Genetics of uniformity of birth weight in piglets

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EAAP 2013

Acknowledgment

TOPIGS Research Center IPG
Egbert Knol and Marcos Lopes

Netherlands Organisation for Scientific Research (NWO)

Dutch Technology Foundation (STW)

Animal Breeding & Genomics Centre

Within-litter variation in birth weight

- Increasing uniformity of within-litter birth weight
  ➔ economic interest

- "Traditional" method analysis of within-litter SD of birth weight

- Advanced method using residuals of records

Why residual variance?

- Uniformity is important in pig breeding

- Within-litter variation in BW has SD, because it is collected on litter level

- Some traits can only be collected on the individual level *e.g.* carcass weight

- Advanced method can also be used for individual observation

Objective

To compare two methods

→ variance of within-litter BW – on litter level
      (traditional method)

→ residual variance of individual BW – on piglet level
      (advanced method)

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Data

- 55,149 crossbred piglets (incl. stillborn)
- 3,387 litters (e 6 piglets)
- Parents: 1,056 sows x 499 boars

Trait	
BW	1.19 ± 0.31
SD of BW	0.25 ± 0.008
TNB	16.3 ± 3.1
#born alive	14.7 ± 2.9

Method 1 (traditional)

$$\textbf{Log(V(BW))} = \textbf{X}b + \textbf{Z}a + \textbf{W}s + \textbf{e}$$

Fixed effects: parity, TNB, farm_year_season, iυht ♂ * iυht ♀

Method 2 (advanced)

Double Hierarchical GLM (Ronnegard *et al.*, 2010; Felleki *et al.*, 2012)

Birth weight part $\quad$ **BW** = **X**b + **Z**a + **W**c + **e**

Residual part $\quad$ **Log(V(e))** = **X**b_v + **Z**a_v + **W**c_v + **e**$_v$

Fixed effects: parity, sex, farm*ys, TNB

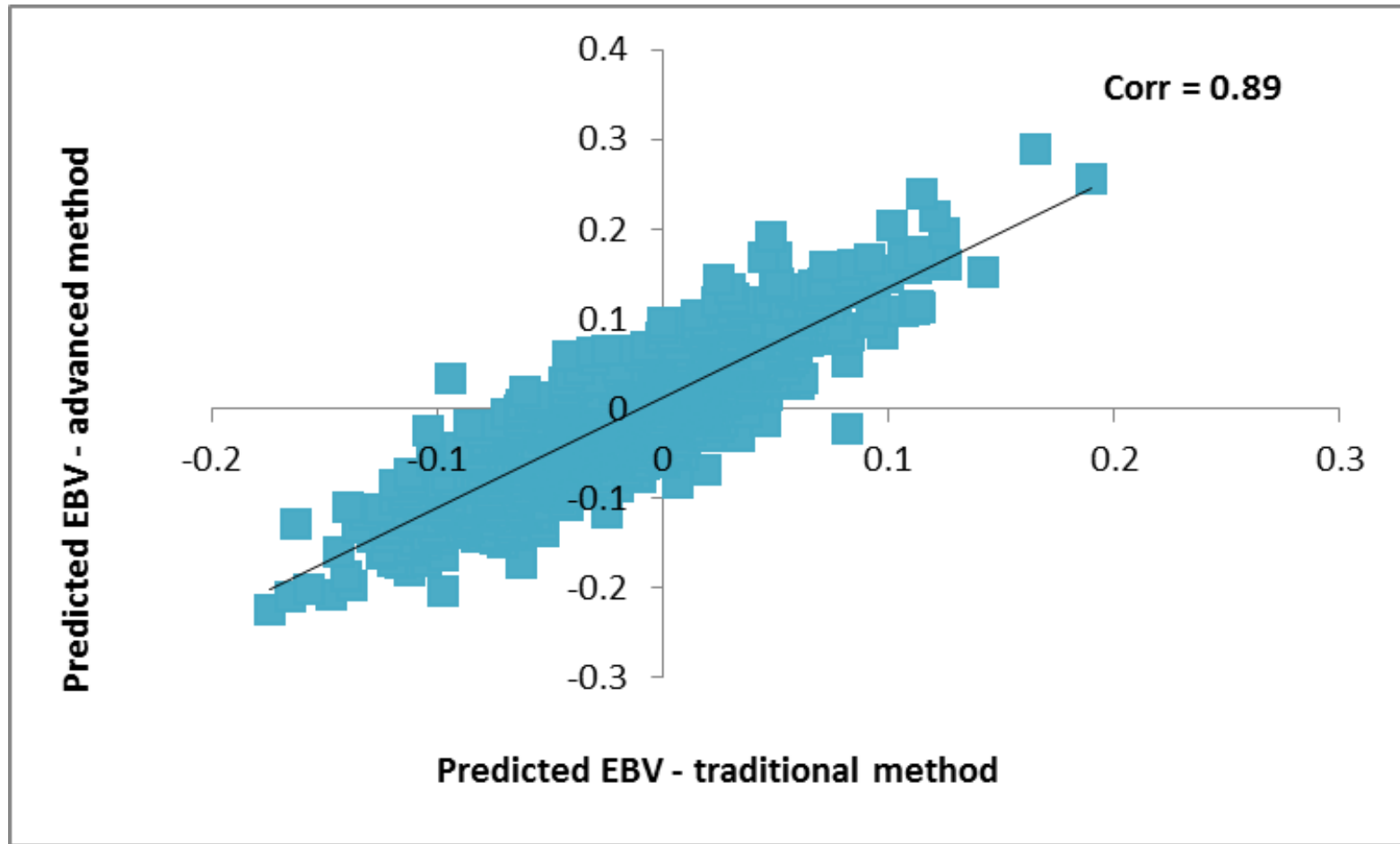Method iterates between the two parts of the model until convergence

Results

Comparison of additive variance

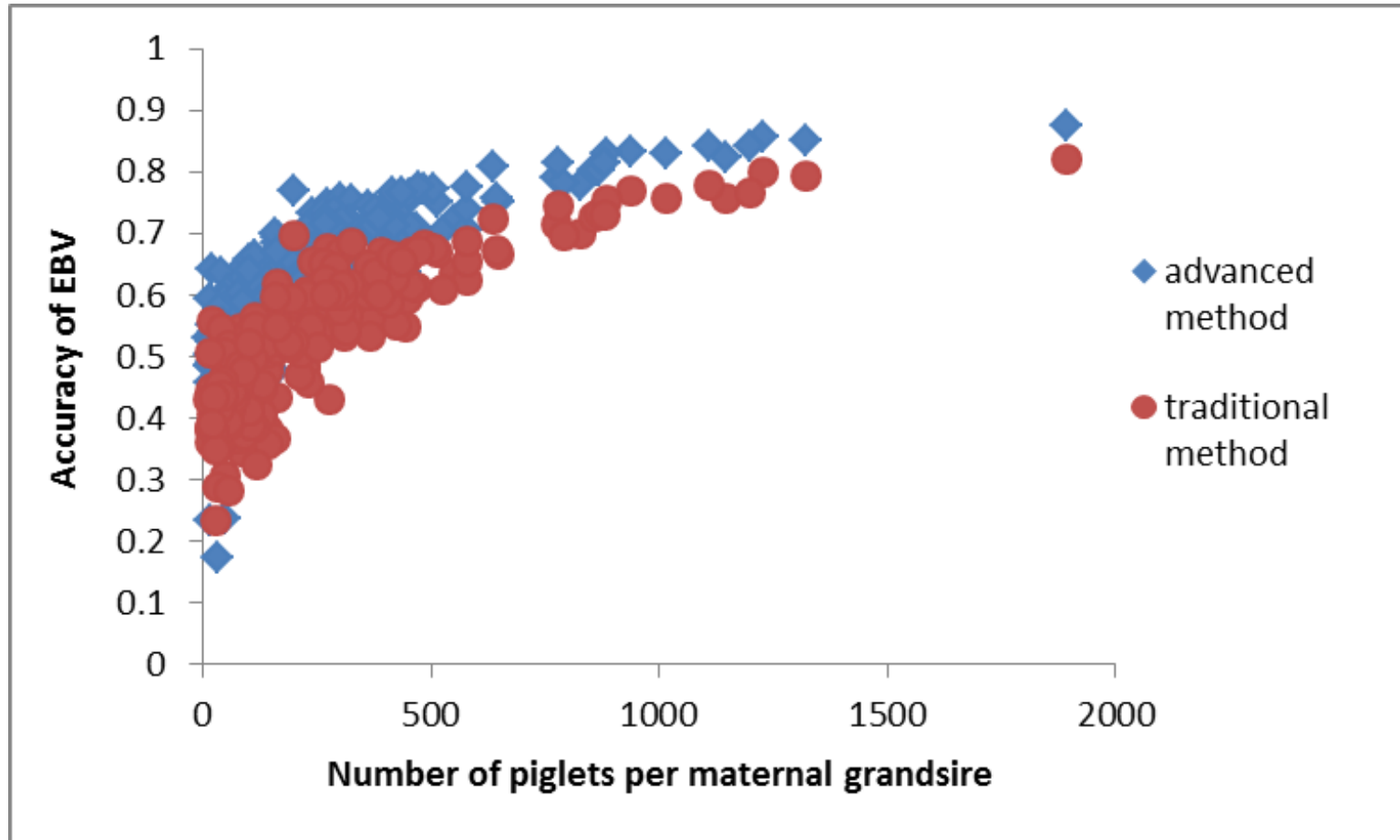|	Traditional	Advanced
σ^2_a	0.036 (0.012)	0.046 (0.006)
$\sigma_a = \mathrm{GCV}$	0.190	0.214

SD of within-litter BW = 0.25
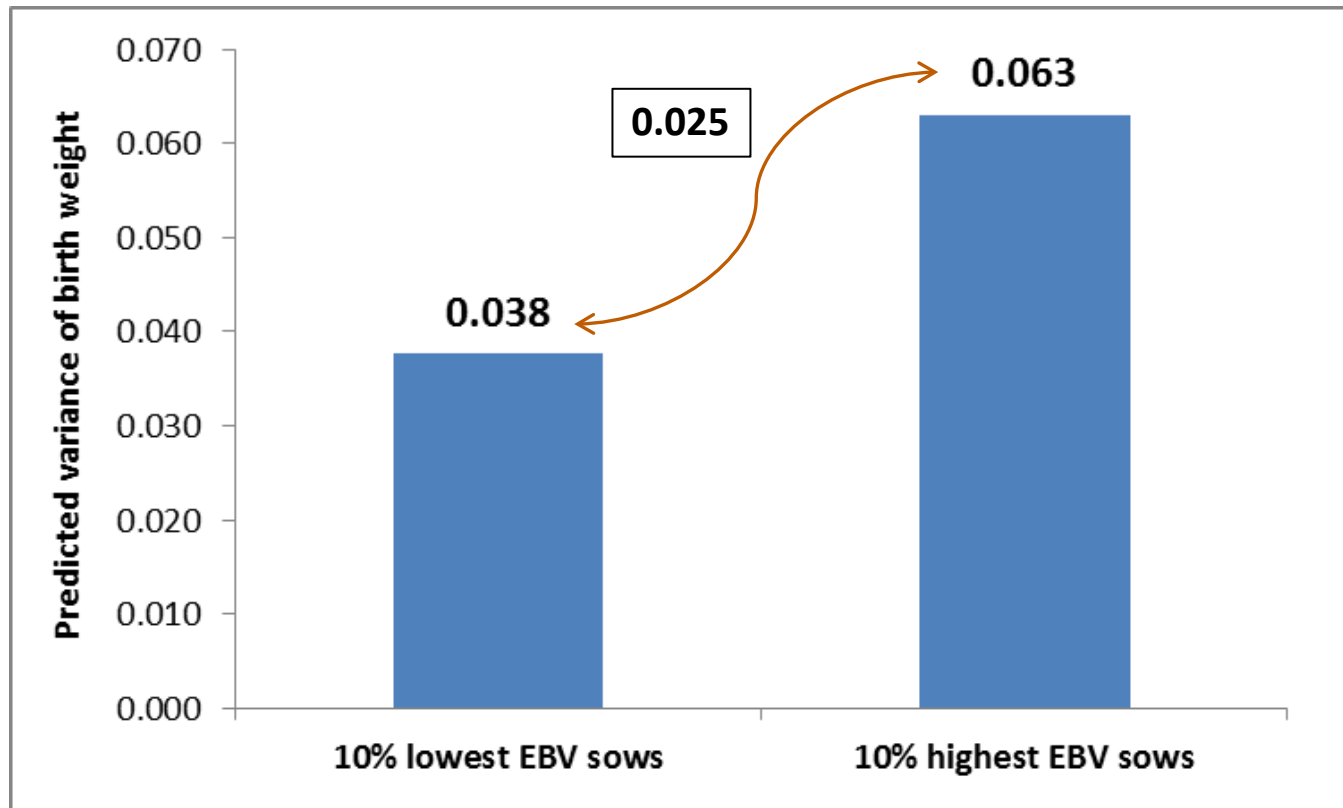
SD of individual BW = 0.31

Comparison of EBV

Accuracy of EBV in both methods

Predicted variance of birth weight in sows with highest and lowest EBV (advanced method)

Conclusions

- Both methods show that BW variability has a genetic

  component

- Estimates of genetic variance are similar

- EBV in both methods have high correlations

- Both methods show similar accuracy of EBV

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Advanced method can be used

to achieve uniformity in traits recorded on individual level

Thank you for your attention!

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