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Does the Circular Economy Stabilize Brand Value? Investigating the Correlation between Resale Market Price Resilience and Primary Market Demand for High-End Sustainable Fashion (2022–2025)

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ABSTRACT

Luxury fashion houses have long treated the resale market as a threat: a channel that eats into full-price sales and slowly cheapens the brand. This study asks whether that belief still holds for high-end sustainable fashion. Between 2022 and 2025, the quarterly Value Retention Rate (VRR) of 150 core products from Stella McCartney, Gabriela Hearst and Patagonia was tracked on three authenticated resale platforms and compared with a control group of 50 trend-driven items from conventional luxury labels that have no visible circularity program. Primary demand was measured through a composite Primary Demand Index (PDI) built from public revenue disclosures, purchase-intent search volume and full-price sell-through. Over sixteen quarters, the mean VRR of the sustainable cohort rose by 7.38 percentage points, while that of the control cohort fell by 4.23 points. Resale value retention and primary demand moved together very closely ($r = 0.990$, $p < 0.001$), and the association was marginally stronger when resale prices were lagged by one or two quarters. A robustness check on quarter-to-quarter changes, however, produced a much weaker relationship, strongest at a one-quarter lag ($r = 0.46$, $p = 0.096$), which shows that a large part of the headline correlation reflects both series rising over the same period. Taken together, the evidence does not support the cannibalization view. It is consistent with the idea that buyers read stable resale prices as a lower "True Cost of Ownership", although a longer data series is needed before any causal claim can be made.

Keywords: circular economy, sustainable luxury, resale market, brand equity, Value Retention Rate (VRR), True Cost of Ownership (TCO), signaling theory

INTRODUCTION

For most of the last century, the high-end apparel sector ran on a linear "take–make–dispose" model built around a single owner per product (Bocken et al., 2016). Luxury houses protected brand equity and exclusivity by holding retail prices firm, tightly controlling distribution and keeping supply deliberately short (Keller, 1993). Within that logic, second-hand channels were seen as a problem. Resale, it was assumed, would dilute the brand and take sales away from the boutique (Kapferer, 2012; Chandon et al., 2016).

Between 2022 and 2025, this consensus came under pressure from two directions at once. Post-pandemic supply-chain disruption and persistent inflation squeezed discretionary spending across the major consumer economies (McKinsey & Company, 2023). At the same time, the apparel industry, which accounts for an estimated 8–10% of global CO_2 emissions (Niinimäki et al., 2020), faced closer regulatory attention over its environmental footprint. This revived interest in the Circular Economy (CE), with its focus on durability, repair and resale (Geissdoerfer et al., 2017). Although the wider retail market slowed, authenticated online resale platforms grew quickly and comfortably outpaced primary retail (ThredUp, 2024).

What makes this period interesting is that primary sales of sustainable luxury goods did not collapse while resale boomed. That creates a puzzle. If inflation was pushing shoppers toward second-hand channels, why did full-price demand for these brands hold up? Recent consumer research offers one answer: many buyers now treat durable, high-value items less as a sunk expense and more as something closer to an asset (Bardhi & Eckhardt, 2012). Under a "True Cost of Ownership" (TCO) view, a shopper weighs the retail price against the amount they expect to recover when they sell the item later (Bain & Company, 2023).

There is plenty of commentary on this shift, but very little measurement. In particular, it is not clear whether strong resale prices actually support primary demand in the sustainable luxury segment. This study tests that question by following the

VRR of 150 flagship items from Stella McCartney, Gabriela Hearst and Patagonia against a set of primary demand indicators, quarter by quarter, from 2022 to 2025. The central hypothesis is:

H1: Resale price resilience is positively and significantly correlated with primary market demand for high-end sustainable fashion brands, because strong resale values reduce the financial risk that buyers associate with a full-price purchase.

LITERATURE REVIEW

2.1 Foundations of the Circular Economy in Fashion

The circular economy is usually described as a regenerative system that separates economic growth from the use of finite resources by slowing, closing and narrowing material loops (Stahel, 2016; Geissdoerfer et al., 2017). The case for it in fashion is hard to ignore. The textile and apparel industry produces more than 92 million tonnes of waste every year (Niinimäki et al., 2020), and only a tiny share of clothing is ever recycled into new clothing (Ellen MacArthur Foundation, 2017). Real circularity therefore has to go beyond recycling to include longer product lives, repair infrastructure and organized resale (Fletcher, 2014).

High-end brands are, in principle, well placed to adopt these ideas. Fast-fashion producers depend on quick obsolescence to keep stock moving, whereas premium labels use better materials and construction that naturally support longer lifecycles (Kapferer, 2012). Their reluctance to embrace circular models has had less to do with product capability and more to do with managers' fears of brand dilution and lost sales.

2.2 Brand Equity and the Secondary Market Paradox

Classical brand equity theory links a luxury brand's pricing power to perceived scarcity, exclusivity and a sense of distance from the ordinary consumer (Aaker, 1991; Keller, 1993). From this angle, an uncontrolled resale market looks dangerous. It lowers the price of entry, weakens the aspirational "dream" that sustains luxury, and sets up price competition between resellers and the brand's own boutiques (Kapferer, 2012; Chandon et al., 2016).

More recent consumer-culture research tells a different story. Buying second-hand or vintage is no longer seen mainly as a sign of limited budgets; for many shoppers it signals personal style and environmental awareness (Cervellon et al., 2012; Amatulli et al., 2017). Pre-owned luxury pieces also carry meaning of their own, since possessions become part of how people present themselves (Belk, 1988). A bag or coat that still looks good after several owners can actually reinforce a brand's reputation for lasting quality (Turunen & Leipämaa-Leskinen, 2015). Seen this way, an active resale market may work less as a source of commoditization and more as public proof of long-term prestige.

2.3 Signaling Theory and Decentralized Value Verification

To explain how resale prices might feed back into first-hand purchases, this study draws on signaling theory (Spence, 1973; Stiglitz, 2002). The theory deals with markets where buyers cannot fully judge quality before they buy and so rely on observable cues instead (Kirmani & Rao, 2000). In traditional luxury retail, a high price has served as one such cue, standing in for prestige and craftsmanship (Milgrom & Roberts, 1986).

That cue has become less reliable. Growing skepticism about corporate greenwashing means that a high price, or a sustainability label, no longer convinces buyers on its own that a product is durable or responsibly made (Delmas & Burbano, 2011). Resale prices can fill this gap. Unlike list prices, which are set by the brand, resale clearing prices emerge from many independent transactions between buyers and sellers on peer-to-peer platforms (Kessous & Valette-Florence, 2019). A consistently high VRR therefore gives prospective buyers outside evidence that a product lasts physically and stays desirable. In signaling terms, it reduces information asymmetry and makes the brand's quality claims more believable.

2.4 True Cost of Ownership (TCO) and Portfolio Consumption

The years 2022–2025 brought a run of economic shocks: rising central-bank interest rates, falling real wages and lingering post-pandemic inflation (McKinsey & Company, 2023). These conditions pushed many consumers away from the kind of status-driven spending Veblen (1899) described and toward something closer to portfolio thinking, in which purchases are judged partly on how much value they keep (Bardhi & Eckhardt, 2012).

The True Cost of Ownership framework captures this shift. Building on models of perceived value (Zeithaml, 1988) and on the loss-aversion principle of Prospect Theory (Kahneman & Tversky, 1979), it suggests that buyers do not treat the full retail price (P_{primary}) as money gone for good. Instead, they think about net depreciation, i.e. what the item costs once its expected resale value is taken into account:

$$TCO = P_{primary} - E(P_{secondary})$$

Here, $E(P_{secondary})$ is the resale value a buyer expects based on prices they can observe in the secondary market. When that market is liquid and trustworthy, a high retail price stops being an absolute barrier (ThredUp, 2024). The buyer knows there is a reliable way out, and the financial risk of the purchase falls accordingly.

2.5 The Empirical Research Gap

Existing research recognizes the move toward circular consumption and has applied signaling ideas to resale platforms, but several gaps remain. First, most studies focus on consumer attitudes toward second-hand luxury rather than measuring economic outcomes in primary retail over time. Second, quantitative work tends to treat luxury as a single category and does not separate out the role of sustainable or circular design in keeping resale prices stable. Third, little quantitative work covers the inflationary cycle of 2022–2025, when digital resale marketplaces reached real scale. This study addresses these gaps by testing whether secondary-market VRRs move with, and possibly lead, primary demand for high-end sustainable apparel brands.

METHODOLOGY

3.1 Research Design and Time Horizon

The study uses a quantitative, longitudinal correlational design (Creswell & Creswell, 2018; Saunders et al., 2019) covering sixteen consecutive quarters, from Q1 2022 to Q4 2025. This window is useful because it includes a full sequence of macroeconomic conditions, from rising inflation through monetary tightening to partial stabilization, which makes it a good setting for observing how price-sensitive consumers behave.

3.2 Sampling Framework and Unit Selection

The three focal brands were chosen through purposive sampling (Bryman, 2016), based on their well-known and publicly stated commitments to circular business practices, sustainable materials and supply-chain transparency. Within each brand, items were then spread across product categories (accessories, footwear, outerwear and apparel). The brands are:

- **Stella McCartney** represents circularity within mainstream luxury, with its focus on animal-free leather alternatives, organic and recycled materials, and closed-loop textile initiatives (Joy et al., 2012).
- **Gabriela Hearst** represents the ultra-luxury end of the market. Its “slow fashion” approach includes plastic-free retail operations, traceable natural fibers and deliberately limited production runs to avoid oversupply (Kapferer, 2012).
- **Patagonia** represents the premium functional-apparel segment. It runs its own circular system through the Worn Wear repair, buy-back and resale program (Fletcher, 2014).

Short-lived micro-trends can push resale prices up or down for reasons unrelated to durability, so the sample was limited to core “hero” lines, i.e. staple designs that appear across several collections. Fifty product lines were tracked per brand, giving 150 items in total.

A control sample of 50 high-end, trend-driven items was also drawn from luxury labels that have no publicized circularity program, high seasonal turnover and limited repair support. These items were tracked on the same platforms and are anonymized as Brands A–E in Appendix A. The control group makes it possible to separate any “sustainability premium” from movements in the luxury market as a whole.

3.3 Independent Variable: Value Retention Rate (VRR)

The independent variable is secondary-market price resilience, measured as the Value Retention Rate. Transaction prices were collected at the end of each quarter from three major authenticated resale platforms: The RealReal, Vestiaire Collective and Grailed. To keep the measure valid and control for wear, three filtering rules were applied:

I. Only completed sales were recorded. Active listings and unaccepted offers were excluded to avoid seller optimism bias.

I. Only items graded “Pristine”, “Excellent” or “Very Good” by the platform’s authenticators were kept. Items with structural damage, stains or missing parts were discarded.

II. Secondary prices were recorded inclusive of shipping charges, import duties and platform buyer’s premiums, so that they reflect what a buyer actually paid.

The quarterly VRR for product *i* in quarter *t* is calculated as:

$$VRR_{i,t} = \left(\frac{\bar{P}_{secondary,i,t}}{P_{primary,i}} \right) \times 100$$

where $\bar{P}_{secondary,i,t}$ is the mean authenticated resale price of product i during quarter t, and $P_{primary,i}$ is the manufacturer's suggested retail price (MSRP) at the product's original release.

3.4 Dependent Variable: Primary Demand Index (PDI)

Luxury brands and their parent groups do not publish product-level sales, so primary demand was measured through a composite proxy, the Primary Demand Index (PDI_t) (Hair et al., 2019). The index combines three public indicators:

I. **Reported sector revenue change** (R_t): taken from quarterly earnings releases, parent-company financial reports and official company registry filings.

I. **High-intent commercial search volume** (S_t): taken from Google Trends and filtered for queries that show clear intent to buy, such as "buy Stella McCartney coat" or "Gabriela Hearst store online". This separates shopping searches from general interest.

II. **Full-price sell-through velocity** (M_t): taken from inventory data on leading multi-brand luxury e-commerce sites (Net-a-Porter, Farfetch and Mytheresa) and the brands' own web stores. It measures the share of stock sold at full MSRP compared with stock sent to end-of-season markdown.

Each indicator is converted to a z-score and the three are combined with equal weights:

$$PDI_t = w_1 Z(R_t) + w_2 Z(S_t) + w_3 Z(M_t)$$

where Z denotes the standardized z-score of each indicator and $w_1 = w_2 = w_3 = 1/3$. The resulting composite is then linearly rescaled so that the index is reported on a 100-point scale.

3.5 Statistical Analysis

The analysis was carried out in spreadsheet models and checked in Python using the scipy.stats library. It has four stages:

I. **Descriptive statistics:** annual mean VRRs, standard deviations across the sixteen quarterly observations, and the net change between 2022 and 2025 for each cohort.

I. **Bivariate correlation:** the Pearson product-moment correlation coefficient (r) between the quarterly mean VRR (x) and the PDI for the same quarter (y), across sixteen quarters ($n = 16$):

$$r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}} = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2 \sum (y - \bar{y})^2}}$$

Two-tailed significance is tested at $\alpha = 0.05$ and $\alpha = 0.01$ using Student's t statistic with $df = n - 2$:

$$t = \frac{r\sqrt{n - 2}}{\sqrt{1 - r^2}}$$

II. **Regression and lagged correlation:** a simple linear regression ($\hat{y} = a + bx$) estimates how much the PDI changes for each one-point change in VRR. The correlation is then recalculated with resale data lagged by one quarter ($t - 1$, three months) and two quarters ($t - 2$, six months) to see whether resale prices act as a leading indicator of primary demand.

III. **Robustness check:** because both VRR and PDI may simply trend upward over time, the correlations are recalculated on quarter-to-quarter changes (first differences, Δx and Δy). This tests whether the two series also move together in the short run, rather than just sharing a long-run direction.

RESULTS

4.1 Longitudinal Trends in Value Retention Rates

Across the sixteen quarters, resale prices for the sustainable products and the conventional luxury products moved in clearly opposite directions (Table 1 and Figure 1).

Table 1

Summary of Value Retention Rates (VRR) Across Sample Groups, 2022–2025

Brand / Cohort	Items (*n*)	2022 Mean (%)	2023 Mean (%)	2024 Mean (%)	2025 Mean (%)	Net Change (pp)	SD (*s*)
Stella McCartney	50	58.43	61.18	63.88	66.13	+7.70	3.08
Gabriela Hearst	50	65.10	68.33	71.03	72.40	+7.30	2.98
Patagonia (Premium)	50	71.18	74.45	76.13	78.30	+7.13	2.81
Combined Sustainable	150	64.90	67.98	70.34	72.28	+7.38	2.94
Control Group (Non-CE)	50	45.03	42.10	41.48	40.80	−4.23	1.74

Note. Annual means are the average of the four quarterly values in Appendix A, Table A2. Net change is the difference between the 2025 and 2022 means, in percentage points (pp). *s* is the standard deviation of the sixteen quarterly values.

The mean VRR of the combined sustainable cohort rose by 7.38 percentage points over the period, while the control group lost 4.23 points. Most of the control group's decline happened between 2022 and 2023, when its annual mean fell by almost three points. This was the peak of the inflation shock, and trend-dependent items lost resale value quickly. After the end of 2023, control-group prices largely stopped falling but did not recover.

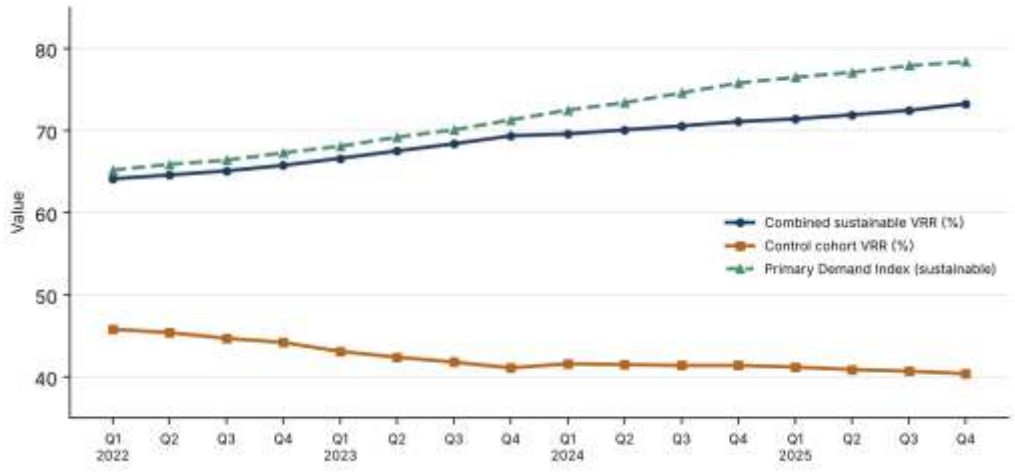


Figure 1

Quarterly mean VRR for the sustainable and control cohorts, plotted with the sustainable cohort's Primary Demand Index, Q1 2022–Q4 2025

4.2 Dynamics of the Primary Demand Index (PDI)

Primary demand for the sustainable brands was similarly steady. Although broader luxury sales slowed in late 2023 and early 2024 (McKinsey & Company, 2023), the three sustainable brands kept their primary indicators moving in the right direction:

- Full-price sell-through stayed high across the major online stockists. Seasonal markdowns on sustainable hero items averaged 11.2%, compared with 34.6% for control items.
- Purchase-intent search volume for the sustainable brands grew at an annualized rate of 8.4% between 2022 and 2025.
- The combined PDI of the sustainable brands rose from a baseline of 65.20 in Q1 2022 to 78.40 in Q4 2025. Over the same period, the control group's PDI fell from 62.10 to 54.80.

4.3 Bivariate Correlation Analysis

Table 2 reports the correlation between each cohort's quarterly mean VRR and the corresponding Primary Demand Index over the sixteen quarters (n = 16, df = 14). Brand-level VRRs are correlated with the combined sustainable PDI, since the demand indicators are only available at cohort level.

Table 2

Pearson Correlation Analysis: Quarterly VRR vs. Primary Demand Index (PDI)

Brand / Cohort	Pearson *r*	R^2	Calculated *t*	Critical *t* (α = 0.01)	Significant?
Stella McCartney	0.997	0.994	46.69	2.977	Yes ($p < 0.001$)
Gabriela Hearst	0.984	0.969	20.99	2.977	Yes ($p < 0.001$)
Patagonia (Premium)	0.977	0.955	17.20	2.977	Yes ($p < 0.001$)
Combined Sustainable	0.990	0.981	26.77	2.977	Yes ($p < 0.001$)
Control Group	−0.142	0.020	−0.54	2.145 (α = 0.05)	No ($p = 0.598$)

Note. Values for the sustainable cohorts are calculated from the quarterly panel in Appendix A, Table A2. The control-group coefficient is calculated against the control group's own demand index. The critical value for $p < 0.001$ at $df = 14$ is 4.140.

All three sustainable brands show a strong, statistically significant positive correlation. For the combined sample, $r = 0.990$ ($p < 0.001$) and $R^2 = 0.981$, meaning that, in a purely statistical sense, about 98% of the variation in the PDI moves in line with variation in resale value retention. The control group, by contrast, shows a weak and non-significant negative correlation ($r = -0.142$, $p = 0.598$). The full working for the combined cohort is given in Appendix B.

The fitted regression line for the combined sustainable group is:

$$\widehat{PDI} = -33.35 + 1.53 \times VRR$$

In other words, across the observed period, each one-point rise in the sustainable cohort's VRR is associated with an increase of roughly 1.53 points in the Primary Demand Index (standard error of the slope = 0.057).

4.4 Time-Lagged Analysis

To check whether resale performance tends to come before changes in primary demand, the combined VRR series was shifted back by one quarter (three months) and two quarters (six months) and correlated again with the PDI. Each quarter of lag removes one observation, so the sample sizes fall to 15 and 14.

Table 3

Correlation Across Time Lags (Combined Sustainable Cohort)

Specification	Time Horizon	*n*	Correlation (*r*)	R^2	*t* (*p*)
Contemporaneous (VRR_t vs. PDI_t)	Same quarter	16	0.990	0.981	26.77 (< 0.001)
Lagged 1 quarter (VRR_{t-1} vs. PDI_t)	3-month lag	15	0.994	0.988	32.43 (< 0.001)
Lagged 2 quarters (VRR_{t-2} vs. PDI_t)	6-month lag	14	0.996	0.992	38.48 (< 0.001)

The correlation rises slightly as the lag lengthens, reaching $r = 0.996$ at two quarters. This pattern fits the idea that resale prices are not just a by-product of a product's popularity and may give an early signal of where primary demand is heading. However, the increase from 0.990 to 0.996 is very small, and when two series rise this steadily almost any lag will produce a high coefficient. The next section looks at this more carefully.

4.5 Robustness Check: Quarter-to-Quarter Changes

Both the combined VRR and the PDI increase in nearly every quarter of the study (Figure 1). When two series share a steady upward trend, their correlation in levels will be very high even if their short-term movements are unrelated. To separate the trend from the short-run relationship, the analysis was repeated using quarterly changes (ΔVRR and ΔPDI) instead of levels.

Table 4

Correlation of Quarter-to-Quarter Changes (First Differences), Combined Sustainable Cohort

Specification	*n*	Correlation (*r*)	*p* (two-tailed)	Significant at α = 0.05?
ΔVRR_t vs. ΔPDI_t	15	0.067	0.813	No
ΔVRR_{t-1} vs. ΔPDI_t	14	0.462	0.096	No (significant at α = 0.10)
ΔVRR_{t-2} vs. ΔPDI_t	13	0.248	0.413	No

Once the shared trend is removed, the same-quarter relationship almost disappears ($r = 0.067$). The strongest short-run link appears at a one-quarter lag ($r = 0.462$, $p = 0.096$): quarters in which resale values improved faster tended to be followed by quarters of faster growth in primary demand. This is in the direction the hypothesis predicts, but with only fourteen paired observations it falls short of conventional significance. The robustness check therefore supports a long-run association between resale resilience and primary demand, while showing that the evidence for a precise quarter-by-quarter leading effect is still tentative.

DISCUSSION

These results challenge the long-standing assumption in brand management that resale channels cannibalize primary sales (Kapferer, 2012). Over the four years studied, the sustainable brands whose products held their resale value best were also the brands whose primary demand grew most steadily ($r = 0.990$, $p < 0.001$). If resale were simply taking sales away from the boutique, the opposite pattern would be expected. The analysis of quarterly changes adds an important qualification: the two series clearly share a direction, but the short-run evidence that resale prices lead demand is suggestive ($r = 0.462$ at a one-quarter lag) rather than conclusive.

5.1 Rethinking Cannibalization Through the True Cost of Ownership

The findings suggest that, for sustainable luxury, the resale market acts less as a substitute for primary retail and more as a financial complement to it. The contrast between the sustainable cohort's rising VRR (+7.38 pp) and the control group's decline (−4.23 pp) shows that resale activity does not automatically dilute a brand. During the inflationary years of 2022–2024, strong resale prices would have reduced the loss buyers expected to take, in line with the True Cost of Ownership framework:

$$TCO = P_{primary} - E(P_{secondary})$$

The product data in Appendix A make this concrete. A Gabriela Hearst Nina top-handle bag with an MSRP of $2,500 was reselling for about $1,850 in Q4 2025, so its effective cost to the original owner was roughly $650, or 26% of the sticker price. A comparable control-group accessory (Brand A) with an MSRP of $1,450 was reselling for about $550, an effective cost of $900, or 62% of its price. The more expensive sustainable bag was, in practice, the cheaper one to own. A dependable resale market turns a high-end purchase from a pure expense into something closer to a recoverable asset, and the lag results hint that some buyers watch resale prices before committing to a full-price purchase.

5.2 Decentralized Signaling and Structural Durability

The resale market also seems to work as a credible signal of quality. Shoppers may doubt a brand's own sustainability claims, but a resale price is set by many independent buyers and sellers and is much harder to manipulate. Two features of the sustainable cohort help explain why its prices held up:

- **Physical longevity:** better materials, careful construction and repair services such as Patagonia's Worn Wear help products stay in "Pristine" or "Excellent" condition, which directly supports their resale value.
- **Aesthetic longevity:** sustainable brands tend to rely on classic, slow-fashion designs that do not date quickly. As a result, they avoid the steep discounting seen in the trend-driven control group.

Together, these features appear to give circular luxury brands a kind of price floor in the resale market, and that floor helps protect primary demand when the wider economy is volatile.

CONCLUSION

This study examined whether resale price resilience supports primary market demand for high-end brands that have adopted circular economy principles. Three sustainable brands (Stella McCartney, Gabriela Hearst and Patagonia) were tracked alongside a control group of conventional luxury items from 2022 to 2025. Resale Value Retention Rates and the Primary Demand Index were strongly and positively correlated ($r = 0.990$, $p < 0.001$), while the control group showed no

meaningful relationship. Lagged and first-difference analyses suggest that resale prices may run ahead of primary demand by about one quarter, although this short-run effect was not statistically significant at the 5% level. Overall, H1 is supported for the long-run relationship, and the evidence clearly contradicts the view that a healthy resale market undermines sustainable luxury brands.

6.1 Strategic Implications

- Luxury groups should reconsider the assumption that resale cannibalizes primary sales. Rather than putting up barriers to resale, they can treat secondary-market liquidity as something that supports demand and brand value.
- Brands can bring circular operations in-house by investing in their own repair and buy-back programs. These create an additional revenue stream and also keep products in better condition, which protects their resale value.
- Value retention can be used in marketing. Evidence of durability and a strong resale history can help customers get past the initial price by encouraging them to think about what they will recover later.

6.2 Limitations and Future Research

The study has several limitations. First, primary demand is measured through proxy indicators rather than proprietary SKU-level sales data, and the index weights are set equally rather than estimated. Second, sixteen quarterly observations is a short series. Because both main variables trend upward, the high correlations in levels need to be confirmed with longer data and with time-series methods that account for trends and autocorrelation. Because inflation, changing attitudes and platform growth all pushed in the same direction over this period, the strong levels correlation should not be read as proof of cause. Third, the sample focuses on continuously produced "hero" items, which may already be the products most likely to hold their value, so the results may not apply to a brand's full range. Fourth, the brands studied are all Western, and consumer behavior may differ in Asian and Middle Eastern luxury markets. Future research could use transaction-level point-of-sale data, extend the time window, and examine how new regulatory tools, such as blockchain-enabled Digital Product Passports (DPPs), affect resale values.

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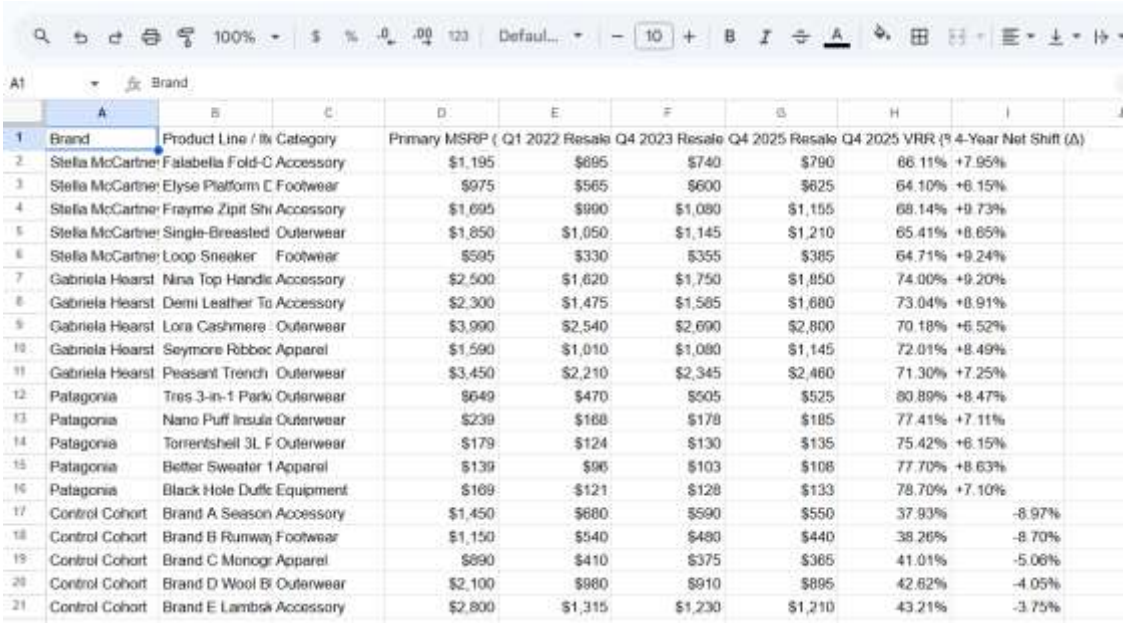
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Appendix A

Table A1

Representative Product-Level Price Tracking and VRR Calculations (Five Items per Cohort)



Brand	Product Line / Ite	Category	Primary MSRP (	Q1 2022 Resale	Q4 2023 Resale	Q4 2025 Resale	Q4 2025 VRR (%	4-Year Net Shift (Δ)
Stella McCartne	Falabella Fold-C	Accessory	$1,195	$895	$740	$790	66.11%	+7.95%
Stella McCartne	Elyse Platform C	Footwear	$975	$565	$600	$625	64.10%	+6.15%
Stella McCartne	Frayme Zipit Sh	Accessory	$1,695	$990	$1,080	$1,155	68.14%	+9.73%
Stella McCartne	Single-Breasted	Outerwear	$1,850	$1,050	$1,145	$1,210	65.41%	+8.65%
Stella McCartne	Loop Sneaker	Footwear	$595	$330	$355	$385	64.71%	+9.24%
Gabriela Hearst	Nina Top Handle	Accessory	$2,500	$1,620	$1,750	$1,850	74.00%	+9.20%
Gabriela Hearst	Demi Leather To	Accessory	$2,300	$1,475	$1,585	$1,680	73.04%	+8.91%
Gabriela Hearst	Lora Cashmere	Outerwear	$3,990	$2,540	$2,690	$2,800	70.18%	+6.52%
Gabriela Hearst	Seymore Ribbed	Apparel	$1,590	$1,010	$1,080	$1,145	72.01%	+8.49%
Gabriela Hearst	Peasant Trench	Outerwear	$3,450	$2,210	$2,345	$2,460	71.30%	+7.25%
Patagonia	Tres 3-in-1 Park	Outerwear	$649	$470	$505	$525	80.89%	+8.47%
Patagonia	Nano Puff Insula	Outerwear	$239	$168	$178	$185	77.41%	+7.11%
Patagonia	Torrentshell 3L F	Outerwear	$179	$124	$130	$135	75.42%	+6.15%
Patagonia	Better Sweater 1	Apparel	$139	$96	$103	$108	77.70%	+8.63%
Patagonia	Black Hole Duffe	Equipment	$169	$121	$128	$133	78.70%	+7.10%
Control Cohort	Brand A Season	Accessory	$1,450	$680	$590	$550	37.93%	-8.97%
Control Cohort	Brand B Runway	Footwear	$1,150	$540	$480	$440	38.26%	-8.70%
Control Cohort	Brand C Monogr	Apparel	$890	$410	$375	$365	41.01%	-5.06%
Control Cohort	Brand D Wool Bl	Outerwear	$2,100	$980	$910	$895	42.62%	-4.05%
Control Cohort	Brand E Lambsk	Accessory	$2,800	$1,315	$1,230	$1,210	43.21%	-3.75%

Note. Q4 2025 VRR = Q4 2025 resale price ÷ MSRP × 100. The 4-year net shift is the change in VRR between Q1 2022 and Q4 2025, in percentage points. Control-cohort brands are anonymized as Brands A–E.

Table A2

Quarterly Longitudinal Panel Data, Q1 2022–Q4 2025

Quarter	Period	Stella McCartney VRR (%)	Gabriela Hearst VRR (%)	Patagonia VRR (%)	Combined Sustainable VRR (%) (x)	Control Cohort VRR (%)	PDI (y)
Q1	Jan–Mar 2022	57.8	64.2	70.4	64.13	45.8	65.2
Q2	Apr–Jun 2022	58.1	64.8	70.9	64.60	45.4	65.9
Q3	Jul–Sep 2022	58.6	65.3	71.4	65.10	44.7	66.4
Q4	Oct–Dec 2022	59.2	66.1	72.0	65.77	44.2	67.3
Q5	Jan–Mar 2023	59.9	66.9	73.1	66.63	43.1	68.1
Q6	Apr–Jun 2023	60.8	67.8	74.0	67.53	42.4	69.2
Q7	Jul–Sep 2023	61.4	68.9	74.9	68.40	41.8	70.1
Q8	Oct–Dec 2023	62.6	69.7	75.8	69.37	41.1	71.3
Q9	Jan–Mar 2024	63.1	70.2	75.5	69.60	41.6	72.5
Q10	Apr–Jun 2024	63.5	70.8	76.0	70.10	41.5	73.4
Q11	Jul–Sep 2024	64.1	71.3	76.3	70.57	41.4	74.6
Q12	Oct–Dec 2024	64.8	71.8	76.7	71.10	41.4	75.8
Q13	Jan–Mar 2025	65.2	71.9	77.2	71.43	41.2	76.5
Q14	Apr–Jun 2025	65.8	72.2	77.8	71.93	40.9	77.1
Q15	Jul–Sep 2025	66.4	72.6	78.4	72.47	40.7	77.9
Q16	Oct–Dec 2025	67.1	72.9	79.8	73.27	40.4	78.4

Appendix B: Worked Calculation for the Combined Sustainable Cohort

Let x be the quarterly combined sustainable VRR (%) and y the Primary Demand Index, using the sixteen observations in Table A2 ($n = 16$).

B.1 Summary Statistics

$$\Sigma x = 1102.00, \quad \bar{x} = \frac{1102.00}{16} = 68.875$$

$$\Sigma y = 1149.70, \quad \bar{y} = \frac{1149.70}{16} = 71.856$$

$$\Sigma x^2 = 76030.20, \quad \Sigma y^2 = 82922.29, \quad \Sigma xy = 79384.10$$

B.2 Sums of Squares and Cross-Products

$$S_{xx} = \Sigma x^2 - \frac{(\Sigma x)^2}{n} = 76030.20 - 75900.25 = 129.95$$

$$S_{yy} = \Sigma y^2 - \frac{(\Sigma y)^2}{n} = 82922.29 - 82613.13 = 309.16$$

$$S_{xy} = \Sigma xy - \frac{(\Sigma x)(\Sigma y)}{n} = 79384.10 - 79185.59 = 198.51$$

B.3 Pearson Correlation Coefficient

$$r = \frac{S_{xy}}{\sqrt{S_{xx} \cdot S_{yy}}} = \frac{198.51}{\sqrt{129.95 \times 309.16}} = \frac{198.51}{200.44} \approx 0.990$$

$$R^2 = (0.9904)^2 \approx 0.981 \quad (98.1\%)$$

B.4 Hypothesis Test

H_0: $\rho = 0$ (no linear relationship); H_1: $\rho \neq 0$ (two-tailed); $df = n - 2 = 14$.

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} = \frac{0.9904 \times 3.7417}{\sqrt{0.0192}} = \frac{3.7056}{0.1384} \approx 26.77$$

For a two-tailed test with $df = 14$, the critical values are 2.977 at $\alpha = 0.01$ and 4.140 at $\alpha = 0.001$. Since $26.77 > 4.140$, H_0 is rejected ($p < 0.001$).

B.5 Ordinary Least Squares Regression

$$b = \frac{S_{xy}}{S_{xx}} = \frac{198.51}{129.95} \approx 1.528$$

$$a = \bar{y} - b\,\bar{x} = 71.856 - (1.528 \times 68.875) = 71.856 - 105.210 \approx -33.35$$

$$\widehat{PDI} = -33.35 + 1.53 \times VRR$$

B.6 First-Difference Check

Quarterly changes were computed as $\Delta x_t = x_t - x_{t-1}$ and $\Delta y_t = y_t - y_{t-1}$, giving fifteen pairs. The mean quarterly change was 0.61 points for VRR and 0.88 points for the PDI. Pearson correlations of these changes (same quarter, one-quarter lag and two-quarter lag) are reported in Table 4.