We deeply appreciate the time and effort you have spent in reviewing our manuscript (sustainability-633009). Your comments are really thoughtful and helpful, we have carefully taken your kind advices and referee's detailed suggestions into consideration in revising our manuscript. Enclosure is our point-point answer to the referee’s comments. We sincerely hope this revised manuscript will be finally acceptable to be published on Sustainability. Thank you very much for all your helps and looking forward to hearing from you soon.

**Improve the abstract pls.**

*Thank you for your suggestion, we modify the abstract as follows.* **Abstract:** Green and sustainable consumption are more popular among consumers, and recycling has become an important activity to save energy. In a closed-loop supply chain (CLSC), the right alliance can help manufacturers better manufacture green products and make more profits. Therefore, choosing the most suitable alliance partner is critical for manufacturers. This paper considers product greenness and recycling competition, deals with alliance decision in a CLSC that is comprised of a dominant manufacturer, a retailer and a third-party recycler. The Stackelberg game is employed to analyze the optimal decision-making of this supply chain under four different models. Then, after making the optimal alliance decision from the perspective of CLSC profit maximization, we distribute the revenue to the members in the SC to ensure their enthusiasm to participate in the alliance. This further proves that the profit maximization of the CLSC is also the manufacturer's profit maximization. The results show that manufacturer's optimal alliance decisions is related to the degree of recycling competition. When less than the threshold, C alliance is optimal, otherwise, MR alliance is more beneficial for the manufacturer.

*From your research you declare to "use game analysis technology", I suppose this is your methodology, you eventually should explain you methodology strategy in a separate paragraph, if not your study is totally not reliable.*

*Thank you for your insightful suggestion, we explain the Stackelberg methodology at the end of introduction. The details are as follows.* we establish four different alliances, and compare the profits of each agent and CLSC under the two conditions of alliance and non-alliance. In the manufacture–Stackelberg game (As the leader of the supply chain, the manufacturer makes the decision first, and retailer and third-party recycler make the decision according to the manufacturer's decision).

*Different alliance modes also need to be explained.*

*Thank you for your suggestion, we explain the different alliance modes in the title. The details are as follows. And we add some literature related to cosmetics to clarify modes. The details are as follows.* Figure 1 shows the four alliance modes constructed in this paper. In model D, there is no alliance relationship among manufacturer, retailer and third-party recycler. They make independent decisions, which is actually decentralized decisions. In model C, the manufacturer, the retailer and the third-party recycler are in alliance at the same time, and they make decisions together, which is actually a centralized decision. In the model MR, the manufacturer and the retailer make alliance
and joint decision and the third-party recycler makes an independent decision. In the model MC, the manufacturer and the third-party recycler make alliance and joint decision, and the retailer makes independent decision.

You mention in some study points an example of cosmetics producer, I suggest to present some more to clarify modes taken into consideration. Your assumptions for further equations need to be much more, and more clearly, rooted in the literature thesis/findings/arrangements.

Thank you for your suggestion, we add some literature related to cosmetics to clarify modes. For the formula in the assumptions, we explain it and add references.

Finally, shortly explain conclusions. Why your conclusions are important? for whom? what is your contribution to the theory and practice? improve your language, there are many basic but glaring errors.

Thank you for your insightful suggestion, we add our contribution to the theory and practice in the conclusion. The details are as follows.

8. Conclusion

Considering the recycling competition, we construct four different alliances modes (Non-alliance, MR alliance, MC alliance and C alliance) to find the best alliance of manufacturer in a CLSC, and analyze the influence of recycling competition on the choice of manufacturers’ alliances. Through analysis, the following conclusions are as follows.

(1) When the competition intensity is greater than the threshold $\theta^*$, the third-party recycler will exit the recycling market under the mode D and the mode MR. And the mode C is not absolutely optimal. Also, the third-party’s exit are beneficial to manufacturer, retailer and supply chain systems. Therefore, from the perspective of the third-party recycler, when the manufacturer participates in recycling and the recycling competition is relatively big, the recycler should take the initiative to seek the opportunity of alliance with the manufacturer, otherwise, he should not participate in this recycling activity.

(2) When there are two recyclers in the market, the recycling rates of both manufacturer and third-party will decrease as competition intensity increasing. As competition intensity increases and third-party does not withdraw from the recycling market, manufacturer in the MR alliance have a higher recycling rate than that in C alliance. This shows that the advantage of alliance C is only obvious when there is a very small recycling competition, and when there is a large recycling competition, it is more beneficial for manufacturer to maximize profits by alliance with retailers. This provides a theoretical reference for enterprises to seek the best alliance partner in the competition and make profit distribution after the alliance.

(3) When the competition intensity is less than the threshold $\theta^{**}$, the alliance of manufacturer, the retailer and the third-party recycler (C alliance) are the optimal decision; When higher than threshold, the alliance of manufacturer and retailer (MR alliance) is more beneficial. For the managers of the SC, our conclusions provide theoretical support for the integration of the R&D of green products into the daily operation of enterprises. They can take advantage of this idea to actively seek the best alliance partners, maximize the performance of the SC, enhance the competitiveness of enterprises, and finally achieve the sustainable development of the supply chain.

The problems considered in this paper are more practical. Based on recycling competition in
the market, this paper analyzes the optimal decisions in four different alliances and provides a theoretical reference for the selection of manufacturer's optimal alliance.

Generally speaking, the alliance model and profit distribution constructed in this paper help manufacturers make better alliance decisions from the perspective of their own profit and supply chain profit. At the same time, she also enriched the single alliance theory, from the perspective of the supply chain to achieve competition and cooperation. However, there are some limitations in this paper. For example, we assume that green R&D costs are quadratic in greenness, and this is a reference to the previous literature, but the actual relationship between them in real life may not be the case, and we idealize it for convenience. In addition, we only consider single-phase CLSC decision-making. In fact, CLSC decisions tend to be multi-phase in many cases, these will be one of the directions for this article to study further.