

“Asset-light vs. asset-heavy: Financial resilience and recovery in the global hotel industry during COVID-19”

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ARTICLE INFO	Dijana Čičin-Šain (2026). Asset-light vs. asset-heavy: Financial resilience and recovery in the global hotel industry during COVID-19. <i>Problems and Perspectives in Management</i> , 24(4), 102–118. doi: 10.21511/ppm.24(4).2026.07
DOI	http://dx.doi.org/10.21511/ppm.24(4).2026.07
RELEASED ON	Wednesday, 14 October 2026
RECEIVED ON	Wednesday, 17 June 2026
ACCEPTED ON	Wednesday, 16 September 2026
LICENSE	 This work is licensed under a Creative Commons Attribution 4.0 International License
JOURNAL	"Problems and Perspectives in Management"
ISSN PRINT	1727-7051
ISSN ONLINE	1810-5467
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

21



NUMBER OF FIGURES

4



NUMBER OF TABLES

7

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BUSINESS PERSPECTIVES



LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine
www.businessperspectives.org

Type of the article: Research Article

Received on: 17th of June, 2026

Accepted on: 16th of September, 2026

Published on: 14th of October, 2026

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Conflict of interest statement:

Author(s) reported no conflict of interest

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ASSET-LIGHT VS. ASSET-HEAVY: FINANCIAL RESILIENCE AND RECOVERY IN THE GLOBAL HOTEL INDUSTRY DURING COVID-19

Abstract

The COVID-19 pandemic caused the most severe demand shock in the global hotel industry's recorded history, but its financial consequences were not equally distributed across firms. This study aims to examine whether hotel business model structure, specifically the degree of asset-light orientation, predicts the timing of financial recovery. The analysis uses a 15-year (2010–2024) Bloomberg panel of publicly listed hotel companies. Business model scores are measured from Bloomberg segment revenue filings wherever segmentation separately identifies fee, property, and zero-margin reimbursement revenue, and by the structured classification otherwise, with treatment anchored at pre-crisis (2019) values. Two-way fixed effects difference-in-differences estimates show that asset-light companies outperformed asset-heavy peers by 13.5 percentage points in EBITDA margins during the 2020–2021 crisis ($p = 0.014$). The event study shows this advantage is concentrated in the recovery year rather than the shock year: both groups collapsed comparably in 2020, asset-light margins recovered to near pre-crisis levels in 2021 while asset-heavy margins remained negative (+20.3 pp, $p < 0.001$), and the differential is no longer distinguishable from zero by 2022. The recovery premium is robust to region-by-year and pre-crisis-size controls and, separately, to restricting the treated group to segment-verified firms.

Keywords

asset-light business model, hotel industry, financial resilience, COVID-19, difference-in-differences, operating leverage

JEL Classification

L83, G01, C23

INTRODUCTION

The COVID-19 pandemic caused the most severe and fastest decline in demand in recorded history for the international lodging industry. In 2020, international tourist arrivals plunged by 74% over the previous year, representing an estimated loss of USD 1.3 trillion in export revenues, more than eleven times the loss recorded during the 2009 global economic crisis (UN Tourism, 2021). This situation resulted in significant margin destruction for the hotel sector, whose economic characteristics include high operating leverage and a cost structure based on revenues. Among the asset-heavy operators in this sample, mean EBITDA margins fell from 21.2% in 2019 to –6.2% in 2020, with 45% of these firms recording negative EBITDA margins in that year (Table 2). However, this aggregate view of the industry masked a structural diversity that has received relatively little empirical attention: hotels were not equally affected by demand shocks. Over the past twenty years, a long-term shift in lodging business models from capital-intensive, proprietary-owned operations to asset-light models using management contracts and franchise arrangements (Seo & Soh, 2019; Seo, 2021) has led both companies and their investors to question whether this structural evolution provided meaningful financial resilience during the downturn. This paper addresses this primary research question.

The theoretical rationale for differences in resilience is based on operating leverage. Nicolau (2005) showed that hotels with high fixed costs are more sensitive to demand changes. In contrast, owned and leased hotels must continue to service debt, depreciate physical assets, and maintain at least minimal staffing regardless of occupancy. Consequently, margins will contract nonlinearly as fixed costs are spread across rapidly diminishing revenue. While this mechanism is theoretically clear, no empirical research has examined whether the degree of a company's asset-light structure predicts financial resilience in response to a macroeconomic event of the magnitude experienced during COVID-19, using a panel of publicly traded hotel firms and appropriate identification procedures.

This paper addresses this research gap. To develop a comprehensive panel dataset of 335 publicly traded hotel companies across six geographical regions over fifteen years (2010–2024), the dataset includes hotels ranging from purely asset-heavy owner-operators to fully asset-light franchises. Each company is placed on a continuous business model score (0 = pure asset-heavy; 100 = pure asset-light) constructed from fee revenue as a share of total revenue net of pass-through reimbursements, computed directly from Bloomberg segment filings wherever segmentation permits and assigned by structured review of annual reports otherwise. Measuring business model orientation from revenue composition rather than from property counts or balance-sheet asset levels departs from prior practice and is a contribution of the study in its own right.

This study provides the first cross-regional panel evidence linking hotel business model orientation to financial resilience during a macroeconomic shock, contributing to the hotel resilience literature and the COVID-19 financial impact literature.

1. LITERATURE REVIEW

Organizational resilience in the hotel industry has been conceptualized progressively, moving from disaster-management frameworks toward financial and structural determinants. In their systematic review of the hotel disaster resilience literature, Brown et al. (2017) define hotel resilience as a hotel's and its stakeholders' dynamic capacity to assess, innovate, adapt, and overcome disaster-triggered disruptions. Building on this foundation, Brown et al. (2018) develop an integrative framework comprising six capital dimensions (economic, social, human, physical, natural, and cultural), each providing a separate entry point for building resilience, with the economic capital dimension encompassing the availability of financial resources, income diversity, and financial strength. The present study is positioned within that economic capital dimension, but departs from the capital-stock perspective in one important respect: it examines not the level of financial resources a hotel company holds, but the structural architecture through which it generates revenue. Business model structure is, in this sense, a pre-crisis strategic choice that determines how a given stock of resources translates into margin dynamics when demand collapses and returns.

The body of research on hotel resilience during COVID-19 has developed rapidly, but much work remains. Clark et al. (2021), in their event study of 154 publicly traded international hospitality companies, found that those with lower debt-to-equity ratios and higher relative profitability experienced fewer stock price losses when the COVID-19 crisis began. Heryán et al. (2025), using a heterogeneous difference-in-differences methodology on European hotel data from 17 countries, found that the impact of COVID-19 on shareholders' funds depended heavily on ownership concentration structure. Polemis (2020) employs a difference-in-differences model to estimate the effect of Italy's national COVID-19 lockdown on hotel performance, using Turkey as the control group, providing an empirical precedent for the difference-in-differences design used in the present study. Dogru et al. (2023) demonstrated that hotels and peer-to-peer accommodations exhibited varying levels of resilience during the COVID-19 crisis, and that state-level policies significantly moderated these variations. Wszendybył-Skulska et al. (2024) extended the notion of heterogeneity to regional clusters of the Polish hotel industry, showing that pre-crisis growth factors and resilience factors are distinct concepts that may not always coexist. Aharon et al. (2021) demonstrated that government contain-

ment interventions during COVID-19 were consistently associated with negative hospitality stock returns, with uncertainty about government policy constituting a primary driver of financial market deterioration in the sector.

Two features of this literature motivate the present design. First, the evidence base is dominated by market-based outcomes over short event windows: Clark et al. (2021) and Aharon et al. (2021) measure abnormal stock returns during the first weeks of the pandemic, capturing investor expectations rather than realized operating performance. Accounting-based studies over longer horizons remain scarce, and those that exist, like Heryán et al. (2025) on shareholders' funds and Zhang et al. (2022) on Taiwanese listed hotels, cover single regions or single balance-sheet outcomes. Realized EBITDA margins over a full crisis-and-recovery cycle, observed globally, remain largely unexamined. Second, the structural determinants studied to date (leverage, ownership concentration, size, region, and policy environment) are all characteristics of the firm's financing or context rather than of its operating model. The business model itself, the contractual architecture that determines whether a company earns property revenues against fixed obligations or fee revenues against variable overheads, has not been isolated as a treatment variable in a causal design. This omission is notable because business model choice, unlike leverage or geography, is the strategic variable most directly under the long-run control of hotel executives and boards, which makes its resilience consequences a management question rather than solely a finance question.

The global hospitality industry experienced a complete paradigm shift in the twenty years preceding COVID-19. International hotel chains gradually sold their properties, moved to management contracts and franchise agreements, and now focus on managing brands, distributing bookings, and maintaining loyalty programs, no longer owning property (Seo & Soh, 2019). In 2020, Marriott International operated approximately 99% of its 1.4 million rooms under management or franchise agreements; Hilton reported a comparable figure of 98% (Seo, 2021).

Asset-light business models in hotels are characterized by two distinct revenue streams with fundamentally different risk profiles. Under management contracts, operators earn base and incentive

fees; under franchise agreements, they earn royalty fees in exchange for brand affiliation and system access. Both fee types share a critical structural property: they are almost entirely variable with respect to the operating performance of the underlying property, imposing no fixed cost obligations on the operator regardless of occupancy levels. The asset-light operator's cost base consists primarily of corporate overheads, technology infrastructure, and brand management expenses, a structure that scales efficiently and does not create downside leverage during periods of revenue contraction (Seo & Soh, 2019).

To date, Seo and Soh (2019) have provided the most comprehensive empirical research into the asset-light financial features of the U.S. lodging industry. Their analysis, using a panel dataset of publicly listed U.S. lodging firms, shows that companies with an asset-light model had lower investment-cash flow sensitivity and higher Return on Invested Capital (ROIC) than the traditional owner-operated model. This aligns with theory, which states that reducing the assets used in a business increases capital efficiency. Seo (2021) argues that asset-light hotel companies have greater strategic flexibility to reconfigure resources during demand crises. Additionally, Masset et al. (2019), who conducted comparative research on publicly listed hospitality companies from sixteen Western European countries from 2004 to 2016, showed that ownership has a significant influence on company performance in relation to asset intensity; those with more asset-intensive operations experienced poorer performance, especially during the Global Financial Crisis. Zhang et al. (2022) extended this work into the COVID-19 era, finding an inverted U-shaped relationship between financial flexibility and performance among publicly listed Taiwanese hotels, with the pattern differing across the distribution for asset-heavy and asset-light firms.

The measurement strategies underlying these studies share a common feature. Seo and Soh (2019) construct two alternative measures: the share of franchised and managed properties in a firm's total portfolio, hand-collected from company reports, and the ratio of intangible to tangible assets and a composite measure of asset lightness derived from returns, book assets, goodwill, and

intangibles, while Masset et al. (2019) proxy asset intensity through balance-sheet asset levels. These capture portfolio structure rather than revenue composition. A firm managing many properties on behalf of owners and a firm operating its own can share a portfolio profile while earning fundamentally different revenue streams, and it is the revenue composition, not the property count, that determines margin behavior when demand collapses. Measuring fee intensity directly from segment revenue filings is therefore a departure from prior practice rather than a refinement of it.

The conceptual link between the structural nature of a firm's business model and its financial resilience is known as "operating leverage." Operating leverage refers to the sensitivity of profits to changes in sales. Firms with high fixed cost ratios experience proportionally greater profit volatility in response to variations in sales volume because their fixed costs do not change with the level of sales activity (Nicolau, 2005). The hotel industry is particularly susceptible to these effects, as hotels have fixed-cost exposures associated with ownership or leasehold interests in real estate, including entirely fixed costs such as property taxes, insurance, debt service, staffing mandates, and maintenance of physical assets, which persist even when occupancy rates fall sharply, as occurred in 2020 (Rushmore & O'Neill, 2015).

Rushmore and O'Neill (2015) empirically establish that hotel operating expenses carry significant fixed components (rooms department expenses at 36%, administrative and general at 33%, utilities at 33%, and marketing at 29%), meaning that revenue declines compress margins non-linearly as fixed obligations persist regardless of occupancy. When total revenue falls by 60–70%, as occurred in many markets in 2020, these fixed cost obligations compress EBITDA margins severely and non-linearly, driving many asset-heavy operators into negative EBITDA territory even with moderate revenue declines. Nicolau (2005) uses an event study methodology to show that new hotel investment decisions affect a chain's operating leverage, measured through post-announcement stock return volatility, with new properties potential-

ly increasing or decreasing systematic financial risk depending on how they alter the chain's exposure to fixed cost obligations.

The operating leverage mechanism also generates a sharp temporal prediction that prior studies have not tested: because the disadvantage of fixed obligations binds only while revenues are depressed, the margin differential between business models should open during the demand collapse, peak in the first phase of demand recovery, and close as revenues normalize.

Asset-light operators have a structurally different cost model. Their revenue base (management and franchise fees) is linked to overall system-wide RevPAR performance; therefore, as demand declines, these fees decrease proportionally. However, because the primary expense for an asset-light company is generally variable corporate overhead (rather than property-specific fixed expenses), any margin contraction from lower fees during a demand decline is limited (Seo & Soh, 2019).

The theoretical framework above produces three testable hypotheses:

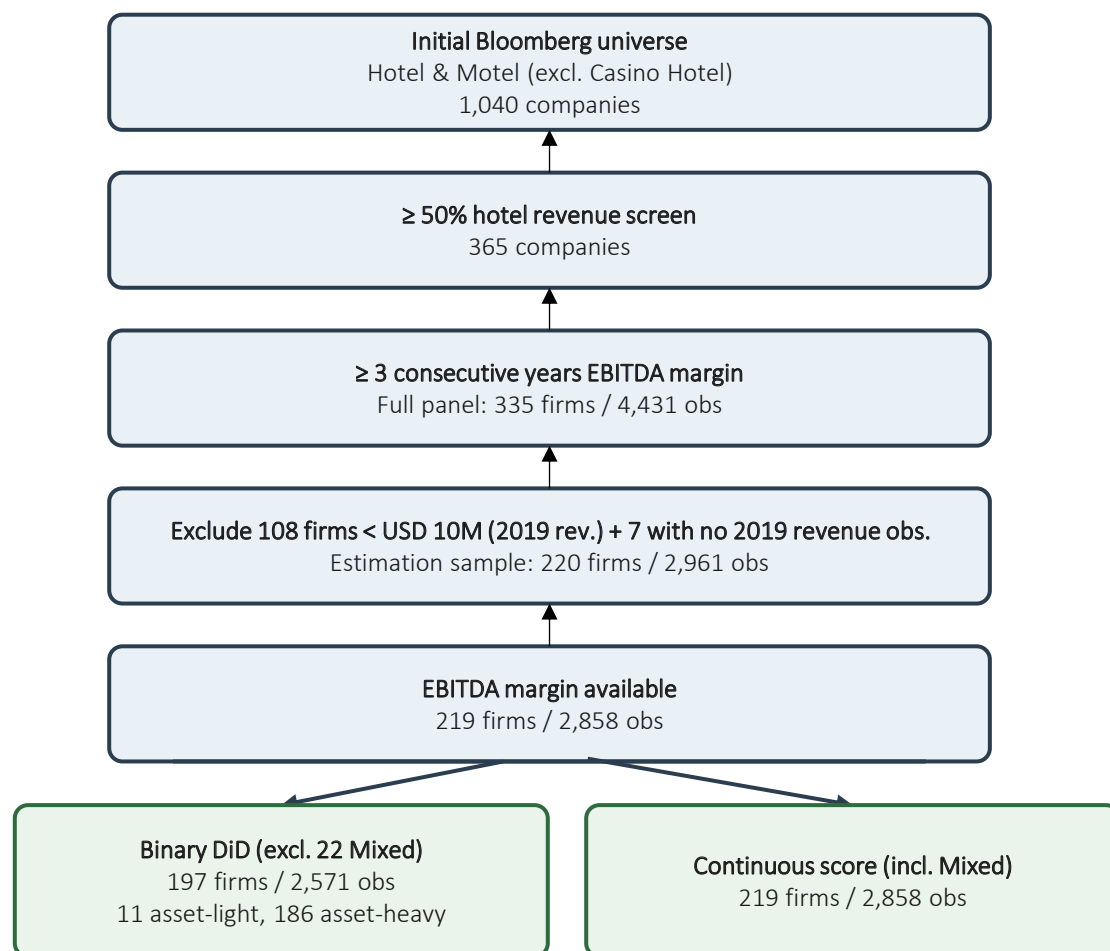
- H₁: Asset-light hotel companies demonstrate significantly greater EBITDA margin resilience during the COVID-19 crisis period (2020–2021) compared to asset-heavy companies, after controlling for firm and year fixed effects.*
- H₂: The asset-light advantage takes the form of earlier margin normalization rather than a persistent margin premium: the differential is concentrated in the first recovery year and dissipates as asset-heavy margins normalize.*
- H₃: The asset-light advantage is consistent with a revenue-recovery interpretation, in which fee-based revenues that track system-wide performance rebound proportionally as demand returns.*

Because realized revenue is itself an outcome of the crisis, this interpretation is examined descriptively and through pre-crisis size interactions rather than by conditioning on contemporaneous revenue, which would introduce post-treatment bias.

2. METHODOLOGY

The initial universe consists of all 1,040 publicly listed companies classified under Bloomberg's Hotel & Motel (excl. Casino Hotel) industry segment. Companies are included only if hotel industry revenues account for at least 50% of total revenues as reported by Bloomberg's Industry Classification Service. Companies for which Bloomberg does not report a revenue breakdown are excluded, as compliance with this criterion cannot be verified. This screen reduces the universe to 365 companies. After requiring at least three consecutive years of non-missing EBITDA Margin data, the full unbalanced panel comprises 335 companies across 15 years (2010–2024), yielding 4,431 firm-year observations. From this panel, firms with 2019 revenues below USD 10 million, or without a 2019 revenue observation, are excluded from the estimation sample (115 firms), as margin

dynamics of micro-cap firms are dominated by idiosyncratic noise; results are robust to a USD 50 million threshold. The resulting estimation sample comprises 220 companies and 2,961 firm-year observations, spanning six geographic regions: Asia-Pacific (58.8% of observations), Europe (18.5%), Africa (8.5%), North America (5.9%), Middle East (5.8%), and Latin America (2.4%). All financial data are extracted from Bloomberg Terminal company financial files. Monetary values are reported in USD millions using Bloomberg's currency conversion at annual average exchange rates. Figure 1 summarizes the sample construction from the initial Bloomberg universe to the final estimation sample and its binary and continuous analysis branches. Of these 2,961 observations, 2,858 have non-missing EBITDA margin; excluding Mixed companies leaves 2,571 for the binary specifications, of which 2,570 enter estimation after one singleton firm is dropped.



Note: One singleton firm-year is dropped in estimation, giving N = 2,570 for the binary specifications.

Figure 1. Sample construction flow

The primary dependent variable is EBITDA margin (%), defined as EBITDA divided by total revenues expressed as a percentage. This measure captures operational profitability net of differences in financing structure and depreciation policy across firms, making it the most appropriate cross-country comparison metric in a sample spanning six regions with heterogeneous accounting standards.

2.1. Business model score construction

The key independent variable is a business model score ranging from 0 (pure asset-heavy) to 100 (pure asset-light), measured as fee-based revenue as a percentage of total revenue net of pass-through reimbursements. Scores are computed directly from Bloomberg segment revenue files for every company whose filings contain a machine-readable segment breakdown (228 of 335 companies; 3,335 company-year observations). Three measurement safeguards are applied. First, Bloomberg segment tables are hierarchical: parent segments (e.g., “Management & Franchise”) are reported alongside their child segments (e.g., “Franchise & Licensing”, “Base Management Fees”); scores are computed from top-level segments only to prevent double counting. Second, zero-margin cost reimbursements from managed and franchised properties, recorded as revenue by major operators including Hilton, Hyatt, Accor, and InterContinental, are identified and excluded from the denominator, since these pass-through amounts would otherwise mechanically suppress measured fee intensity. Third, segment-based scores are used only where the segmentation is informative, that is, where at least one top-level segment identifies fee, property, or reimbursement revenue. Where companies report only geographic or product-opaque segments, the segment-based score is treated as missing and the author classification from annual reports is retained. Segment classifications were verified in a multi-step process, with all 21 manual corrections recorded in an auditable override table (available on request). This procedure yields directly measured scores for 121 companies with informative segmentation, author-classified scores for the remainder, and verified zero fee revenue, rather than assumed default values, for the large majority of owner-operators.

2.2. Author classification

Where Bloomberg segmentation is uninformative, that is, where no top-level segment identifies fee, property, or reimbursement revenue, the 2019 anchor is assigned by the author from a review of annual reports, investor presentations, and company business descriptions. This assignment is not a computed fee ratio, and the fee-share variable is undefined for these firms. It is an ordinal judgment about the balance between properties a company owns or leases and properties it operates or franchises on behalf of third-party owners, expressed on the same 0–100 scale so that the two sources of the business model score remain commensurable. The procedure is anchor-based rather than continuous. A company whose filings report only room, food and beverage, and departmental revenue, with no indication of income earned from third-party owners, receives the asset-heavy floor value of 10. A company that reports property revenue alongside a described but unquantified managed or franchised estate is placed in the 40–55 band. A company whose disclosures describe a predominantly managed and franchised estate is placed at 75 or above. Because judgments are mapped onto these anchor points rather than onto a measured percentage, the resulting variable is semi-discrete: of the 21 non-default author scores in the estimation sample, 19 fall on multiples of five, and the two exceptions arise from a manual correction and an interpolated backfill rather than from the anchoring procedure itself. Author scores are also time-invariant, assigned once and held constant across the panel, whereas segment-based scores vary annually with the reported revenue mix. Because the treatment anchor is fixed at the 2019 value in every specification, time-invariance does not affect identification; it does mean, however, that author scores carry no information about within-firm business-model change.

Table 1 summarizes the basis of classification across the estimation sample. The resulting treatment anchor is verified directly from segment filings for 87 of the 220 estimation-sample firms (39.5%): 28 firms with a directly quantified 2019 fee share and 59 verified as earning no material fee revenue. The remaining 133 firms retain an author-assigned score, of which 112 receive the default asset-heavy value of 10, which is a floor convention applied to firms that display no evidence of fee-based revenue in

Table 1. Basis of business model classification in the estimation sample (220 firms)

Basis for 2019 treatment anchor	Firms	% of sample	Group
Directly quantified 2019 fee share (segment filings)	28	12.7	AL / Mixed / AH
Verified zero fee revenue (segment filings)	59	26.8	AH
Author-assigned specific (non-default) score	21	9.5	AL / Mixed / AH
Author-assigned default asset-heavy score (10)	112	50.9	AH
Total	220	100.0	

Note: The 2019 business model score serves as the pre-crisis treatment anchor. “Directly quantified” rows are computed from Bloomberg segment revenue filings; “verified zero fee revenue” denotes firms whose segment filings report no fee-based revenue. “Author-assigned specific score” denotes firms manually assigned a non-default score from annual-report review. The default value of 10 is a floor convention applied to firms that display no evidence of fee-based revenue but for which segment data do not permit positive confirmation of a zero fee share; these are overwhelmingly small, single-market owner-operators. Business model status is thus verified directly from segment filings for 87 firms (39.5%). The default value affects only the control group: of the eleven asset-light (treated) firms, four are segment-verified, and seven carry an explicitly assigned non-default score; no treated firm rests on the default value. AL = asset-light; AH = asset-heavy. Author-assigned scores are anchor-based ordinal judgments from annual-report review, not computed fee ratios; 19 of the 21 non-default author scores fall on multiples of five. The paper further reports a re-inspection of the 2019 segment files for the seven author-classified treated firms and the corresponding robustness check (Table 7, Specification 4).

their filings but for which segment data do not permit positive confirmation of a zero fee share. These firms are overwhelmingly small, single-market owner-operators for which asset-heavy classification is not in doubt; the default value affects only the control group, since all firms classified as asset-light or mixed carry either a segment-verified or an explicitly assigned non-default score.

The author scale is accordingly coarser and less reliable than the segment-based scale, and a re-inspection of the underlying segment files quantifies that gap for the treated group. Of the eleven firms whose 2019 anchor places them at or above the asset-light threshold, four carry a directly computed segment score (GreenTree, Hilton, InterContinental, Wyndham) and seven carry an author score. For two of the seven (Arab International Hotels and FDC International Hotels), the 2019 filings report only departmental property revenue (“Room – Hotels”; “Guest Room Department” and “Catering Department”) and identify no fee income, which is inconsistent with the assigned scores of 50. For two further firms (Jinjiang International Holding and Shanghai Jinjiang Hotels), the 2019 filings combine hotel operation and management in a single revenue line and disaggregate it geographically rather than by revenue type, so fee income is neither confirmed nor excluded and the assigned scores of 55 are not supported by the filings in either direction. For Meliá Hotels, 2019 segmentation is unpopulated, but the nearest populated years report management-model revenue at 15.2% of total in 2020 and 12.0% in 2021; since fee shares rise mechanically when property revenue collapses, the pre-crisis share is lower still,

and the assigned score of 55 is not supportable. Meliá also reports a vacation-club line, which accounts for between 4% and 8% of total revenue in every pre-crisis year in which it is populated and does not alter this reading. For the remaining two, Marriott International and Lemon Tree Hotels, no machine-readable segmentation is available in any year, and their status cannot be assessed from segment data in either direction. Five of the seven author-classified treated firms therefore carry scores that the segment evidence does not support, and all five sit at 50–55, immediately at the asset-light cut-off, so a downward revision of a single anchor step would remove them from the treated group.

Specification 4 of Table 7 addresses precisely this sensitivity. It restricts the treated group to the four firms whose 2019 asset-light status is computed directly from segment filings and is therefore not open to dispute, dropping all seven author-classified treated firms, including the largest. On this restricted group, the 2021 recovery premium is 21.49 percentage points ($p = 0.018$), and the pooled crisis coefficient is 12.23 ($p = 0.025$), both larger in magnitude than in the baseline. The recovery result therefore does not rest on the author-classified firms; their inclusion attenuates rather than inflates it, which is the direction non-differential misclassification of a binary treatment indicator would be expected to produce, and the extent of misclassification documented above is consistent with the attenuation observed. The cost of the restriction is statistical power: with four treated firms, the more demanding specifications reported in Table 7 cannot be estimated with adequate precision, though their point estimates remain positive

and comparable in magnitude to those obtained on the full treated group. The two definitions are thus complementary: the restricted group is cleaner in measurement, the full group better powered, and the recovery premium is positive under both.

2.3. Treatment definition

Because fee shares rise mechanically during demand collapses (property revenues fall faster than fee revenues), interacting contemporaneous scores with crisis indicators would contaminate treatment with the outcome. Treatment intensity is therefore anchored at the pre-crisis value: each firm's 2019 business model score, the last full pre-crisis year. Binary indicators classify firms as asset-light (score ≥ 50), mixed (10–50, excluded from the binary comparison), and asset-heavy (≤ 10). Vacation-ownership (time-share) companies, whose revenues derive from vacation ownership interest sales rather than hotel fees, are classified by the segment data as non-asset-light. Following the WHO's declaration of a global pandemic on March 11, 2020, the crisis period is defined as 2020–2021, the recovery period as 2022–2023, and the pre-crisis period as 2017–2019. The reference year for the event study is 2019. Because realized revenue is an outcome of the treatment, the H_3 interpretation is not tested by conditioning on contemporaneous revenue, which would introduce post-treatment bias and, since EBITDA margin is itself scaled by revenue, a mechanical association. Instead, the revenue-recovery interpretation is assessed through interactions of pre-crisis (2019) firm size with year indicators, which absorb differential size-related trajectories without conditioning on a post-treatment mediator.

Three complementary specifications are estimated. Model 1 (Binary DiD, H_1 – H_2) follows a Two-Way Fixed Effects (TWFE) difference-in-differences design comparing asset-light companies against an asset-heavy control group, with Mixed companies excluded:

$$EBITDA_{it} = \alpha_i + \gamma_t + \beta_1(D_{AL,i} \cdot Crisis_t) + \beta_2(D_{AL,i} \cdot Recovery_t) + X'_{it}\Gamma + \varepsilon_{it}, \quad (1)$$

where α_i is firm fixed effects, γ_t is year fixed effects, and X_{it} is time-varying controls. The co-

efficient β_1 identifies the average differential EBITDA margin of asset-light firms during the crisis period relative to asset-heavy firms, over and above their respective pre-crisis baselines. The identification exploits cross-sectional variation in pre-determined exposure to a common temporal shock, a standard difference-in-differences design when treatment intensity varies across units rather than over time. The event-study specification is consistent with best practices for such designs (Callaway & Sant'Anna, 2021; Goodman-Bacon, 2021).

Model 2 (Continuous score) replaces the binary indicator with the continuous pre-crisis business model score and retains mixed companies. Model 3 (Event study, H_2 – H_3 and parallel trends) interacts the asset-light indicator with a full set of year dummies, using 2019 as the omitted reference category; pre-crisis coefficients (2010–2018) provide the formal parallel trends test via a joint F -test. A continuous analog interacting the pre-crisis score with year dummies is estimated as a complementary specification.

All specifications are estimated using the `feols()` function in R (R Core Team, 2026) with the `fixest` package (Bergé et al., 2026), with standard errors clustered at the firm level to account for within-firm serial correlation. Firm-level clustering is applied throughout. Because the binary specification contains only eleven asset-light clusters, inference was corroborated with wild cluster bootstrap tests with Rademacher weights and 9,999 replications, clustered by firm. Following MacKinnon and Webb (2018), both restricted and unrestricted variants were computed, since agreement between them, with the restricted p -value the larger, indicates that the procedure is not distorted by the small number of treated clusters. The two variants agree closely: the pooled Asset-Light $\times$ Crisis coefficient yields $p = 0.034$ and $p = 0.025$, and the 2021 recovery-year coefficient $p = 0.003$ and $p = 0.0003$, while the recovery-period coefficient remains insignificant under both. The parallel trends assumption is formally tested by a joint F -test on the pre-crisis interaction terms from Model 3, following the pre-treatment testing approach recommended in the recent DiD literature (Roth et al., 2023).

3. RESULTS

Table 2 presents summary statistics by business model group for the estimation sample. Asset-light companies are larger by revenue (mean Log Revenue = 6.69 vs. 4.06 for asset-heavy) and exhibit modestly higher mean EBITDA margins (20.78% vs. 17.25%). Figure 2 plots mean EBITDA margin trajectories for the three groups across 2010–2024, revealing three phases: a broadly parallel pre-crisis period, a simultaneous collapse in 2020, and divergent recovery paths, with asset-

light firms recovering sharply in 2021 while asset-heavy margins remained depressed before converging in 2022–2023.

Table 3 reports group-level mean EBITDA margins for each pre-crisis year alongside the asset-light minus asset-heavy differential. The differentials alternate in sign and are small in magnitude throughout 2010–2019. The joint F -test on pre-trend interactions from the event-study specification confirms the parallel trends assumption: $F(9, 195) = 1.30$, $p = 0.237$, failing to reject the null of common pre-trends.

Table 2. Summary statistics by business model group

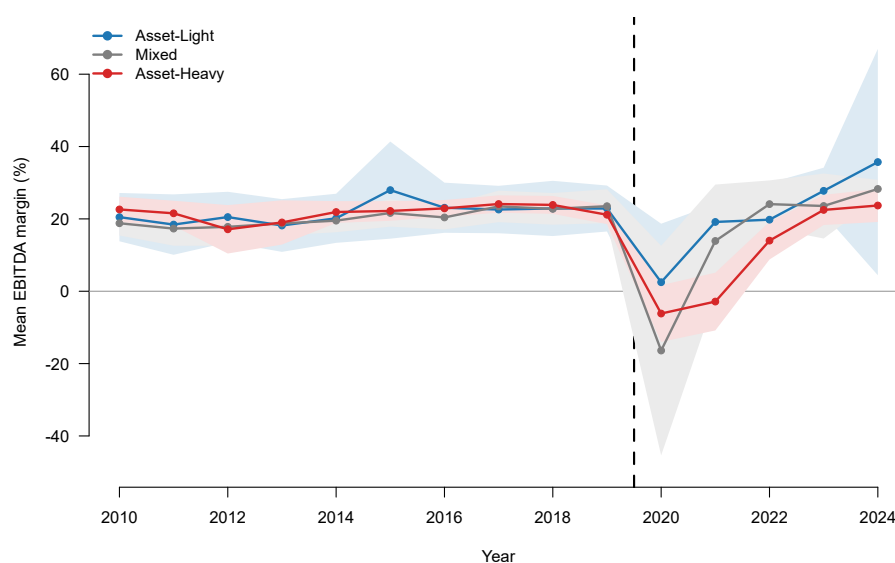
Group	Firms	Obs.	Mean Score (pre-crisis)	Mean Log Revenue	Mean EBITDA Margin (%)
Asset-Light	11	139	66.2	6.69	20.78
Mixed	22	287	29.3	6.01	17.83
Asset-Heavy	186	2,432	6.3	4.06	17.25

Note: Summary statistics for the full panel period (2010–2024). Score is the pre-crisis (2019) business model score: 0 = pure asset-heavy, 100 = pure asset-light. Obs. counts firm-year observations with non-missing EBITDA margin.

Table 3. Pre-treatment EBITDA margin means and parallel trends test

Year	Asset-Light (%)	Mixed (%)	Asset-Heavy (%)	Differential (pp)
2010	20.49	18.79	22.61	-2.12
2011	18.43	17.32	21.55	-3.12
2012	20.50	17.81	17.12	3.38
2013	18.17	18.74	19.02	-0.85
2014	20.16	19.51	21.90	-1.74
2015	27.95	21.63	22.19	5.76
2016	23.09	20.40	22.90	0.19
2017	22.58	23.45	24.11	-1.53
2018	22.89	22.77	23.87	-0.98
2019	22.87	23.51	21.15	1.72

Note: Means are unweighted averages of firm-level EBITDA margins within each group (estimation sample). Differential = asset-light mean minus asset-heavy mean (percentage points). Formal parallel trends test from the TWFE event study (firm FE, year FE, firm-clustered SEs): $F(9, 195) = 1.30$, $p = 0.237$ – fail to reject H_0 (parallel trends supported).



Note: Mean EBITDA margin with 95% confidence intervals, estimation sample. Dashed line marks COVID-19 onset.

Figure 2. EBITDA margin trends by business model group (2010–2024)

3.1. Model 1: Binary DiD results (H_1 and H_2)

Table 4 presents the binary DiD estimates. The baseline specification (Column 1) yields a crisis-period differential of +13.54 pp (SE = 5.46, $p = 0.014$), supporting H_1 . The recovery-period (2022–2023) coefficient is +3.78 pp (SE = 5.64, $p = 0.503$), statistically indistinguishable from zero, supporting the revised H_2 : the advantage is transitional, not persistent.

The estimate is stable across specifications: restricting the sample to firms with 2019 revenue of at least USD 50 million (Column 2) yields a crisis differential of +11.03 pp ($p = 0.009$), and excluding 2024, for which Bloomberg data may include forward estimates (Column 3), leaves it essentially unchanged at +13.73 pp ($p = 0.015$). Table 7 examines the robustness of the recovery premium to region-by-year fixed effects, pre-crisis size interactions, and treated-group composition.

3.2. Model 2: Continuous score results

Table 5 presents the continuous specification including mixed companies. The baseline coefficient on Score $\times$ Crisis is +0.140 (SE = 0.080, $p = 0.080$), implying a 14.0 pp differential between the score endpoints; under the USD 50 million filter, the coefficient strengthens to +0.163 ($p = 0.021$). Recovery-period coefficients are positive but insignificant in all specifications, consistent with H_2 . The continuous estimates are directionally consistent with the binary results; the binary comparison remains the primary specification because, with verified scores, the asset-light group constitutes an economically meaningful category (global franchise-and-management-fee operators) and the score distribution remains semi-discrete, as most owner-operators have verified zero fee revenue.

Table 4. Binary difference-in-differences estimates of crisis resilience

Dependent variable: EBITDA margin (%)	(1) Baseline	(2) $\geq$ USD 50M	(3) Excl. 2024
Asset-Light $\times$ Crisis (2020–2021)	13.536** (5.463)	11.033*** (4.173)	13.733** (5.566)
Asset-Light $\times$ Recovery (2022–2023)	3.784 (5.641)	1.919 (5.800)	3.976 (5.734)
Observations	2,570	1,429	2,515
Asset-Light / Asset-Heavy firms	11 / 186	10 / 100	11 / 186
Firm FE / Year FE	Yes / Yes	Yes / Yes	Yes / Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at the firm level in parentheses. Mixed-business-model companies are excluded from all specifications. Column (2) restricts to firms with 2019 revenue of at least USD 50 million. Column (3) excludes 2024, for which Bloomberg data may include forward estimates. Table 7 reports the robustness of the recovery premium to region-by-year fixed effects, pre-crisis size interactions, and treated-group composition. Wild cluster bootstrap inference (null imposed, Rademacher weights, 9,999 replications, firm-level clusters) yields $p = 0.034$ for the crisis coefficient and $p = 0.543$ for the recovery coefficient, against $p = 0.014$ and $p = 0.503$ from the cluster-robust t-statistics.

Table 5. Continuous business model score estimates of crisis resilience

Dependent variable: EBITDA margin (%)	(1) Baseline	(2) $\geq$ USD 50M	(3) Excl. 2024
Score $\times$ Crisis (2020–2021)	0.140* (0.080)	0.163** (0.070)	0.147* (0.080)
Score $\times$ Recovery (2022–2023)	0.128 (0.095)	0.065 (0.082)	0.134 (0.096)
Observations	2,857	1,678	2,798
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at the firm level in parentheses. The Score is the pre-crisis (2019) business model score (0–100). Mixed companies included. Multiply coefficients by 100 for the estimated pure asset-light vs. pure asset-heavy differential.

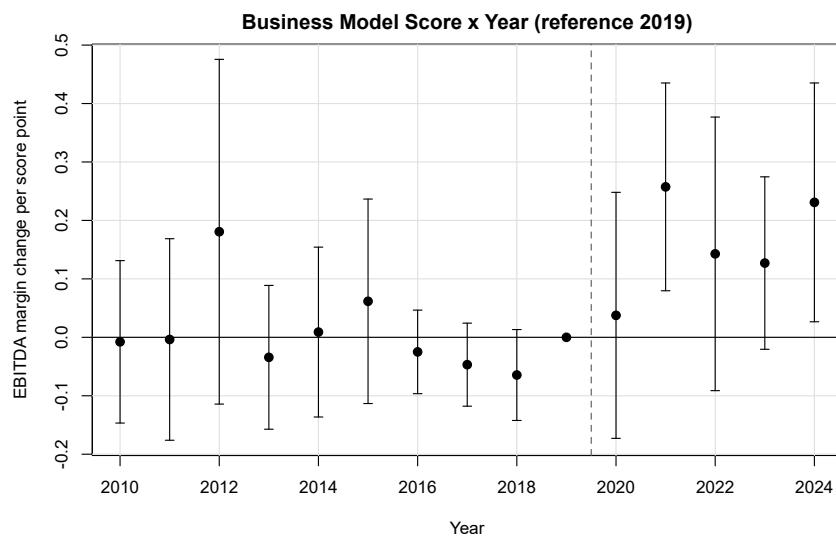
3.3. Model 3: Event study results (H_2)

Figure 3 presents the continuous analog.

Figure 4 and Table 6 present the year-by-year event study for the binary comparison.

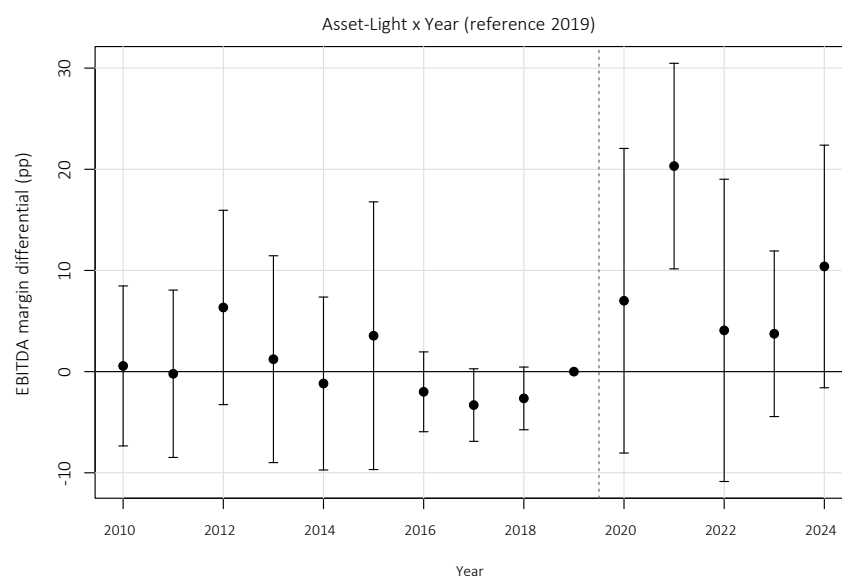
Pre-crisis coefficients (2010–2018) are jointly insignificant ($F(9, 195) = 1.30, p = 0.237$), with the

2017–2018 point estimates mildly negative, implying (if anything), a slight pre-crisis disadvantage for asset-light firms that works against the findings. The 2020 coefficient is +7.01 pp (SE = 7.68, $p = 0.363$): both groups collapsed comparably in the shock year. The 2021 coefficient is +20.32 pp (SE = 5.18, $p < 0.001$; wild-bootstrap $p = 0.003$), the largest single-year differential in the 15-year window; the continuous event study replicates the pattern



Note: Year-by-year effect of a one-point increase in the pre-crisis business model score on EBITDA margin (pp), full sample with firm and year fixed effects; 95% confidence intervals from firm-clustered standard errors. Reference year 2019. Multiply by 100 for the pure asset-light vs. pure asset-heavy gap; 2021 coefficient +0.257 ($p = 0.005$). $N = 2,857$.

Figure 3. Event study – Business Model Score $\times$ year coefficients (continuous)



Note: Year-by-year asset-light vs. asset-heavy EBITDA margin differential from the TWFE event study (Table 6). Reference year 2019; dashed line marks COVID-19 onset; 95% confidence intervals based on firm-clustered standard errors. Mixed companies excluded.

Figure 4. Asset-light vs. Asset-heavy EBITDA margin differential (binary event study)

Table 6. Event-study coefficients — Asset-light × Year (reference year 2019)

Year	Coefficient (SE)
2010 × AL	0.563 (4.034)
2011 × AL	-0.211 (4.220)
2012 × AL	6.343 (4.900)
2013 × AL	1.230 (5.215)
2014 × AL	-1.175 (4.361)
2015 × AL	3.551 (6.749)
2016 × AL	-1.994 (2.013)
2017 × AL	-3.304* (1.829)
2018 × AL	-2.645* (1.580)
2020 × AL	7.007 (7.680)
2021 × AL	20.317*** (5.183)
2022 × AL	4.077 (7.620)
2023 × AL	3.742 (4.175)
2024 × AL	10.395* (6.116)

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at the firm level in parentheses. Reference year: 2019 (omitted). Joint pre-trend test: $F(9, 195) = 1.30$, $p = 0.237$, parallel trends supported. The mildly negative 2017–2018 coefficients imply a slight pre-crisis disadvantage for asset-light firms, which runs counter to the main finding. The 2021 coefficient remains significant under a restricted wild cluster bootstrap (9,999 replications, Rademacher weights), $p = 0.003$.

with a 2021 coefficient of +0.257 per score point ($p = 0.005$). Coefficients for 2022 (+4.08, $p = 0.593$) and 2023 (+3.74, $p = 0.371$) are small and insignificant, documenting convergence as asset-heavy margins normalized. The 2024 coefficients (+10.40, $p = 0.091$ binary; +0.231, $p = 0.028$ continuous) are based on partial-year data and should be interpreted with caution.

These specifications assess the revenue-recovery interpretation without conditioning on a post-treatment mediator. Interacting pre-crisis firm size with year indicators leaves the 2021 recovery premium intact (+15.98 pp, $p = 0.026$; Table 7, Specification 3), indicating that the effect is not an artifact of differential size trajectories. The pattern is separately robust to treatment definition: restricting the treated group to the four asset-light firms whose 2019 status is verified from Bloomberg segment filings preserves both the pooled crisis differential (+12.23 pp, $p = 0.025$) and the 2021 spike (+21.49 pp, $p = 0.018$; Table 7, Specification 4). These patterns are consistent with

H_3 's revenue-recovery interpretation: the advantage is concentrated in the demand-recovery year, when fee-based revenues that track system-wide performance would be expected to rebound proportionally. The interpretation is offered as consistent with the evidence rather than as a formally identified causal mechanism, since fee revenue, property revenue, and RevPAR are not separately observed in the estimation sample.

4. DISCUSSION

The evidence supports H_1 and H_2 and is consistent with H_3 . Asset-light hotel companies outperformed asset-heavy peers by 13.5 percentage points in EBITDA margin during the pooled 2020–2021 crisis period (H_1). The differential is concentrated in 2021 and does not persist into 2022–2023, indicating an advantage in the timing of margin normalization rather than a permanent margin premium (H_2). The pattern is consistent with a revenue-recovery interpretation, although the paper does not identify it separately (H_3).

Table 7. Robustness of the asset-light recovery premium

Specification	Pooled crisis (2020–2021)	2021 event coefficient	Asset-light firms	N
(1) Baseline	13.54**	20.32***	11	2,570
	(5.46)	(5.18)		
(2) Region × Year FE	10.23	14.99**	11	2,570
	(6.31)	(6.19)		
(3) Pre-crisis Size × Year	3.63	15.98**	11	2,570
	(6.13)	(7.10)		
(4) Segment-verified treated only	12.23**	21.49**	4	2,477
	(5.40)	(9.02)		
(5) Leave-one-region-out (range)	8.91 to 19.34	—	5 to 11	987 to 2,529

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Firm-clustered standard errors in parentheses. All specifications exclude mixed companies and drop singleton observations. Specification (1) reproduces the baseline event study. Specification (2) adds region-by-year fixed effects, absorbing region-specific pandemic shocks; the 2021 recovery premium remains significant, while the pooled crisis coefficient does not. Specification (3) adds interactions of pre-crisis (2019) firm size with year indicators. Specification (4) restricts the treated group to the four asset-light firms whose 2019 status is directly verified from Bloomberg segment filings (GreenTree, Hilton, InterContinental, Wyndham). Specification (5) reports the range of the pooled crisis coefficient across six re-estimations, each excluding one region; the coefficient remains positive in every case and significant in four of six. The exceptions are excluding Asia-Pacific, which removes six of the eleven treated firms and reduces the sample to 987 observations (+8.91, $p = 0.202$), and excluding North America, which leaves eight treated firms (+10.24, $p = 0.111$). The 2021 recovery premium is statistically significant in specifications (1) through (4).

The event study sharpens the paper's central interpretive point. The 2020 shock year produced statistically indistinguishable margin collapses across business model groups: the asset-light coefficient for 2020 is positive but imprecise, and the asset-light model did not insulate firms from the initial demand halt. The groups diverge in 2021. Asset-light firms recovered to a mean EBITDA margin of 19.2%, against 22.9% in 2019, while asset-heavy firms remained negative at -2.9% ; the estimated differential for that year is 20.3 percentage points ($p < 0.001$). By 2022, the estimated differential is no longer distinguishable from zero, although asset-heavy group means remain below asset-light means through 2023. The advantage is therefore concentrated in a single year rather than sustained as a margin premium. One interpretation is that fee revenues, indexed to system-wide performance, recovered with returning demand while fixed property obligations continued to suppress asset-heavy margins for approximately one additional year, a mechanism that would be inherently transitional. Neither fee revenue nor RevPAR is observed in the estimation sample, so this remains an interpretation of the timing pattern rather than a demonstrated channel.

Because realized revenue is an outcome of treatment, the revenue-recovery interpretation is assessed without conditioning on a post-treatment mediator. The most informative test interacts pre-crisis firm size with year indicators: allowing large and small firms to follow separate annual trajectories leaves the 2021 premium intact (+15.98 pp; Table 7, specification 3), indicating that the advantage is not an artifact of differential size trajectories, the most plausible non-business-model source of differential revenue recovery. The pattern is also robust to treatment definition: restricting the treated group to the four asset-light firms whose 2019 status is verified from segment filings preserves the 2021 spike (+21.49 pp; Table 7, specification 4), which speaks to measurement rather than the revenue channel itself. Together, these results are consistent with an account in which fee-based revenues, which scale with system-wide performance, recovered with returning demand in 2021 while fixed property obligations continued to suppress asset-heavy margins for approximately one additional year. This account aligns with Seo and Soh's (2019) documentation that franchise and management fees are variable revenue streams that scale with system performance, and with

Nicolau's (2005) framework linking operating leverage to demand-shock sensitivity. It is offered as an interpretation consistent with the evidence rather than as a formally identified causal decomposition, since fee revenue, property revenue, and RevPAR are not separately observed in the estimation sample.

The treatment of vacation-ownership companies illustrates the importance of directly measuring this segment for this research question. Under name- or description-based classification, timeshare operators are readily categorized as asset-light, since their business models are nominally fee- and brand-driven. Their revenues, however, derive from vacation ownership interest sales and consumer financing rather than from hotel franchise and management fees, and the segment data accordingly place them outside the asset-light group: Hilton Grand Vacations and Marriott Vacations receive 2019 scores of 11.4 and 30.1, respectively, and Travel & Leisure a score of zero. The distinction matters for what the treated group represents. Because the asset-light designation here rests on measured hotel fee intensity rather than brand-led business descriptions, the 2021 differential is identified from firms whose revenue actually consists of management and franchise fees, which is what the theoretical framework concerns. The same logic applies within the treated group: Meliá Hotels reports a vacation-club line accounting for between 4% and 8% of total revenue in every pre-crisis year in which it is populated, so no treated firm approaches timeshare dominance.

With a treated group of eleven firms, estimates are potentially sensitive to individual observations. A single micro-cap firm with near-zero revenue and noise-driven segment shares materially altered unfiltered estimates; the USD 10 million revenue floor removes this vulnerability, and the crisis-period estimate is stable at a USD 50 million floor (+11.03 pp, $p < 0.01$; Table 4, column 2). This sensitivity is disclosed deliberately: it defines the population to which the findings generalize, economically substantive listed hotel companies, and cautions against extrapolation to micro-cap firms.

Two alternative explanations deserve consideration. First, the asset-light advantage may partly reflect a size effect: asset-light companies are, on average, larger than asset-heavy peers, and larger firms may

have benefited from stronger balance sheets, better capital market access, and greater pricing power during the recovery. Interacting pre-crisis size with year indicators addresses this directly; the specification used above to assess the revenue-recovery interpretation serves here as a control for differential size trajectories, and the 2021 premium remains at +15.98 pp ($p = 0.026$; Table 7, specification 3). Second, geographic concentration poses a potential confound: with 58.8% of observations drawn from Asia-Pacific, where containment policies, vaccination timelines, and fiscal support regimes differed substantially from Europe and North America, the estimated differential could partly reflect regional rather than business model effects. Two specifications bear on this. Region-by-year fixed effects, which absorb region-specific pandemic shocks entirely, reduce the 2021 premium to +14.99 pp while leaving it significant ($p = 0.016$; Table 7, specification 2); the pooled crisis coefficient, however, falls to 10.23 and is no longer distinguishable from zero ($p = 0.107$), indicating that the crisis-period average is more regionally dependent than the 2021 result. Re-estimating the model six times, each excluding one region, returns pooled crisis coefficients between 8.91 and 19.34, significant in four of six cases (Table 7, specification 5). The two exceptions are informative rather than contradictory: excluding North America leaves eight treated firms (+10.24, $p = 0.111$), and excluding Asia-Pacific removes six of the eleven and reduces the sample to 987 observations (+8.91, $p = 0.202$). In both cases, the point estimate remains positive and of comparable magnitude; precision changes. The recovery premium is therefore not attributable to any single region, although the treated group is too small for the estimate to survive the loss of its largest regional bloc.

The findings carry implications for hotel company strategy and for investor decision-making, subject to the identification limits set out above. For operators and their boards, the results indicate where the financial benefit of an asset-light structure is located: in the timing of margin normalization after a severe demand shock, rather than in shock absorption or a permanent margin premium. An operator weighing asset-light transformation against the revenue foregone by relinquishing property ownership would, on this evidence, be valuing an episodic benefit realized in recovery rather than a continuous one. For companies that

have not completed the transition, the majority of this sample, the results are consistent with a resilience case for asset divestiture, though the present design estimates margin differentials rather than the returns to a divestiture program, and does not establish that firms transitioning during or after the crisis would realize a comparable advantage. For investors and lenders, the results suggest that business model orientation merits consideration alongside conventional risk factors in hotel sector credit analysis and valuation, since asset intensity and financial leverage both bear on the severity of margin compression under demand shocks. Whether business model structure adds explanatory power beyond size, geography, and leverage in a formal risk model is a question this design does not answer and one that portfolio-level research could address directly.

Several limitations should inform interpretation. First, business model classification is not uniformly verified. In the estimation sample, the 2019 treatment anchor rests on directly quantified segment data for 87 of 220 firms, while the remainder, predominantly smaller owner-operators whose Bloomberg segments are geographic or product-based, retain an author-assigned score. For the control group, this matters little, since verified owner-operators overwhelmingly report zero fee revenue. For the treated group, it is consequential, and the paper documents it directly: of the seven author-classified asset-light firms, five carry scores that the segment evidence does not support, and all of which sit within five points of the classification threshold. This error is toward attenuation, and the estimates behave accordingly; restricting the treated group to the four firms whose status is directly verified (Table 7, Specification 4) raises rather than lowers the 2021 recovery premium. The finding is therefore not an artifact of

the author-assigned scores, though the treatment variable is measured less precisely than a continuous 0–100 scale implies, and a larger set of firms with disaggregated fee reporting would permit a sharper test. Second, the estimation sample excludes 115 firms with 2019 revenues below USD 10 million or without a 2019 revenue observation; the findings therefore generalize to economically substantive listed hotel companies, not micro-cap firms. Third, the treated group remains small, 11 asset-light companies, reflecting the true rarity of predominantly fee-based business models among listed hotel firms; wild-bootstrap inference, region-by-year and pre-crisis-size controls, leave-one-region-out re-estimation, and the USD 50 million threshold check mitigate, but cannot eliminate, small-treatment-group concerns, which the verified-only specification illustrates directly. Finally, EBITDA margin does not capture below-the-line effects such as impairments and interest expense increases that may have further disadvantaged asset-heavy operators.

Future research could extend this analysis in three directions. First, as segment disclosure improves and the set of firms reporting disaggregated fee revenue grows, the treatment variable can be constructed for a larger treated group, permitting the demanding specifications that the present sample supports only imprecisely. Second, the segment-based measurement framework developed here can be applied to other demand shocks and to adjacent hospitality sub-sectors, testing whether the recovery-timing advantage generalizes beyond the pandemic. Third, examining market-based outcomes such as stock returns, and testing whether business model structure carries explanatory power beyond size, geography, and leverage, would complement the accounting-based evidence presented here.

CONCLUSION

The objective of this study was to examine whether the degree of asset-light orientation in hotel business models is associated with financial resilience and the timing of recovery during the COVID-19 demand shock.

Asset-light companies outperformed asset-heavy peers in EBITDA margin across the pooled crisis period, but the advantage was concentrated in the recovery year rather than the shock year: both groups experienced comparable margin collapses in 2020, while in 2021 asset-light margins recovered to near

pre-crisis levels as asset-heavy margins remained negative. The differential was not sustained, becoming indistinguishable from zero as asset-heavy margins normalized in 2022–2023.

Theoretically, these results refine the operating-leverage account of hotel resilience. The asset-light model appears to confer an advantage in the timing of margin recovery rather than in absorbing the initial shock or sustaining a permanent margin premium, a pattern consistent with fee-based revenues recovering alongside system demand while fixed property obligations continue to constrain owner-operators, although the components of that mechanism are not separately observed here.

Practically, the significance for operators, boards, and investors lies in when the benefit of an asset-light structure is realized, in recovery from severe demand shocks rather than continuously, which bears on how business model orientation is weighed alongside size, geography, and leverage in assessing sector risk. Because the effect is identified from a small set of asset-light operators, these estimates are best read as evidence of a consistent pattern rather than a precise magnitude, and a larger set of firms reporting disaggregated fee revenue would permit a sharper test.

AUTHOR CONTRIBUTIONS

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ACKNOWLEDGMENT

The author gratefully acknowledges financial support from the Department of Economics, University of Zadar, which covered the article processing charge for this publication.

DECLARATION OF GENERATIVE AI IN THE WRITING PROCESS

In preparing this manuscript, the author used Claude Fable 5 (Anthropic) for generating the R analysis scripts. The author also used InstaText and Grammarly to enhance English writing and grammar. After use, the author processed and edited the output and bears full responsibility for the publication's content.

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