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Supply chain coordination contract design: The case of farmer with capital constraints and behavioral preferences

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ABSTRACT

Coordination mechanism design is an important issue in agricultural supply chain. This study investigates agricultural supply chain coordination contracts in the presence of output uncertainty. It considers a two-level supply chain comprising a farmer and a retailer, where the farmer faces capital constraints and shows stockout-averse (SA), waste-averse (WA), or stockout- and waste-averse (SW) preferences. The results show that the retailer order, production input, and supply chain expected utility in the decentralized decision framework are lower than those realized under the centralized decision model; hence, the wholesale price contract cannot coordinate the supply chain. Nevertheless, the designed coordination contract mechanism coordinates the supply chain efficiently and realizes a flexible distribution of benefits between the farmer and the retailer. Furthermore, when the revenue-sharing coefficient meets specific conditions, both the farmer and the retailer achieve a win-win situation. Finally, we verify the coordination contract design using numerical simulations and analyze the effects of SA and WA preferences on decision-making and the supply chain expected utility. This study provides theoretical guidance for the coordination mechanism design of agricultural supply chain with capital constraints and behavioral preferences.

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References

[1] Jian, M., Wang, Y.L. (2018). Decision-making strategies in supply chain management with a waste-averse and stockout-averse manufacturer, *Advances in Production Engineering & Management*, Vol. 13, No. 3, 345-357, doi: 10.14743/apem2018.3.295.
[2] Vanaga, R., Sloka, B. (2020). Financial and capital market commission financing: Aspects and challenges, *Journal of Logistics, Informatics and Service Science*, Vol. 7, No. 1, 17-30, doi: 10.33168/LISS.2020.0102.
[3] Yu, X., Wan, Z. (2020). Supply chain financing model under a new mechanism of bankruptcy guarantee, *Economic Computation and Economic Cybernetics Studies and Research*, Vol. 54, No. 2, 243-262, doi: 10.24818/18423264/54.2.20.15.
[4] Hua, S., Liu, J., Cheng, T.C.E., Zhai, X. (2019). Financing and ordering strategies for a supply chain under the option contract, *International Journal of Production Economics*, Vol. 208, 100-121, doi: 10.1016/j.ijpe.2018.10.008.
[5] Kouvelis, P., Zhao, W. (2018). Who should finance the supply chain? Impact of credit ratings on supply chain decisions, *Manufacturing & Service Operations Management*, Vol. 20, No. 1, 19-35, doi: 10.1287/msom.2017.0669.
[6] Jin, W., Zhang, Q., Luo, J. (2019). Non-collaborative and collaborative financing in a bilateral supply chain with capital constraints, *Omega*, Vol. 88, 210-222, doi: 10.1016/j.omega.2018.04.001.

[7] Shah, N., Shah, P., Patel, M. (2020). Inventory policies with retailer's flexible payment time and customer's fixed credit time for manufacturer-retailer supply chain, *Economic Computation and Economic Cybernetics Studies and Research*, Vol. 54, No. 4, 87-102, doi: 10.24818/18423264/54.4.20.06.

[8] Jin, W., Luo, J., Zhang, Q. (2018). Optimal ordering and financing decisions under advance selling and delayed payment for a capital-constrained supply chain, *Journal of the Operational Research Society*, Vol. 69, No. 12, 1978-1993, doi: 10.1080/01605682.2017.1415643.

[9] Zhao, L., Huchzermeier, A. (2019). Managing supplier financial distress with advance payment discount and purchase order financing, *Omega*, Vol. 88, 77-90, doi: 10.1016/j.omega.2018.10.019.

[10] Zhang, L.-L.., Kim, H.-K. (2020). The influence of financial service characteristics on use intention through customer satisfaction with mobile fintech, *Journal of System and Management Sciences*, Vol. 10, No. 2, 82-94, doi: 10.33168/J SMS.2020.0206.

[11] Hua, S., Liu, J., Cheng, T.C.E., Zhai, X. (2019). Financing and ordering strategies for a supply chain under the option contract, *International Journal of Production Economics*, Vol. 208, 100-121, doi: 10.1016/j.ijpe.2018.10.008.

[12] Jin, W., Luo, J., Zhang, Q. (2018). Optimal ordering and financing decisions under advance selling and delayed payment for a capital-constrained supply chain, *Journal of the Operational Research Society,* Vol. 69, No. 12, 1978-1993, doi: 10.1080/01605682.2017.1415643.

[13] Yang, H., Zhuo, W., Shao, L. (2017). Equilibrium evolution in a two-echelon supply chain with financially constrained retailers: The impact of equity financing, *International Journal of Production Economics*, Vol. 185, 139-149, doi: 10.1016/j.ijpe.2016.12.027.

[14] Yan, N., Sun, B. (2013). Coordinating loan strategies for supply chain financing with limited credit, *OR Spectrum*, Vol. 35, 1039-1058, doi: 10.1007/s00291-013-0329-4.

[15] Liang, Y., Qiao, P.L., Luo, Z.Y., Song, L.L. (2016). Constrained stochastic joint replenishment problem with option contracts in spare parts remanufacturing supply chain, *International Journal of Simulation Modelling*, Vol. 15, No. 3, 553-565, doi: 10.2507/IJSIMM15(3)CO13.

[16] Moon, I., Feng, X.-H., Ryu, K.-Y. (2015). Channel coordination for multi-stage supply chains with revenue-sharing contracts under budget constraints, *International Journal of Production Research*, Vol. 53, No. 16, 4819-4836, doi: 10.1080/00207543.2014.993438.

[17] Feng, X., Moon, I., Ryu, K. (2015). Supply chain coordination under budget constraints, *Computers & Industrial Engineering*, Vol. 88, 487-500, doi: 10.1016/j.cie.2015.08.005.

[18] Shi, J., Du, Q., Lin, F., Li, Y., Bai, L., Fung, R.Y.K., Lai, K.K. (2020). Coordinating the supply chain finance system with buyback contract: A capital-constrained newsvendor problem, *Computers & Industrial Engineering*, Vol. 146, Article No.106587, doi: 10.1016/j.cie.2020.106587.

[19] Xu, X., Cheng, X., Sun, Y. (2015). Coordination contracts for outsourcing supply chain with financial constraint, *International Journal of Production Economics*, Vol. 162, 134-142, doi: 10.1016/j.ijpe.2015.01.016.

[20] Phan, D.A., Vo, T.L.H., Lai, A.N. (2019). Supply chain coordination under trade credit and retailer effort, *International Journal of Production Research*, Vol. 57, No. 9, 2642-2655, doi: 10.1080/00207543.201 9.1567950.

[21] Zhao, L., Li, L., Song, Y., Li, C., Wu, Y. (2018). Research on pricing and coordination strategy of a sustainable green supply chain with a capital-constrained retailer, *Complexity*, Vol. 2018, Article ID 6845970, doi: 10.1155/2018/6845970.

[22] Fang, X., Wang, R., Yuan, F.J., Gong, Y., Cai, J.R., Wang, Y.L. (2020). Modelling and simulation of fresh-product supply chain considering random circulation losses, *International Journal of Simulation Modelling*, Vol. 19, No. 1, 169-177, doi: 10.2507/IJSIMM19-1-CO5.

[23] Cachon, G.P., Lariviere, M.A. (2005). Supply chain coordination with revenue-sharing contracts: Strengths and limitations, *Management Science*, Vol. 51, No. 1, 30-44, doi: 10.1287/mnsc.1040.0215.

[24] Yan, K., Cui, L., Zhang, H., Liu, S., Zuo, M. (2022). Supply chain information coordination based on blockchain technology: A comparative study with the traditional approach, *Advances in Production Engineering & Management*, Vol. 17, No. 1, 5-15, doi: 10.14743/apem2022.1.417.