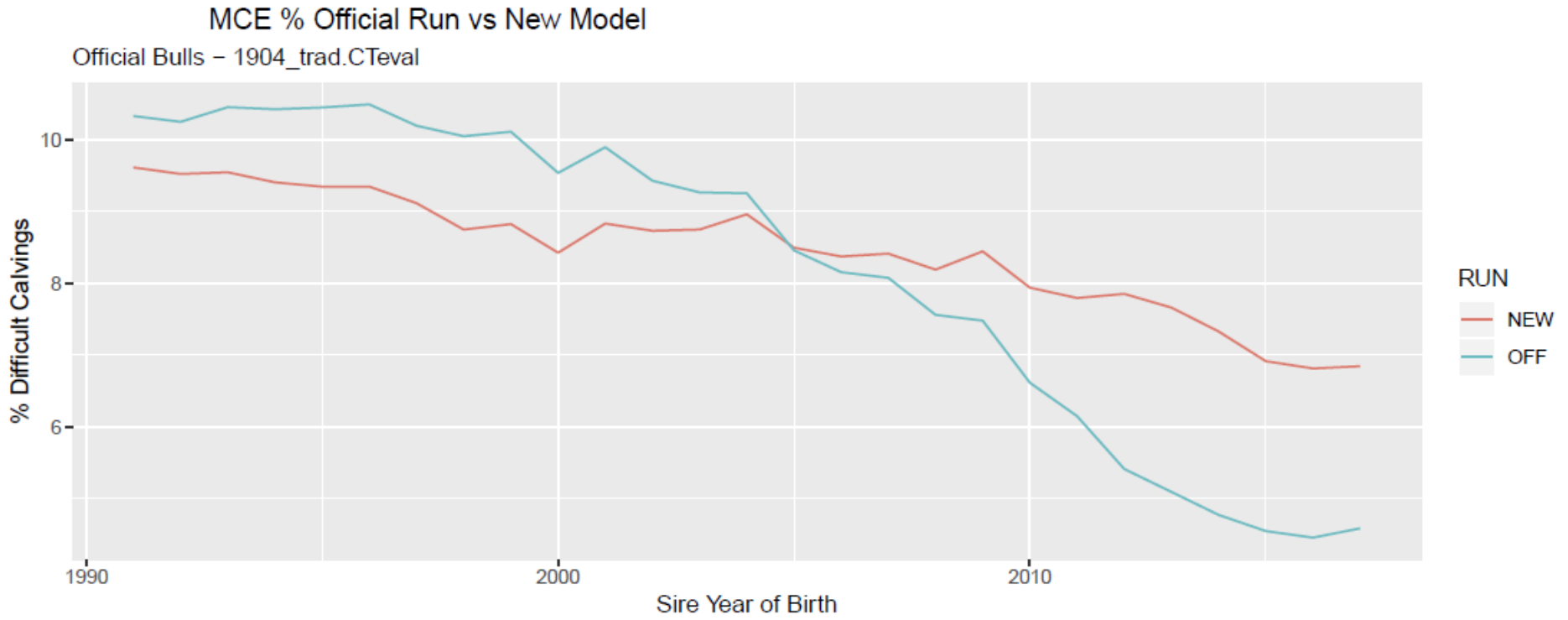


Results – Genetic Correlation

- The introduced changes increased the international genetic correlation between US and 14, 7, 1 and 2 countries for DCE, MCE, DSB and MSB, respectively.
- The largest observed effects were actually for both DCE and MCE
- The new variance components and the new model have had an effect on the reliabilities of US bulls across different countries.

Results – Genetic Trend

- model improvement: effect on the genetic trends (especially for MCE)



Conclusion and Final remarks

- evidence of a bias due to sexed-semen
- new model : **Inclusion of the interaction of Parity-Sex-Year of birth of Sire and MGS.**
- positive results in terms of validation tests
- positive results in terms of genetic correlation with the other countries (on average)
- effect on genetic trends (MCE)

Thank you for the attention

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