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Consumer Preferences for Cut Roses and the Effect of the Introduction of a New Cultivar on the US Market

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Abstract. **During this study, we explored the consumer preferences for the US rose market using a nationwide online survey. Through conjoint analysis, we evaluated how attributes such as price, origin, vase life, and bloom size influence consumer choice. We found that rose origin is the most significant factor, accounting for 31% of consumer preference, followed by price (23%) and vase life (21%). The US roses are favored over those from Ecuador, Colombia, and other Latin American countries. Price sensitivity is evident, with a preference for roses priced at approximately $9.99 per dozen and a vase life of 14 days. During this study we identified eight distinct consumer segments with varying priorities, including those who value origin, price, vase life, or a combination of these attributes. Market simulation indicates that US rose producers can gain a substantial market share by emphasizing US origin, offering competitive pricing, and enhancing product attributes like bloom size and vase life. The findings suggest that to remain competitive, US rose growers should focus on origin labeling and innovative practices to counteract the influence of international sellers and capitalize on emerging market opportunities.**

Flowers play a significant role in social settings and are frequently used to commemorate important life events such as holidays, weddings, births, and funerals. Essentially, giving flowers is closely tied to specific occasions such as Christmas, Mother's Day, and Valentine's Day (Lai and Huang 2013; Yue and Hall 2010). Different flower types are preferred for different occasions. For instance, lilies are preferred for home decorations and weddings, carnations are preferred for bereavement, and roses are preferred or highly rated for most events (Yue and Behe 2010).

With respect to flower availability in the United States, the United States imported approximately $3.3 billion worth of cut flowers, plants, and nursery stock from 81 nations in 2022 (USDA-Economic Research Service 2023), of which $1.9 billion was attributed to cut flower imports (USDA-Economic Research Service 2024). Cut flower imports represented approximately 71% of cut flower sales in 2022 (USDA-Economic Research Service 2024). Imports of fresh-cut roses constituted more than $800 million of this total, whereas other fresh-cut flowers were collectively valued at $1.1 billion (USDA-Economic Research Service 2023). Among the numerous nations that contribute flowers and nursery stock, Colombia emerged as the top supplier, contributing an import value of $1.2 billion (USDA-Economic Research Service 2023). Between 2018 and 2022. Colombia accounted for approximately 37% of the total value of cut flowers and nursery stock imported by the United States (USDA-Economic Research Service 2023). In 2022, other major suppliers included Canada, Ecuador, and the European Union (Scott 2023). According to Guaita-Pradas et al. (2023), flower-producing nations fall into four categories, with Colombia and Ecuador categorized within the group of countries characterized by a low domestic demand for flowers but substantial export volumes.

As consumers continue to purchase flowers, roses are a main staple for almost all occasions. Some of the desirable characteristics that influence rose purchases include color (Grygorczyk et al. 2016), foliage and flower coverage (Anderson 2007), price and packaging (Rombach et al. 2018), vase life (Rihn et al. 2011; Rombach et al. 2021), and organic labeling (Berki-Kiss and Menrad 2019). Additionally, country of origin has been shown to affect consumer preferences when other product attributes, such as quality, are similar (Elliott and Cameron 1994).

As countries and retailers battle for market share within the rose market, it is essential to understand the purchase drivers of roses. As noted, various drivers have been identified; however, given new developments within the industry, there is a gap in the research surrounding rose demand. Notably, Ecuador has recently introduced a new rose cultivar that has blooms larger than the current blooms on the market (Tamimi 2022). Hence, it has become crucial to comprehend and evaluate the preference and the impact of introducing this new cultivar on the domestic rose market in the United States. To accomplish this, we performed conjoint analysis and presented participants with various flowers sourced from multiple countries, with each exhibiting distinct characteristics. We then performed a simulation analysis via a first-choice model to assess how varying product (e.g., a larger rose from Ecuador) impacts the US rose market.

Materials and Methods

A nationally representative online survey was implemented in Jun 2021. Random panelists from the online panel database of Toluna Inc. (Dallas, TX, USA) were sent a link to the survey. Toluna Inc. has a panel database of millions of consumers from which they sampled for this study. Panelists who chose to participate entered the survey link and completed the survey. The only screening questions were the age of the respondent (older than 18 years of age). Specific quotas were not used; instead, data were monitored to ensure median age, median income, race, sex, and geographical region of participants were similar to those of the overall US population. Questions within the survey focused on flower purchasing, demographics, and the conjoint analysis experiment. For the conjoint portion of the survey, respondents were told to consider their household budget constraints and their past purchasing of roses. University of Georgia Institutional Review Board approval was obtained for the survey (#00004215).

A total of 2776 respondents completed the conjoint portion of the survey. The median age of the sample was 43 years, which is slightly older than US Census estimate median of 38 years (US Census Bureau 2019) (Table 1). However, US Census estimates include persons younger than 18 years of age, who were not included in this survey sample. The median household income was $55,000 for the sample, which is slightly lower than the estimated median of $62,843 determined by the US Census (US Census Bureau 2021). Education level, gender, and race were also similar to US Census estimates.

With respect to the conjoint portion of the survey, conjoint analysis was based on a random utility framework in which a consumer's

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Table 1. Demographics of a sample of US households from a national online survey of 2776 respondents during Jun 2021.

	Means	
	Sample	Census[i]
Median age (years)	43.0	38
Generation[ii]		
Silent Gen	9%	
Baby Boomers	28%	
Gen X	20%	
Millennial	29%	
Gen Z	14%	
Region[iii]		
Far West	11%	
Rocky Mountains	7%	
Southwest	10%	
Plains	8%	
Great Lakes	4%	
Mideast	21%	
New England	7%	
Southeast	33%	
Race		
Caucasian	71%	76%
African American	14%	
Hispanic	6%	
Other race	8%	
Male	45%	49%
Political affiliation		
Democrat	26%	
Republican	40%	
Independent	27%	
Political other	7%	
Education		
High school or less	26%	38%
Some college	30%	28%
Bachelor's degree	22%	22%
Higher than bachelor's degree	21%	13%
Kids in household, no.	0.9	
Adults in household, no.	2.4	
Urbanicity		
Metropolitan	25%	
Suburban	46%	
Rural	29%	
Median household income	$55,000	$62,843
Primary plant buyer	79%	

[i] US Census Bureau 2021; US Census Bureau 2023.
[ii] Baby Boomers (born in 1964 or before), Gen X (born between 1965 and 1984), Millennials (born in 1985 or later).
[iii] US regions are based on the Bureau of Economic Analysis definitions (Abadi 2018).

overall product utility is the sum of all the consumer's individual utilities across all product attributes (Wirth et al. 2011). Conjoint analysis has been widely used to determine consumer preferences across different industries, automobiles (Kowalska-Pyzalska et al. 2022), apparel (Wang et al. 2022; Zhou and Xu 2020), and agriculture including fruits and vegetables (Campbell et al. 2006, 2016; Noor et al. 2023) consumption. To estimate product utilities, respondents evaluated 12 individual products using a 0- to 100-point willingness-to-purchase scale, whereby 0 = definitely would not purchase, 50 = may or may not purchase, 100 = definitely would purchase, and all numbers between being intermediary values between 0 and 100. When presented with a product, the respondent clicked on the spot of the willingness-to-purchase scale that corresponded to their purchase intention. It should be noted that conjoint analysis, as used in this study, is a stated preference technique that could have inherent hypothetical bias, although researchers attempted to minimize hypothetical bias by telling respondents to act as they would in a real purchasing situation and consider their budget constraints.

The products had six attributes (price, bloom size, vase life, carbon footprint, organic, and rose origin). Price consisted of three prices ($9.99, $19.99, and $34.99 per 12 stems). Prices were determined by online searches of major retailers as well as surveying local retailers in Georgia. Bloom size was regular and large. The instructions given before starting the conjoint section told the respondents that large-stemmed roses were 1 to 2 inches larger in diameter than a rose described as regular, similar to that stated by Tamimi (2002). Pictures of a large and regular bloom were also provided to provide context for the size differences. Vase life included 3, 7, and 14 d. The literature suggests that the mean vase life can range from 5 to 12 d, depending on a variety of conditions (Butt 2005; Byung-Chun and Lim 2018). Given the variation in vase life, the vase life was extended to encompass days slightly above and below the mean times found in the literature. Carbon footprint was noted as either carbon-neutral or no label was given. Organic was noted as being organic or no description was given. Rose origin followed import data, with options being Colombia, the Netherlands, Canada, Ecuador, United States, or no origin provided.

Before starting the conjoint section, respondents were shown an example of a large red rose and a regular red rose bloom, with the large rose example noting it was 1 to 2 inches larger in diameter than the regular rose. The picture was shown to give an idea of bloom size differences between regular and large roses. When evaluating the 12 products within the conjoint section, the attribute levels were provided in word format with each attribute level within the product written out.

The willingness-to-purchase scale can be characterized as follows:

$$Uij = Vij + \varepsilon ij \quad [1]$$

where Uij is total utility for the i^{th} respondent to the j^{th} product, εij is the stochastic error, and Vij is "the systematic portion of the utility function" (Lusk and Schroeder 2004). Each utility associated with an attribute level can be termed a part-worth utility with the summation of part-worth utilities being a product's total utility. The part-worth utilities are estimated via an individual (i.e., one for every respondent) ordinary least square regression model as follows:

$$Yij = \beta 0 + \beta i\, \mathbf{X}ij + \varepsilon ij \quad [2]$$

where εij is the error term (assumed to be independent and identically distributed), $\mathbf{X}ij$ is the vector of product-related attributes, Yij is the dependent variable (ratings), $\beta 0$ is the intercept, and βi is a vector of part-worth utilities. Normally, in an ordinary least squares regression, the categorical explanatory variables are dummy-coded (i.e., 0, 1); however, by using traditional dummy coding, the "base" parameter cannot be recovered. Therefore, we use effects coding (−1, 0, 1), which transforms the parameter estimates into deviations from the mean (Hair et al. 1998). From the effects coded parameter estimates, the "base" category can be recovered, allowing for the calculation of all attribute-level parameter estimates and relative importance values (Wirth et al. 2011). Relative importance can be thought of as the amount of the buying decision derived from each attribute.

Respondents with like part-worth utility estimates were then clustered together into clusters (or market segments) using cluster analysis. Ward's linkage was the clustering algorithm used with the pseudo J and pseudo T-square tests as quantitative factors to help determine the optimal number of clusters. Ward's linkage was used because it provided results similar to those of other clustering algorithms and is commonly used in conjoint studies. Subjective criteria (market segments should be measurable, accessible, substantial, differentiable, and actionable) provided by Kotler and Armstrong (2001) was then used in conjunction with the quantitative criteria to identify the final number of clusters.

Although understanding part-worth utilities, relative importance, and market segments is a critical step in understanding the rose market, they do not fully showcase what happens when new products (or product attributes) are introduced into the market. Therefore, a first-choice simulation approach was used to construct realistic hypothetical markets and observe how market shares change when new products are introduced (Bretton-Clark 1992). First-choice models have been used to understand market dynamics in horticultural markets (Berning and Campbell 2021; Campbell et al. 2006, 2013, 2016, 2021; Nelson et al. 2005).

The first-choice simulation approach starts with constructing an initial market. The initial market for this simulation was a regular bloom product with no origin for $19.99, regular bloom product with the Netherlands as the origin for $19.99, regular bloom product with Colombia as the origin for $19.99, and regular bloom product with Ecuador as the origin for $19.99. We then made changes to the market by adding in different origins, bloom sizes, vase life, prices, organic, and carbon footprint. With each of the changes, we evaluated the change in market shares for all products on the market.

Results and Discussion

Overall, rose origin had the highest relative importance value (31%), followed by price (23%) and vase life (21%) (Table 2). Produced organically, carbon footprint, and bloom size were less important, with less than 10% relative importance each. This does not mean that organic, carbon footprint, and bloom size are unimportant, because they could play an important role if several roses are from origins with similar part-worth utilities, the same price, and/or have similar vase life.

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Table 2. Relative importance values and part-worth utilities from a conjoint analysis of 2776 US respondents in a national online survey during Jun 2021.

	Origin	Nondistinct	Price/origin	Price/origin/vase life	Price/vase life	Vase life	More origin	Price-sensitive	Total
Attribute									
Price	16%	**17%**	**37%**	**25%**	**29%**	13%	16%	**57%**	23%
Size	9%	10%	8%	7%	6%	6%	7%	5%	8%
Vase life	16%	18%	15%	**27%**	**32%**	**51%**	16%	11%	21%
Carbon	9%	10%	7%	7%	5%	5%	7%	5%	8%
Organic	9%	10%	8%	7%	5%	6%	6%	5%	9%
Origin	**40%**	**34%**	**25%**	**26%**	22%	19%	**48%**	17%	31%
Obs., no.[i]	268	1,295	221	242	221	210	112	207	2,776
Market share	10%	47%	8%	9%	8%	8%	4%	7%	100%

[i] This is the number of respondents (observations) in each market segment and in the total sample.
Bold values represent significant variables at a $P < 0.1$.

With respect to part-worth utilities, lower prices were preferred to higher prices (Table 3). A $9.99 per 12 stems price increased willingness-to-purchase by 6.08 points (or 6.08%) on the rating scale, whereas a $34.99 per 12 stems price resulted in a decrease of 7.25 points. The large bloom was only slightly preferred by the entire sample, with a 0.47 higher rating. A 14-d vase life resulted in an increase of 6.23 points on the rating scale, whereas the 3-d vase life saw a 7.17-point decrease. Carbon-neutral had a positive part-worth utility, implying that respondents preferred carbon-neutral labeling to no label, although only slightly (0.52 rating increase). Organically produced had a small positive increase in rating, with a 0.20 increase. The US-produced roses resulted in the highest increase in rating (2.14), while Colombia caused the largest rating point decrease of 2.49. Canada and no origin also had positive impacts on part-worth utilities, while the Netherlands and Ecuador had negative impact part-worth utilities.

Market segments

We identified eight distinct market segments via the cluster analysis ranging from 4% to 47% market share (Table 2). The market segments were termed origin, nondistinct, price/origin, price/origin/vase life, price/vase life, vase life, more origin, and price-sensitive.

Origin. This first market segment consists of respondents who prioritize country of origin when purchasing cut roses (Table 2). This group allocated 40% relative importance to the country of origin and assigned 16% or less importance to other attributes such as price and vase life. The "origin" group constituted 10% of the sample. Members of this segment showed a strong preference for roses originating from the United States and exhibited a slight preference for roses priced at $9.99 and those with a vase life of 14 d (Table 3). A rose from the United States generated an increase of 14.2 on the rating scale, whereas Colombian roses decreased the willingness-to-purchase rating by 7.29. With respect to the demographic make-up of this segment, this segment tended to be average across all demographics (Table 4). For instance, the median household income was similar to US Census estimates, and 64% of respondents in this segment had purchased cut flowers within the last year. The "origin" segment did have the lowest percentage of metropolitan respondents at 21%.

Nondistinct. Although rose origin had a relative importance value twice that of price (Table 2), the part-worth utilities are small, which means attribute levels did not have a large impact on the willingness-to-pay rating (Table 3). Because of the small part-worth utilities, this segment was named the "nondistinct" segment. There is precedence for a nondistinct segment because this segment has been found in numerous horticultural products (Campbell et al. 2013, 2021; Hall et al. 2010), The "nondistinct" segment represented 47% of the total surveyed population. Notably, this segment had the lowest number of older respondents (Silent Generation and Baby Boomers) and the most millennials (Table 4). Furthermore, this segment had the largest percentage of minority respondents, most males, and the highest number of adults and children their household.

Price/origin. The "price/origin" segment constitutes 8% of the sample (Table 2). Within this segment, respondents assigned significant importance to price (37%) and the origin of the product (25%). The lowest price ($9.99 per

Table 3. Part-worth utilities from a conjoint analysis of 2776 US respondents in a national online survey during Jun 2021.

	Avg part-worth utility								
	Origin	Nondistinct	Price/origin	Price/origin/vase life	Price/vase life	Vase life	More origin	Price-sensitive	Total
Constant	56.10	60.17	55.68	51.89	44.34	51.43	39.47	46.08	54.55
Price									
$9.99/12 stems	2.44	−0.24	12.92	12.03	15.61	3.78	5.13	31.67	6.08
$19.99/12 stems	−0.27	0.68	0.60	2.82	5.56	1.04	3.57	−0.57	1.17
$34.99/12 stems	−2.17	−0.44	−13.52	−14.85	−21.17	−4.82	−8.69	−31.11	−7.25
Bloom size									
Regular	−0.15	−0.10	0.24	−1.08	−1.58	−1.55	−1.06	−0.86	−0.47
Large	0.15	0.10	−0.24	1.08	1.58	1.55	1.06	0.86	0.47
Vase life									
3 d	−3.14	−1.51	−2.28	−16.05	−21.35	−32.04	−9.81	−4.29	−7.17
7 d	0.27	0.16	1.08	2.39	0.91	4.19	3.33	0.81	0.95
14 d	2.87	1.35	1.20	13.66	20.44	27.86	6.49	3.48	6.23
Carbon									
Neutral	0.62	0.33	−0.50	1.78	−0.65	1.50	2.77	0.42	0.52
No carbon Label	−0.62	−0.33	0.50	−1.78	0.65	−1.50	−2.77	−0.42	−0.52
Organic									
Yes	0.69	0.41	−0.03	−0.10	−0.16	−0.04	0.12	−0.47	0.20
No label	−0.69	−0.41	0.03	0.10	0.16	0.04	−0.12	0.47	−0.20
Origin									
Colombia	−7.29	0.52	−0.55	−4.43	−7.64	0.99	−21.34	−3.93	−2.49
United States	14.20	−0.19	−0.66	7.99	−7.71	−0.93	29.55	−2.93	2.14
The Netherlands	−3.17	0.40	0.55	−0.91	0.28	−1.49	−9.97	0.98	−0.55
Canada	0.74	0.04	−0.31	2.12	6.42	1.61	4.77	2.76	1.24
Ecuador	−5.04	−0.52	0.23	−6.91	0.88	−3.93	−20.46	0.58	−2.24
No origin Label	0.55	−0.24	0.73	2.14	7.77	3.75	17.46	2.54	1.91
r^2	77%	73%	83%	87%	88%	93%	88%	94%	80%
Adjusted r^2	22%	7%	41%	56%	60%	76%	61%	78%	32%

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Table 4. Demographics and purchasing patterns across market segments among 2776 respondents from a national online survey of US respondents.

	Origin	Nondistinct	Price/origin	Price/origin/vase life	Price/vase life	Vase life	More origin	Price-sensitive
Region								
Far West	8%	11%	12%	13%	11%	10%	14%	13%
Rocky Mountain	7%	7%	5%	7%	9%	8%	4%	5%
Southwest	9%	10%	8%	8%	11%	10%	13%	9%
Plains	8%	8%	12%	10%	7%	9%	12%	6%
Great Lakes	1%	4%	4%	5%	5%	4%	4%	3%
Mideast	27%	22%	17%	19%	21%	16%	15%	20%
New England	8%	7%	6%	6%	6%	6%	5%	11%
Southeast	32%	32%	36%	32%	29%	37%	31%	33%
Age								
Baby Boomer and older	31%	23%	41%	47%	**60%**	**60%**	**64%**	55%
Gen X	24%	21%	19%	18%	**14%**	16%	21%	25%
Millennial and younger	46%	**56%**	40%	36%	26%	25%	15%	20%
Race								
Caucasian	72%	65%	69%	79%	76%	**82%**	**90%**	75%
African American	12%	19%	14%	9%	9%	10%	5%	9%
Hispanic	7%	8%	7%	6%	6%	3%	0%	6%
Other race	9%	8%	10%	7%	9%	5%	4%	10%
Male	43%	48%	42%	46%	**37%**	42%	48%	**35%**
Political leanings								
Democrat	29%	22%	27%	26%	27%	31%	36%	33%
Republican	39%	**44%**	36%	39%	37%	35%	26%	35%
Other political party	32%	34%	38%	35%	36%	33%	38%	32%
Education								
High school or less	28%	29%	25%	20%	25%	17%	23%	28%
Some college	29%	26%	**32%**	32%	**33%**	**40%**	**43%**	33%
Bachelor's degree	22%	22%	22%	28%	24%	22%	18%	20%
Higher than bachelor's degree	21%	23%	21%	19%	18%	21%	16%	18%
Kids in household, no.	0.97	**1.11**	0.71	0.62	**0.36**	0.43	0.55	0.44
Adults in household, no.	2.49	**2.53**	2.39	2.21	**2.14**	2.21	2.28	2.13
Urbanicity								
Metropolitan	21%	23%	26%	24%	28%	28%	38%	26%
Suburban	50%	42%	48%	51%	50%	52%	42%	47%
Rural	28%	35%	26%	24%	23%	20%	20%	27%
Household income (2020)	$67,835	$72,366	$63,755	$73,760	$63,529	**$83,714**	$62,455	**$56,618**
Primary food Purchaser (1 = yes)	88%	89%	92%	93%	94%	93%	88%	95%
Purchased roses within last year								
Birthday	12%	13%	**8%**	11%	10%	18%	10%	11%
Anniversary	12%	10%	11%	12%	12%	**17%**	12%	9%
Home	9%	9%	8%	9%	**15%**	14%	8%	14%
Bereavement	5%	3%	4%	4%	5%	4%	3%	4%
Wedding	6%	7%	4%	6%	3%	3%	3%	4%
Valentine's Day	18%	15%	15%	15%	15%	**27%**	14%	13%
I'm sorry	4%	5%	3%	4%	0%	1%	2%	1%
Get well	7%	6%	5%	3%	3%	4%	4%	4%
Mother's Day	12%	13%	14%	14%	13%	**23%**	14%	13%
Holidays	3%	5%	3%	5%	6%	4%	4%	4%
Easter	2%	4%	5%	2%	2%	1%	5%	3%
Other	3%	2%	1%	3%	3%	2%	3%	5%

Bold represents the minimum and maximum values across the demographic or purchasing occasion.

dozen stems) resulted in a 12.9 increase in the willingness-to-purchase rating, while the highest price ($34.99 per dozen stems) caused a rating decrease of 14.9 (Table 3). Although origin had a high relative importance, the impact was smaller because the no origin label had a 0.7-point rating increase. Gen Z respondents made up 17% of the segment (Table 4).

Multifaceted. In this segment, respondents prioritized price (25%), vase life (27%), and country of origin (26%) (Table 2). This group represented 9% of the sample. They showed a preference for a product with a 14-d vase life, originating from the United States, and priced at $9.99 (Table 3). Rating increases were given for a low price (12.0), 14-d vase life (13.7), and US roses (8.0) with the largest decreased rating for a high price (14.9), 3-d vase life (21.4), and Ecuadorian roses (6.9). This segment had the largest percentage of respondents with a bachelor's degree (28%) (Table 4).

Price/vase life. This segment valued price (29%) and vase life (32%) and comprising 8% of the sample (Table 2). They clearly preferred roses priced at $9.99 with a vase life of 14-d and also showed a slight preference for Canadian roses (Table 3). This segment had the lowest percentage of Gen Z respondents and the least number of children per household (Table 4).

Vase life. Respondents in the "vase life" segment showed a strong preference for vase life (51%) and accounted for 8% of those surveyed (Table 2). As the name suggests, this group exhibited a strong preference for plants with a vase life of 14 d. The 14-d vase life resulted in a 27.9-point rating increase (Table 3). The majority of this group consisted of Baby Boomers and represented the highest household income bracket among the market segments identified (Table 4). This segment also had the highest percentage of recent cut flower buyers, with 70% having purchased within the last year.

More origin. This segment valued a country of origin (48%) label and represented 4% of the surveyed population (Table 2). They exhibited a strong preference for US roses and showed a significant aversion to products from Latin America (Table 3). A US rose generated a 29.6-point rating increase, while no label also had a positive impact on willingness-to-purchase (17.5). Additionally, this group demonstrated a slight preference for lower prices and longer vase life. It is notable that this group had the highest percentage of the Silent Generation (19%), least Gen Z respondents (1%), least respondents with a bachelor's degree or above, and was more likely to live in a metropolitan area (Table 4). The age finding is not surprising because Schooler (1971) reported that preference for foreign products decreases with age.

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Price-sensitive. Finally, the price-sensitive segment assigned high importance to price (57%) and comprised 7% of the sample (Table 2). As the name suggests, this group showed a strong preference for roses at the lowest price point. The $9.99 per dozen rose stems resulted in a 31.7 increase in the willingness-to-purchase rating, while the $34.99 per dozen rose stems price decreased the rating by 31.8 points (Table 3). This demographic also reported the lowest household income, which likely explains their sensitivity to price and preference for the most economical product (Table 4). This segment also had the least number of adults, lowest percentage of males, and largest percentage of millennials compared with the other market segments.

Market simulations

The base market (base) established for the simulation consisted of regular-sized roses from various locations (no origin listed, the Netherlands, Colombia, Ecuador), with all selling at the same price of $19.99 per dozen, no carbon label, no organic label, and a 3-d vase life (Table 5). The roses from nonlabeled origins, the Netherlands, Colombia, and Ecuador had initial market shares of 35%, 24%, 21%, and 19%, respectively. The US-labeled roses (S1) were then introduced, keeping all the other products and attribute levels the same. After the US-labeled rose introductions, the new market shares were 28% for nonlabeled origin, 24% for the Netherlands, 17% for Colombia, 16% for Ecuador, and 15% for the newly introduced US roses. The US origin roses took 7% market share from the nonlabeled origin, 4% from the Colombia origin, and smaller percentages from the Ecuador origin. This indicates that when given similar attributes for roses, origin was important to consumers, as noted by Elliott and Cameron (1994). From the relative importance values, we see that among all conforming groups, origin holds a percentage of 31%, which explains the consumer shift to the American product. The group of people who valued country of origin the most was largely composed of older Caucasian consumers.

The product introduction (S2) adds an Ecuadorian large-bloom rose (keeping all previous products and product characteristics the same, a comparison of S2 vs. S1) to the market (Table 5). With this change, Ecuadorian large roses grabbed 20% of the market share. The no origin, the Netherlands, Colombia, and Ecuadorian normal roses saw market share reductions of up to 4%. The US regular-sized roses were the largest loser when Ecuadorian large roses were introduced to the market, with the US roses losing 8% of the market share (from 15% to 7%).

With the introduction of Canadian regular-sized roses (S3 compared with S2) at the same

Table 5. Market shares from the conjoint analysis of 2776 US respondents in a national online survey during Jun 2021.

	No origin label, $19.99, regular size	Netherlands roses, $19.99, regular size	Colombia roses, $19.99, regular size	Ecuador roses, $19.99, regular size	US roses, $19.99, regular size	Ecuador roses, $19.99, large roses	Canada roses, $19.99, regular size	US roses, $9.99, regular size	US roses, $34.99, regular size	US roses, $19.99, large size	US roses, 14-d vase life	US roses, $34.99, organic	US roses, carbon neutral
Base: Current market	35%	24%	21%	19%	ND	ND	ND	ND	ND	ND	ND	ND	ND
S1: Adding US	28%	24%	17%	16%	15%	ND	ND	ND	ND	ND	ND	ND	ND
S2: Adding Ecuador large roses	24%	21%	15%	14%	7%	20%	ND	ND	ND	ND	ND	ND	ND
S3: Adding Canada	21%	16%	12%	11%	5%	18%	16%	ND	ND	ND	ND	ND	ND
S4: Adding US regular roses at a lower price	7%	12%	9%	8%	4%	14%	11%	34%	ND	ND	ND	ND	ND
S5: Adding US regular roses at a higher price	14%	15%	11%	10%	5%	17%	15%	ND	14%	ND	ND	ND	ND
S6: Adding US large roses	11%	15%	11%	10%	5%	13%	15%	ND	ND	21%	ND	ND	ND
S7: Adding US roses, 14-d vase life	8%	11%	9%	9%	4%	14%	11%	ND	ND	ND	33%	ND	ND
S8: Adding US organic roses at a higher price	14%	14%	11%	9%	5%	17%	14%	ND	ND	ND	ND	15%	ND
S9: Adding US carbon-neutral roses	8%	13%	11%	10%	5%	16%	14%	ND	ND	ND	ND	ND	23%

Change in US share given different scenarios

	US share	
	Change from base	Total US share
S1: Adding US	15%	15%
S2: Adding Ecuador large roses	−8%	7%
S3: Adding Canada	−10%	5%
S4: Adding US regular roses at lower price	23%	38%
S5: Adding US regular roses at higher price	3%	18%
S6: Adding US large roses	11%	26%
S7: Adding US roses, 14-d vase life	22%	37%
S8: Adding US organic roses at higher price	5%	20%
S9: Adding US carbon-neutral roses	13%	28%

ND = not determined.

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price as that of the competitors, Canadian roses captured 16% of the market (Table 5). However, roses from other origins lost approximately 3% of their market share. Adding US roses at a lower price of $9.99 per dozen stems (S4 compared with S3) captured a market share of 34%. Flowers from non-US origins reduced their market share by up to 5%. However, the product that experienced the largest market share reduction with the lower-priced US introduction was the no-origin roses sold at $19.99, which dropped from 21% to 7%. Interestingly, there was little movement away from US roses priced at $19.99 to the $9.99 introduction. It is natural to think that consumers who prefer US roses, when exposed to the same product at a lower price, will shift to the more economical option. However, rose consumers may view the higher-priced roses as having a higher quality and, thus, stick with the higher-priced version. The market with two US roses on the market at varying prices drew the largest market share for US retailers at 38%. By having differently priced options, retailers of US roses can target price-sensitive consumers while also targeting consumers who view price as an indicator of quality.

Introducing a US rose priced at $34.99 per dozen stems but removing the US $9.99 rose stems from the market (S5 compared with S3) indicated that the $34.99 price captured a market share of 14% and the US $19.99 rose stems had a 14% market share (Table 5). The 14% market share for the higher-priced rose stems further showed that some consumers infer quality from price or that price is indicative of the prestige of the gift. A downside for US retailers is that having medium-priced and high-priced roses on the market generated 18% market share, which was a decrease from the 38% market share with US $9.99 and $19.99 roses on the market. However, from a revenue standpoint, having high-priced and medium-priced flowers is better because revenues would increase. Assuming 100 rose buyers purchasing one bouquet (12 stems), the combination of high-priced and medium-priced roses would generate $570 in revenue for US firms (high-priced: 13.6% market share × 100 consumers = 13.6 sold, 13.6 sold × $34.99 price = $476 revenue; medium-priced: 4.7% market share × 100 consumers = 4.7 sold, 4.7 sold × $19.99 price = $93 revenue; $476 + $93 = $570 total US revenue), while the low and medium prices would generate only $422 for US firms (low-priced: 33.9% market share × 100 consumers = 33.9 sold, 33.9 sold × $9.99 price = $338 revenue; medium-priced: 4.2% market share × 100 consumers = 4.2 sold, 4.2 sold × $19.99 price = $84 revenue; $338 + $84 = $422 total US revenue).

If US roses are introduced at the same price of $19.99 but are able to replicate the large bloom size of the Ecuadorian roses (S6 compared with S3), then the US large-bloom roses would have a market share of 21% (Table 5). Therefore, the total US market share would be 26%. In this scenario, large roses from Ecuador lose only 5% of their market share. The no-origin roses would lose 10% market share (from 21% to 11%). In the case of the introduction of US regular-sized roses at a price of $19.99, but with the characteristic of having a vase life of 14 d (S7 compared with S3), this product captured a market share of 33%, bringing the total US market share to 37%. The relative importance of vase life and origin, specifically from the United States, and the high utility of a 14-d vase life explain the higher market share of the product with these two characteristics. The US roses with a 14-d vase life grabbed most of its market share from no-origin roses (13%) and Canadian roses (5%).

When US regular-sized organic roses were introduced at the higher price of $34.99 (S8 compared with S3), the market share was 15% (Table 5). As with earlier scenarios, most of the market share for US organic roses came from the no-origin roses. Introducing US regular-sized carbon-neutral roses priced at $19.99 (S9 compared with S3) grabbed a market share of 23%, bringing the total US market share to 28%. Consumers continue to prefer US roses but are inclined toward the additional attribute when all other factors are equal. In this case, the new attribute was carbon-neutral roses. This underscored that some consumers place significant importance on sustainability labeling.

Conclusions

The cut flower market within the United States is significant because flowers are used by consumers for personal use and as gifts for friends and family for a wide range of occasions (Huang 2007; Huang and Lin 2015). Among cut flowers, roses comprise the largest amount of imports given their popularity across a plethora of gift-giving occasions. This research took a close look at the rose market, notably consumer preference for various rose attributes.

Using a nationally representative online study, the rose market was found to be heterogeneous in nature, with a wide variety of consumers. Overall, eight consumer segments were identified, with rose origin, price, and vase life being the primary drivers across almost all segments. Through market simulations, the rose market is dynamic in that introductions of roses with different characteristics will have varying effects on the market as a whole. For instance, if US roses at different prices are introduced into the market, then different outcomes can be expected given the prices used. Low-priced and medium-priced roses will grab a larger aggregate market share compared with the introduction of medium-priced and high-priced rose. However, the US medium-priced and high-priced rose introductions will draw higher overall revenues compared with those of US low-priced and medium-priced introductions.

With respect to applicability of this research to the US cut flower, specifically US rose, industry, US roses can compete against roses from other countries. The easiest market share grab is ensured when US roses are labeled prominently with a US origin label because roses with no origin listed or origins that are difficult to determine will be less preferred. Offering differently priced options will target both price-sensitive and nonprice-sensitive consumers. Understanding whether the goal is overall market share or increasing revenues is critical because market share and revenues may not go hand-in-hand. Increasing vase life and/or highlighting sustainability efforts will pay dividends for large numbers of consumers, which will drive sales. Finally, competing and not evolving as other countries evolve their roses will lead to losses for US retailers. As noted in the simulations in Table 5, Ecuador introducing a large-bloom rose would harm US retailers the most. Failure to evolve and adapt with new rose innovations will lead to continued pressure on US rose producers and retailers.

With respect to past research comparisons, this study mimics the work of others in the cut flower realm. For instance, Rihn et al. (2011) noted that some consumers are dissatisfied with the vase life available. This would correlate with this study that showed that consumers, by and large, want a longer vase life. The results of this study also correlated with the findings of Rombach et al. (2021) because they found four cut flower clusters, whereas we found eight. However, the cluster values of the clusters in the Rombach et al. (2021) study were similar to clusters in this study. For instance, Rombach et al. (2021) found price and ethical clusters for cut flowers. These clusters would be similar to clusters in this study that focused on price sensitivity and origin clusters. The origin clusters are also similar to the findings by Elliott and Cameron (1994). Overall, there is clear evidence that the cut flower, and especially rose, markets are heterogeneous in nature, with findings across different cut flower products showing similarities.

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