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Comparative Implications of Decarbonization of Luxury: Emission Profile and Strategic Limitations

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Abstract. The paper compares carbon footprint structures and decarbonization plans of the four most popular luxury conglomerates (LVMH, Kering, Prada, Richemont) based on Environmental, Social and Governance (ESG) reports. Carbon Disclosure Project (CDP) disclosures, and financial reports (2019-2024). The main findings are as follows: (1) Carbon intensity(tCO_2 /e Million euros revenue) has a multifaceted connection with revenue growth: whereas LVMH and Prada recorded absolute decoupling (decrease of intensity with growth of revenues), Kering reported steadier increase in intensity using first-order volume scaling and not supply-chain innovation, corroborating H1 with reservations regarding its applicability to all corporations, and overriding H2; (2) Scope 3 emissions (encompassing 68%-90% of Decarbonization will need to implement selective transparency mechanisms (i.e. permissioned blockchain) as well as commercialization of high cost abatement technology (i.e. bio-based material) through high-end product lines with policy supportive supplier capacity building to deal with the collective action problems of Scope 3. The tools of regulation such as Corporate Sustainability Reporting Directive (CSRD)/Carbon Border Adjustment Mechanism (CBAM) should be supplemented with the transition support to avoid displacement of suppliers.

Keywords: Luxury goods, Carbon intensity, Scope 3, Decarbonization, Stakeholder theory

1. Introduction

International transition towards decarbonization, such as the commitments made by nations, pressure by investors and demands on consumers, have increased attention to corporate greenhouse gas (GHG) emissions across industries [1]. Although heavy industry is the largest polluter in terms of volume, there is an increase in the regulation of industries whose economic role is symbolic in nature, e.g. luxury goods, due to institutional spillover and image effect [2]. The luxury brand is normally synonymous with craftsmanship and high unit value as well as with durable materials, yet these very factors can generate its own hard-to-abate emissions by sourcing rare materials and utilizing complex, cross-border supply chains. Relatively, compared to fast fashion, where the wastes are accused of being volume-based and products have a short lifecycle, the luxury industry has a more concentrated scope in supply chains (Scope 3). The importance of this concentration is linked to the fact that policy instruments (e.g.CSRD), which increase disclosure requirements, and new trade instruments (e.g.CBAM) have the potential to change the economics of production in

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material-intensive inputs. Provenance and supplier secrecy represent a natural tradeoff in luxury houses that value secrecy, since the desire to be transparent to comply with regulations conflicts with the need to keep proprietary supply chains and brand heritage confidential and unsullied. This paper examines four exemplary luxury conglomerates (LVMH, Kering, Prada, and Richemont) in seeking to explore the following: (1) the relationship between carbon intensity and revenue trends; (2) whether it is true that any savings gained in Scope 1+2 translates into any significant Scope 3 developments; and (3) how strategic constraints and opportunities exist, in the alignment of decarbonization with luxury brand logics. It is based on official ESG reports, CDP disclosures and company financials (2019–2024), and 2019 was selected as the base year because it normalizes the changes in reporting and the pandemic-induced distortions. The paper will have a contribution by intertwining both cross-firm empirical comparison and theory guided strategic implications to regulators, investors and brand managers [3].

2. Theoretical framework and hypotheses

2.1. Institutional theory in deluxe decarbonization

The institutional theory dwells on how firms respond to regulatory, normative and cultural forces to ensure they become legitimate [4]. Regulatory pressure in the case of luxury firms is compulsory disclosure and trade measures which bring on their share of burden in measurements and economic implications. The first type of pressure, which can be described as normative pressure, includes the demands that investors and NGOs have regarding credible climate action whereas cultural pressures pertain to the consumer expectations of the brand authenticity and ethics [5]. Institutional pressures hence drive luxury companies to increased transparency of their reportage, but the companies' historical dependence on secrecy and handcrafted manufacturing impose contradictions that cannot be solved through uniform solutions but involve rather piecemeal adaptations.

2.2. Market signals and stakeholder theory

According to the stakeholder theory a firm must juggle multiple interests of various stakeholders. ESG risks are progressively reflected in valuations by investors; consumers say they are willing to pay a premium to get sustainable credentials; regulators require disclosure; suppliers may simply not be able to decarbonize fast enough. These competing forces cast light upon the heterogeneous responses among firms: some prioritize investor signaling (detailed SBTi-aligned targets), others prioritize supply-chain control (conservative disclosures), and many increase product-level innovation to monetize sustainability [6]. Managing such interests and reconciling them is the focal point of strategic decision making in the luxury industry.

2.3. Hypotheses development

The high pressure of decarbonization forces the luxury businesses to locate the carbon intensity of operations by making their operations more up to date. Efficiencies that can be verified have a positive impact on the legitimacy and reputation which increasingly affects regulators, investors, and consumers concerned with sustainability [7]. This type of legitimacy reduces the extent of regulatory/financing risks as well as consumer willingness to pay that will be added as revenue [8]. Decoupling therefore associates the low intensity with high revenue.

H1: There is a negative relationship between carbon intensity and revenue growth of luxury conglomerates.

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The luxury growth via volumes increases material circulation in the lack of innovations in supply chains [9]. Resource and external manufacture make such concentrations of emissions in Scope 3 (raw materials, production). Co-Linear Scaling of units enhances these emissions whereas the revenue gains can dwindle [10]. In such a way, the carbon intensity increases because of structural emission drag of non-innovative growth.

H2: Higher carbon intensity is correlated positively with revenue growth achieved mostly by volume scaling.

About 80 percentage of luxury emissions fall under Scope 3 and cannot be managed since they are global supply chains that are in pieces [11]. Structural rigidities are displayed through the lack of traceability of rare materials, the organization of suppliers as well as long-term upstream investments of more than 10 years [12]. Scope 1+2 reductions, on the contrary, tap into internal efficiencies in cycles that are shorter [13]. Therefore, the mitigation of Scope 3 is still way behind.

H3: Luxury conglomerates have vastly lower absolute reduction rates of Scope 3 emissions than Scope 1+2 shipments.

3. Methodology

3.1. Data sources and baseline

In the research, annual sustainability reports, CDP disclosures, and financial statements of LVMH, Kering, Prada, and Richemont companies obtained in the period 2019 to 2024 have been summed up [14-17]. To make comparisons, the year 2019 is deemed as the base year. These emissions are made standardized; earnings are in million euros. The two biggest sources were the company reports and CDP, where Bloomberg ESG datasets provided an additional opportunity to compare numbers reported. Accurate references list will be provided in the References.

3.2. Definitions of the variables and data analysis

Total Emissions are the elements of sum of Scope 1, Scope 2 and Scope 3 where reported. In cases where they (Scope 3 data) are not fully disclosed, we observe disclosure gaps. Carbon Intensity, which means sum of emissions / revenue in million euros. The percentage change in reported revenue 2019 and 2024 is revenue growth. These differences in accounting boundaries/anomalies necessitated adjustments: (1) all emissions recalculated to a 2019 boundary where available; (2) Richemont result has a giant anomaly in 2020 (22% drop) which we treat by (a) excluding 2020–2021 with respect to binding an individual year, (b) using the CAGR for 2019–2024 to estimate trend; (3) where companies report intensity values in different ways (e.g. per value added) H1–H3 are tested using descriptive longitudinal analysis and cross firm comparisons . This is due to the small-N comparative study where it is noted that patterns are emphasized, triangulation of more corporate accounts, and supply-chain bottleneck identification as opposed to formal panel regressions.

4. Results

The three tables show targets/ progress summary, Emissions vs. revenue comparison, and Scope 3 structure and bottlenecks. A more detailed analysis is given after each table to relate data to hypotheses.

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Table 1. Carbon reduction targets and 2024 progress (2030 unified target year)

Brand	Baseline year	Scope 1+2 target (2030)	Scope 3 target (2030)	Current progress (2024)	SBTi
LVMH	2019	−50% absolute	−55% intensity	Scope 1+2: −55% (achieved early)	Yes
Kering	2019*	−36.2% absolute	−33.4% absolute	Scope 1+2: +6.3%; Scope 3: +34.4%	Yes
Prada	2019	Carbon neutral (2026)	−42% absolute	Scope 1+2: −34%; Scope 3: −5.3%	Commitment
Richemont	2019	−46% absolute	−55% intensity	No public historic progress	Yes (2025 validation)

Data source: LVMH, Kering, Prada, Richemont, SBTi database.

Note*: Data information provided by the company sustainability reports (LVMH 2024, Kering 2024, Prada 2024, Richemont 2025) and CDP. Where companies adopt intensity and absolute targets that quote the naming convention and standardized when possible. Kering justified by 2015-2021 database.

According to Table 1, trajectories of decarbonization reflect the strategic distinctiveness in the rigor of target-setting. LVMH performs severely well in operational dispatch, to the extent that Scope 1+2 is lowered by 55 percent, however, no progress on Scope 3 has been revealed. Even the adjusted baseline presented by Kering in 2019 reveals pervasive problems: Scope 1+2 went 6.3% up when targeted at -36.2 percent, and Scope 3 increased by 34.4 percent versus -33.4 percent. Such a difference between reported progress (-2%/-16%) and restated outcomes indicate possible methodological inconsistencies or unfinished implementation. Prada (2019 baseline) is close to Scope 1+2 carbon neutrality [-34%] and behind in its Scope 3 target [-5.3% vs. -42%]. Richemont does not publish any progress data even though targets are proven.

More importantly, the recalibration of history (2021 to 2019) shows that Kering has a later commitment start than peers has shown, consistent with its poor performance. This is in contrast with the prior anchoring of LVMH/Prada in early 2019, an indication of less-systematic initial carbon regulation. Its slow adoption of the baseline may be an indicator of less preparatory work regarding systemic decarbonization.

Table 2. Carbon emissions and revenue comparison (2019–2024)

Brand	Total emissions change	Revenue change	Carbon intensity 2019 → 2024	Key trend
LVMH	↓30% (1,200k → 840k*)	↑23%	0.82 → 0.45 (↓45%)	Absolute decoupling
Kering	↑21% (1,791k → 2,160k)	↑12%	1.02 → 1.20 (↑18%)	Scope 3 growth offsets gains
Prada	↓1.2% (328k → 324k)	↑19%	1.15 → 0.83 (↓28%)	Intensity reduced via tech
Richemont	↑13% (1.54k → 1.74k*)	↑15%	0.10 → 0.11 (↑10%) *	Supplier dependence

Data source: LVMH, Kering, Prada, Richemont company financial reports (2019–2024) and CDP disclosures.

Notes: LVMH total emissions estimated based on scope percentages; Richemont 2020 is adjusted for pandemic anomaly.

It is all about H1 and H2 discussed in Table 2. There is unarguable absolute decoupling at LVMH: total emissions fell on the order of 30 percent whereas revenue increased 23 percent; there was a 45 percent decline in intensity. Prada exhibits a decrease in intensity (28%) with an increase in revenue (19%), which is evidence of technological or sourcing advances despite a seeming lack of

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significant change in total emissions. Both outcomes are against the simplistic version of H2 (that the revenue growth inevitably will increase intensity) and therefore H2 is not universal. Kering is an exception: revenues grew 12 percent and total emissions and intensity increased (emissions +21%, intensity +18%), proving that scale absent upstream transformation can carry increases in overall intensity- this fits the conditional quality of H2. The poor data of Richemont and the pandemic adjustment make inference more difficult, although the response does imply that a near-complete supplier fragmentation and late release may obscure structural raise ups.

Table 3. Scope 3 emission structure and bottlenecks (2024)

Brand	Largest Scope 3 category	Share (%)	Reduction difficulty	Current measures
LVMH	Raw material procurement (leather/metal)	68%	Traceability of scarce materials	Recycled gold pilot (2023)
Kering	Purchased goods & services (leather)	82.6%	Animal ethics & supplier scale	Bio-based substitutes (2024)
Prada	Supply-chain production (textile/chemical)	90%*	Cross-border subcontract opacity	Re-Nylon recycling program (2022)
Richemont	Purchased goods & services (jewelry raw materials)	71.6%	Many small suppliers; dispersed sourcing	Supplier carbon audits (2025 pilot)

Data source: LVMH, Kering, Prada, Richemont ESG reports (2023–2024).

Note*: Percentages based on firm reporting and CDP; Prada's 90% is calculated from 2024 total emission breakdown.

The few categories that dominate Scope 3 in table 3 such as leather, textiles, metal, and jewelry material use reveal why supply-chain interventions are critical. The challenges are technical (substitute the materials, processes), and organizational (minor suppliers, confidentiality). At LVMH and Kering, traceability of material takes pride of place; at Prada, lack of visibility of subcontractors is the issue; at Richemont, fragmentation of artisanal suppliers occurs. The presence of these structural traits, however, confirms the continued lack of Scope 3 progress (H3) and implies the need to coordinate policy and industry action to generate upstream action.

5. Discussion

5.1. Dilemma: legacies versus openness

The artisanal of luxury brands and their possession of a personalized supply chain present an organizational conundrum. The practice of disclosure of supplier names and material origin may be detrimental to competitive advantage and brand mystique; the lack of such disclosure demeans regulatory legitimacy and investor confidence. The workable way out is selective transparency: report summarized, confirmable data in large-emitting categories and apply confidentiality-maintaining tracing mechanisms (e.g., permissioned blockchain anchoring with selective disclosure).

5.2. Strategic placing: MACC and product economies

The analysis of marginal abatement cost curves (MACC) reveals that differentiation in prioritization may occur in the context of the luxury. Very expensive options (bio-based leather, blockchain traceability) could be justified by a sector with a greater willingness and ability to pay . An example

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of a hypothetical bio-leather measure that would cost much might be absorbed in premiums on limited-edition products (e.g. 20–30 per cent premiums) without causing loss of exclusivity. On the other hand, low-cost operational improvements (onsite renewable energy, logistic optimization) are to be implemented on a large scale since they produce consistent cost/benefit results.

5.3. Policy levers and supply-chain governance

The high Scope 3 means individual firm measures are insufficient. Supplier capacity building on an industry-wide basis, standard setting with coordination, and subsidies (to retrofit to small suppliers) are in order. Regulatory tools such as CSRD and CBAM create incentives to decarbonize upstream and cannot be used alone, requiring additional transition support to prevent supplier loss and perverse offshoring.

5.4. Leverage and revenue strategies in consumers

Survey data suggest that a significant proportion of purchasers would be willing to pay premiums on carbon-neutral luxuries. However, the sustainability credentials of many brands have not been communicated down to the product level in a manner that can drive consumer willingness to pay (e.g., LVMH holds a certification on recycled gold that has been certified, but the certification is not regularly shown on product labels). The commercial plan is to develop carbon-premium product ranges in which reduction costs are capitalized into limited editions and provenance narratives that bestow and underpin luxury credentials (not undermine them) .

6. Limitations and future research

The findings are limited by several factors. First, the lack of comparability makes Scope 3 disclosure inconsistent; more granular and standardized disclosure would allow testing an economy-wide sample via econometrics. Second, causal inference is constrained by the small-N design; in the future, one should implement a panel regression with a greater coverage of firms. Third, we forego direct willingness-to-pay evidence at consumer level in response to verified carbon footprints of products: incorporation of survey data or records of sales would allow analysis of carbon-premium policies. Lastly, the research is based on data reported by companies; independent life cycle assessments (LCAs) will enhance the estimates, especially of the upstream material.

7. Conclusions

This is the product of the present-day scenario of carbon neutrality in the luxury industry, in case of which the juxtaposition of potential and shortcomings becomes obvious. The experience of such giants (LVMH, Kering, Prada, and Richemont) indicates that substantial cuts in operational emissions in Scope 1 and Scope 2 have been attained through efficiency gains in energy usage and the use of renewable energy. Nevertheless, it is merely a thin layer of decarbonization undertakings. The key structural dilemma is Scope 3 emissions, which represents the carbon footprint of upstream supply chain processes such as the supply of is not in the direct control of the industry, especially raw material extraction, processes, and transport, which constitute more than 80% of the sector total carbon emissions and very scattered with little control.

There is a complicated correlation between carbon intensity and revenue growth: conglomerates that focus intensively on innovation will be able to work towards continuously reduced carbon intensity through technological integration as they grow, whereas firms that are mainly focused on

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scale may find themselves in a situation of increasing intensity of carbon due to outsourced production. Luxury brands should thus go beyond the checks of compliance-based disclosure strategies and pursue practices of discretionary transparency, by publishing important emission data and commercializing decarbonization investments in the form of carbon premium products certified. More importantly, they should help suppliers to lessen their emissions by providing them with financial reimbursement, technological collaboration, and long-term orders, and not merely replace suppliers to simply pass on a burden of emissions.

Policymakers must drive change as catalysts: as in the case of mandating Scope 3 data reporting, policymakers should introduce custom-designed transition support to SMEs, such as the subsidy of available technologies, green financing, and training opportunities, to prevent the socio-climatic consequences of the policy of replacement instead of remediation. It is only in the case that both brands and policymakers increase the degree of upstream technologies adoption and extensive supply chain decarbonization that the luxury industry can be on its way to a veritable low-carbon transition, as opposed to being limited to the reach of marginal operational gains.

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