

Retailer-Defined Gender Taxonomy and Listed-Price Associations on a Digital Retail Platform: Evidence from Sephora

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Abstract. This study examines how Sephora's online platform organizes products through its retailer-defined Women and Men categories, and whether this classification is related to listed fragrance prices. The study uses 8,494 product listings to describe the platform's overall taxonomy and then examines 974 Women- and Men-categorized fragrances using nested OLS models with HC3 robust standard errors. The models control bottle size, fragrance concentration, brand, customer rating, and product popularity. The unadjusted comparison shows that Women-categorized fragrances have lower listed prices but are generally sold in smaller bottles. After controlling bottle size, the direction of the association reverses. In the preferred model, Women categorization is associated with approximately 19.3% higher listed prices. The main robustness checks produce estimates of about 12% to 19%. These findings suggest that price patterns depend on product comparability and platform taxonomy, but do not establish discriminatory pricing. Future research should compare multiple retailers, use more balanced, closely matched samples, and track prices and taxonomies over time.

Keywords: pink tax, gender-based pricing, digital retail platforms, product taxonomy, fragrance pricing

1. Introduction

On digital beauty retail platforms such as Sephora, products are organized through taxonomies, labels, filters, and category pages. These functions affect how products are found and which alternative products appear comparable [1, 2]. On Sephora, the Women and Men categories make gender a part of the browsing structure, placing products into gender-defined comparison sets alongside other distinctions based on price, size, brand, or product format.

This form of gender positioning is also relevant to the Pink Tax debate. Some studies report higher prices for products marketed to women, while others find that the price gap narrows when package size, formulation, and other product characteristics are considered [3, 4]. Part of this disagreement reflects differences in research design. Broad comparisons across product ranges show how markets are organized but often compare products with different characteristics. Closely

matched comparisons improve comparability but may ignore the role of retailer categories in determining which products are presented together.

This study examines product listings from Sephora's online platform. The taxonomy is highly asymmetric: the Women category consists entirely of fragrances, while the Men category includes both fragrances and non-fragrance products from Sephora's wider Men section. The analysis therefore adopts a two-stage approach. The first stage describes the distribution of explicit gender categories across the platform and the price structure associated with them. The second examines Women- and Men-categorized fragrances in a more comparable setting, controlling for bottle size, fragrance concentration, brand, customer rating, and popularity. Together, these stages address two questions: how Sephora's explicit Women and Men categories are distributed across the platform and whether Women categorization is associated with listed fragrance prices after relevant product characteristics are considered.

The study makes three contributions. It treats retailer-defined taxonomy as part of digital information architecture rather than a neutral labelling system. Methodologically, it distinguishes platform-level assortment analysis from controlled within-category analysis. Finally, it shows how conclusions in the Pink Tax debate may vary with the level of comparison and the degree of product heterogeneity. The results are therefore interpreted as conditional associations rather than causal evidence of discriminatory pricing or a Pink Tax between otherwise identical products.

2. Literature review

The literature review covers three related areas: platform information architecture and gendered product positioning; the Pink Tax debate and the role of product heterogeneity in price comparisons; and fragrance as a context in which retailer-defined gender categories are especially visible.

2.1. Platform architecture and gendered product positioning

Digital retail platforms organize large product assortments through information architectures including taxonomies, labels, navigation systems, and searchable attributes. Information architecture refers to the organization and labelling of information environments to support finding and understanding. In e-commerce, product taxonomies determine how products are grouped, retrieved, and connected to browsing and recommendation systems. Standardized information structures help coordinate products and actors across e-commerce ecosystems [5]. Platform classification therefore affects how products become visible and comparable.

These structures also influence which products are presented together and which comparisons are easier to make. Online marketplaces encourage sequential movement between related and competing brands, suggesting that browsing paths may affect the alternatives users consider [6]. Digital interfaces also function as choice environments, and their design can influence users' judgments and decisions [7]. When Women and Men labels are included in the retail taxonomy, gender positioning becomes part of the platform's information architecture rather than remaining solely a brand-level message.

Positioning links platform structure and product meaning. Product attributes, uses, user groups, product classes, and competitors are major bases for positioning [8]. Gender can therefore serve as a basis for user-oriented positioning. Products may carry symbolic meanings beyond their functional utility [9]. For example, consumers tend to associate curved packaging with feminine brand images and angular packaging with masculine ones [10]. Gender positioning can therefore be expressed both through product design and platform labels.

Once gender cues are formalized as platform categories, positioning is shaped not only by brands but also by retailers through product placement and the alternatives presented together. Butler's theory of gender performativity suggests that gender categories are reproduced through repeated social practices rather than simply reflecting fixed distinctions [11]. Applied to digital retail, repeated binary classification may make gendered product categories appear normal or inherent. Gender-neutral marketing can reduce consumers' reliance on binary gender stereotypes when evaluating product attributes. Demographic targeting may be perceived as less fair when differentiation is based on characteristics regarded as irrelevant or uncontrollable [12]. Diversity and marketplace justice are also central concerns in inclusive marketing [13].

This literature suggests that platform taxonomies organize comparison sets and that gender labels operate as positioning attributes in them. However, gender positioning may also coincide with differences in size, design, brand identity, function, and format. Existing research has paid limited attention to how retailer-defined gender categories structure product assortments and comparison sets on digital retail platforms.

2.2. Pink Tax, product heterogeneity, and levels of comparison

The Pink Tax broadly refers to gender-related price differences in products marketed to women, although narrower definitions limit the term to price differences between otherwise comparable or equivalent products. This study engages with the broader debate but does not test for a Pink Tax between otherwise identical products. An analysis of more than 3,000 personal-care products identifies price premiums for women-targeted products in several categories [3]. The same study also identifies differences in package size, product variety, and functional positioning between women's and men's products. This suggests that observed price gaps may coexist with substantial product differentiation.

A contrasting approach examines whether a women's price premium remains when products are made more directly comparable. Women- and men-targeted personal-care products often differ in formulation. Comparisons of products with similar ingredients find no systematic women's price premium [4]. This evidence therefore cautions against treating every observed average gap as evidence of discriminatory pricing between equivalent products.

The disagreement concerns not only the findings but also what each analytical approach is designed to estimate. Product size, formulation, packaging, and format may be included as control variables when the aim is to isolate a gender-related price association. However, these characteristics may also form part of gendered product positioning. Existing studies tend to rely either on broad but heterogeneous assortment comparisons or on narrow-matched-product designs. Less attention has been paid to approaches that combine platform-level assortment structure with controlled analysis within a product category. However, neither approach can establish discriminatory intentions or effects on consumer behavior alone.

2.3. Fragrance context, research gap, and questions

Fragrance provides a useful setting for a within-category analysis because products are commonly organized through Women and Men categories, while listed prices also depend on bottle size, concentration, brand, and format. Online fragrance descriptions use language and sensory associations to construct gender identities [14]. This makes fragrance relevant to both symbolic positioning and price comparison.

Despite this relevance, retailer-defined gender taxonomies in fragrance remain underexamined. Existing studies also rarely combine a platform-level description of gendered assortment structure with a controlled price analysis within the same product category.

This study addresses these gaps through the following research questions:

RQ1: How are Sephora's explicit Women and Men categories distributed across its platform taxonomy, and what descriptive price patterns accompany this distribution.

RQ2: Within fragrance, is classification into Sephora's Women category associated with listed prices after accounting for bottle size, fragrance concentration, brand, customer rating, and popularity.

3. Data and methodology

3.1. Dataset

This study uses the file from the publicly available Sephora Products and Skincare Reviews dataset on Kaggle [15]. According to the dataset documentation, product information was scraped from Sephora's online store in March 2023. The original file contains product names, brands, listed prices, product sizes, ratings, popularity, ingredients, and Sephora's hierarchical product categories. After removing duplicate listings, the final data set contains 8,494 products. The data provides a cross-sectional snapshot of Sephora's product assortment. They do not capture promotions, dynamic pricing, seasonal changes, or production costs, and they cannot establish the temporal ordering between product positioning and price. The analysis therefore estimates conditional associations rather than causal effects.

3.2. Platform-based gender categorisation

The original dataset does not contain a predefined target-gender variable. Gender categorization was therefore constructed from Sephora's hierarchical taxonomy. Products placed in the platform's Women category were coded as Women; products in the Men fragrance category or Sephora's wider Men section were coded as Men; all remaining products were classified as Other. This measure captures the retailer's organization of products rather than consumers' gender identities or any intrinsic property of the products. Throughout the paper, gender categorization refers to Sephora's taxonomic assignment, gender positioning refers to its role in marketing and information architecture, and gender-price association refers to the statistical relationship estimated in Section 4.

The resulting groups are 875 Women listings, 195 Men listings, and 7,424 Other listings. This imbalance reflects Sephora's observed platform taxonomy rather than the study's sampling procedure. All Women listings are fragrances, whereas the Men group contains 135 fragrances and 60 products from Sephora's wider Men section. The unequal group sizes therefore reflect differences in the scope and composition of the platform's explicit gender categories. Because the dataset does not explain why Sephora adopted this assortment or classification structure, the imbalance should be treated as a feature of the March 2023 platform snapshot rather than as evidence of differences in consumer demand. The Other group is a heterogeneous residual category containing products outside Sephora's explicit Women and Men paths. The platform-wide analysis therefore describes assortment patterns rather than estimating an independent gender effect. No platform-wide regression is conducted because the three groups are not comparable cross-category groups.

3.3. Variable measurement and empirical strategy

The dependent variable is listed price in US dollars. Raw listed prices are used for descriptive analysis. Because prices are strongly right skewed, fragrance regression models use the natural logarithm of listed price. Women categorization is the main independent variable, with Men as the reference group (As shown in Table 1).

Table 1. Variable definitions and measurement

Variable	Measurement	Role
Listed price	Listed price in US dollars; log-transformed in regression	Dependent variable
Women categorization	1 = Women fragrance; 0 = Men fragrance	Main independent variable
Bottle size	Volume in mL; log-transformed	Control variable
Fragrance concentration	EDP, EDT, Parfum/Extrait, Cologne, Mist, or Other	Control variable
Customer rating	Product rating reported in the dataset	Control variable
Popularity	Log of one plus product "loves"	Control variable
Brand	Brand fixed effects	Control variable

Popularity is measured as the natural logarithm of one plus the number of products "loves". Bottle size is standardized in milliliters where a valid volume is available and entered as log milliliters. Fragrance concentration is classified as Eau de Parfum, Eau de Toilette, Parfum/Extrait, Cologne, Mist, or Other/Unspecified. Customer rating and popularity are treated as observed product covariates rather than exogenous confounders because they may partly reflect consumer responses after a product is listed. Their coefficients are therefore not interpreted causally. The gender variable is based only on the retailer taxonomy used in the reported analysis; no separate unisex-text indicator is introduced.

Before analysis, bottle size, fragrance concentration, and mini/travel status were cleaned and standardized. The fragrance regression sample retained only Women- or Men-categorized listings with a positive bottle-size value and non-missing rating and popularity information. The taxonomy initially contained 1,010 Women- or Men-categorized products. After these requirements were applied, 974 products remained: 843 Women fragrances and 131 Men fragrances. Log bottle size was calculated for the main regression, while log price per 100 mL was calculated for the unit-price robustness analyses. The common-brand robustness sample was restricted to brands containing both Women- and Men-categorized fragrances.

Four nested ordinary least squares models are estimated. F1 includes only Women categorization. F2 adds log bottle size, allowing the role of package size in the unadjusted Women–Men price difference to be examined separately. F3 further includes customer rating, log popularity, and fragrance-concentration fixed effects. F4 adds brand fixed effects and serves as the preferred specification.

The fragrance sample contains 68 brands, but only 20 contain both Women- and Men-categorized fragrances. In the brand fixed-effects model, the Women coefficient is identified from these common brands, which limits the extent of direct within-brand comparison. The main models use HC3 robust standard errors to address heteroskedasticity. Standard errors clustered by brand are reported as a supplementary check for within-brand error correlation. Because the identifying variation for the Women coefficient is concentrated in 20 common brands, the clustered results are interpreted cautiously.

Four principal robustness checks assess whether the preferred result depends on sample composition or measurement. These checks restrict the sample to common brands, exclude mini and travel-size products, use log price per 100 mL as the dependent variable, and exclude products above the 99th percentile of listed price. Two additional checks remove rating and popularity from the preferred model and re-estimate F4 using standard errors clustered by brand.

4. Results

4.1. Platform-wide descriptive statistics

Table 2 shows substantial descriptive differences across the three platform categories. Women-categorized products have the highest mean listed price (\$96.89), followed closely by Men-categorized products (\$93.45), while the mean price of other products is considerably lower (\$45.23). However, Men products have the highest median price (\$99.00), compared with \$90.00 for Women products and \$34.00 for other products. Prices are more dispersed among Women-categorized products (SD = \$68.31) than among Men-categorized products (SD = \$52.28). The maximum price of \$1,900 in the other group further reflects the heterogeneity of this residual category.

Table 2. Descriptive statistics of listed prices by platform gender category

Other	7,424	45.23	34.00	48.44	3.00	1900.00
Men	195	93.45	99.00	52.28	10.00	295.00
Women	875	96.89	90.00	68.31	15.00	395.00

Notes: Prices are listed in US dollars. Other includes products outside Sephora's explicit Women and Men taxonomy paths and is therefore a heterogeneous residual category. The data reflects a March 2023 cross-sectional snapshot.

4.2. Fragrance descriptive comparison

As shown in Table 3, within fragrance, men products have higher unadjusted listed prices, with a mean of \$120.05 compared with \$96.96 for women products. However, bottle size differs substantially. The median Men bottle is 100 mL, twice the median size of 50 mL for Women fragrances. Women fragrances therefore have a much higher median price per 100 mL (\$230.00 versus \$132.22). These descriptive results show why listed price alone is not sufficient for comparing Women and Men fragrances when bottle sizes differ.

Table 3. Descriptive statistics for women- and men-categorized fragrances

Category	N	Mean price	Median price	Mean size (mL)	Median size (mL)	Mean price/100 mL	Median price/100 mL
Men	131	120.05	115.00	86.49	100.00	154.66	132.22
Women	843	96.96	90.00	48.75	50.00	282.60	230.00

Notes: The table reports the 974-product regression sample (843 Women and 131 Men) after excluding observations without a positive bottle-size value or complete rating and popularity information. Prices are listed in US dollars.

4.3. Adjusted fragrance models and robustness checks

The coefficient changes sign when bottle size alone is introduced. In F1, Women-categorized fragrances have approximately 34.2% lower unadjusted listed prices than Men-categorized fragrances ($\beta = -0.419$, $p < .001$). After log bottle size is added in F2, the coefficient becomes positive and statistically significant ($\beta = 0.118$, $p = .001$), corresponding to approximately 12.5% higher listed prices. The model R^2 also increases from 0.042 to 0.641. As shown in Table 4, the reversal in the coefficient and the substantial improvement in model fit suggest that the bottle-size differences account for much of the lower unadjusted price of Women fragrances.

Table 4. Fragrance log-price models with HC3 robust standard errors

Variables	F1	F2	F3	F4
Women (Men reference)	-0.419*** (0.036)	0.118** (0.036)	0.134*** (0.037)	0.177*** (0.034)
Rating	—	—	-0.078* (0.037)	0.014 (0.033)
Log popularity	—	—	0.032*** (0.008)	-0.009 (0.007)
Log size (mL)	—	0.581*** (0.018)	0.592*** (0.019)	0.608*** (0.016)
Concentration FE	No	No	Yes	Yes
Brand FE	No	No	No	Yes
Observations	974	974	974	974
R^2	0.042	0.641	0.696	0.885
Adjusted R^2	0.041	0.641	0.693	0.875

Notes: Dependent variable is logging listed price. HC3 robust standard errors are reported in parentheses. Men is the reference group. * $p < .05$; ** $p < .01$; *** $p < .001$.

F3 further controls customer rating, popularity, and fragrance concentration. The Women coefficient remains positive and increases slightly to 0.134 ($p < .001$), equivalent to approximately 14.3%. F4 additionally includes brand fixed effects and serves as the preferred model. Women categorization is associated with approximately 19.3% higher listed prices ($\beta = 0.177$, HC3 SE = 0.034, $p < .001$; 95% CI [0.109, 0.244]). The confidence interval corresponds to an approximate difference of 11.5% to 27.7%. Rating and popularity are no longer statistically significant after brand fixed effects are introduced, suggesting that their estimated relationships with price are sensitive to adjustment for differences across brands. Because brand fixed effects account for average price differences between brands, the positive Women coefficient cannot be explained solely by Women fragrances being concentrated in more expensive brands. However, F4 compares products that are similar in observed characteristics rather than otherwise identical.

As shown in Table 5, The preferred result remains positive when the sample is restricted to common brands (13.7%), when mini and travel products are excluded (11.6%), and when products above the 99th percentile of listed price are removed (18.2%). Across these principal checks, the conditional difference is approximately 12% to 19%.

Table 5. Robustness checks for fragrance analysis

Specification	Coefficient	HC3 SE	p-value	Approx. difference	N	R^2
Common brands	0.128	0.046	0.006	13.7%	406	0.794
Exclude mini/travel	0.110	0.038	0.004	11.6%	683	0.824

Table 5. (continued)

Unit-price model	0.494	0.053	< .001	63.9%	974	0.540
Trim top 1% price	0.167	0.034	< .001	18.2%	965	0.889

Notes: The common-brand, no-mini/travel, and trimmed-price specifications include rating, log popularity, log bottle size, fragrance-concentration fixed effects, and brand fixed effects. The unit-price specification uses log price per 100 mL as the dependent variable and includes rating, log popularity, concentration fixed effects, and brand fixed effects; log bottle size is omitted because size is incorporated into the dependent variable. The unit-price model produces a larger estimate of 63.9%, consistent with the higher price per 100 mL shown in Table 3. However, this result should be interpreted cautiously. Women fragrances are generally sold in smaller bottles, which may have higher prices per milliliter. The estimate may also reflect differences in packaging, gift sets, or product positioning. The unit-price result is therefore treated as supplementary rather than primary evidence.

Two additional checks examine model specification and statistical inference. Excluding rating and popularity produces a similar Women coefficient of 0.165 (HC3 SE = 0.033, $p < .001$), equivalent to approximately 18.0%. Re-estimating F4 with standard errors clustered by brand leaves the coefficient unchanged at 0.177 and increases the standard error to 0.039; the association remains statistically significant ($p < .001$; 95% CI [0.100, 0.254]). These checks indicate that the preferred finding is not dependent on the inclusion of rating and popularity or on the use of HC3 rather than brand-clustered standard errors.

5. Discussion

The findings show that gender-price relationships depend on the level of comparison. At the platform level, Women and Men products have similar average prices but come from very different parts of Sephora's assortment. Women appear only within fragrance, Men includes fragrance and a small number of other products, and Other covers the rest of the beauty catalogue. A platform-wide regression would therefore mix differences in product composition with gender positioning and would be difficult to interpret for a single gender coefficient.

The within-fragrance comparison provides a clearer picture. Men fragrances have higher unadjusted listed prices, but they are also sold in much larger bottles. When bottle size is controlled, the Women coefficient changes from -0.419 to 0.118 , or from approximately 34.2% lower to 12.5% higher listed prices. The increase in R^2 from 0.042 to 0.641 further indicates that bottle size explains much of the initial price difference. After rating, popularity, concentration, and brand are added, the association remains positive and reaches approximately 19.3% in the preferred model.

This pattern is consistent with evidence that gendered personal-care markets combine category-specific price differences with systematic variation in package size and product differentiation. However, the remaining coefficient may still reflect unobserved differences in design, formulation, exclusivity, product line, or demand. It should therefore be understood as a conditional association rather than the independent effect of a Women label.

Butler's theory of gender performativity offers one way of interpreting the platform taxonomy [11]. Repeated use of Women and Men categories may help make gendered product boundaries appear normal or natural within the shopping environment. The data cannot show whether these categories change consumers' identities, preferences, or purchasing decisions. What they do show is that binary gender labels were built into Sephora's navigation and assortment structure, creating different comparison contexts. The platform therefore did more than display positioning created by brands; it also reinforced that positioning through its information architecture.

5.1. Pink tax debate

The two levels of analysis help explain why studies of the Pink Tax may reach different conclusions. The size-only model shows that simple Women–Men comparisons are highly sensitive to package format. Women fragrances have lower unadjusted listed prices, but the association reverses once bottle size is controlled for. The unit-price model produces an even larger positive difference. The interpretation therefore depends on both the price measure used and how closely the products being compared are matched.

However, controlling observable product characteristics does not remove the association. In the preferred model and the main robustness checks, Women categorization remains associated with approximately 12% to 19% higher listed prices. This is consistent with studies that identify gender-related price patterns, but it does not show that women pay more for an equivalent product. The data do not include costs, consumer demand, or perfectly matched Women and Men versions of the same fragrance. The study therefore makes a more limited claim. Platform structure and product differences explain part of the observed price pattern, but a conditional gender-price association remains within fragrance.

5.2. Digital platform and fairness implications

The findings show how retailer taxonomy shapes the product sets available for comparison. Sephora's Women and Men paths do more than describe products. They organize browsing and make certain comparisons more immediate than others. The study cannot show whether these categories change consumer decisions or lead to comparison errors because it does not observe clicks or purchases. However, the two paths contain products with different bottle-size distributions and assortment compositions, making their listed prices difficult to compare directly.

Platforms could address this issue by offering gender-neutral browsing routes, cross-category recommendations, and clearer price-per-milliliter information alongside concentration and bottle size. This is consistent with evidence that demographic targeting can raise fairness concerns when consumers perceive the basis for differential treatment as irrelevant or uncontrollable [12]. It also aligns with broader concerns about diversity and marketplace justice in inclusive marketing [13].

These changes would not require removing Women and Men categories. Instead, they could provide consumers with additional ways to browse and compare products beyond binary gender labels. Brands should also present bottle size and concentration clearly, particularly when smaller formats have higher unit prices. For consumers, the practical implication is to compare volume, concentration, and product format rather than relying only on the listed price.

5.3. Limitations and future suggestions

The study uses data from a single retailer and a single snapshot taken in March 2023. It therefore cannot examine changes over time or determine whether similar patterns appear on other platforms. The dataset also does not include promotions, production costs, search rankings, recommendation exposure, clicks, purchases, consumer demand, or willingness to pay. It is therefore not possible to establish the temporal relationship between retailer taxonomy, product positioning, and listed price.

The imbalance between the Women- and Men-categorized fragrance samples is another limitation. As discussed in Section 3.3, relatively few brands contain products in both categories. This restricts direct Women–Men comparisons and concentrates the identifying variation in a limited

number of common brands. Although the common-brand and brand-clustered results remain positive, they do not remove this limitation.

Unobserved product differences may also affect the estimates. The dataset does not consistently identify fragrance notes, gift sets, limited editions, refill ability, packaging materials, product-line prestige, retailer exclusivity, or exact formulation. Brand fixed effects account for average differences across brands but cannot control unobserved variation between products within the same brand. Rating and popularity may also reflect consumer responses after listing, although excluding both variables produces a similar estimate of approximately 18.0%.

Future research should compare multiple retailers, use more balanced Women and Men samples, and examine closely matched products within the same brand and product line. Tracking prices and taxonomies over time would help determine whether the observed price patterns are stable. Experimental or behavioral data could test whether gender labels and navigation paths affect perceived value, product comparisons, and willingness to pay.

6. Conclusion

This study examined the relationship between retailer-defined gender taxonomy and listed prices using a March 2023 snapshot of Sephora. At the platform level, the Women and Men categories covered structurally different parts of the assortment, making a broad gender–price comparison difficult to interpret. Within fragrance, Women products had lower unadjusted listed prices but were also generally sold in much smaller bottles. Once bottle size was controlled, the direction of the association was reversed. In the preferred model, Women categorization was associated with approximately 19.3% higher listed prices after adjustment for fragrance concentration, brand, rating, and popularity. The results highlight the importance of considering both platform classification and product composition when interpreting gender-related price patterns. Retailer taxonomies do not simply label products; they also shape which products are presented as comparable. However, the remaining within-fragrance association should not be interpreted as evidence of discriminatory pricing or a Pink Tax between otherwise identical products. The data does not capture all relevant product characteristics, costs, or demand. The study therefore contributes to a more qualified account of gender-related pricing in digital retail and suggests the potential value of clearer unit-price information and more inclusive browsing routes.

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