

## **Review Report**

Revilla et al. Quantifying growth perturbations over the fattening period in swine via mathematical modelling

### **Overall comments:**

Authors used large data of pig weight automatically collected and proposed resilience indicator by using statistical models. I appreciate the motivation of using ‘big data’ to create new values that could not be otherwise realized. Also I appreciate that authors paid a significant attention for data quality and conducted multiple quality validations. Overall, the manuscript is interesting and this is a definitely important area.

I am an infectious disease epidemiologist and not a specialist of the production, so please understand I come from a direction that may be slightly different and I may not perfectly understand the validity of this analysis. I appreciate that authors clearly noted that they made an important assumption that all pigs were subjected (on average) to the same perturbation. Nevertheless, I think if this resilience index is going to be applied, it is essential to consider wider factors that would affect pig growth such as disease and climate. Without accounting for these factors, the calculated index values may be biased and misleading. Was it not possible to consider these factors in the analysis? If so, was it due to the limitation in the analytical method, or lack of data, or both? I think discussing these would help readers to clearly understand the limitation and provide useful directions for further improvements. Please find more detailed comments below.

### **Major comments:**

As the authors are clearly mentioning (P16 first paragraph)t, my major comment is that the validity of the assumption that all “animals are subjected to the same perturbations”. I question this assumption from an epidemiologist’s point of view. For example infectious diseases such as swine influenza cause a significant production loss, and given the high infectiousness of this disease, many pigs that are present in a room would be affected if virus is introduced. If these pigs were the same breed, then this will introduce a systematic bias in the ABC parameter. So I would like the authors to add more information on how pigs were managed (I appreciate that there are a lot of descriptions given already in “Station conditions’ section in page 3). For instance, when pigs were introduced, were they a mixture of different breeds? Were different breed pigs put into the same pen and/or room? Pigs came from 7 different birth farms – did pigs come from more than one birth farms at the same time? Any information of vaccination programs and disease histories in these farms and station?

I understand that it was not really the intention of this study to compare the ABC parameter between breeds. Nevertheless, the analysis was carried out to compare parameters between breeds. Therefore it requires a thorough discussion about the difference between breeds was not due to systematic bias such as one breed group was more likely to be affected by a disease or other adverse conditions (e.g. climate). Or were these potential bias already accounted for in Gompertz model? (I see that variables such as birth farm, group of animals that were introduced together etc were included in linear models). If so please add explanations in the manuscript.

I completely agree with the authors' statement in P15 'Understanding the data and identifying the main data quality issues require deep data exploration" so I would very appreciate it if these issues I mentioned would be addressed.

**Minor comments:**

*P5 Two-step mathematical model approach: Paragraph 4*

"The perturbed curve was constructed using the linear interpolation implemented in the "interp1" function in Scilab"

By looking at Figure 2, it seems that perturbed predictions never go above the unperturbed prediction values even though some data points sit above the unperturbed prediction lines. I'm not familiar with this method, so please could you explain whether or not these data points above unperturbed lines were ignored in this interpolation, and if so please explain why this is justifiable when considering resilience.

*P9 "A visual comparison of the AFS measurements dataset of Pie line..."*

Please explain what Figure 1 (and S1/S2) means – readers (including myself) would struggle to interpret this beautiful figure without explanations. Specifically please explain what has (visually) changed before and after filtering and how these changes would affect the results. This would help readers to understand why these filtering was necessary and why specific filtering criteria (values) such as those explained in Page 4 and 5 (e.g. ration > 0.15, more than 10% of the weights measured on AFS\*Group > 3 SD).

*P13 Table 3 and Table 5*

There were a lot of analyses conducted here. Nevertheless, implications of these results were not discussed and just numbers appear in the manuscript. What do these correlations in Table 3 mean and what was the intention of this analysis? The same comment applies to Table 5. Please explain these results and discuss.