# Manufacturer-Retailer Competitive Dynamics for National versus Private, Green versus Non-green Products

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# Abstract

Private brands (PB) and green products (GP) have witnessed remarkable growth in recent years. This growing popularity of PBs and GPs leads to their competition with the existing national brands (NB) and non-green (regular) products (NGP), respectively. The purpose of this thesis is to examine these competitions with the help of three essays.

The first essay deals with national versus private brand competition. The study first tries to find conditions under which it is beneficial for the retailer to introduce the competing PB in a two-echelon supply chain with one manufacturer and one retailer. The study then investigates the effect of the competing PB on the retailer's price discount on the NB. The study also attempts to find the optimal decision-making sequence for the retailer to counter the manufacturer's move and maximize her profit. Furthermore, the study explores the scenarios under which the manufacturer can benefit from the competing PB. The study develops a three-stage retailer Stackelberg game and analyzes four cases to address these objectives. The findings of the study suggest that the retailer is always better off with the presence of the PB. Counterintuitively, the manufacturer also benefits from the competing PB when the base demand for the NB products is either very low or very high. The retailer always benefits by sequentially deciding the price first and the advertisement efforts later. The higher degree of substitutability between brands further increases the profit for both players. Surprisingly, the retailer benefits by increasing the price discount on the NB with an increase in the base demand for the PB. These findings provide valuable insights to practitioners for demystifying complexities related to the national versus private brand competition, which further facilitates decision-making and strategizing to optimize profit.

The second essay deals with the competition between green and non-green products under government subsidy and cost-sharing between the manufacturer and the retailer. The study aims to understand how government subsidies and cost-sharing between players influence the production and consumption of green products. The study also examines the impact of government subsidies and cost-sharing on players' decisions and profits. The study develops a two-stage game-theoretic model with the manufacturer being the Stackelberg leader and examines four scenarios based on the presence or absence of government subsidy and cost-sharing. The findings of the study suggest that the government should provide subsidies for green products as it leads to an increase in greenness level and green sales effort, which further leads to an increase in the production and consumption of green products. The findings also

highlight a counterintuitive result that the manufacturer's profit will increase with an increase in the fraction of the cost shared by the manufacturer. The findings further highlight that the manufacturer must not share more cost than the retailer. The findings also suggest that the players should try to increase the quality of green products and put less effort into quality and advertisement for non-green products. This leads to an increase in the greenness level, the green sales effort, and the profit of the manufacturer and the retailer. These findings provide valuable insights to practitioners for promoting the competing green products.

The third essay simultaneously considers national versus private and green versus non-green product competitions. The study argues that the retailer can launch a private brand of either green or non-green products depending on parameters such as cost, demand, nature of the national brand and degree of substitutability between brands. Therefore, the study mainly tries to find the conditions under which the retailer should introduce a private brand of either green or non-green products. The study also examines how the nature of the NB's product, base demand of products, and degree of substitutability influence this decision. The study further examines how the manufacturer can also benefit from the introduction of the PB. The study models a two-stage price competition game and analyzes four cases to address these objectives. The findings suggest that irrespective of the NB's product, the retailer benefits by introducing green products for high values of the base demand for green products when the base demand for the NB's product is higher than the base demand for PB's non-green products. Similarly, irrespective of the nature of its products, the manufacturer benefits from the introduction of PB's green products for high values of the base demand for green products when the base demand for the PB's non-green products is higher than the base demand for NB's products. The findings also highlight that irrespective of the nature of the national brand's product, the manufacturer and the retailer should increase the wholesale and the retail price of NB's product in case of PB's green products in comparison to PB's non-green products if the base demand for PB's non-green products is higher than the base demand for PB's green products. Similarly, irrespective of the nature of the NB's product, the retailer should increase the retailer price of the PB in case the retailer introduces green products in comparison to non-green products if the base demand for PB's green products is higher than the base demand for PB's non-green products. Overall, this thesis contributes to the body of knowledge by developing and analyzing game theory models to explore the competition between national and private brands, as well as green and non-green products, offering valuable managerial insights for retailers and manufacturers.

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