

Entrance-Line Visitation Patterns in Retail: When Do People Come, How Concentrated, and How the Week Breathes

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Abstract

We characterise the *when* of retail visitation from entrance-line crossing data. Using 5 697 complete location-days across 186 cohort locations (open-hours-only capture, local timezone), we find that retail footfall is strongly concentrated in time: the single busiest hour of a day carries, on average, 21.8% of that day’s visitors, and the top three hours together account for 53.1%. The typical open-hours window centres on 10:00–18:00 local (median span 9h — that is, nine open hours per day), with a sparse tail of longer- and late-hours stores. Visitation peaks in the midday–early-afternoon band (the most common, or *modal*, peak is 14:00 on weekends and 15:00 on weekdays), and weekends are materially heavier than weekdays: among locations with comparable weekday and weekend coverage, the mean weekend daily total is $1.79\times$ the weekday total (median $1.56\times$), and 83% of such stores are busier on weekends. On a per-location weekly index — each day-of-week’s footfall relative to a store’s own average day — Saturday is the clear peak (mean index 1.50, i.e. 50% above a store’s average), while Tuesday is the trough (0.83). All figures are *observed* footfall (measured entrance crossings, not model forecasts), are reproducible from the project’s analysis script and results file, and give a defensible, reproducible read on who comes when, and how concentrated, from observed data.

1 Problem & Motivation

Retail planning questions are fundamentally questions about *when*: when do customers arrive, when is a store at capacity, how should staffing and promotions be scheduled, and how large is the weekend uptick. The hourly and day-of-week structure of who comes when is the first thing a retail planner, analyst, or property team needs answered about a store, and grounding it in observed data rather than assumption is the natural starting point. This paper reports that entrance structure as a set of defensible, reproducible, clearly-labelled findings.

Forecast vs. observed. The platform distinguishes two kinds of numbers: *observed* measurements of what actually happened, and *forecast* predictions of what is expected to happen. This paper is strictly about the *observed* entrance-line series. Every number reported is a measurement, never a model output, and is labelled as such. This separation matters because observed and forecast values must never be treated as interchangeable.

1.1 Related work and positioning

The temporal structure of retail footfall is an established object of study in the retail-geography and urban-analytics literature, and our contribution is a measurement-side addition to it. Footfall series carry recognisable temporal signatures: Mumford et al. [1] classify UK retail centres by their

weekly and seasonal footfall profiles, showing that centres separate into distinct temporal types rather than moving as a single aggregate. Philp et al. [2] quantify how temporal variations in retail footfall relate to micro-location characteristics, and Devanesan and Venkatesh [3] systematically review the antecedents of retail footfall. On the measurement side, Soundararaj et al. [4] recover high-street footfall from Wi-Fi probe requests, and Oosterlinck et al. [5] track indoor shopping-mall visits from Bluetooth sensing; both show that passive, sensor-based counting can recover the same hourly and day-of-week structure we analyse here. Sousa et al. [6] model hourly retail customer flow with multiple seasonality, treating the within-day and within-week cycles as first-class structure rather than noise.

This paper differs in setting and unit: where the works above study street-level or mall-level footfall, we work from store-level entrance-line crossings observed continuously across a retail estate, and we report the concentration of a store-day’s visitors into its busiest hours alongside the weekly shape. The specific figures reported here — the mean and median single-hour share, the top-three-hour share, the weekend-to-weekday ratio, and the weekly index — are *our own measured* results for this estate and this observation window. We do not claim that their magnitudes generalise; we claim only that the temporal structure they describe is consistent with the patterns reported in this literature.

2 Method

2.1 Conceptual model

An *entrance-line crossing* is a single entry event counted at a store’s entrance zone. The series we analyse counts these crossings, not unique individuals, and is captured only during a store’s open hours. Because the data are collected in hourly intervals, the natural unit of analysis is the hourly count $v_{l,t}$ for location l at local hour t .

2.2 What we measure

1. **Canonical open-hours window.** Rather than relying on a separate scheduled-hours table (which is not populated for this data set), we recover each location’s operating window empirically. For each location–day we take the set of distinct local hours recorded; we keep only the days whose hours form a single uninterrupted block, discarding clipped or partially captured days. A location’s *canonical window* is then the *modal* (most common) such block across its days, with open hour o_l , close hour c_l , and span $s_l = c_l - o_l + 1$ (the number of open hours in the day). A day is *complete* when its recorded within-window hours equal the full s_l span.
2. **Hourly concentration.** On each complete location–day, define the hourly share $p_{l,t} = v_{l,t} / \sum_{t'} v_{l,t'}$ — the fraction of that day’s visitors arriving in hour t . We report the grand mean hourly profile (by hour, weekdays and weekends separately), and per location–day *peak-hour share* $= \max_t p_{l,t}$ (the single busiest hour’s share), together with the sum of the top-2 and top-3 hourly shares (the two and three busiest hours combined). The *modal peak hour* is the most common busiest hour across location–days.
3. **Weekend/weekday contrast.** For each location with at least one complete weekday and one complete weekend day, we take $\rho_l = \overline{\text{weekend daily total}}_l / \overline{\text{weekday daily total}}_l$ and summarise its distribution across those locations.

4. **Weekly shape.** On a per-location basis we index each day-of-week’s mean daily total to the location’s overall mean (so an index of 1.0 means an average day, 1.5 means 50% above that store’s average). The reported *index-by-dow* is the mean of those indices across locations; because each store is compared to its own average, the weekly shape is size-invariant and compares like-for-like stores regardless of how busy each one is.

2.3 Cohort definition & robustness

We restrict analysis to complete location–days to avoid under-counting daily totals and mis-weighting hourly shares that partial captures would introduce. The cohort comprises locations with a canonical window of span $s_l \geq 4$ hours *and* at least 7 complete days. This removes the 35 locations that record only a single distinct hour (data-coverage artefacts) and the partial-capture days that dominate the raw series. Of the 230 raw timezone locations, the 35 single-hour artefacts together with a further 9 locations that fail the span or complete-day filters leave the 186-location cohort. All reported figures use this cohort. Complete location–days are the backbone of every finding: a day is only counted when all of the store’s open hours were recorded, which guards against days whose totals would be silently under-counted.

3 Data

3.1 Source

All data come from the vendor’s production analytics platform, read-only. Series definitions and data-quality rules follow the platform’s data documentation (internal) [7]. We analyse the canonical observed entrance-line visitor series, restricted to the observed visitor metric, joined to each store’s local timezone. Timestamps are stored in Coordinated Universal Time (UTC) and are converted to each location’s local time for all hour-of-day and day-of-week analysis, so “hour 9” means 9am local at that store, not UTC. The local wall-clock is retained and is not round-tripped through UTC, so the hours reported here are true local trading hours.

Analyses use the frozen study snapshot (data through 2026-09-07).

3.2 Scope and coverage

The raw series contains 72 804 hourly rows across 230 locations with a timezone. Coverage is uneven: 35 locations record only a single distinct hour (omitted as artefacts), and many location–days record only a few of their open hours. The complete-day cohort after the §2 filters is:

Quantity	Value
Raw locations (with timezone)	230
Cohort locations (span ≥ 4 h, ≥ 7 complete days)	186
Complete location–days analysed	5 697
weekday location–days	5 271
weekend location–days	426

We emphasise the asymmetry between weekday and weekend coverage (5 271 vs. 426 complete location–days). The weekend–weekday ratio (§4) is therefore computed only on the subset of locations that have *both* a complete weekday and a complete weekend day ($n = 70$ locations), and is reported alongside that caveat.

3.3 Data-quality rules respected

Three rules govern how the numbers are produced, and each is honoured throughout:

- **Never sum the per-zone counters.** The data set also carries finer-grained per-zone visitor counts, but those are measured independently and do not add up to the location total. All aggregation here is at the location (entrance-line) level, never by summing zones.
- **Open-hours capture only.** Daily totals and hourly shares are computed on open-hours capture only, so a day’s total reflects trading hours, not off-hours noise.
- **Labelled observed, never forecast.** Every figure is a measured observation. Forecast values (model predictions) are excluded from every number and every figure in this paper.

4 Results

4.1 Open-hours window

Across the 186 cohort locations the median open hour is 10:00 and the median close hour is 18:00, giving a median span of 9 hours (Table 1). The distribution is concentrated on a standard daytime band—most stores open 09:00–11:00 (the most common open hour is 10:00) and close 17:00–18:00 (the most common close hour is 18:00) (Fig. 1)—with a small tail of longer-hours or late-hours stores (open from midnight or late morning, close up to 23:00) that reflects regional or format heterogeneity (e.g. mall anchors in markets with late-evening trading).

Table 1: Open-hours window distribution across the 186 cohort locations.

Metric	Value
Median open hour (local)	10:00
Median close hour (local)	18:00
Median span (open hours per day)	9
Mode open/close	10:00 – 18:00 (~40 locations)

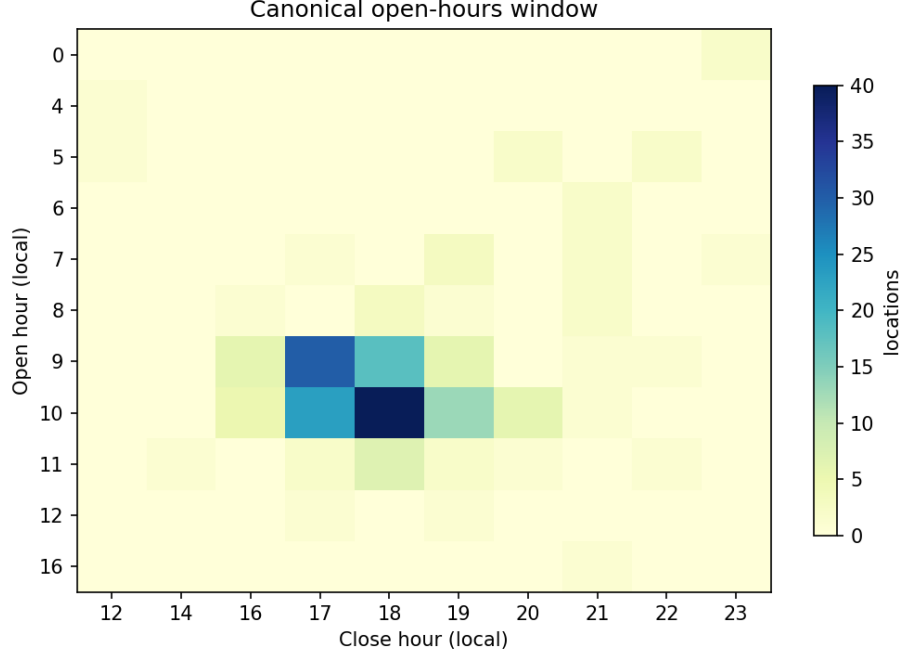


Figure 1: Canonical open-hours window (open hour $\times$ close hour, count of locations, $N=186$). The modal cell is open 10:00 / close 18:00 (40 locations), with a secondary mode open 09:00 / close 17:00.

4.2 Hourly profile: the concentration of *when*

The grand hourly share profile (Fig. 2) shows a clear midday–early-afternoon peak. Weekday visitation ramps through the morning to a peak share of 13.3% at 15:00 (with 14:00–16:00 all near 12.6–13.3%), then declines through the late afternoon. The weekend profile is broader and, in this grand-mean profile, peaks at the same 15:00 hour, reaching 14.2% (the *modal* per-store-day weekend peak is 14:00 — a different statistic; Table 2). Hourly concentration is strong: the single busiest hour of a store-day carries on average 21.8% of that day’s visitors (median 19.7%); the top two hours cover 38.9% and the top three 53.1% (Table 2). This means over half of the average day’s footfall arrives in a three-hour window—a compact, actionable fact for staffing and capacity.

The modal peak hour (the most common busiest hour) is 14:00 overall and on weekends, and 15:00 on weekdays (Table 2).

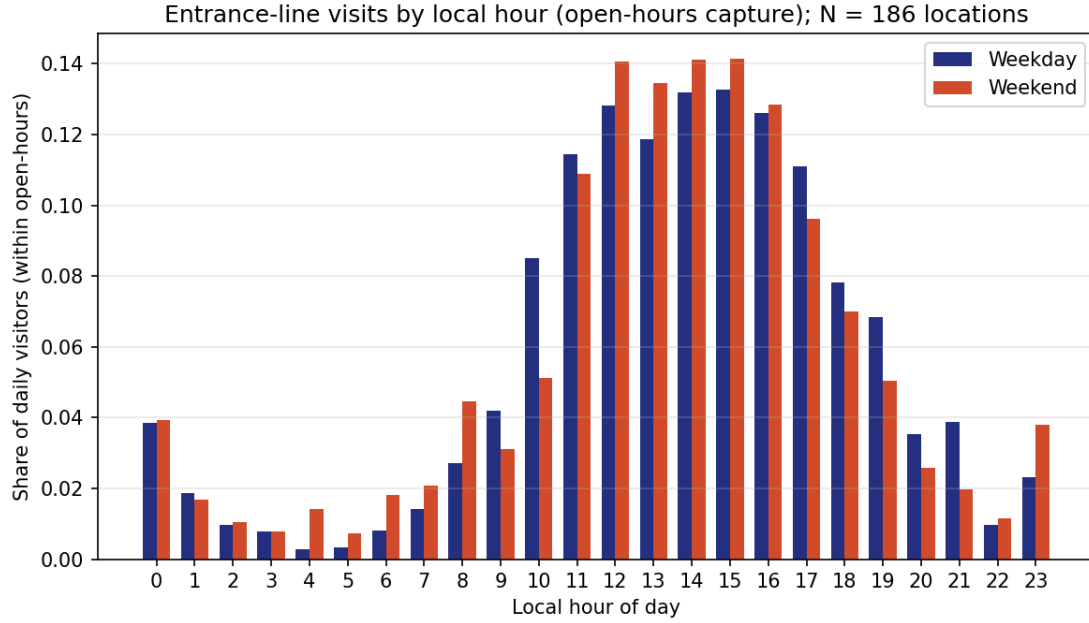


Figure 2: Grand mean hourly share of daily visitors, weekdays vs. weekends, across $N=186$ complete-day cohort locations (open-hours capture). Weekday peak share 13.3% at 15:00; weekend peak 14.2% at 15:00.

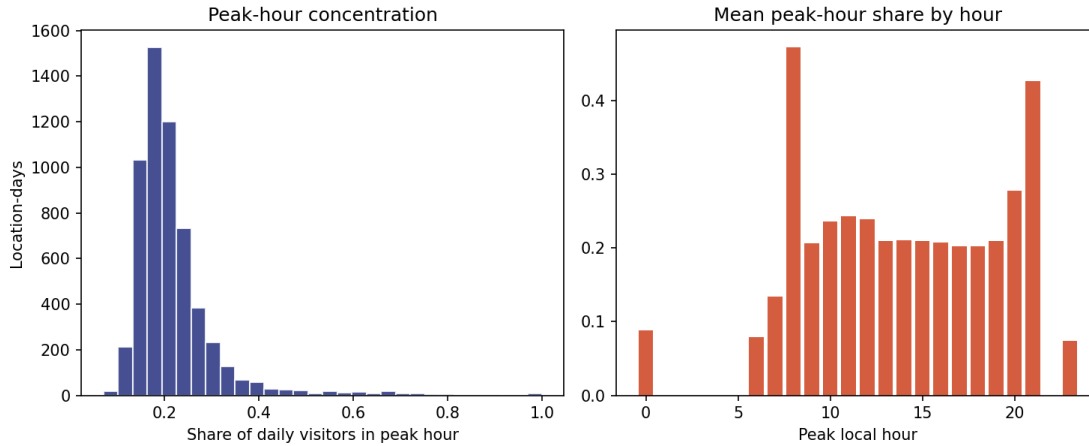


Figure 3: Left: distribution of per-store-day peak-hour share (single busiest hour's share of that day's visitors; mean 0.22, median 0.20). Right: mean peak-hour share by peak local hour, showing the midday–early-afternoon concentration.

Table 2: Peak-hour concentration across 5,697 complete location-days.

Metric	Value
Mean peak-hour share	21.8%
Median peak-hour share	19.7%
Mean top-2 hour share	38.9%
Mean top-3 hour share	53.1%
Modal peak hour (all days)	14:00
Modal peak hour (weekday)	15:00
Modal peak hour (weekend)	14:00

4.3 Weekend vs. weekday

Weekends are materially heavier than weekdays. On a per-location basis among the $n=70$ locations with comparable complete weekday *and* weekend coverage, the mean weekend daily total is $1.79\times$ the weekday total (median $1.56\times$), and 83% of those locations are busier on weekends (Table 3; mean weekend daily 5,429 visitors/store vs. 2,178 on weekdays).

Table 3: Weekend vs. weekday daily-total contrast (per-location ratios, $n=70$ locations with both weekday and weekend complete days).

Metric	Value
Mean ratio (weekend / weekday)	$1.79\times$
Median ratio	$1.56\times$
Share of stores busier on weekends	83%
Weekday mean daily total (per store)	2 178
Weekend mean daily total (per store)	5 429

Note the two ways to read the same contrast: $1.79\times$ is the *equal-weight* mean of the per-store ratios ($\bar{\rho}_l$ over the $n=70$ locations), while dividing the aggregate means themselves ($5,429/2,178$) gives a *pooled*, traffic-weighted ratio of $\approx 2.49\times$ — larger because busy stores put more weight in the pooled figure. Both are correct; they answer different questions, and we report the equal-weight per-store mean alongside the raw totals so the reader can see both. We restate the coverage note from §3: weekend complete days are far fewer (426 vs. 5,271), so this ratio reflects the 70 well-covered locations and may over- or under-state the population; it is directionally robust (a large majority of stores are weekend-heavy).

4.4 Weekly shape

On the size-invariant weekly index (Fig. 4), visitation is roughly flat through the work week at or just below a store’s own mean (Mon 0.93, Tue 0.83, Wed 1.00, Thu 0.96, Fri 1.03), then surges on Saturday to a mean index of 1.50 (50% above a store’s average day) before easing back to just below the mean on Sunday (0.96). Saturday is therefore the single strongest trading day across the network, and its magnitude—roughly $1.8\times$ the Tuesday trough—is the second headline pattern after the hourly concentration.

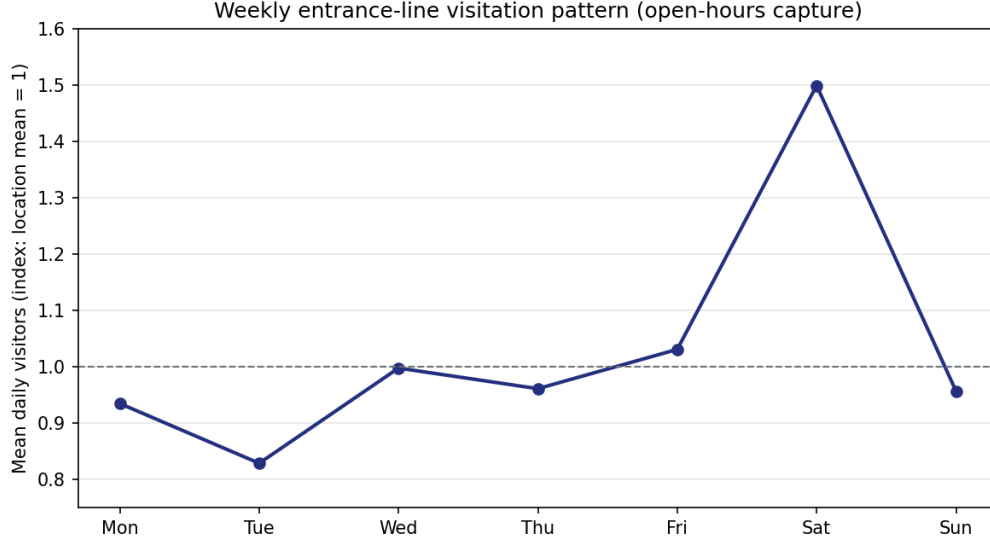


Figure 4: Weekly visitation shape: mean daily total indexed to each location’s own overall mean (size-invariant). Saturday peaks at index 1.50; Tuesday is the trough at 0.83.

5 Validation & Quality

5.1 Quality controls

- **Reproducibility.** Every number in this paper is produced by the project’s analysis script and written to its results file; the figures and tables are generated by that same script. Re-running the script reproduces the numbers byte-for-byte (verified across two independent runs; the $N=186$ cohort and all headline metrics matched exactly).
- **Observed, not forecast.** The series analysed is the canonical observed measurement. No forecast values enter any figure or number; observed and forecast are kept strictly separate.
- **Open-hours only.** Daily totals and hourly shares are computed on open-hours capture only. We do not sum the per-zone counters: all aggregation is at the location (entrance-line) level.
- **Coverage guard.** The cohort and complete-day filters are the principal validity control. The 230 raw timezone locations drop to 186 once we require a stable window and ≥ 7 complete days; single-hour artefacts (35 locations) are excluded. This trades a moderate loss of breadth for a material gain in measurement integrity.
- **Timezone correctness.** Hour-of-day and day-of-week values are computed on each store’s timezone-converted local wall-clock, never on the raw UTC wall-clock. This ensures the reported trading hours are true local hours.

5.2 Limitations

1. **Weekend coverage asymmetry.** Only $n=70$ locations have both a complete weekday and a complete weekend day in the window; the weekend/weekday ratio is computed on that subset and should be read with its n in hand. The weekly-index result (§2.2, measure 4) is more broadly based (all 186 locations; 5 697 complete days).

2. **Empirical windows.** Because the scheduled-hours table is not populated for the observed set, each location’s open-hours window is recovered from its most common uninterrupted hour block, not from an authoritative schedule. A store that genuinely opened or closed early in the window could be marginally mis-windowed; the effect on the median open/close hours is small because the windows are computed per location from many days.
3. **Partial captures.** A non-trivial share of raw location–days are partial captures. We exclude them by design; this is a feature of the method, not a hidden filter.
4. **Crossing counts, not people.** Figures are entrance-line crossings, not unique individuals. Absolute magnitudes are therefore event counts; all *share* and *index* patterns are unaffected by this convention (a uniform counting factor cancels in ratios).

6 Glossary

For a non-specialist reader:

Entrance-zone visitor counter the canonical observed series that counts crossings of a store’s entrance line each hour (open hours only). A *crossing* is an entry event, not a unique person.

Complete location–day a store–day in which every one of the store’s open hours was recorded. Only complete days enter the analysis, so daily totals are never under-counted by missing hours.

Modal the most common value (e.g. the modal open hour is the hour most stores open).

Index a store–day-of-week’s mean footfall divided by that store’s own overall mean, so 1.0 is an average day, 1.5 is 50% above it.

Top-3 hours the three busiest hours of a store–day combined.

Open-hours span how many open hours a store trades per day.

Observed vs. forecast *observed* are measured entrance crossings; *forecast* values are model predictions. This paper reports observed only.

7 Discussion

7.1 What the numbers mean for retail operations

Two patterns dominate and are directly actionable. *First*, footfall is time-compressed: the top three hours of a trading day carry more than half (53.1%) of its visitors, with the modal peak in the early afternoon (14:00–15:00). Staffing, promotion scheduling, and queue capacity should be built around a narrow early-afternoon peak rather than a flat day. *Second*, the week breathes: Saturday is 50% above a store’s average day and roughly 1.8× the Tuesday trough, and weekends are ~1.6–1.8× weekdays among well-covered stores. Together, these two facts mean the “busy period” a retailer must design for is a Saturday early-afternoon band.

7.2 Relevance in practice

These are exactly the entrance-structure facts that a retailer, analyst, or property team wants answered (“when is my store busiest?”, “how do weekends compare to weekdays?”), and they are now grounded in observed, reproducible data rather than assumption. The peak-hour concentration and the Saturday surge, read together as a compact “when people come” summary, are a strong, defensible way to communicate a store’s week.

7.3 Future work

- *Per-format and per-region decomposition* (mall anchors vs. high-street; the late-hours tail).
- *Cross-zone comparison* using the per-zone counters—without summing them into location totals—to see how dwell and non-entrance zones shift through the day.
- *Forecast–observed confrontation* (a follow-on) once forecast values are available as a separately-labelled series, to compare how well predictions track the observed structure.
- *Store-hours reconciliation* to replace empirically recovered windows with authoritative schedules where available.

References

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