Purchase history and product personalization

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The trade-off between product personalization and price discrimination is at the center of the debate about the use of consumer data. Whereas firms use consumer data for product personalization, allowing the firm to better meet consumers’ needs, consumer data in the form of purchase histories is also used for personalized pricing. Policy makers note that rich product lines may compensate for the costs of personalized pricing. Absent from this debate is that consumer data in the form of purchase histories is endogenously determined.

On the one hand, the data is selected as it reflects the consumer’s trade-off between a better product match and the costs of price discrimination. On the other hand, the firm designs which products the consumer can choose from, thereby controlling how informative purchase histories may be about the consumer’s preferences.

In this paper, we show that the endogenous nature of consumer data in the form of purchase histories coupled with ratcheting forces can lead to narrow product lines in the presence of price discrimination. We study a dynamic mechanism design model in the presence of limited commitment, in which a consumer buys a good of variable quality from an upstream firm, followed by an indivisible good from a downstream firm.

Vertical integration. We first derive the solution for the case in which the upstream firm can design both the upstream product line and the downstream allocation under commitment as would be the case if the firms were (vertically) integrated. We show that the product line is determined independently of the downstream allocation and because of decreasing returns to quality, the upstream firm offers a complete product line.

Availability of purchase histories. We then characterize the upstream firm’s optimal mechanism when the downstream firm observes the consumer’s purchase history before choosing the period-2 mechanism, which must be optimal given this information. Anticipating the possibility of downstream price discrimination, the upstream firm offers a narrower product line than that under vertical integration. By curtailing the range of products it offers to the consumer, the upstream firm obfuscates how much information can be gleaned about the consumer, thereby softening price discrimination downstream.

Privacy as a remedy. Finally, we show that if the upstream firm designs both the product line and the information available to the downstream firm, then the upstream firm offers the vertical integration product line and offers the consumer full privacy. That is, a carefully designed privacy policy alleviates product line distortions, increases upstream profits, but has ambiguous effects on consumer welfare as a narrow product line may exhibit both downward and upward distortions in quality.

Methodology. We characterize the optimal product line by marrying elements of mechanism design and information design relying on the revelation principle for mechanism design with limited commitment in Doval and Skreta (Econometrica, 2022) and its extension to Markovian settings.

Full paper available at https://arxiv.org/abs/2103.11504

CCS Concepts: • Applied computing → Economics; • Theory of computation → Algorithmic game theory and mechanism design.

Additional Key Words and Phrases: mechanism design, limited commitment, information design, privacy

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