Product rollover strategies in a supply chain

Durable goods manufacturers have been increasing their rate of innovation to retain and expand their consumer base (BCG 2015). Consumers have thus grown to expect constant improvement in durable products. A survey conducted by Nielsen found that 63% of consumers want the manufacturers to offer new products (Nielsen 2015). Polaris industries, a manufacturer of off-road vehicles, which was the top total shareholder return performer in the durables sector from 2010 through 2014, rolled out 31 models in 2014 alone (BCG 2015). In 2017, Samsung unveiled QLED TVs following the launch of SUHD TVs in 2016 (Techradar 2017).

As new models are introduced, manufacturers need to decide how to manage the old models. Should they introduce a new product using a single rollover strategy, in which the old generation of the product is phased out at the launch of the improved one? Or should introduce a new product using a dual rollover strategy, in which the old generation of the product is sold along with the new one? The former strategy prevents the cannibalization of new product sales by the old generation of the product while the latter increases total sales volume through better market segmentation. For the manufacturer, resolving this trade-off is further complicated by the fact that consumers are becoming increasingly sophisticated in their purchasing decisions. Consumers may strategically postpone their purchase of a product when they anticipate that its price will drop when a new version of the product is introduced (WSJ 2010). Given that consumers are forward-looking in their purchasing decisions, how can manufacturers convince them to adopt the early version of a product? The literature presents some answers to these questions in certain settings. Researchers have found that a manufacturer who sells her product through an integrated supply chain is better off publicly committing to phasing out the old generation of a product (i.e., committing to a single rollover) upon introducing a new generation of the product (Levinthal and Purohit 1989). In essence, this commitment takes away the consumers’ postponement incentive and helps counter the consumers’ strategic behavior, improving the manufacturers’ profitability. Yet, in practice manufacturers rarely make such a public commitment to phasing out the old generation of their products when introducing a new generation.

In this paper, we show that supply chain relationships may be part of the reason why manufacturers are reluctant to committing to phasing out the old generation of their products. When the manufacturer sells her product through a profit-maximizing retailer, the decentralization of the decisions and the ensuing double marginalization affect the incentives in place. Double
marginalization refers to the distortion in prices, quantities and profits in a supply chain when both the manufacturer and the retailer apply a mark-up to maximize their own profit (Spengler 1950). We find that not committing to a single rollover may alleviate the double marginalization and improve the manufacturer’s and retailer’s profits, compared to committing to a single rollover. Interestingly, we find that in some cases, the manufacturer and the retailer are better off when the manufacturer does not commit to a single rollover, even when the manufacturer ends up implementing a variant of a single rollover strategy.

We consider a supply chain consisting of one manufacturer and one retailer selling a durable product over two time periods. The manufacturer offers the first version of the product (“base product”) in the first time period, and an improved version of the product (“improved product”) in the second time period through the retailer. At the beginning of each time period, the manufacturer selects the wholesale price for each product sold in that period. The retailer then selects the order quantity of the product. Consumers are heterogeneous in their valuation of the products. They are also strategic: they decide whether to make a purchase in the first period or in the second period (or not at all) so as to maximize their utility. We characterize the equilibrium under both a commitment and a no-commitment strategy. Under the commitment strategy, the manufacturer publicly commits to phasing out the base product upon introducing the improved product (i.e., she commits to a single rollover). Under the no-commitment strategy, the manufacturer does not make any such commitment, and hence, may implement either a single or a dual rollover.

We find that the results that are valid when the supply chain is centralized may no longer hold when the supply chain is decentralized. In particular, committing to phasing out the base product may hurt the manufacturer’s and the retailer’s profits. When the cost of producing the improved product is either moderately low or sufficiently high, the manufacturer earns higher profits by not committing to phasing out the base product when introducing the improved one. Similarly, when the cost of the improved product is sufficiently high, the retailer earns a higher profit under the no-commitment strategy. These findings may help explain why manufacturer commitment to phasing out the old generation of a durable product is not commonly observed in practice.

In addition, we find that when the no-commitment strategy is optimal for the manufacturer, either a single or a dual rollover may arise in equilibrium. In both cases, the no-commitment
strategy alleviates the double marginalization problem in the sales of the base product. In a dual rollover, the opportunity to sell over two time periods allows the manufacturer to set lower wholesale prices for the base product, and hence, alleviates double marginalization. In a single rollover, the dynamics that lead to higher profits under no-commitment are more intricate. The possibility that the manufacturer can sell the base product in the second period boosts the retailer’s first-period order of the base product, easing the double marginalization in base-product sales. In this case, the retailer increases his order quantity in the first period to restrain himself from selling the base product in the second period.

Finally, we investigate the effect of the improved product cost on profits. As expected, we find that a higher cost of the improved product reduces the manufacturer’s and retailer’s profits under the commitment strategy. In contrast, and counter to intuition, under the no-commitment strategy, a higher cost may increase the manufacturer’s and retailer’s profits. Therefore, in some cases the manufacturer and the retailer may be better off if the manufacturer avoids cost-cutting opportunities for the improved product.

References


