

Incorporating Label Image Information into Hedonic Wine Price Models: Machine Learning and ChatGPT-Assisted Image Analysis

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Abstract

This paper examines whether the visual information conveyed by wine labels and packaging helps explain wine prices beyond the traditional determinants emphasized in the hedonic literature. While previous research has shown that factors such as origin, vintage, alcohol content, expert ratings, and reputation signals explain a substantial share of price variation, less attention has been paid to the economic role of the visual appearance of the product itself. In differentiated markets such as wine, however, labels and bottle design may influence consumer perceptions and operate as signals of quality, style, and market positioning. Against this background, the paper asks whether visual attributes extracted from product images provide additional explanatory power and contribute to a better understanding of price formation in the wine market. The empirical analysis is based on a sample of 5,485 red and white wines from Spain, France, and Italy. The study first estimates benchmark hedonic models using the covariates most commonly considered in the literature. It then extends these specifications by incorporating visual information derived from bottle and label images through an automated procedure assisted by artificial intelligence. This allows the inclusion of attributes related to packaging and label design in a systematic and scalable way. In addition, the analysis employs Multivariate Adaptive Regression Splines (MARS) in order to identify possible non-linear relationships and threshold effects while preserving a degree of interpretability that is especially valuable in applied economic research. Preliminary findings indicate that the conventional hedonic determinants remain central to the explanation of wine prices, but also suggest that visual information contributes additional explanatory value. The inclusion of image-based attributes improves model performance and points to the relevance of certain label and packaging features as economically meaningful signals. The results also suggest that the relationship between some product characteristics and price is not strictly linear, which supports the use of more flexible modelling strategies. The paper highlights the potential of multimodal AI tools to enrich hedonic price models and offers new evidence on the role of visual cues in the valuation of differentiated products.

Keywords: hedonic pricing, wine labels, machine learning, MARS, image analysis

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